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In cooperation with
Regents of the University
of California (Agricultural
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United States Department
of Agriculture, Forest
Service

Soil Survey of Yuba County, California



How to Use This Soil Survey

General Soil Map

The general soil map, which is the color 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 color-coded map legend, then refer to the section **General Soil Map Units** for a general description of the soils in your area.

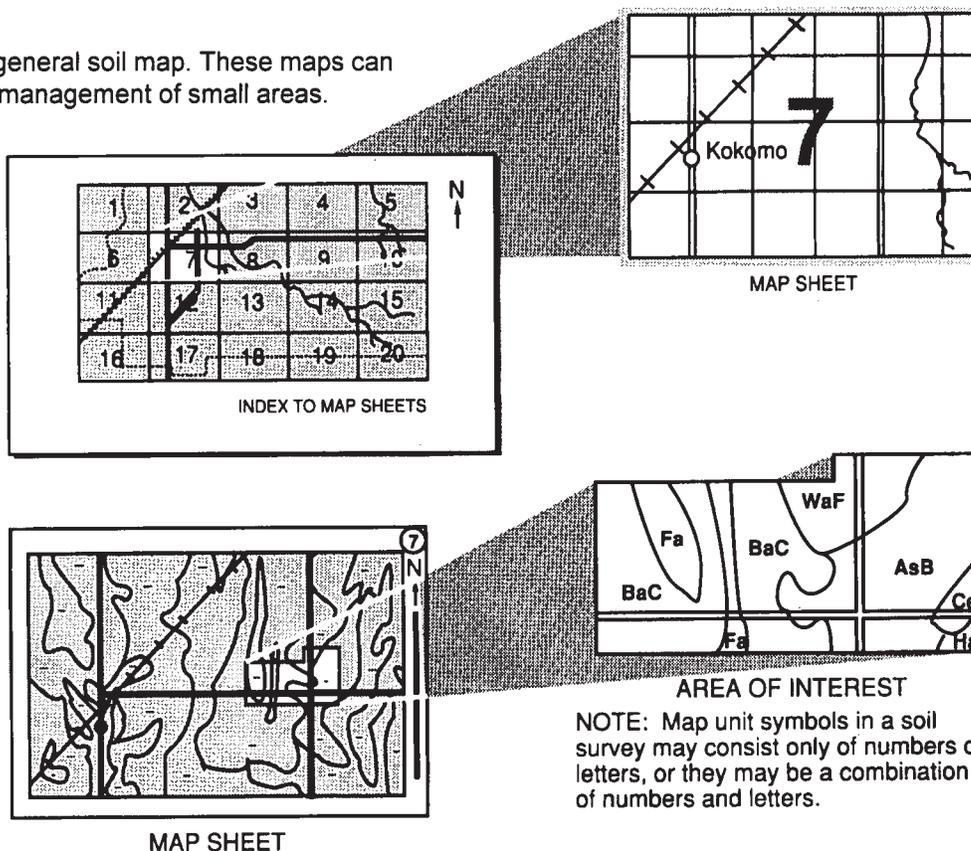
Detailed Soil Maps

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 units 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.

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.



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.

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

Major fieldwork for this soil survey was completed in 1987. Soil names and descriptions were approved in 1992. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1987. This survey was made cooperatively by the Natural Resources Conservation Service, the Regents of the University of California (Agricultural Experiment Station), and the United States Department of Agriculture, Forest Service. The survey is part of the technical assistance furnished to the Yuba County Resource Conservation District.

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

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Cover: Small pond and pasture in an area of Auburn-Sobrante complex, gravelly, 3 to 8 percent slopes.

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Foreword

This soil survey contains information that affects land use planning in this survey area. It contains predictions of soil behavior for selected land uses. The survey also highlights soil limitations, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

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

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

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

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

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Soil Survey of Yuba County, California

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United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with Regents of the University of California (Agricultural Experiment Station) and United States Department of Agriculture, Forest Service

YUBA COUNTY is in the northern part of California (fig. 1). It has an area of 412,116 acres, or about 644 square miles. It is bounded on the north by Butte and Plumas Counties, on the east by Sierra and Nevada Counties, on the south by the Bear River and Placer and Sutter Counties, and on the west by the Feather River and Sutter County.

About one-third of the acreage in the county is used for agriculture; one-third is used for livestock grazing, wildlife habitat, and other purposes; and one-third is used for commercial timber production. A few areas are used for urban development. Elevation ranges from about 4,825 feet in the Sierra Nevada to about 20 feet near the southwestern boundary of the county, in an area along the Feather River.

This soil survey updates the soil surveys of the Marysville area, the Sacramento Valley, and the Yuba area, which were published in 1911, 1915, and 1969, respectively. It provides additional information and has larger maps, which show the soils in greater detail.

General Nature of the Survey Area

The paragraphs that follow provide general information about the county. They describe history and development, water supply, agriculture, geology and physiography, and climate.

History and Development

Maidu Indians inhabited the area now known as Yuba County before settlers arrived. Yuba is the name of a tribe that lived along the Feather River. Perhaps the first explorer to cross the area was Gabriel Moraga in 1808.

The first settlement was made by Captain John A. Sutter in the winter of 1841-1842. His New Helvetia Mexican land grant included portions of both Yuba and Sutter Counties. Settlement accelerated during the gold rush beginning in 1848. Mining, lumber, livestock, and farming enterprises soon became important industries. A multitude of related industries developed in Marysville, which soon became a major California city.

From about 1848 to 1860, gold was mined in all of the rivers and small streams in the county. After strikes on the rivers began to fail around 1855, hydraulic mining started. Large amounts of sediment were washed into the Yuba River from mines, such as the ones in and around Smartsville. "The effects of mining debris first began to be seriously felt about 1860. * * * The flood left a sediment on Bear River about 2 feet thick, and created great alarm" (Chamberlain and Wells, 1879). The Feather River, which had previously been navigable to Marysville, was now navigable only to Nicholas (Chamberlain and Wells, 1879). Farmers filed suit and obtained an injunction to stop the hydraulic mining. The channel of the Yuba River at Marysville rose about 19 feet from 1849 to 1905. The



Figure 1.—Location of Yuba County in California.

river continued to fill with sediment after hydraulic mining ceased. In 1904, a concrete barrier was built above Marysville to trap the bed load. In 1904, the barrier was 6 feet high, but it filled the following year. Another 8 feet was added in 1905. By 1907, this higher barrier also filled with sediment, and in that year it was destroyed by a major flood and never rebuilt (Gilbert, 1917).

As a result of a suit filed by the mining industry, G.K. Gilbert from the U.S. Geologic Survey studied the effects of continued hydraulic mining on the river system. He was able to show that although the effects of sediment from hydraulic mining may have been managed in relation to farming through such controls as levees, the sediment was beginning to fill in San Francisco Bay and would eventually interrupt the shipping industry. Eight times the amount of material excavated from the Panama Canal had come down the rivers (Gilbert, 1917).

Flooding had always occurred, but hydraulic mining had worsened the problem. Regarding an 1862 flood, the Marysville Appeal stated, "Westward one vast water level stretched to Yuba City, where kindred inundation was raging, the entire town being under water. Beyond this to the foothills of the coast range there appeared to be no dry land" (Chamberlain and Wells, 1879).

As a result of the flooding, levees were constructed on

the Feather, Yuba, and Bear Rivers, first by private individuals, then by local units of government. Most of the major levees were begun in the early 1860's and completed by the early 1900's. Flooding continues as a problem today.

In 1905, dredger mining began on the Yuba River, and it still continues today with dredging of the old tailings (fig. 2). About 10,000 acres that originally consisted of deep, fertile soils is now dredger tailings.

With the decline of mining activities in the 1860's and 1870's, many people returned to lumber, livestock, and farming enterprises in the area and agriculture boomed. By 1870, lumbering was a large industry in and around Challenge. Sawmills around Challenge employed several hundred people. Near the peak of operations in 1886, mills around Challenge and Woodville produced eight million board feet. Flumes were initially used to transport logs and wood products and were partially replaced later by a small railroad. The operators produced a wide variety of wood products, including railroad ties, lumber, posts, shakes, firewood, and boxes (McDonald and Lahore, 1984).

Large herds of cattle, sheep, and horses were raised in the foothills of Yuba County beginning in the early 1840's. Captain John Sutter had about 5,000 head of cattle and 1,200 horses. Hay was cut from the river bottoms to supply livestock both locally and in other areas. Large areas of oaks were cut to supply firewood for local use and for steamboats (Chamberlain and Wells, 1879).

The agricultural development of this portion of the Sacramento Valley began with the growth of a few acres of grain by one Theodore Cordua, in 1845, near the present site of Hock farm. The success of this attempt led to a rapid increase in grain production. By 1856, the supply exceeded the amount that was needed for home consumption and John Sutter shipped a considerable quantity to Alaska to supply Russian settlements in that region. By 1861, the supply of California wheat had so increased that it was being shipped to foreign ports (Strathorn and others, 1911).

For many years the settlement of the valley was confined to distances within easy reach of the larger rivers, as the sole method of shipping produce and receiving supplies was by steamers plying these streams. The outlying plains were devoted to the cattle business until the construction of the railroad (1866) gave this region an easy method of transportation, and the entire region was then given over to the production of wheat. The virgin soils of these plains were high in humus, retained moisture well, and yields of 20 to 40 and even 60 bushels per acre in favorable localities were not uncommon. As the grain was allowed to stand in the field



Figure 2.—Dredger mine tailings in the background. The Yuba River is in the foreground.

until dead ripe, considerable shelling took place, and from this volunteer crops equal to or even larger than the preceding ones were not uncommon. This method of cropping continued year after year, with the result that the original organic matter in the soil was exhausted and the power of the soil to retain moisture was lost. Then came the decline in the yield of the grain, and in excessively dry years the crop was not thrashed. Then followed the practice of summer fallowing to conserve the moisture of two seasons. After the grain was removed the land was plowed as early in the fall as the moisture conditions would permit. The succeeding fall would see the land sown to grain either without further preparation of the soil or with a light plowing. In spite of this the yield of grain has continued to decline steadily (Strathorn and others, 1911).

By 1909, nonirrigated peaches, prunes, almonds, grapes, alfalfa, and hops were grown on a considerable acreage. Some water was diverted from the rivers for irrigation in the late 1800's, but the irrigated acreage increased most rapidly after 1910 (Strathorn and others,

1911). Currently, most of the farmland in the county is irrigated. Water supplies are still being developed.

Water Supply

Irrigation, domestic, and industrial water is obtained from precipitation, ground water, and the major streams. Wells supply the major portion of irrigation water. The depth of ground water is generally less than 200 feet, except for the southeastern part of the county, where water levels are declining. Ground water is generally abundant and of excellent quality. Water is diverted or pumped from most of the major streams and rivers in the county. Browns Valley Irrigation District was one of the first to divert water from the Yuba River to irrigate the foothills of the county. Numerous dams have been constructed to control flooding, generate electricity, and provide irrigation water. The major ones are New Bullards Bar and Englebright on the Yuba River and Camp Far West on the Bear River.

Agriculture

Suitable soils, a long growing season, and abundant irrigation water are responsible for an intensive and diversified agricultural industry in Yuba County. About 135,000 acres is intensively used for fruit, nut, grain, vegetable, and seed crops. More than 30 crops are grown commercially. Fruit and nut trees and vegetable and seed crops are grown mainly on the deep, fertile, alluvial soils along the rivers. Small grain is grown mainly on the fine textured soils and claypan soils farther from the rivers.

Geology and Physiography

Assistance in preparing this section was provided by Jerry M. Curry, State Geologist, Natural Resources Conservation Service.

Yuba County is in part of two geomorphic provinces—the Sierra Nevada and the Central Valley. The county is on the east-central edge of the Sacramento Valley, which is the northern part of the Central Valley of California, and extends eastward into the Sierra Nevada. The Central Valley is surrounded on all sides by mountains, except where the Sacramento River from the north and the San Joaquin River from the south join and enter San Francisco Bay.

Sierra Nevada

California is the product of a prolonged head-on collision between the leading western edge of North America and the floor of the Pacific Ocean. When the moving floor of the Pacific Ocean began to slide beneath the edge of the continent, thick deposits of sediment near shore were crushed together and jammed onto the old continent, making the crumpled metamorphic rocks of the Sierra Nevada and wrecking what was once a quiet coastal plain. Generous slices of the black sea floor itself were incorporated within the sediments, becoming the broad belts of dark rocks that lace through the mountain range. In Yuba County these metamorphic rocks are part of the Smartville complex, a complicated assemblage of metamorphosed sedimentary and volcanic rocks of Paleozoic and Mesozoic age thought to be an ophiolite, "a characteristic sequence of rocks generally believed to represent a fragment of oceanic crust and mantle tectonically emplaced on land" (Buer, 1979). As the movement of the two plates continued, the Coast Range was formed near the seaward edge. While the younger sediments were accumulating to form the Coast Range, molten magma rose from the descending slab of sea floor into the Sierra Nevada rocks that had already formed. Some of the new magma erupted at the surface, but most of it solidified within the crust to become the masses of granitic rocks in Yuba County, now deeply exposed by

erosion. The tremendous quantity of heat that was generated by the eruption of the magma cooked the crumpled sedimentary rocks and welded them into solid metamorphic rocks that form the western foothills. This catastrophic activity began about 200 million years ago and continued for about 100 million years. The Sierra Nevada remained generally quiet during the next 40 or 50 million years. The climate was warm and rainy during much of this long time, and the soils in the western foothills of the Sierra Nevada formed.

The millions of years of warm rain attacked the gold-bearing veins of the "Mother Lode," decomposing the quartz and releasing the gold, unchanged, into the soil and ultimately into streams. Gold is very heavy, so it works its way downward through stream gravel to bedrock, where it lags behind and accumulates as lighter minerals are swept onward by floods. The big placer gold deposits of California began their long history of accumulation during this period, while the rocks in the Sierra Nevada were weathering and eroding under the warm, humid climate.

The long period of geologic quiet ended about 15 or 20 million years ago. A large portion of the earth's crust, from the present Sierra Nevada eastward, began to stretch and break into large blocks. The largest and westernmost of these blocks is the Sierra Nevada. It rose along faults that define the east face of the present range, tilting the land surface westward. More volcanic eruptions producing basalt lava flows and clouds of volcanic ash accompanied the new movements of the earth's crust. These eruptions mantled large areas of the Sierra Nevada under blankets of white volcanic ash and poured lava and debris down streambeds, partially filling some of the blocked valleys. New streams formed, eroding new valleys across the abandoned channels of the old ones, now mostly buried beneath blankets of volcanic debris. These are the streams that flow today and the ones in which prospectors first found placer gold.

In the western part of the Sierra Nevada in Yuba County, these numerous perennial and intermittent streams generally flow west and south, eventually to the Feather River. They often bisect the ridges that are oriented northwest to southeast. Elevation increases from about 200 feet near the Central Valley on the west to about 1,900 feet.

The eastern part of the Sierra Nevada in Yuba County is drained west and south into the deeply entrenched Yuba River. The area is a complex of round, smooth ridgetops, steep mountainsides, and very steep canyons. Elevation increases from about 1,900 feet in the foothills to about 4,825 feet.

Uplift of the Sierra Nevada and development of the modern landscape are both far from complete. The modern streams have only begun the long process of

carving a new landscape into the old surface tilted upward by faulting just a few million years ago. Active faults are in the Sierras. Since the 1975 Oroville earthquake, the western foothills of the Sierras are considered potentially very active.

Central Valley

Situated between the Sierra Nevada on the east and the Coast Range on the west, the Central Valley is a long, narrow, northwest-trending structural trough formed by the westward tilting of the Sierra Nevada. In this great trench, accumulated sediments locally may have reached a thickness of 10 miles in the Sacramento Valley. Most of the sediments in the Sacramento Valley consist of Upper Jurassic and Cretaceous sandstone and siltstone of marine origin. About 1.5 million years ago, the Sacramento Valley had filled to sea level and became more or less dry land.

The Central Valley part of the county is drained west and south into the Feather River. Elevation decreases from about 200 feet near the foothills of the Sierra Nevada to about 20 feet on the flood plain along the Feather River on the western edge of the county.

Climate

Yuba County has a climate that is characterized by hot, dry summers and cool, moist winters in the valley and lower foothills and by warm, dry summers and cold, wet winters in the upper foothills and in the mountains. The Coast Range to the east diverts the direct flow of marine air from the Pacific Ocean. The Sierra Nevada to the west shields the county from the cold continental winter climate to the east.

Table 1 gives data on air temperature and precipitation for Marysville, California, in the period 1961 to 1990. Figure 3 shows the mean annual precipitation for the county. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season. Table 4 provides data on soil temperature.

Air Temperature

In winter, the average temperature is 47.6 degrees and the average daily minimum temperature is 38.7 degrees at Marysville. The lowest temperature on record, which occurred at Marysville on December 22, 1990, is 17 degrees. In summer, the average temperature is 76.9 degrees and the average daily maximum temperature is 93.5 degrees at Marysville. The highest recorded temperature, which occurred at Marysville on June 16, 1961, is 113 degrees.

Growing Degree Days

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

Precipitation

Precipitation increases with increasing elevation in Yuba County (California DWR, 1966). The total annual precipitation is 21.04 inches at Marysville, on the eastern edge of the county, at an elevation of 65 feet. Of this, more than 7 inches, or nearly 34 percent, usually falls in March through October. The growing season for most crops falls within this period. The heaviest 1-day rainfall during the period of record at Marysville was 7.29 inches on December 15, 1983. Thunderstorms occur on about 5 days each year, and most occur in April.

Snowfall is rare. At Marysville, the greatest snow depth at any one time during the period of record and the heaviest 1-day snowfall on record were 1 inch on December 13, 1972.

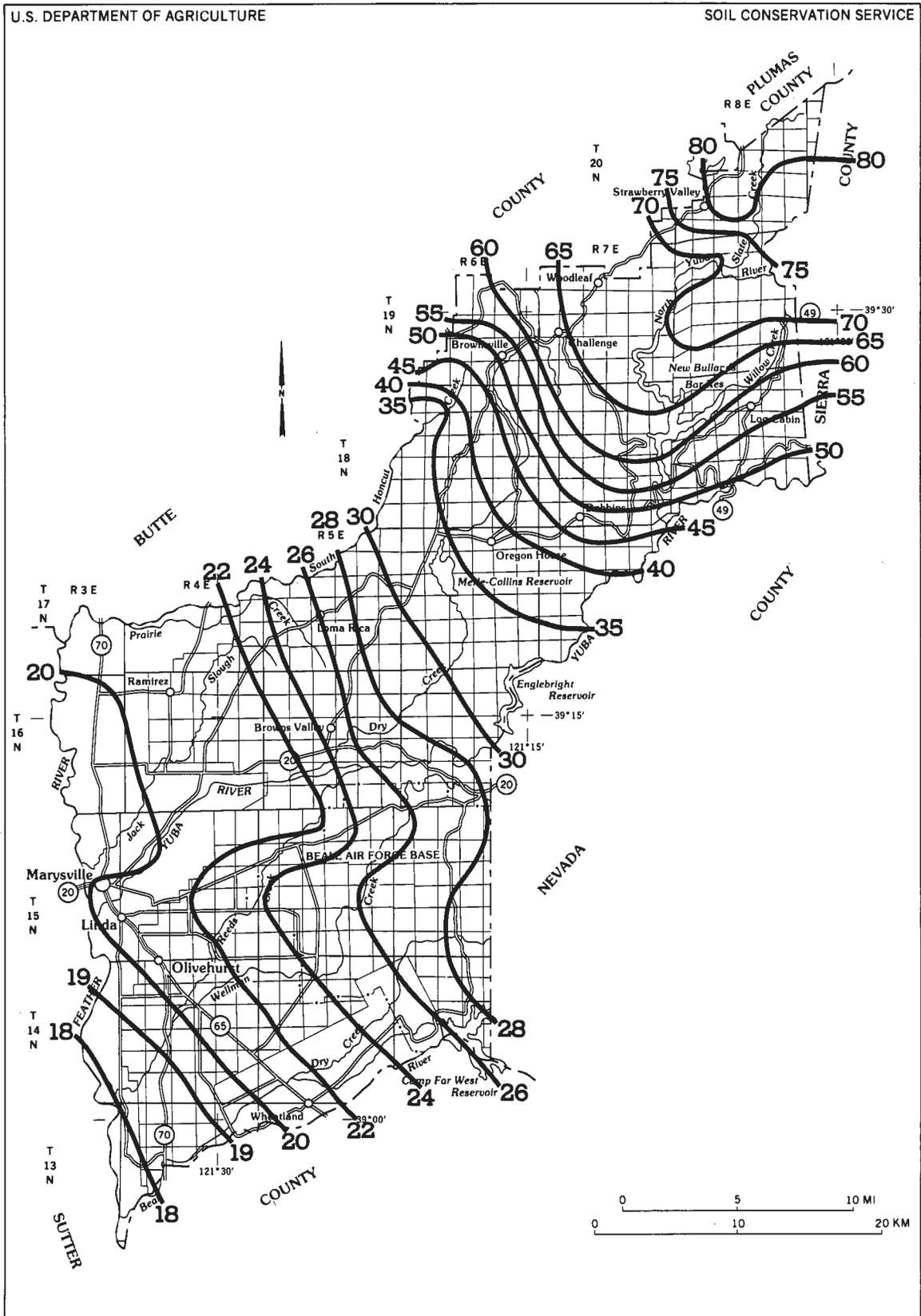
In some years heavy amounts of spring rainfall from persisting subtropical storms combine with snowmelt to cause flooding, especially along the rivers and streams in the valley.

Winds

At Marysville, the prevailing wind is from the southwest and the average windspeed is highest, about 9.8 miles per hour, in June. The southwesterly winds in the valley are the result of the north-south orientation and heating of the Sacramento Valley, which deflects the westerly winds coming through the Carquinez Straits northward. Occasionally, strong northerly winds occur. Late in winter and early in spring, these winds bring cold, dry weather. Late in spring and early in summer, these same north winds cause pronounced heat waves and can remove moisture from the soil, dry out crops, and cause a serious fire hazard, especially in the foothills. In the upper foothills and in the mountains, the direction of the wind conforms more closely with the free-flowing westerly winds over northern California.

Relative Humidity

At Marysville, the average relative humidity is about 46 percent in midafternoon, is higher at night, and is about 83 percent at dawn. In the valley the relative humidity averages less than 20 percent on hot summer afternoons and occasionally drops to less than 10 percent when



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Figure 3.—Annual precipitation, in inches, in Yuba County.

winds blow from the north. At night the summer humidities range from about 50 to 60 percent. In the winter, relative humidities range from about 60 to 70 percent during the day to nearly 90 percent at night. No humidity figures are available for the mountain areas, but it is likely that the relative humidities are roughly 10 percent higher than in the valley.

At times of low wind velocities in winter, cold air drainage from the surrounding uplands and the relatively moist, warm soil cause fog to form in the valley and the lower foothills. These periods of fog may last several days to several weeks.

Soil Temperature

Soil temperature is one of the important properties of a soil. Within limits, it controls the possibilities of plant growth and soil formation. Between temperatures of 32 and 42 degrees F, the roots of most plants cannot grow and the germination of most seeds is impossible. The soil does not really come to life until its temperature exceeds about 42 degrees F, and the pace quickens rapidly as the temperature rises above 45 degrees F (Smith and others, 1964).

In Yuba County soil temperature generally decreases with increasing elevation (Lytle, 1987). Aspect, or direction of slope exposure, also influences soil temperature. Soil temperatures are higher, on average, on south and west exposures than on north and east exposures. Also, as the angle of slope increases, the amount of radiant energy received in an area decreases. The steeper the slope, the lower the soil temperature, on average.

In the areas of Yuba County that have a tree canopy and a layer of litter, soil temperature extremes are moderated. The canopy and the litter protect the soil from excessively high summer temperatures by interception of solar radiation, and they reduce the rate of heat loss from the soil during the winter. The influence of the canopy on soil temperature is greater in summer than in winter. In summer the soil temperature is appreciably higher in open areas than under a dense canopy. At the higher elevations in the county, the tree canopy and litter may prevent frost penetration or reduce the depth to which frost penetrates in winter.

Table 4 shows the mean monthly soil temperature and mean annual soil temperature for five sites in Yuba County. Soil temperatures were taken monthly at a depth of 20 inches from August 1982 to November 1985. The Beale AFB site had a 100-percent canopy of annual grass. The U.C. Sierra Field Station site had a 27-percent canopy of trees and shrubs and a 60-percent canopy of grasses and forbs. It was on a southwest-facing slope of 7 percent. The Dobbins site had a 95-percent canopy of trees and shrubs and a 5-percent canopy of grasses and

forbs. It was on a southwest-facing slope of 15 percent. The Challenge site had a 100-percent canopy of trees and shrubs. It was on a northwest-facing slope of 5 percent. The Strawberry Valley site had a 50-percent canopy of trees and shrubs. It was on a northwest-facing slope of 20 percent.

The soil temperatures shown in table 4 can be used as a guide to seeding and planting in Yuba County. For instance, if ponderosa pine seedlings are planted at Strawberry Valley, planting should be delayed in the spring until the soil temperature at a depth of about 4 inches is above about 45 degrees F and rising. More detailed information can be obtained from the Natural Resources Conservation Service, the Forest Service, or Cooperative Extension Service.

How This Survey Was Made

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

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

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

landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

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

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

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

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

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

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

General Soil Map Units

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

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

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

The general soil map units in this survey area have been grouped for broad interpretive purposes. Each of the broad groups and the map units in each group are described on the following pages.

Map Unit Descriptions

Soils on Flood Plains and Terraces

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

1. Columbia-Holillipah-Shanghai

Very deep, somewhat poorly drained or somewhat excessively drained, alluvial soils; on flood plains

This map unit is along the Feather, Bear, and Yuba Rivers. The soils in this unit formed in alluvium. The native vegetation is oaks, shrubs, forbs, and grasses. Elevation ranges from 20 to 150 feet.

This unit makes up about 6 percent of the survey area. It is about 34 percent Columbia soils, 22 percent Holillipah soils, and 18 percent Shanghai soils. The remaining 26 percent is components of minor extent.

Typically, the somewhat poorly drained Columbia soils have a surface layer of fine sandy loam. The underlying material is stratified silt loam, fine sandy loam, very fine sandy loam, and fine sand. Slope is 0 to 1 percent.

Typically, the somewhat excessively drained Holillipah soils have a surface layer of loamy sand. The underlying material is stratified sand, loamy fine sand, and fine sandy loam. Slope is 0 to 1 percent.

Typically, the somewhat poorly drained Shanghai soils have a surface layer of silt loam. The underlying material is stratified silt, silt loam, fine sandy loam, and silty clay loam. Slope is 0 to 1 percent.

Of minor extent in this unit are Tujung, Horst, and Feather soils; Urban land; Riverwash; Pits, sand; and Dumps, mine tailings.

This unit is used for irrigated orchard crops, mainly peaches, walnuts, prunes, pears, and almonds. The other crops include kiwis. Some areas are used for nonirrigated wheat or barley. The unit is limited by a hazard of flooding inside levees. Where protected from flooding, Columbia and Shanghai soils are limited by a seasonal high water table and Holillipah soils are limited by a low available water capacity.

2. Dumps, Mine Tailings

Very deep material dredged from river channels and flood plains during gold mining; on flood plains

This map unit is along the Yuba River. The native vegetation is mainly sparse annual grasses with scattered willows and cottonwoods. Elevation ranges from 90 to 175 feet.

This unit makes up 2 percent of the survey area. It is about 81 percent Dumps, mine tailings. The remaining 19 percent is components of minor extent.

Dumps, mine tailings, consist of very deep material that was dredged from river channels and flood plains during gold mining and was left mounded in long, narrow tailing piles.

Of minor extent in this unit is Riverwash.

This unit is used mainly as a source of construction material, such as sand and gravel. It also is used for wildlife habitat and recreation.

3. Conejo-Kilaga

Very deep or deep, well drained, alluvial soils; on stream terraces

This map unit is on terraces along the Feather, Yuba, and Bear Rivers and Dry Creek. The soils in this unit formed in alluvium. The native vegetation is oaks, shrubs, forbs, and annual grasses. Elevation ranges from 50 to 150 feet.

This unit makes up about 5 percent of the survey area. It is about 49 percent Conejo soils and 38 percent Kilaga soils. The remaining 13 percent is components of minor extent.

Typically, the very deep Conejo soils have a surface layer of loam. The subsoil is clay loam and loam. Slope ranges from 0 to 2 percent.

Kilaga soils are very deep or deep to a hardpan. Typically, they have a surface layer of clay loam. The subsoil is clay loam, silty clay loam, and silty clay. Below this is a hardpan underlain by siltstone. Slope is 0 to 1 percent.

Of minor extent in this unit are Marysville soils and Urban land.

This unit is used for irrigated orchard crops, mainly prunes, walnuts, and almonds. The other crops include corn. Some areas are used for nonirrigated wheat and barley. Conejo soils have few limitations. Kilaga soils are limited by slow permeability. Some areas are limited by a hazard of flooding.

4. San Joaquin

Moderately well drained, alluvial soils that are moderately deep to a hardpan and have a dense clay subsoil; on low fan terraces

This map unit is in the western part of the survey area. The soils in this unit formed in alluvium. The native vegetation is annual grasses and forbs. Elevation ranges from 30 to 200 feet.

This unit makes up about 23 percent of the survey area. It is about 59 percent San Joaquin soils. The remaining 41 percent is components of minor extent.

Typically, San Joaquin soils have a surface layer of loam. The subsoil is clay and is underlain by a hardpan. Slope ranges from 0 to 3 percent.

Of minor extent in this unit are Capay, Kimball, Perkins, Conejo, Oakdale, Trainer, and Bruella soils; Urban land; and Dumps, landfills.

This unit is used for irrigated crops, mainly rice and corn. Some areas are used for irrigated or nonirrigated pasture or for nonirrigated wheat. San Joaquin soils are limited by very slow permeability and a restricted rooting depth.

5. Redding-Corning-Pardee

Moderately deep, very deep, or shallow, well drained, alluvial soils that have a dense clay subsoil or are underlain by bedrock; on high fan terraces and hills

This map unit is in the western part of the survey area. The soils in this unit formed in alluvium. The native vegetation is annual grasses and forbs. Elevation ranges from 70 to 250 feet.

This unit makes up about 6 percent of the survey area. It is about 64 percent Redding soils, 15 percent Corning soils, and 17 percent Pardee soils. The remaining 4 percent is components of minor extent.

Redding soils are moderately deep to a hardpan. Typically, they have a surface layer of gravelly loam. The subsoil is gravelly loam and clay. Slope ranges from 0 to 8 percent.

Typically, the very deep Corning soils have a surface layer of gravelly loam. The subsoil is gravelly clay and gravelly sandy clay loam. Slope ranges from 2 to 8 percent.

Typically, the shallow Pardee soils have a surface layer of gravelly loam. The subsoil is very cobbly loam. Slope ranges from 1 to 8 percent.

Of minor extent in this unit are Ranchoseco soils.

This unit is used for livestock grazing. Some areas are used for urban or homesite development. Redding and Corning soils are limited by very slow permeability and a restricted rooting depth. Pardee soils are limited by a very low available water capacity and a restricted rooting depth.

Soils on Foothills and Mountains

Two map units are in this group. They make up about 29 percent of the survey area.

6. Sobrante-Auburn

Moderately deep or shallow, well drained soils that formed in material weathered from basic metavolcanic rocks; on foothills

This map unit is in the center of the survey area. The native vegetation is oaks, shrubs, forbs, and annual grasses. Elevation ranges from 125 to 1,900 feet.

This unit makes up about 23 percent of the survey area. It is about 44 percent Sobrante soils and 40 percent Auburn soils. The remaining 16 percent is components of minor extent.

Typically, the moderately deep Sobrante soils have a surface layer and subsoil of loam. Slope ranges from 3 to 75 percent.

Typically, the shallow or moderately deep Auburn soils have a surface layer and subsoil of loam. Slope ranges from 3 to 75 percent.

Of minor extent in this unit are Timbuctoo and Argonaut soils and Rock outcrop.

This unit is used for livestock grazing, woodland, homesite development, and wildlife habitat. It is limited by a restricted soil depth, the slope, and the hazard of water erosion.

7. Flanly-Mildred

Moderately deep, well drained soils that formed in material weathered from acid and basic intrusive igneous rocks; on foothills and mountains

This map unit is in the central part of the survey area. The native vegetation is oaks, shrubs, forbs, and annual grasses. Elevation ranges from 125 to 2,500 feet.

This unit makes up about 6 percent of the survey area. It is about 55 percent Flanly soils and 20 percent Mildred soils. The remaining 25 percent is components of minor extent.

Typically, the moderately deep Flanly soils have a surface layer of sandy loam. The subsoil is sandy loam and loam. Slope ranges from 3 to 75 percent.

Typically, the moderately deep Mildred soils have a surface layer of cobbly loam. The subsoil is cobbly clay loam, clay, and clay loam. Slope ranges from 3 to 50 percent.

Of minor extent in this unit are Orose, Ricecross, and Verjeles soils and Rock outcrop.

This unit is used for livestock grazing, woodland, homesite development, and wildlife habitat. Flanly soils are limited by the slope, the hazard of water erosion, and a restricted rooting depth. Mildred soils are limited by the slope, very slow permeability, the hazard of water erosion, and a restricted rooting depth.

Soils on Mountains

Two map units are in this group. They make up about 29 percent of the survey area.

8. Sites-Surnuf

Deep or very deep, well drained soils that formed in material weathered from metamorphic and basic intrusive igneous rocks

This map unit is in the eastern part of the survey area. The native vegetation is mixed conifers, hardwoods, and shrubs. Elevation ranges from 1,400 to 4,825 feet.

This unit makes up about 21 percent of the survey area. It is about 39 percent Sites soils and 18 percent Surnuf soils. The remaining 43 percent is components of minor extent.

Typically, the deep or very deep Sites soils have a surface layer of loam. The subsoil is clay loam and clay. Slope ranges from 2 to 50 percent.

Typically, the very deep Surnuf soils have a surface layer of loam. The subsoil is clay and clay loam. Slope ranges from 8 to 50 percent.

Of minor extent in this unit are Jocal, Mariposa, Boomer, Deadwood, Hurlbut, Pendola, Aiken, Horseshoe, Slacreek, Woodleaf, and Argovar soils; Fluvaquents; and Rock outcrop.

This unit is used for timber production, homesite development, and wildlife habitat. It is limited by the slope and the hazard of water erosion.

9. Hoda-Hotaw-Holland

Moderately deep or very deep, well drained soils that formed in material weathered from acid intrusive igneous rocks

This map unit is in the eastern part of the survey area. The native vegetation is mixed conifers, hardwoods, and shrubs. Elevation ranges from 1,200 to 4,200 feet.

This unit makes up about 8 percent of the survey area. It is about 23 percent Hoda soils, 16 percent Hotaw soils, and 15 percent Holland soils. The remaining 46 percent is components of minor extent.

Typically, the very deep Hoda soils have a surface layer of sandy loam. The subsoil is clay loam and clay. Slope ranges from 3 to 50 percent.

Typically, the moderately deep Hotaw soils have a surface layer of sandy loam. The subsoil is sandy clay loam. Slope ranges from 5 to 75 percent.

Typically, the very deep Holland soils have a surface layer of loam. The subsoil is clay loam. Slope ranges from 3 to 50 percent.

Of minor extent in this unit are Chawanakee, Chaix, Sites, and Musick soils.

This unit is used mainly for timber production and wildlife habitat. It is limited by the slope and the hazard of water erosion. Hotaw soils also are limited by a restricted rooting depth.

Detailed Soil Map Units

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

A map unit delineation on a map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils or miscellaneous areas. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils and miscellaneous areas are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some "included" areas that belong to other taxonomic classes.

Most included soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, inclusions. They may or may not be mentioned in the map unit description. Other included soils and miscellaneous areas, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, inclusions. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The included areas of contrasting soils or miscellaneous areas are mentioned in the map unit descriptions. A few included areas may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical

to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of included areas in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans, but if intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

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

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

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Columbia fine sandy loam, 0 to 1 percent slopes, occasionally flooded, is a phase of the Columbia series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes. A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Aiken-Horseshoe complex, 2 to 8 percent slopes, is an example.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Riverwash is an example.

Table 5 gives the acreage and proportionate extent of

each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils or miscellaneous areas.

Map Unit Descriptions

101—Aiken-Horseshoe complex, 2 to 8 percent slopes. This unit is on mountains. The native vegetation is mainly mixed conifers and hardwoods with an understory of brush. Elevation is between 3,500 and 4,125 feet. The average annual precipitation is between 75 and 85 inches, the average annual air temperature is between 50 and 54 degrees F, and the average frost-free period is between 140 and 160 days.

This unit is about 40 percent Aiken loam and 40 percent Horseshoe loam.

Included in this unit are small areas of soils that are similar to the Horseshoe soil but have bedrock at a depth of 40 to 60 inches. Also included are small areas of Aiken and Horseshoe soils that have slopes of more than 8 percent. Included areas make up about 20 percent of the total acreage.

The Aiken soil is very deep and well drained. It formed in material weathered from andesitic tuff breccia. Typically, the surface is covered with a mat of partially decomposed leaves, twigs, and needles about 3 inches thick. The surface layer is brown and reddish brown loam about 21 inches thick. The upper 8 inches of the subsoil is yellowish red clay loam. The lower 36 inches is yellowish red clay.

Permeability in the Aiken soil is moderately slow. Available water capacity is about 9 to 10 inches. The effective rooting depth is 60 inches or more. The shrink-swell potential is moderate. Runoff is slow, and the hazard of water erosion is slight.

The Horseshoe soil is very deep and well drained. It formed in material weathered from andesitic tuff breccia. Typically, the surface is covered with a mat of leaves, twigs, bark, and needles about 3 inches thick. The surface layer is brown and yellowish red loam about 15 inches thick. The subsoil is yellowish red, strong brown, and brown loam about 60 inches thick. Weathered andesitic tuff breccia is at a depth of 75 inches.

Permeability in the Horseshoe soil is moderate. Available water capacity is about 8 to 10 inches. The effective rooting depth is 60 inches or more. The shrink-swell potential is moderate. Runoff is slow, and the hazard of water erosion is slight.

This unit is used for timber production and livestock grazing.

Ponderosa pine, Douglas-fir, sugar pine, white fir,

California black oak, and incense cedar are the major tree species. On the basis of a 100-year site curve, the mean site index for ponderosa pine is 149 on the Aiken soil and 147 on the Horseshoe soil. On the basis of a 100-year site curve, the mean site index is 150 for Douglas-fir on the Aiken soil. The yield (CMAI) for ponderosa pine in a fully stocked stand of trees 40 years old is 208 cubic feet per acre on the Aiken soil and 203 cubic feet per acre on the Horseshoe soil. The yield (CMAI) for Douglas-fir on the Aiken soil is 158 cubic feet per acre in a fully stocked stand of trees 60 years old.

The main concerns in producing and harvesting timber are seasonal wetness and plant competition. Conventional methods of harvesting timber can be used. Use of wheeled and tracked equipment when the soils are moist results in the formation of ruts, causes soil compaction, and can damage the roots of trees. Soil compaction may increase the rate of water runoff and decrease timber production. Unsurfaced roads and skid trails are slippery when wet, and they may be impassable during rainy periods. Roads require suitable surfacing for year-round use. Rock for the construction of roads is not readily available in areas of this unit. Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees. Competition from mountain misery on southern exposures in this unit may decrease productivity. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling, which helps to eliminate unwanted weeds, brush, or trees. The characteristic understory plant community on this unit is mainly California black oak, tanoak, deerbrush, common snowberry, and mountain misery.

Where this unit is used for livestock grazing, the main management concern is a dense cover of brush. If trees and shrubs are managed so that open areas are created, this unit can produce a good stand of forage plants.

This unit is in capability units IIe-1 (22), irrigated, and IIIe-1 (22), nonirrigated.

102—Argonaut-Auburn complex, 3 to 8 percent slopes. This unit is on foothills. The native vegetation is mainly blue oak and scattered Digger pine with an understory of annual grasses and forbs. Elevation is between 125 and 1,100 feet. The average annual precipitation is between 22 and 26 inches, the average annual air temperature is between 60 and 62 degrees F, and the average frost-free period is between 250 and 270 days.

This unit is about 40 percent Argonaut loam and 40 percent Auburn loam.

Included in this unit are small areas of Rock outcrop and Sobrante soils and small areas of a soil that is similar to the Argonaut soil but has bedrock at a depth of 40 to 60

inches. Also included are small areas of seeps, wet spots, and small areas of a soil that is similar to the Auburn soil but has a subsoil of clay loam. Included areas make up about 20 percent of the total acreage.

The Argonaut soil is moderately deep and well drained. It formed in material weathered from basic metavolcanic rocks. Typically, the surface layer is brown and strong brown loam about 7 inches thick. The upper 7 inches of the subsoil is yellowish red loam. The next 7 inches is yellowish red clay loam. The lower 14 inches is strong brown and brown clay. Weathered greenstone is at a depth of 35 inches. In some areas the surface layer is gravelly loam.

Permeability in the Argonaut soil is very slow. Available water capacity is about 4 to 6 inches. The effective rooting depth is restricted by bedrock at a depth of 20 to 40 inches. The dense clay subsoil restricts the movement of water and air and root penetration. For insignificant periods after heavy rainstorms from December through April, there is a perched water table above the claypan. The shrink-swell potential is high. Runoff is slow, and the hazard of water erosion is slight.

The Auburn soil is shallow or moderately deep and is well drained. It formed in material weathered from basic metavolcanic rocks. Typically, the surface layer is brown loam about 2 inches thick. The subsoil is reddish brown and yellowish red loam about 15 inches thick. Hard amphibolite schist is at a depth of 17 inches.

Permeability in the Auburn soil is moderate. Available water capacity is about 2 to 3 inches. The effective rooting depth is restricted by bedrock at a depth of 10 to 28 inches. Runoff is slow, and the hazard of water erosion is slight.

This unit is used mainly for woodland and livestock grazing. It also is used for homesite development, irrigated pasture, and wildlife habitat.

Blue oak is the major tree species. On the Argonaut soil, volumes of 19 to 20 cords per acre of blue oak with an average diameter of about 10 inches have been measured. On the Auburn soil, volumes of approximately 24 to 50 cords per acre of blue oak with an average diameter of about 10 inches have been measured. Careful harvesting is needed to allow the stand to regenerate through oak stump sprouting and to minimize water erosion when the plant cover is disturbed.

Few limitations affect livestock grazing on this unit. Grazing should be delayed until the soils are firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. If this unit is grazed by livestock when the soils are too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. If the range

is overgrazed, the proportion of preferred forage plants decreases and the proportion of the less preferred forage plants increases. Livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. This unit responds well to applications of fertilizer, to range seeding, and to proper grazing use. The characteristic understory plant community on this unit is mainly soft chess, wild oat, riggut brome, and rose clover.

If this unit is used for homesite development, the main management concerns are the very slow permeability, high shrink-swell potential, and limited depth of the Argonaut soil. If the Argonaut soil is used for septic tank absorption fields, the very slow permeability can be overcome by increasing the size of the absorption field and providing sandy backfill for the trench. If buildings are constructed on the Argonaut soil, properly designing foundations and footings and diverting runoff away from the buildings help to prevent the structural damage caused by shrinking and swelling. The cuts needed to provide essentially level building sites can expose bedrock. Because of the limited soil depth and the very slow permeability, onsite sewage disposal systems often fail or do not function properly during periods of high rainfall. If the density of housing is moderate or high, community sewage systems are needed to prevent the contamination of water supplies caused by seepage from onsite sewage disposal systems. Plans for homesite development should provide for the preservation of as many trees as possible. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

If this unit is used for irrigated pasture, the main management concerns are very slow permeability and limited soil depth. Only the plants adapted to a limited rooting depth should be selected for planting. Because of the very slow permeability in the Argonaut soil, adjustment of the length of irrigation runs is needed to permit adequate infiltration of water. Carefully applying irrigation water helps to prevent the buildup of a water table above the clay layer. A drainage system may be needed. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition. Periodic mowing and clipping help to maintain uniform growth and discourage selective grazing. Fertilizer is needed to ensure the optimum growth of grasses and legumes.

This unit provides habitat for wildlife, such as deer, birds of prey, upland game birds, other birds, and small fur-bearing mammals. Habitat for quail can be improved by building brush piles, especially in areas adjacent to water. Oaks should be maintained as a source of feed and cover for wild turkeys and deer. Planting and

maintaining shrubs and other woody plants in wet areas and in areas adjacent to drainageways improve the habitat.

This unit is in capability unit IVe-8 (18), irrigated and nonirrigated.

103—Argonaut-Auburn complex, 8 to 15 percent slopes. This unit is on foothills. The native vegetation is mainly blue oak and scattered Digger pine with an understory of annual grasses and forbs. Elevation is between 125 and 1,100 feet. The average annual precipitation is between 22 and 26 inches, the average annual air temperature is between 60 and 62 degrees F, and the average frost-free period is between 250 and 270 days.

This unit is about 40 percent Argonaut loam and 40 percent Auburn loam.

Included in this unit are small areas of Rock outcrop and Sobrante soils and small areas of a soil that is similar to the Argonaut soil but has bedrock at a depth of 40 to 60 inches. Also included are small areas of seeps, wet spots, and small areas of a soil that is similar to the Auburn soil but has a subsoil of clay loam. Included areas make up about 20 percent of the total acreage.

The Argonaut soil is moderately deep and well drained. It formed in material weathered from basic metavolcanic rocks. Typically, the surface layer is brown and strong brown loam about 7 inches thick. The upper 7 inches of the subsoil is yellowish red loam. The next 7 inches is yellowish red clay loam. The lower 14 inches is strong brown and brown clay. Weathered greenstone is at a depth of 35 inches. In some areas the surface layer is gravelly loam.

Permeability in the Argonaut soil is very slow. Available water capacity is about 4 to 6 inches. The effective rooting depth is restricted by bedrock at a depth of 20 to 40 inches. The dense clay subsoil restricts the movement of water and air and root penetration. For insignificant periods after heavy rainstorms from December through April, there is a perched water table above the claypan. The shrink-swell potential is high. Runoff is medium, and the hazard of water erosion is moderate.

The Auburn soil is shallow or moderately deep and is well drained. It formed in material weathered from basic metavolcanic rocks. Typically, the surface layer is brown loam about 2 inches thick. The subsoil is reddish brown and yellowish red loam about 15 inches thick. Hard amphibolite schist is at a depth of 17 inches.

Permeability in the Auburn soil is moderate. Available water capacity is about 2 to 3 inches. The effective rooting depth is restricted by bedrock at a depth of 10 to 28 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for woodland and livestock

grazing. It also is used for homesite development, irrigated pasture, and wildlife habitat.

Blue oak is the major tree species. On the Argonaut soil, volumes of 19 to 20 cords per acre of blue oak with an average diameter of about 10 inches have been measured. On the Auburn soil, volumes of 24 to 50 cords per acre of blue oak with an average diameter of about 10 inches have been measured. Careful harvesting is needed to allow the stand to regenerate through oak stump sprouting and to minimize water erosion when the plant cover is disturbed.

Few limitations affect livestock grazing on this unit. Grazing should be delayed until the soils are firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. If this unit is grazed by livestock when the soils are too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of the less preferred forage plants increases. Livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. This unit responds well to applications of fertilizer, to range seeding, and to proper grazing use. The characteristic understory plant community on this unit is mainly soft chess, wild oat, riggut brome, and rose clover.

If this unit is used for homesite development, the main management concerns are the very slow permeability, high shrink-swell potential, and limited depth of Argonaut soil as well as the slope and the hazard of water erosion. If the Argonaut soil is used for septic tank absorption fields, the very slow permeability can be overcome by increasing the size of the absorption field and providing sandy backfill for the trench. If buildings are constructed on the Argonaut soil, properly designing foundations and footings and diverting runoff away from the buildings help to prevent the structural damage caused by shrinking and swelling. The cuts needed to provide essentially level building sites can expose bedrock. Erosion is a hazard on construction sites and on road cuts and fills. Only the part of the site that is used for construction should be disturbed. Preserving the existing plant cover during construction helps to control erosion. Mulching and revegetating as soon as possible in disturbed areas, such as road cuts and fills and construction sites, also help to control erosion. Because of the limited soil depth and the very slow permeability, onsite sewage disposal systems often fail or do not function properly during periods of high rainfall. If the density of housing is moderate or high, community sewage systems are needed to prevent the contamination of water supplies caused by seepage from onsite sewage disposal systems. Plans for homesite

development should provide for the preservation of as many trees as possible. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

If this unit is used for irrigated pasture, the main management concerns are very slow permeability and limited soil depth. Only the plants adapted to a limited rooting depth should be selected for planting. Because of the very slow permeability in the Argonaut soil, adjustment of the length of irrigation runs is needed to permit adequate infiltration of water. Carefully applying irrigation water helps to prevent the buildup of a water table above the clay layer. A drainage system may be needed. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and control erosion. Periodic mowing and clipping help to maintain uniform growth and discourage selective grazing. Fertilizer is needed to ensure the optimum growth of grasses and legumes.

This unit provides habitat for wildlife, such as deer, birds of prey, upland game birds, other birds, and small fur-bearing mammals. Habitat for quail can be improved by building brush piles, especially in areas adjacent to water. Oaks should be maintained as a source of feed and cover for wild turkey and deer. Planting and maintaining shrubs and other woody plants in wet areas and in areas adjacent to drainageways improve the habitat.

This unit is in capability unit IVe-8 (18), irrigated and nonirrigated.

104—Argonaut-Auburn complex, 15 to 30 percent slopes. This unit is on foothills. The native vegetation is mainly blue oak and scattered Digger pine with an understory of annual grasses and forbs. Elevation is between 125 and 1,100 feet. The average annual precipitation is between 22 and 26 inches, the average annual air temperature is between 60 and 62 degrees F, and the average frost-free period is between 250 and 270 days.

This unit is about 40 percent Argonaut loam and 40 percent Auburn loam.

Included in this unit are small areas of Rock outcrop and Sobrante soils and small areas of a soil that is similar to the Argonaut soil but has bedrock at a depth of 40 to 60 inches. Also included are small areas of a soil that is similar to the Auburn soil but has a subsoil of clay loam, small areas of seeps, and wet spots. Included areas make up about 20 percent of the total acreage.

The Argonaut soil is moderately deep and well drained. It formed in material weathered from basic metavolcanic rocks. Typically, the surface layer is brown and strong brown loam about 7 inches thick. The upper 7 inches of the subsoil is yellowish red loam. The next 7 inches is

yellowish red clay loam. The lower 14 inches is strong brown and brown clay. Weathered greenstone is at a depth of 35 inches. In some areas the surface layer is gravelly loam.

Permeability in the Argonaut soil is very slow. Available water capacity is about 4 to 6 inches. The effective rooting depth is restricted by bedrock at a depth of 20 to 40 inches. The dense clay subsoil restricts the movement of water and air and root penetration. For insignificant periods after heavy rainstorms from December through April, there is a perched water table above the claypan. The shrink-swell potential is high. Runoff is rapid, and the hazard of water erosion is severe.

The Auburn soil is shallow or moderately deep and is well drained. It formed in material weathered from basic metavolcanic rocks. Typically, the surface layer is brown loam about 2 inches thick. The subsoil is reddish brown and yellowish red loam about 15 inches thick. Hard amphibolite schist is at a depth of 17 inches.

Permeability in the Auburn soil is moderate. Available water capacity is about 2 to 3 inches. The effective rooting depth is restricted by bedrock at a depth of 10 to 28 inches. Runoff is rapid, and the hazard of water erosion is severe.

This unit is used mainly for woodland and livestock grazing. It also is used for homesite development, irrigated pasture, and wildlife habitat.

Blue oak is the major tree species. On the Argonaut soil, volumes of approximately 19 to 20 cords per acre of blue oak with an average diameter of about 10 inches have been measured. On the Auburn soil, volumes of approximately 24 to 50 cords per acre of blue oak with an average diameter of about 10 inches have been measured. Careful harvesting is needed to allow the stand to regenerate through oak stump sprouting and to minimize water erosion when the plant cover is disturbed.

Few limitations affect livestock grazing on this unit. Grazing should be delayed until the soils are firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. If this unit is grazed by livestock when the soils are too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. Proper management of livestock grazing is needed to control erosion. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of the less preferred forage plants increases. Livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. This unit responds well to applications of fertilizer, to range seeding, and to proper grazing use. The characteristic understory plant community on this unit is mainly soft chess, wild oat, riggut brome, and rose clover.

If this unit is used for homesite development, the main management concerns are the very slow permeability, shrink-swell potential, and limited depth of the Argonaut soil as well as the slope and the hazard of water erosion. If the Argonaut soil is used for septic tank absorption fields, the very slow permeability can be overcome by increasing the size of the absorption field and providing sandy backfill for the trench. If buildings are constructed on the Argonaut soil, properly designing foundations and footings and diverting runoff away from the buildings help to prevent the structural damage caused by shrinking and swelling. The cuts needed to provide essentially level building sites can expose bedrock. Erosion is a hazard on construction sites and on road cuts and fills. Only the part of the site that is used for construction should be disturbed. Preserving the existing plant cover during construction helps to control erosion. Mulching and revegetating as soon as possible in disturbed areas, such as road cuts and fills and construction sites, also help to control erosion. Because of the limited soil depth and the very slow permeability, onsite sewage disposal systems often fail or do not function properly during periods of high rainfall. Effluent from septic tank absorption fields can surface in downslope areas and thus create a health hazard. If the density of housing is moderate or high, community sewage systems are needed to prevent the contamination of water supplies caused by seepage from onsite sewage disposal systems. Plans for homesite development should provide for the preservation of as many trees as possible. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

If this unit is used for irrigated pasture, the main management concerns are very slow permeability and limited soil depth. Only the plants adapted to a limited rooting depth should be selected for planting. Because of the very slow permeability in the Argonaut soil, adjustment of the length of irrigation runs is needed to permit adequate infiltration of water. Carefully applying irrigation water helps to prevent the buildup of a water table above the clay layer. A drainage system may be needed. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and control erosion. Periodic mowing and clipping help to maintain uniform growth and discourage selective grazing. Fertilizer is needed to ensure the optimum growth of grasses and legumes.

This unit provides habitat for wildlife, such as deer, birds of prey, upland game birds, other birds, and small fur-bearing mammals. Habitat for quail can be improved by building brush piles, especially in areas adjacent to water. Oaks should be maintained as a source of feed and cover for wild turkey and deer. Planting and maintaining shrubs and other woody plants in wet areas

and in areas adjacent to drainageways improve the habitat.

This unit is in capability unit IVe-1 (18), irrigated and nonirrigated.

105—Argovar silt loam, 0 to 5 percent slopes. This very deep, poorly drained soil is on the concave foot slopes and toe slopes of foothills. It formed in material weathered from gabbrodiorite. The native vegetation is mainly carex and sedges. Elevation is between 2,000 and 2,500 feet. The average annual precipitation is between 30 and 40 inches, the average annual air temperature is between 58 and 61 degrees F, and the average frost-free period is between 220 and 235 days.

Typically, the surface layer is brown, mottled silt loam about 8 inches thick. It overlies a buried surface layer of grayish brown, mottled loam about 9 inches thick. The upper part of the subsoil is brown, mottled clay loam about 9 inches thick. The lower part is olive, pale yellow, and reddish yellow, mottled clay about 36 inches thick. In some areas the surface layer is loam.

Included in this unit are small areas of Verjeles soils and small areas of soils that are similar to the Argovar soil but are shallower or deeper to a water table. Included areas make up about 25 percent of the total acreage.

Permeability in the Argovar soil is very slow. Available water capacity is about 9 to 10 inches. The effective rooting depth is 60 inches or more. The seasonal high water table is at a depth of 24 to 48 inches from October through May. The shrink-swell potential is high. Runoff is slow, and the hazard of water erosion is slight.

This unit is used for livestock grazing and wildlife habitat.

Where this unit is used for livestock grazing, it is limited by wetness. Grazing should be delayed until the soil is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of the less preferred forage plants increases. Livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. Fencing and properly located salt and livestock watering facilities help to achieve a uniform distribution of livestock grazing. This unit responds well to applications of fertilizer, to range seeding, and to proper grazing use. The characteristic plant community on this unit is mainly carex, perennial ryegrass, and rush.

This unit is in capability unit IIIw-2 (18), irrigated and nonirrigated.

106—Auburn loam, 3 to 8 percent slopes. This shallow or moderately deep, well drained soil is on foothills. It formed in material weathered from basic

metavolcanic rocks. The native vegetation is mainly blue oak and scattered Digger pine with an understory of annual grasses and forbs. Elevation is between 125 and 1,100 feet. The average annual precipitation is between 22 and 26 inches, the average annual air temperature is between 60 and 62 degrees F, and the average frost-free period is between 250 and 270 days.

Typically, the surface layer is brown loam about 2 inches thick. The subsoil is reddish brown and yellowish red loam about 15 inches thick. Hard amphibolite schist is at a depth of 17 inches.

Included in this unit are small areas of Rock outcrop and Sobrante and Argonaut soils. Also included are small areas of a soil that is similar to the Auburn soil but has a subsoil of clay loam. Included areas make up about 15 percent of the total acreage.

Permeability in the Auburn soil is moderate. Available water capacity is about 2 to 3 inches. The effective rooting depth is restricted by bedrock at a depth of 10 to 28 inches. Runoff is rapid, and the hazard of water erosion is severe.

This unit is used mainly for woodland and livestock grazing. It also is used for homesite development, irrigated pasture, and wildlife habitat.

Blue oak is the major tree species. On this unit, volumes of 24 to 50 cords per acre of blue oak with an average diameter of about 10 inches have been measured. Careful harvesting is needed to allow the stand to regenerate through oak stump sprouting and to minimize water erosion when the plant cover is disturbed.

Few limitations affect livestock grazing on this unit. Grazing should be delayed until the soil is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. If this unit is grazed by livestock when the soil is too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of the less preferred forage plants increases. Livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. This unit responds well to applications of fertilizer, to range seeding, and to proper grazing use. The characteristic understory plant community on this unit is mainly soft chess, wild oat, rigput brome, and rose clover.

If this unit is used for homesite development, the main management concern is limited soil depth. The cuts needed to provide essentially level building sites can expose bedrock. Because of limited soil depth, onsite sewage disposal systems often fail or do not function properly during periods of high rainfall. If the density of housing is moderate or high, community sewage systems

are needed to prevent the contamination of water supplies caused by seepage from onsite sewage disposal systems. Plans for homesite development should provide for the preservation of as many trees as possible. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

If this unit is used for irrigated pasture, the main management concern is limited soil depth. Only the plants adapted to a limited rooting depth should be selected for planting. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and control erosion. Periodic mowing and clipping help to maintain uniform growth and discourage selective grazing. Fertilizer is needed to ensure the optimum growth of grasses and legumes.

This unit provides habitat for wildlife, such as deer, birds of prey, upland game birds, other birds, and small fur-bearing mammals. Habitat for quail can be improved by building brush piles, especially in areas adjacent to water. Oaks should be maintained as a source of feed and cover for wild turkeys. Planting and maintaining shrubs and other woody plants in wet areas and in areas adjacent to drainageways improve the habitat.

This unit is in capability unit IVe-8 (18), irrigated and nonirrigated.

107—Auburn loam, 8 to 15 percent slopes. This shallow or moderately deep, well drained soil is on foothills. It formed in material weathered from basic metavolcanic rocks. The native vegetation is mainly blue oak and scattered Digger pine with an understory of annual grasses and forbs. Elevation is between 125 and 1,100 feet. The average annual precipitation is between 22 and 26 inches, the average annual air temperature is between 60 and 62 degrees F, and the average frost-free period is between 250 and 270 days.

Typically, the surface layer is brown loam about 2 inches thick. The subsoil is reddish brown and yellowish red loam about 15 inches thick. Hard amphibolite schist is at a depth of 17 inches.

Included in this unit are small areas of Rock outcrop and Sobrante and Argonaut soils. Also included are small areas of a soil that is similar to the Auburn soil but has a subsoil of clay loam. Included areas make up about 15 percent of the total acreage.

Permeability in the Auburn soil is moderate. Available water capacity is about 2 to 3 inches. The effective rooting depth is restricted by bedrock at a depth of 10 to 28 inches. Runoff is rapid, and the hazard of water erosion is severe.

This unit is used mainly for woodland and livestock grazing. It also is used for homesite development, irrigated pasture, and wildlife habitat.

Blue oak is the major tree species. On this unit,

volumes of 24 to 50 cords per acre of blue oak with an average diameter of about 10 inches have been measured. Careful harvesting is needed to allow the stand to regenerate through oak stump sprouting and to minimize water erosion when the plant cover is disturbed.

Few limitations affect livestock grazing on this unit. Grazing should be delayed until the soil is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. If this unit is grazed by livestock when the soil is too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of the less preferred forage plants increases. Livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. This unit responds well to applications of fertilizer, to range seeding, and to proper grazing use. The characteristic understory plant community on this unit is mainly soft chess, wild oat, rigput brome, and rose clover.

If this unit is used for homesite development, the main management concerns are limited soil depth, the slope, and the hazard of water erosion. The cuts needed to provide essentially level building sites can expose bedrock. Erosion is a hazard on construction sites and on road cuts and fills. Only the part of the site that is used for construction should be disturbed. Preserving the existing plant cover during construction helps to control erosion. Mulching and revegetating as soon as possible in disturbed areas, such as road cuts and fills and construction sites, also help to control erosion. Because of limited soil depth, onsite sewage disposal systems often fail or do not function properly during periods of high rainfall. If the density of housing is moderate or high, community sewage systems are needed to prevent the contamination of water supplies caused by seepage from onsite sewage disposal systems. Plans for homesite development should provide for the preservation of as many trees as possible. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

If this unit is used for irrigated pasture, the main management concern is limited soil depth. Only the plants adapted to a limited rooting depth should be selected for planting. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and control erosion. Periodic mowing and clipping help to maintain uniform growth and discourage selective grazing. Fertilizer is needed to ensure the optimum growth of grasses and legumes.

This unit provides habitat for wildlife, such as deer, birds of prey, upland game birds, other birds, and small

fur-bearing mammals. Habitat for quail can be improved by building brush piles, especially in areas adjacent to water. Oaks should be maintained as a source of feed and cover for wild turkey and deer. Planting and maintaining shrubs and other woody plants in wet areas and in areas adjacent to drainageways improve the habitat.

This unit is in capability unit IVe-8 (18), irrigated and nonirrigated.

108—Auburn loam, 15 to 30 percent slopes. This shallow or moderately deep, well drained soil is on foothills. It formed in material weathered from basic metavolcanic rocks. The native vegetation is mainly blue oak and scattered Digger pine with an understory of annual grasses and forbs. Elevation is between 125 and 1,100 feet. The average annual precipitation is between 22 and 26 inches, the average annual air temperature is between 60 and 62 degrees F, and the average frost-free period is between 250 and 270 days.

Typically, the surface layer is brown loam about 2 inches thick. The subsoil is reddish brown and yellowish red loam about 15 inches thick. Hard amphibolite schist is at a depth of 17 inches.

Included in this unit are small areas of Rock outcrop and Sobrante and Argonaut soils. Also included are small areas of a soil that is similar to the Auburn soil but has a subsoil of clay loam. Included areas make up about 20 percent of the total acreage.

Permeability in the Auburn soil is moderate. Available water capacity is about 2 to 3 inches. The effective rooting depth is restricted by bedrock at a depth of 10 to 28 inches. Runoff is rapid, and the hazard of water erosion is severe.

This unit is used mainly for woodland and livestock grazing. It also is used for homesite development, irrigated pasture, and wildlife habitat.

Blue oak is the major tree species. On this unit, volumes of 24 to 50 cords per acre of blue oak with an average diameter of about 10 inches have been measured. Careful harvesting is needed to allow the stand to regenerate through oak stump sprouting and to minimize water erosion when the plant cover is disturbed.

Few limitations affect livestock grazing on this unit. Grazing should be delayed until the soil is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. If this unit is grazed by livestock when the soil is too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of the less preferred forage plants increases. Livestock grazing should be managed

so that the desired balance of preferred species is maintained in the plant community. This unit responds well to applications of fertilizer, to range seeding, and to proper grazing use. The characteristic understory plant community on this unit is mainly soft chess, wild oat, riggut brome, and rose clover.

If this unit is used for homesite development, the main management concerns are limited soil depth, the slope, and the hazard of water erosion. The cuts needed to provide essentially level building sites can expose bedrock. Erosion is a hazard on construction sites and on road cuts and fills. Only the part of the site that is used for construction should be disturbed. Preserving the existing plant cover during construction helps to control erosion. Mulching and revegetating as soon as possible in disturbed areas, such as road cuts and fills and construction sites, also help to control erosion. Because of limited soil depth, onsite sewage disposal systems often fail or do not function properly during periods of high rainfall. Effluent from septic tank absorption fields can surface in downslope areas and thus create a health hazard. If the density of housing is moderate or high, community sewage systems are needed to prevent the contamination of water supplies caused by seepage from onsite sewage disposal systems. Plans for homesite development should provide for the preservation of as many trees as possible. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

If this unit is used for irrigated pasture, the main management concern is limited soil depth. Only the plants adapted to a limited rooting depth should be selected for planting. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and control erosion. Periodic mowing and clipping help to maintain uniform growth and discourage selective grazing. Fertilizer is needed to ensure the optimum growth of grasses and legumes.

This unit provides habitat for wildlife, such as deer, birds of prey, upland game birds, other birds, and small fur-bearing mammals. Habitat for quail can be improved by building brush piles, especially in areas adjacent to water. Oaks should be maintained as a source of feed and cover for wild turkeys. Planting and maintaining shrubs and other woody plants in wet areas and in areas adjacent to drainageways improve the habitat.

This unit is in capability unit IVe-8 (18), irrigated and nonirrigated.

109—Auburn loam, 30 to 50 percent slopes. This shallow or moderately deep, well drained soil is on foothills. It formed in material weathered from basic metavolcanic rocks. The native vegetation is mainly blue

oak and scattered Digger pine with an understory of annual grasses and forbs. Elevation is between 125 and 1,100 feet. The average annual precipitation is between 22 and 26 inches, the average annual air temperature is between 60 and 62 degrees F, and the average frost-free period is between 250 and 270 days.

Typically, the surface layer is brown loam about 2 inches thick. The subsoil is reddish brown and yellowish red loam about 15 inches thick. Hard amphibolite schist is at a depth of 17 inches. In some areas the surface layer is gravelly loam.

Included in this unit are small areas of Rock outcrop and Sobrante and Argonaut soils. Also included are small areas of a soil that is similar to the Auburn soil but has a subsoil of clay loam. Included areas make up about 20 percent of the total acreage.

Permeability in the Auburn soil is moderate. Available water capacity is about 2 to 3 inches. The effective rooting depth is restricted by bedrock at a depth of 10 to 28 inches. Runoff is rapid, and the hazard of water erosion is severe.

This unit is used mainly for woodland and livestock grazing. It also is used for wildlife habitat.

Blue oak is the major tree species. On this unit, volumes of 24 to 50 cords per acre of blue oak with an average diameter of about 10 inches have been measured. The slope hinders any potential harvesting of blue oak. Careful harvesting is needed to allow the stand to regenerate through oak stump sprouting and to minimize water erosion when the plant cover is disturbed.

Few limitations affect livestock grazing on this unit. Fencing and properly located salt and livestock watering facilities help to achieve a uniform distribution of livestock grazing. Grazing should be delayed until the soil is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. If this unit is grazed by livestock when the soil is too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of the less preferred forage plants increases. Livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. The characteristic understory plant community on this unit is mainly soft chess, wild oat, riggut brome, and rose clover.

This unit provides habitat for wildlife, such as deer, birds of prey, upland game birds, other birds, and small fur-bearing mammals. Habitat for quail can be improved by building brush piles, especially in areas adjacent to water. Oaks should be maintained as a source of feed and cover for wild turkey and deer. Planting and

maintaining shrubs and other woody plants in wet areas and in areas adjacent to drainageways improve the habitat.

This unit is in capability subclass VIe (18), nonirrigated.

110—Auburn-Sobrante complex, 3 to 8 percent slopes. This unit is on foothills. The native vegetation is mainly blue oak and scattered Digger pine with an understory of annual grasses and forbs. Elevation is between 125 and 1,100 feet. The average annual precipitation is between 22 and 26 inches, the average annual air temperature is between 60 and 62 degrees F, and the average frost-free period is between 250 and 270 days.

This unit is about 40 percent Auburn loam and 40 percent Sobrante loam. The Auburn soil is on convex ridgetops and the upper side slopes, and the Sobrante soil is on the lower side slopes and on toe slopes.

Included in this unit are small areas of Rock outcrop and Argonaut and Timbuctoo soils. Also included are small areas of a soil that is similar to the Auburn soil but has bedrock at a depth of less than 10 inches and small areas of soils that are similar to the Auburn and Sobrante soils but have a subsoil of clay loam. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

The Auburn soil is shallow or moderately deep and is well drained. It formed in material weathered from basic metavolcanic rocks. Typically, the surface layer is brown loam about 2 inches thick. The subsoil is reddish brown and yellowish red loam about 15 inches thick. Hard greenstone is at a depth of 17 inches.

Permeability in the Auburn soil is moderate. Available water capacity is about 2 to 3 inches. The effective rooting depth is restricted by bedrock at a depth of 10 to 28 inches. Runoff is slow, and the hazard of water erosion is slight.

The Sobrante soil is moderately deep and well drained. It formed in material weathered from basic metavolcanic rocks. Typically, the surface layer is brown loam about 5 inches thick. The subsoil is dark reddish brown and strong brown loam about 22 inches thick. Below this is weathered greenstone, which extends to a depth of 39 inches. Hard, very fractured greenstone is at a depth of 39 inches.

Permeability in the Sobrante soil is moderate. Available water capacity is about 3.5 to 5.0 inches. The effective rooting depth is restricted by bedrock at a depth of 20 to 40 inches. The shrink-swell potential is moderate. Runoff is slow, and the hazard of water erosion is slight.

This unit is used mainly for woodland and livestock grazing. It also is used for homesite development, wildlife habitat, and irrigated pasture (fig. 4). Blue oak, interior live oak, and Digger pine are the major tree species. On the

Auburn soil, volumes of 24 to 50 cords per acre of blue oak with an average diameter of about 10 inches have been measured. On the Sobrante soil, volumes of 40 to 46 cords per acre of blue oak and Digger pine with an average diameter of about 12 inches have been measured. Careful harvesting is needed to allow the stand to regenerate through oak stump sprouting and to minimize water erosion when the plant cover is disturbed.

Few limitations affect livestock grazing on this unit. Grazing should be delayed until the soils are firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. If this unit is grazed by livestock when the soils are too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of the less preferred forage plants increases. Livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. This unit responds well to applications of fertilizer, to range seeding, and to proper grazing use. The characteristic understory plant community on this unit is mainly soft chess, wild oat, riggut brome, and rose clover.

If this unit is used for homesite development, the main management concern is limited soil depth. The cuts needed to provide essentially level building sites can expose bedrock. Because of limited soil depth, onsite sewage disposal systems often fail or do not function properly during periods of high rainfall. If the density of housing is moderate or high, community sewage systems are needed to prevent the contamination of water supplies caused by seepage from onsite sewage disposal systems. Plans for homesite development should provide for the preservation of as many trees as possible. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

This unit provides habitat for wildlife, such as deer, birds of prey, game birds, other birds, and small fur-bearing mammals. Habitat for quail can be improved by building brush piles, especially in areas adjacent to water. Oaks should be maintained as a source of feed and cover for wild turkey and deer. Planting and maintaining shrubs and other woody plants in wet areas and in areas adjacent to drainageways improve the habitat.

If this unit is used for irrigated pasture, the main management concern is limited soil depth. Only the plants adapted to a limited rooting depth should be selected for planting. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and control erosion. Periodic mowing and clipping help to maintain uniform growth and



Figure 4.—Irrigated pasture and blue oak and annual grasses in an area of Auburn-Sobrante complex, 3 to 8 percent slopes.

discourage selective grazing. Fertilizer is needed to ensure the optimum growth of grasses and legumes.

The Auburn soil is in capability unit IVe-8 (18), irrigated and nonirrigated. The Sobrante soil is in capability unit IIIe-8 (18), irrigated and nonirrigated.

111—Auburn-Sobrante complex, 8 to 15 percent slopes. This unit is on foothills. The native vegetation is mainly blue oak and scattered Digger pine with an understory of annual grasses and forbs. Elevation is between 25 and 1,100 feet. The average annual precipitation is between 22 and 26 inches, the average annual air temperature is between 60 and 62 degrees F, and the average frost-free period is between 250 and 270 days.

This unit is about 40 percent Auburn loam and 40 percent Sobrante loam. The Auburn soil is on convex ridgetops and the upper side slopes, and the Sobrante soil is on the lower side slopes and on toe slopes.

Included in this unit are small areas of Rock outcrop and Argonaut and Timbuctoo soils. Also included are

small areas of a soil that is similar to the Auburn soil but has bedrock at a depth of less than 10 inches and small areas of soils that are similar to the Auburn and Sobrante soils but have a subsoil of clay loam. Included areas make up about 20 percent of the total acreage.

The Auburn soil is shallow or moderately deep and is well drained. It formed in material weathered from basic metavolcanic rocks. Typically, the surface layer is brown loam about 2 inches thick. The subsoil is reddish brown and yellowish red loam about 15 inches thick. Hard greenstone is at a depth of 17 inches.

Permeability in the Auburn soil is moderate. Available water capacity is about 2 to 3 inches. The effective rooting depth is restricted by bedrock at a depth of 10 to 28 inches. Runoff is medium, and the hazard of water erosion is moderate.

The Sobrante soil is moderately deep and well drained. It formed in material weathered from basic metavolcanic rocks. Typically, the surface layer is brown loam about 5 inches thick. The subsoil is dark reddish brown and strong brown loam about 22 inches thick. Below this is

weathered greenstone, which extends to a depth of 39 inches. Hard, very fractured greenstone is at a depth of 39 inches.

Permeability in the Sobrante soil is moderate. Available water capacity is about 3.5 to 5.0 inches. The effective rooting depth is restricted by bedrock at a depth of 20 to 40 inches. The shrink-swell potential is moderate. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for woodland and livestock grazing. It also is used for homesite development, wildlife habitat, and irrigated pasture.

Blue oak, interior live oak, and Digger pine are the major tree species. On the Auburn soil, volumes of 24 to 50 cords per acre of blue oak with an average diameter of about 10 inches have been measured. On the Sobrante soil, volumes of 40 to 46 cords per acre of blue oak and Digger pine with an average diameter of about 12 inches have been measured. Careful harvesting is needed to allow the stand to regenerate through oak stump sprouting and to minimize water erosion when the plant cover is disturbed.

Few limitations affect livestock grazing on this unit. Grazing should be delayed until the soils are firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. If this unit is grazed by livestock when the soils are too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of the less preferred forage plants increases. Livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. This unit responds well to applications of fertilizer, to range seeding, and to proper grazing use. The characteristic understory plant community on this unit is mainly soft chess, wild oat, rigput brome, and rose clover.

If this unit is used for homesite development, the main management concerns are limited soil depth, the slope, and the hazard of water erosion. The cuts needed to provide essentially level building sites can expose bedrock. Erosion is a hazard on construction sites and on road cuts and fills. Only the part of the site that is used for construction should be disturbed. Preserving the existing plant cover during construction helps to control erosion. Mulching and revegetating as soon as possible in disturbed areas, such as road cuts and fills and construction sites, also help to control erosion. Because of limited soil depth, onsite sewage disposal systems often fail or do not function properly during periods of high rainfall. If the density of housing is moderate or high, community sewage systems are needed to prevent the contamination of water supplies caused by seepage from

onsite sewage disposal systems. Plans for homesite development should provide for the preservation of as many trees as possible. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

This unit provides habitat for wildlife, such as deer, birds of prey, game birds, other birds, and small fur-bearing mammals. Habitat for quail can be improved by building brush piles, especially in areas adjacent to water. Oaks should be maintained as a source of feed and cover for wild turkey and deer. Planting and maintaining shrubs and other woody plants in wet areas and in areas adjacent to drainageways improve the habitat.

If this unit is used for irrigated pasture, the main management concern is limited soil depth. Only the plants adapted to a limited rooting depth should be selected for planting. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and control erosion. Periodic mowing and clipping help to maintain uniform growth and discourage selective grazing. Fertilizer is needed to ensure the optimum growth of grasses and legumes.

The Auburn soil is in capability unit IVe-8 (18), irrigated and nonirrigated. The Sobrante soil is in capability unit IIIe-8 (18), irrigated and nonirrigated.

112—Auburn-Sobrante complex, 15 to 30 percent slopes. This unit is on foothills. The native vegetation is mainly blue oak and scattered Digger pine with an understory of annual grasses and forbs. Elevation is between 125 and 1,100 feet. The average annual precipitation is between 22 and 26 inches, the average annual air temperature is between 60 and 62 degrees F, and the average frost-free period is between 250 and 270 days.

This unit is about 40 percent Auburn loam and 40 percent Sobrante loam. The Auburn soil is on convex ridgetops and the upper side slopes, and the Sobrante soil is on the lower side slopes and on toe slopes.

Included in this unit are small areas of Rock outcrop and Argonaut and Timbuctoo soils. Also included are small areas of a soil that is similar to the Auburn soil but has bedrock at a depth of less than 10 inches and small areas of soils that are similar to the Auburn and Sobrante soils but have a subsoil of clay loam. Included areas make up about 20 percent of the total acreage.

The Auburn soil is shallow or moderately deep and is well drained. It formed in material weathered from basic metavolcanic rocks. Typically, the surface layer is brown loam about 2 inches thick. The subsoil is reddish brown and yellowish red loam about 15 inches thick. Hard greenstone is at a depth of 17 inches.

Permeability in the Auburn soil is moderate. Available water capacity is about 2 to 3 inches. The effective rooting

depth is restricted by bedrock at a depth of 10 to 28 inches. Runoff is rapid, and the hazard of water erosion is severe.

The Sobrante soil is moderately deep and well drained. It formed in material weathered from basic metavolcanic rocks. Typically, the surface layer is brown loam about 5 inches thick. The subsoil is dark reddish brown and strong brown loam about 22 inches thick. Below this is weathered greenstone, which extends to a depth of 39 inches. Hard, very fractured greenstone is at a depth of 39 inches.

Permeability in the Sobrante soil is moderate. Available water capacity is about 3.5 to 5.0 inches. The effective rooting depth is restricted by bedrock at a depth of 20 to 40 inches. The shrink-swell potential is moderate. Runoff is rapid, and the hazard of water erosion is severe.

This unit is used mainly for woodland and livestock grazing. It also is used for homesite development and wildlife habitat.

Blue oak, interior live oak, and Digger pine are the main tree species. On the Auburn soil, volumes of 24 to 50 cords per acre of blue oak with an average diameter of about 10 inches have been measured. On the Sobrante soil, volumes of 40 to 46 cords per acre of blue oak and Digger pine with an average diameter of about 12 inches have been measured. Careful harvesting is needed to allow the stand to regenerate through oak stump sprouting and to minimize water erosion when the plant cover is disturbed.

Few limitations affect livestock grazing on this unit. Grazing should be delayed until the soils are firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. If this unit is grazed by livestock when the soils are too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. Proper management of livestock grazing is needed to control erosion. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of the less preferred forage plants increases. Livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. This unit responds well to applications of fertilizer, to range seeding, and to proper grazing use. The characteristic understory plant community on this unit is mainly soft chess, wild oat, ripgut brome, and rose clover.

If this unit is used for homesite development, the main management concerns are limited soil depth, the slope, and the hazard of water erosion. The cuts needed to provide essentially level building sites can expose bedrock. Erosion is a hazard on construction sites and on road cuts and fills. Only the part of the site that is used for construction should be disturbed. Preserving the existing

plant cover during construction helps to control erosion. Mulching and revegetating as soon as possible in disturbed areas, such as road cuts and fills and construction sites, also help to control erosion. Because of limited soil depth, onsite sewage disposal systems often fail or do not function properly during periods of high rainfall. Effluent from septic tank absorption fields can surface in downslope areas and thus create a health hazard. If the density of housing is moderate or high, community sewage systems are needed to prevent the contamination of water supplies caused by seepage from onsite sewage disposal systems. Plans for homesite development should provide for the preservation of as many trees as possible. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

This unit provides habitat for wildlife, such as deer, birds of prey, game birds, other birds, and small fur-bearing mammals. Habitat for quail can be improved by building brush piles, especially in areas adjacent to water. Oaks should be maintained as a source of feed and cover for wild turkey and deer. Planting and maintaining shrubs and other woody plants in wet areas and in areas adjacent to drainageways improve the habitat.

This unit is in capability unit IVe-8 (18), irrigated and nonirrigated.

113—Auburn-Sobrante complex, gravelly, 3 to 8 percent slopes. This unit is on foothills. The native vegetation is mainly blue oak, interior live oak, and Digger pine with an understory of brush, annual grasses, and forbs. Elevation is between 300 and 1,900 feet. The average annual precipitation is between 26 and 35 inches, the average annual air temperature is between 58 and 61 degrees F, and the average frost-free period is between 230 and 250 days.

This unit is about 40 percent Auburn gravelly loam and 40 percent Sobrante gravelly loam. The Auburn soil is on convex ridgetops and the upper side slopes, and the Sobrante soil is on concave side slopes and toe slopes.

Included in this unit are small areas of Rock outcrop and Argonaut and Timbuctoo soils. Also included are small areas of a soil that is similar to the Auburn soil but has bedrock at a depth of less than 10 inches and soils that are similar to the Auburn and Sobrante soils but have a subsoil of gravelly clay loam. Included areas make up about 20 percent of the total acreage.

The Auburn soil is shallow or moderately deep and is well drained. It formed in material weathered from basic metavolcanic rocks. Typically, the surface layer is brown gravelly loam about 4 inches thick. The subsoil is brown and reddish brown gravelly loam about 13 inches thick. Hard greenstone is at a depth of 17 inches.

Permeability in the Auburn soil is moderate. Available

water capacity is about 2.0 to 2.5 inches. The effective rooting depth is restricted by bedrock at a depth of 10 to 28 inches. Runoff is slow, and the hazard of water erosion is slight.

The Sobrante soil is moderately deep and well drained. It formed in material weathered from basic metavolcanic rocks. Typically, the surface layer is brown gravelly loam about 5 inches thick. The subsoil is dark reddish brown gravelly loam about 30 inches thick. Below this is weathered greenstone, which extends to a depth of 40 inches. Hard greenstone is at a depth of 40 inches. In some areas the surface layer is loam.

Permeability in the Sobrante soil is moderate. Available water capacity is about 4 to 5 inches. The effective rooting depth is restricted by bedrock at a depth of 20 to 40 inches. The shrink-swell potential is moderate. Runoff is slow, and the hazard of water erosion is slight.

This unit is used mainly for woodland and livestock grazing. It also is used for homesite development and wildlife habitat.

Blue oak, interior live oak, and Digger pine are the major tree species. On the Auburn soil, volumes of approximately 16 to 27 cords per acre of blue oak, interior live oak, and Digger pine with an average diameter of about 14 inches have been measured. On the Sobrante soil, volumes of approximately 38 to 191 cords per acre of blue oak, interior live oak, and Digger pine with an average diameter of about 10 inches have been measured. Careful harvesting is needed to allow the stand to regenerate through oak stump sprouting and to minimize water erosion when the plant cover is disturbed.

Where this unit is used for livestock grazing, it is limited by a tendency to produce woody species. Fencing and properly located salt and livestock watering facilities help to achieve a uniform distribution of livestock grazing. Brush management improves forage production. Grazing should be delayed until the soils are firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. If this unit is grazed by livestock when the soils are too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of the less preferred forage plants increases. Livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. This unit responds well to applications of fertilizer, to range seeding, and to proper grazing use if brush is controlled. The characteristic understory plant community on this unit is mainly poison oak, soft chess, wild oat, and filaree.

If this unit is used for homesite development, the main management concern is limited soil depth. The cuts

needed to provide essentially level building sites can expose bedrock. Because of the limited soil depth, onsite sewage disposal systems often fail or do not function properly during periods of high rainfall. If the density of housing is moderate or high, community sewage systems are needed to prevent the contamination of water supplies caused by seepage from onsite sewage disposal systems. Plans for homesite development should provide for the preservation of as many trees as possible. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

This unit provides habitat for wildlife, such as deer, birds of prey, game birds, other birds, and small fur-bearing mammals. Planting and maintaining shrubs and other woody plants in wet areas adjacent to drainageways improve the habitat. Habitat for quail can be improved by building brush piles, especially in areas adjacent to water. Creating openings in areas of dense brush can benefit wildlife. Brush controlled by prescribed burning or mechanical methods produces valuable new growth for wildlife. Oaks should be maintained as a source of feed and cover for wild turkeys and deer.

The Auburn soil is in capability unit IVe-8 (18), irrigated and nonirrigated. The Sobrante soil is in capability unit IIIe-8 (18), irrigated and nonirrigated.

114—Auburn-Sobrante complex, gravelly, 8 to 15 percent slopes. This unit is on foothills. The native vegetation is mainly blue oak, interior live oak, and Digger pine with an understory of brush, annual grasses, and forbs. Elevation is between 300 and 1,900 feet. The average annual precipitation is between 26 and 35 inches, the average annual air temperature is between 58 and 61 degrees F, and the average frost-free period is between 230 and 250 days.

This unit is about 40 percent Auburn gravelly loam and 40 percent Sobrante gravelly loam. The Auburn soil is on convex ridgetops and the upper side slopes, and the Sobrante is on concave side slopes and toe slopes.

Included in this unit are small areas of Rock outcrop and Argonaut and Timbuctoo soils. Also included are small areas of a soil that is similar to the Auburn soil but has bedrock at a depth of less than 10 inches, small areas of a soil that is similar to the Sobrante soil but has bedrock at a depth of 40 to 60 inches, and small areas of soils that are similar to the Auburn and Sobrante soils but have a subsoil of gravelly clay loam. Included areas make up about 20 percent of the total acreage.

The Auburn soil is shallow or moderately deep and is well drained. It formed in material weathered from basic metavolcanic rocks. Typically, the surface layer is brown gravelly loam about 4 inches thick. The subsoil is brown and reddish brown gravelly loam about 13 inches thick. Hard greenstone is at a depth of 17 inches.

Permeability in the Auburn soil is moderate. Available water capacity is about 2.0 to 2.5 inches. The effective rooting depth is restricted by bedrock at a depth of 10 to 28 inches. Runoff is medium, and the hazard of water erosion is moderate.

The Sobrante soil is moderately deep and well drained. It formed in material weathered from basic metavolcanic rocks. Typically, the surface layer is brown gravelly loam about 5 inches thick. The subsoil is dark reddish brown gravelly loam about 30 inches thick. Below this is weathered greenstone, which extends to a depth of 40 inches. Hard greenstone is at a depth of 40 inches. In some areas the surface layer is loam.

Permeability in the Sobrante soil is moderate. Available water capacity is about 4 to 5 inches. The effective rooting depth is restricted by bedrock at a depth of 20 to 40 inches. The shrink-swell potential is moderate. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for woodland and livestock grazing. It also is used for homesite development and wildlife habitat.

Blue oak, interior live oak, and Digger pine are the major tree species (fig. 5). On the Auburn soil, volumes of 16 to 27 cords per acre of blue oak, interior live oak, and Digger pine with an average diameter of about 14 inches have been measured. On the Sobrante soil, volumes of 38 to 191 cords per acre of blue oak, interior live oak, and Digger pine with an average diameter of about 10 inches have been measured. Careful harvesting is needed to allow the stand to regenerate through oak stump sprouting and to minimize water erosion when the plant cover is disturbed.

Where this unit is used for livestock grazing, it is limited by a tendency to produce woody species. Fencing and properly located salt and livestock watering facilities help to achieve a uniform distribution of livestock grazing. Brush management improves forage production. Areas where brush is managed by prescribed burning or by chemical or mechanical methods may be subject to an increased hazard of erosion. Grazing should be delayed until the soils are firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. If this unit is grazed by livestock when the soils are too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. Proper management of livestock grazing is needed to control erosion. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of the less preferred forage plants increases. Livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. This unit responds well to applications of fertilizer, to range seeding, and to

proper grazing use if brush is controlled. The characteristic understory plant community on this unit is mainly poison oak, soft chess, wild oat, and filaree.

If this unit is used for homesite development, the main management concerns are limited soil depth, the slope, and the hazard of water erosion. The cuts needed to provide essentially level building sites can expose bedrock. Erosion is a hazard on construction sites and on road cuts and fills. Only the part of the site that is used for construction should be disturbed. Preserving the existing plant cover during construction helps to control erosion. Mulching and revegetating as soon as possible in disturbed areas, such as road cuts and fills and construction sites, also help to control erosion. Because of the limited soil depth, onsite sewage disposal systems often fail or do not function properly during periods of high rainfall. Effluent from septic tank absorption fields can surface in downslope areas and thus create a health hazard. If the density of housing is moderate or high, community sewage systems are needed to prevent the contamination of water supplies caused by seepage from onsite sewage disposal systems. Plans for homesite development should provide for the preservation of as many trees as possible. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

This unit provides habitat for wildlife, such as deer, birds of prey, game birds, other birds, and small fur-bearing mammals. Planting and maintaining shrubs and other woody plants in wet areas and in areas adjacent to drainageways improve the habitat. Habitat for quail can be improved by building brush piles, especially in areas adjacent to water. Creating openings in areas of dense brush can benefit wildlife. Brush controlled by prescribed burning or mechanical methods produces valuable new growth for wildlife. Oaks should be maintained as a source of feed and cover for wild turkey and deer.

The Auburn soil is in capability unit IVe-8 (18), irrigated and nonirrigated. The Sobrante soil is in capability unit IIIe-8 (18), irrigated and nonirrigated.

115—Auburn-Sobrante complex, gravelly, 15 to 30 percent slopes. This unit is on foothills. The native vegetation is mainly blue oak, interior live oak, and Digger pine with an understory of brush, annual grasses, and forbs. Elevation is between 300 and 1,900 feet. The average annual precipitation is between 26 and 35 inches, the average annual air temperature is between 58 and 61 degrees F, and the average frost-free period is between 230 and 250 days.

This unit is about 40 percent Auburn gravelly loam and 40 percent Sobrante gravelly loam. The Auburn soil is on convex ridgetops and the upper side slopes, and the Sobrante soil is on concave side slopes and toe slopes.



Figure 5.—Blue oak, interior live oak, and annual grasses in an area of Auburn-Sobrante complex, gravelly, 8 to 15 percent slopes. The Englebright Reservoir separates Yuba County on the right from Nevada County on the left.

Included in this unit are small areas of Rock outcrop and small areas of Argonaut and Timbuctoo soils. Also included are small areas of a soil that is similar to the Auburn soil but has bedrock at a depth of less than 10 inches, small areas of a soil that is similar to the Sobrante soil but has bedrock at a depth of 40 to 60 inches, and small areas of a soil that is similar to the Auburn soil but has a subsoil of gravelly clay loam. Included areas make up about 20 percent of the total acreage.

The Auburn soil is shallow or moderately deep and is well drained. It formed in material weathered from basic metavolcanic rocks. Typically, the surface layer is brown gravelly loam about 4 inches thick. The subsoil is brown and reddish brown gravelly loam about 13 inches thick. Hard greenstone is at a depth of 17 inches. In some areas the surface layer is loam.

Permeability in the Auburn soil is moderate. Available water capacity is about 2.0 to 2.5 inches. The effective rooting depth is restricted by bedrock at a depth of 10 to

28 inches. Runoff is rapid, and the hazard of water erosion is severe.

The Sobrante soil is moderately deep and well drained. It formed in material weathered from basic metavolcanic rocks. Typically, the surface layer is brown gravelly loam about 5 inches thick. The subsoil is dark reddish brown gravelly loam about 30 inches thick. Below this is weathered greenstone, which extends to a depth of 40 inches. Hard greenstone is at a depth of 40 inches. In some areas the surface layer is loam.

Permeability in the Sobrante soil is moderate. Available water capacity is about 4 to 5 inches. The effective rooting depth is restricted by bedrock at a depth of 20 to 40 inches. The shrink-swell potential is moderate. Runoff is rapid, and the hazard of water erosion is severe.

This unit is used mainly for woodland and livestock grazing. It also is used for homesite development and wildlife habitat.

Blue oak, interior live oak, and Digger pine are the major tree species. On the Auburn soil, volumes of 16 to

27 cords per acre of blue oak, interior live oak, and Digger pine with an average diameter of about 14 inches have been measured. On the Sobrante soil, volumes of 38 to 191 cords per acre of blue oak, interior live oak, and Digger pine with an average diameter of about 10 inches have been measured. Careful harvesting is needed to allow the stand to regenerate through oak stump sprouting and to minimize water erosion when the plant cover is disturbed.

Where this unit is used for livestock grazing, it is limited by a tendency to produce woody species. Fencing and properly located salt and livestock watering facilities help to achieve a uniform distribution of livestock grazing. Brush management improves forage production. Areas where brush is managed by prescribed burning or by chemical or mechanical methods may be subject to an increased hazard of erosion. Grazing should be delayed until the soils are firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. If this unit is grazed by livestock when the soils are too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of the less preferred forage plants increases. Livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. This unit responds well to applications of fertilizer, to range seeding, and to proper grazing use if brush is controlled. The characteristic understory plant community on this unit is mainly poison oak, soft chess, wild oat, and filaree.

If this unit is used for homesite development, the main management concerns are limited soil depth, the slope, and the hazard of water erosion. The cuts needed to provide essentially level building sites can expose bedrock. Erosion is a hazard on construction sites and on road cuts and fills. Only the part of the site that is used for construction should be disturbed. Preserving the existing plant cover during construction helps to control erosion. Mulching and revegetating as soon as possible in disturbed areas, such as road cuts and fills and construction sites, also help to control erosion. Because of limited soil depth, onsite sewage disposal systems often fail or do not function properly during periods of high rainfall. Effluent from septic tank absorption fields can surface in downslope areas and thus create a health hazard. If the density of housing is moderate or high, community sewage systems are needed to prevent the contamination of water supplies caused by seepage from onsite sewage disposal systems. Plans for homesite development should provide for the preservation of as many trees as possible. In summer, irrigation is needed

for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

This unit provides habitat for wildlife, such as deer, birds of prey, game birds, other birds, and small fur-bearing mammals. Planting and maintaining shrubs and other woody plants in wet areas and in areas adjacent to drainageways improve the habitat. Habitat for quail can be improved by building brush piles, especially in areas adjacent to water. Creating openings in areas of dense brush can benefit wildlife. Brush controlled by prescribed burning or mechanical methods produces valuable new growth for wildlife. Oaks should be maintained as a source of feed and cover for wild turkey and deer.

This unit is in capability unit IVe-8 (18), irrigated and nonirrigated.

116—Auburn-Sobrante complex, gravelly, 30 to 50 percent slopes. This unit is on foothills. The native vegetation is mainly blue oak, interior live oak, and Digger pine with an understory of brush, annual grasses, and forbs. Elevation is between 300 and 1,900 feet. The average annual precipitation is between 26 and 35 inches, the average annual air temperature is between 58 and 61 degrees F, and the average frost-free period is between 230 and 250 days.

This unit is about 50 percent Auburn gravelly loam and 25 percent Sobrante gravelly loam. The Auburn soil is on convex ridgetops and side slopes, and the Sobrante is on the lower concave side slopes and on toe slopes.

Included in this unit are small areas of Rock outcrop and Timbuctoo soils. Also included are small areas of a soil that is similar to the Auburn soil but has bedrock at a depth of less than 10 inches and a soil that is similar to the Sobrante soil but has bedrock at a depth of 40 to 60 inches. Included areas make up about 25 percent of the total acreage.

The Auburn soil is shallow or moderately deep and is well drained. It formed in material weathered from basic metavolcanic rocks. Typically, the surface layer is brown gravelly loam about 4 inches thick. The subsoil is brown and reddish brown gravelly loam about 13 inches thick. Hard greenstone is at a depth of 17 inches.

Permeability in the Auburn soil is moderate. Available water capacity is about 2.0 to 2.5 inches. The effective rooting depth is restricted by bedrock at a depth of 10 to 26 inches. Runoff is rapid, and the hazard of water erosion is severe.

The Sobrante soil is moderately deep and well drained. It formed in material weathered from basic metavolcanic rocks. Typically, the surface layer is brown gravelly loam about 5 inches thick. The subsoil is dark reddish brown gravelly loam about 30 inches thick. Below this is weathered greenstone, which extends to a depth of 40

inches. Hard greenstone is at a depth of 40 inches. In some areas the surface layer is very gravelly loam.

Permeability in the Sobrante soil is moderate. Available water capacity is about 4 to 5 inches. The effective rooting depth is restricted by bedrock at a depth of 20 to 40 inches. The shrink-swell potential is moderate. Runoff is rapid, and the hazard of water erosion is severe.

This unit is used for woodland, livestock grazing, and wildlife habitat.

Blue oak, interior live oak, and Digger pine are the major tree species. On the Auburn soil, volumes of 16 to 27 cords per acre of blue oak, interior live oak, and Digger pine with an average diameter of about 14 inches have been measured. On the Sobrante soil, volumes of 38 to 191 cords per acre of blue oak, interior live oak, and Digger pine with an average diameter of about 10 inches have been measured. The slope hinders any potential harvesting of trees. Careful harvesting is needed to allow the stand to regenerate through oak stump sprouting and to minimize water erosion when the plant cover is disturbed.

Where this unit is used for livestock grazing, it is limited by a tendency to produce woody species. Fencing and properly located salt and livestock watering facilities help to achieve a uniform distribution of livestock grazing. Brush management improves forage production. Areas where brush is managed by prescribed burning or by chemical or mechanical methods may be subject to an increased hazard of erosion. Mechanical treatment is not practical because of the slope. Grazing should be delayed until the soils are firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. If this unit is grazed by livestock when the soils are too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of the less preferred forage plants increases. Livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. The characteristic understory plant community on this unit is mainly poison oak, soft chess, wild oat, and filaree.

This unit provides habitat for wildlife, such as deer, birds of prey, game birds, other birds, and small fur-bearing mammals. Planting and maintaining shrubs and other woody plants in wet areas and in areas adjacent to drainageways improve the habitat. Habitat for quail can be improved by building brush piles, especially in areas adjacent to water. Creating openings in areas of dense brush can benefit wildlife. Brush controlled by prescribed burning or mechanical methods produces valuable new growth for wildlife. Oaks should be

maintained as a source of feed and cover for wild turkey and deer.

This unit is in capability subclass VIe (18), nonirrigated.

117—Auburn-Sobrante-Rock outcrop complex, 8 to 15 percent slopes. This unit is on foothills. The native vegetation is mainly blue oak, interior live oak, and Digger pine with an understory of brush, annual grasses, and forbs. Elevation is between 300 and 1,900 feet. The average annual precipitation is between 26 and 35 inches, the average annual air temperature is between 58 and 61 degrees F, and the average frost-free period is between 230 and 250 days.

This unit is about 35 percent Auburn gravelly loam, 30 percent Sobrante gravelly loam, and 15 percent Rock outcrop. The Auburn soil and Rock outcrop are on ridgetops and the upper side slopes, and the Sobrante soil is on side slopes and toe slopes.

Included in this unit are small areas of Argonaut and Timbuctoo soils. Also included are small areas of soils that are similar to the Auburn soil but are less than 10 inches deep or have a subsoil of gravelly clay loam and small areas of a soil that is similar to the Sobrante soil but have bedrock at a depth of 40 to 60 inches or have a subsoil of gravelly clay loam. Included areas make up about 20 percent of the total acreage.

The Auburn soil is shallow or moderately deep and is well drained. It formed in material weathered from basic metavolcanic rocks. Typically, the surface layer is brown gravelly loam about 4 inches thick. The subsoil is brown and reddish brown gravelly loam about 13 inches thick. Hard greenstone is at a depth of 17 inches.

Permeability in the Auburn soil is moderate. Available water capacity is about 2.0 to 2.5 inches. The effective rooting depth is restricted by bedrock at a depth of 10 to 28 inches. Runoff is medium, and the hazard of water erosion is moderate.

The Sobrante soil is moderately deep and well drained. It formed in material weathered from basic metavolcanic rocks. Typically, the surface layer is brown gravelly loam about 5 inches thick. The subsoil is dark reddish brown gravelly loam about 30 inches thick. Below this is weathered greenstone, which extends to a depth of 40 inches. Hard greenstone is at a depth of 40 inches.

Permeability in the Sobrante soil is moderate. Available water capacity is about 4 to 5 inches. The effective rooting depth is restricted by bedrock at a depth of 20 to 40 inches. The shrink-swell potential is moderate. Runoff is medium, and the hazard of water erosion is moderate.

Rock outcrop consists of exposures of bare rock that support little or no vegetation.

This unit is used mainly for woodland and livestock grazing. It also is used for homesite development, wildlife habitat, and irrigated pasture.

Blue oak, interior live oak, and Digger pine are the major tree species. On the Auburn soil, volumes of 16 to 27 cords per acre of blue oak, interior live oak, and Digger pine with an average diameter of about 14 inches have been measured. On the Sobrante soil, volumes of 38 to 191 cords per acre of blue oak, interior live oak, and Digger pine with an average diameter of about 10 inches have been measured. Careful harvesting is needed to allow the stand to regenerate through oak stump sprouting and to minimize water erosion when the plant cover is disturbed.

Where this unit is used for livestock grazing, it is limited by a tendency to produce woody species. Fencing and properly located salt and livestock watering facilities help to achieve a uniform distribution of livestock grazing. Brush management improves forage production. Areas where brush is managed by prescribed burning or by chemical methods may be subject to an increased hazard of erosion. Mechanical treatment is not practical because of the Rock outcrop. Grazing should be delayed until the soils are firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. If this unit is grazed by livestock when the soils are too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of the less preferred forage plants increases. Livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. This unit responds well to applications of fertilizer, to range seeding, and to proper grazing use if brush is controlled. The characteristic understory plant community on this unit is mainly poison oak, soft chess, wild oat, and filaree.

If this unit is used for homesite development, the main management concerns are limited soil depth, the slope, and the hazard of water erosion. The cuts needed to provide essentially level building sites can expose bedrock. Erosion is a hazard on construction sites and on road cuts and fills. Only the part of the site that is used for construction should be disturbed. Preserving the existing plant cover during construction helps to control erosion. Because of limited soil depth, onsite sewage disposal systems often fail or do not function properly during periods of high rainfall. If the density of housing is moderate or high, community sewage systems are needed to prevent the contamination of water supplies caused by seepage from onsite sewage disposal systems. Plans for homesite development should provide for the preservation of as many trees as possible. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

This unit provides habitat for wildlife, such as deer, birds of prey, game birds, other birds, and small fur-bearing mammals. Planting and maintaining shrubs and other woody plants in wet areas and in areas adjacent to drainageways improve the habitat. Habitat for quail can be improved by building brush piles, especially in areas adjacent to water. Creating openings in areas of dense brush can benefit wildlife. Brush controlled by prescribed burning or mechanical methods produces valuable new growth for wildlife. Oaks should be maintained as a source of feed and cover for wild turkey and deer.

This unit is suited to irrigated hay and pasture, although hay is not commonly grown. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and control erosion. Proper grazing practices, weed control, and fertilizer are needed to ensure the maximum quality of forage.

The Auburn soil is in capability unit IVe-8 (18), irrigated and nonirrigated. The Sobrante soil is in capability unit IIIe-8 (18), irrigated and nonirrigated. The Rock outcrop is in capability class VIII (18), nonirrigated.

118—Auburn-Sobrante-Rock outcrop complex, 15 to 30 percent slopes. This unit is on foothills. The native vegetation is mainly blue oak, interior live oak, and Digger pine with an understory of brush, annual grasses, and forbs. Elevation is between 300 and 1,900 feet. The average annual precipitation is between 26 and 35 inches, the average annual air temperature is between 58 and 61 degrees F, and the average frost-free period is between 230 and 250 days.

This unit is about 35 percent Auburn gravelly loam, 30 percent Sobrante gravelly loam, and 15 percent Rock outcrop. The Auburn soil and Rock outcrop are on ridgetops and the upper side slopes, and the Sobrante soil is on the lower side slopes and on toe slopes.

Included in this unit are small areas of Argonaut and Timbuctoo soils. Also included are small areas of soils that are similar to the Auburn soil but have bedrock at a depth of less than 10 inches or have a subsoil of gravelly clay loam and small areas of soils that are similar to the Sobrante soil but have bedrock at a depth of 40 to 60 inches or have a subsoil of gravelly clay loam. Included areas make up about 20 percent of the total acreage.

The Auburn soil is shallow or moderately deep and is well drained. It formed in material weathered from basic metavolcanic rocks. Typically, the surface layer is brown gravelly loam about 4 inches thick. The subsoil is brown and reddish brown gravelly loam about 13 inches thick. Hard greenstone is at a depth of 17 inches.

Permeability in the Auburn soil is moderate. Available water capacity is about 2.0 to 2.5 inches. The effective rooting depth is restricted by bedrock at a depth of 10 to

28 inches. Runoff is rapid, and the hazard of water erosion is severe.

The Sobrante soil is moderately deep and well drained. It formed in material weathered from basic metavolcanic rocks. Typically, the surface layer is brown gravelly loam about 5 inches thick. The subsoil is dark reddish brown gravelly loam about 30 inches thick. Below this is weathered greenstone, which extends to a depth of 40 inches. Hard greenstone is at a depth of 40 inches.

Permeability in the Sobrante soil is moderate. Available water capacity is about 4 to 5 inches. The effective rooting depth is restricted by bedrock at a depth of 20 to 40 inches. The shrink-swell potential is moderate. Runoff is rapid, and the hazard of water erosion is severe.

Rock outcrop consists of exposures of bare rock that support little or no vegetation.

This unit is used mainly for woodland and livestock grazing. It also is used for homesite development and wildlife habitat.

Blue oak, interior live oak, and Digger pine are the major tree species. On the Auburn soil, volumes of 16 to 27 cords per acre of blue oak, interior live oak, and Digger pine with an average diameter of about 14 inches have been measured. On the Sobrante soil, volumes of 38 to 191 cords per acre of blue oak, interior live oak, and Digger pine with an average diameter of about 10 inches have been measured. Careful harvesting is needed to allow the stand to regenerate through oak stump sprouting and to minimize water erosion when the plant cover is disturbed.

Where this unit is used for livestock grazing, it is limited by a tendency to produce woody species. Fencing and properly located salt and livestock watering facilities help to achieve a uniform distribution of livestock grazing. Brush management improves forage production. Areas where brush is managed by prescribed burning or by chemical methods may be subject to an increased hazard of erosion. Mechanical treatment is not practical because of the Rock outcrop. Grazing should be delayed until the soils are firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. If this unit is grazed by livestock when the soils are too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of the less preferred forage plants increases. Livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. This unit responds well to applications of fertilizer, to range seeding, and to proper grazing use if brush is controlled. The characteristic understory plant community is mainly poison oak, soft chess, wild oat, and filaree.

If this unit is used for homesite development, the main management concerns are limited soil depth, the hazard of water erosion, and the slope. The cuts needed to provide essentially level building sites can expose bedrock. Erosion is a hazard on construction sites and on road cuts and fills. Only the part of the site that is used for construction should be disturbed. Preserving the existing plant cover during construction helps to control erosion. Mulching and revegetating as soon as possible in disturbed areas, such as road cuts and fills and construction sites, also help to control erosion. Because of limited soil depth, onsite sewage disposal systems often fail or do not function properly during periods of high rainfall. Effluent from septic tank absorption fields can surface in downslope areas and thus create a health hazard. If the density of housing is moderate or high, community sewage systems are needed to prevent the contamination of water supplies caused by seepage from onsite sewage disposal systems. Plans for homesite development should provide for the preservation of as many trees as possible. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

This unit provides habitat for wildlife, such as deer, birds of prey, game birds, other birds, and small fur-bearing animals. Planting and maintaining shrubs and other woody plants in wet areas and in areas adjacent to drainageways improve the habitat. Habitat for quail can be improved by building brush piles, especially in areas adjacent to water. Creating openings in areas of dense brush can benefit wildlife. Brush controlled by prescribed burning or mechanical methods produces valuable new growth for wildlife. Oaks should be maintained as a source of feed and cover for wild turkey and deer.

The Auburn and Sobrante soils are in capability unit IVe-8 (18), irrigated and nonirrigated. The Rock outcrop is in capability class VIII (18), nonirrigated.

119—Auburn-Sobrante-Rock outcrop complex, 30 to 50 percent slopes. This unit is on foothills. The native vegetation is mainly blue oak, interior live oak, and Digger pine with an understory of brush, annual grasses, and forbs. Elevation is between 300 and 1,900 feet. The average annual precipitation is between 26 and 35 inches, the average annual air temperature is between 58 and 61 degrees F, and the average frost-free period is between 230 and 250 days.

This unit is about 30 percent Auburn gravelly loam, 30 percent Sobrante gravelly loam, and 20 percent Rock outcrop. The Auburn soil and Rock outcrop are on ridgetops and the upper side slopes, and the Sobrante soil is on the lower side slopes and on toe slopes.

Included in this unit are small areas of Timbuctoo soils. Also included are small areas of a soil that is similar to the

Sobrante soil but has bedrock at a depth of 40 to 60 inches and small areas of soils that are similar to the Auburn soil but are less than 10 inches deep or have more than 35 percent rock fragments. Included areas make up about 20 percent of the total acreage.

The Auburn soil is shallow or moderately deep and is well drained. It formed in material weathered from basic metavolcanic rocks. Typically, the surface layer is brown gravelly loam about 4 inches thick. The subsoil is brown and reddish brown gravelly loam about 13 inches thick. Hard greenstone is at a depth of 17 inches.

Permeability in the Auburn soil is moderate. Available water capacity is about 2.0 to 2.5 inches. The effective rooting depth is restricted by bedrock at a depth of 10 to 28 inches. Runoff is rapid, and the hazard of water erosion is severe.

The Sobrante soil is moderately deep and well drained. It formed in material weathered from basic metavolcanic rocks. Typically, the surface layer is brown gravelly loam about 5 inches thick. The subsoil is dark reddish brown gravelly loam about 30 inches thick. Below this is weathered greenstone, which extends to a depth of 40 inches. Hard greenstone is at a depth of 40 inches.

Permeability in the Sobrante soil is moderate. Available water capacity is about 4 to 5 inches. The effective rooting depth is restricted by bedrock at a depth of 20 to 40 inches. The shrink-swell potential is moderate. Runoff is rapid, and the hazard of water erosion is severe.

Rock outcrop consists of exposures of bare rock that support little or no vegetation.

This unit is used for woodland, livestock grazing, and wildlife habitat.

Blue oak, interior live oak, and Digger pine are the major tree species. On the Auburn soil, volumes of 16 to 27 cords per acre of blue oak, interior live oak, and Digger pine with an average diameter of about 14 inches have been measured. On the Sobrante soil, volumes of 38 to 191 cords per acre of blue oak, interior live oak, and Digger pine with an average diameter of about 10 inches have been measured. The slope hinders any potential harvesting of trees. Careful harvesting is needed to allow the stand to regenerate through oak stump sprouting and to minimize water erosion when the plant cover is disturbed.

Where this unit is used for livestock grazing, it is limited by a tendency to produce woody species. Fencing and properly located salt and livestock watering facilities help to achieve a uniform distribution of livestock grazing. Brush management improves forage production. Areas where brush is managed by prescribed burning or by chemical methods may be subject to an increased hazard of erosion. Mechanical treatment is not practical because of the Rock outcrop and the slope. Grazing should be delayed until the soils are firm and the more desirable

forage plants have achieved sufficient growth to withstand grazing pressure. If this unit is grazed by livestock when the soils are too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of the less preferred forage plants increases. Livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. The characteristic understory plant community on this unit is mainly poison oak, soft chess, wild oat, and filaree.

This unit provides habitat for wildlife, such as deer, birds of prey, game birds, other birds, and small fur-bearing mammals. Planting and maintaining shrubs and other woody plants in wet areas and in areas adjacent to drainageways improve the habitat. Habitat for quail can be improved by building brush piles, especially in areas adjacent to water. Creating openings in areas of dense brush can benefit wildlife. Brush controlled by prescribed burning or mechanical methods produces valuable new growth for wildlife. Oaks should be maintained as a source of feed and cover for wild turkey and deer.

The Auburn and Sobrante soils are in capability subclass VIe (18), nonirrigated. The Rock outcrop is in capability class VIII (18), nonirrigated.

120—Auburn-Sobrante-Rock outcrop complex, 50 to 75 percent slopes. This unit is on foothills in the inner gorge of river and stream canyons. The native vegetation is mainly blue oak, interior live oak, and Digger pine with an understory of brush, annual grasses, and forbs. Elevation is between 300 and 1,900 feet. The average annual precipitation is between 26 and 35 inches, the average annual air temperature is between 58 and 61 degrees F, and the average frost-free period is between 230 and 250 days.

This unit is about 30 percent Auburn gravelly loam, 30 percent Sobrante gravelly loam, and 20 percent Rock outcrop. The Auburn soil and Rock outcrop are on ridgetops and the upper side slopes, and the Sobrante soil is on the lower side slopes and on toe slopes.

Included in this unit are small areas of Timbuctoo soils and a soil that is similar to the Auburn soil but has bedrock at a depth of less than 10 inches or has more than 35 percent rock fragments. Also included are small areas of the Auburn soil and Rock outcrop that have slopes of more than 75 percent. Included areas make up about 20 percent of the total acreage.

The Auburn soil is shallow or moderately deep and is well drained. It formed in material weathered from basic metavolcanic rocks. Typically, the surface layer is brown gravelly loam about 4 inches thick. The subsoil is brown

and reddish brown gravelly loam about 13 inches thick. Hard greenstone is at a depth of 17 inches.

Permeability in the Auburn soil is moderate. Available water capacity is about 2.0 to 2.5 inches. The effective rooting depth is restricted by bedrock at a depth of 10 to 28 inches. Runoff is very rapid, and the hazard of water erosion is very severe.

The Sobrante soil is moderately deep and well drained. It formed in material weathered from basic metavolcanic rocks. Typically, the surface layer is brown gravelly loam about 5 inches thick. The subsoil is dark reddish brown gravelly loam about 30 inches thick. Below this is weathered greenstone, which extends to a depth of 40 inches. Hard greenstone is at a depth of 40 inches.

Permeability in the Sobrante soil is moderate. Available water capacity is about 4 to 5 inches. The effective rooting depth is restricted by bedrock at a depth of 20 to 40 inches. The shrink-swell potential is moderate. Runoff is very rapid, and the hazard of water erosion is very severe.

Rock outcrop consists of exposures of bare rock that support little or no vegetation.

This unit is used mainly for wildlife habitat. It also is a watershed.

This unit provides habitat for wildlife, such as deer, birds of prey, game birds, other birds, and small fur-bearing mammals. Planting and maintaining shrubs and other woody plants in wet areas and in areas adjacent to drainageways improve the habitat. Habitat for quail can be improved by building brush piles, especially in areas adjacent to water. Creating openings in areas of dense brush can benefit wildlife. Brush controlled by prescribed burning or mechanical methods produces valuable new growth for wildlife. Oaks should be maintained as a source of feed and cover for wild turkey and deer.

The Auburn and Sobrante soils are in capability subclass VIIe (18), nonirrigated. The Rock outcrop is in capability class VIII (18), nonirrigated.

121—Auburn-Timbuctoo-Argonaut complex, 3 to 8 percent slopes. This unit is on foothills. The native vegetation is mainly blue oak, interior live oak, Digger pine, and scattered ponderosa pine with an understory of brush, annual grasses, and forbs. Elevation is between 300 and 1,900 feet. The average annual precipitation is between 26 and 35 inches, the average annual air temperature is between 58 and 61 degrees F, and the average frost-free period is between 230 and 250 days.

This unit is about 30 percent Auburn gravelly loam, 25 percent Timbuctoo gravelly loam, and 20 percent Argonaut gravelly loam. The Auburn soil is on convex ridgetops and the upper side slopes; the Timbuctoo soil is on side slopes and toe slopes, generally on north or east

aspects; and the Argonaut is on concave ridgetops and side slopes.

Included in this unit are small areas of Rock outcrop and Sobrante soils and soils that are similar to the Argonaut and Timbuctoo soils but have bedrock at a depth of 40 to 60 inches. Also included are small areas of soils that are similar to the Auburn soil but have bedrock at a depth of less than 10 inches or have a subsoil of gravelly clay loam. Included areas make up about 25 percent of the total acreage. The percentage varies from one area to another.

The Auburn soil is shallow or moderately deep and is well drained. It formed in material weathered from basic metavolcanic rocks. Typically, the surface layer is brown gravelly loam about 4 inches thick. The subsoil is brown and reddish brown gravelly loam about 13 inches thick. Hard greenstone is at a depth of 17 inches.

Permeability in the Auburn soil is moderate. Available water capacity is about 2.0 to 2.5 inches. The effective rooting depth is restricted by bedrock at a depth of 10 to 28 inches. Runoff is slow, and the hazard of water erosion is slight.

The Timbuctoo soil is moderately deep and well drained. It formed in material weathered from basic metavolcanic rocks. Typically, the surface layer is yellowish red gravelly loam about 4 inches thick. The upper 22 inches of the subsoil is red and dark red gravelly clay loam and gravelly clay. The lower 12 inches is dark red gravelly sandy clay loam. Below this is weathered diabase, which extends to a depth of 45 inches. Hard diabase is at a depth of 45 inches.

Permeability in the Timbuctoo soil is slow. Available water capacity is about 4.0 to 5.5 inches. The effective rooting depth is restricted by bedrock at a depth of 20 to 40 inches. The shrink-swell potential is moderate. Runoff is slow, and the hazard of water erosion is slight.

The Argonaut soil is moderately deep and well drained. It formed in material weathered from basic metavolcanic rocks. Typically, the surface layer is brown gravelly loam about 7 inches thick. The upper 14 inches of the subsoil is yellowish red clay loam. The lower 10 inches is strong brown clay. Weathered greenstone is at a depth of 31 inches.

Permeability in the Argonaut soil is very slow. Available water capacity is about 3.5 to 5.0 inches. The effective rooting depth is restricted by bedrock at a depth of 20 to 40 inches. The dense clay subsoil restricts the movement of water and air and root penetration. For insignificant periods after heavy rainstorms from December through April, there is a perched water table above the claypan. The shrink-swell potential is high. Runoff is slow, and the hazard of water erosion is slight.

This unit is used mainly for woodland and livestock

grazing. It also is used for homesite development, irrigated pasture, and wildlife habitat.

Blue oak, interior live oak, and Digger pine are the major tree species. Ponderosa pine is in some areas of the Timbuctoo soil. On the Auburn soil, volumes of 16 to 27 cords per acre of blue oak, interior live oak, and Digger pine with an average diameter of about 10 inches have been measured. On the Timbuctoo soil, volumes of approximately 26 cords per acre of blue oak, interior live oak, and Digger pine with an average diameter of about 8 inches have been measured. A site index of 112 for ponderosa pine has been measured on the Timbuctoo soil on north aspects. On the Argonaut soil, volumes of approximately 47 cords per acre of blue oak with an average diameter of about 10 inches have been measured. Careful harvesting is needed to allow the stand to regenerate through oak stump sprouting and to minimize water erosion when the plant cover is disturbed.

Where this unit is used for livestock grazing, it is limited by a tendency to produce woody species. Fencing and properly located salt and livestock watering facilities help to achieve a uniform distribution of livestock grazing. Brush management improves forage production. Areas where brush is managed by prescribed burning or by chemical or mechanical methods may be subject to an increased hazard of erosion. Grazing should be delayed until the soils are firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. If this unit is grazed by livestock when the soils are too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of the less preferred forage plants increases. Livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. This unit responds well to applications of fertilizer, to range seeding, and to proper grazing use if brush is controlled. The characteristic understory plant community is mainly poison oak, soft chess, wild oat, and filaree on the Auburn and Argonaut soils and poison oak, deerbrush, blue wildrye, and mountain brome on the Timbuctoo soil.

If this unit is used for homesite development, the main management concerns are the very slow permeability and shrink-swell potential of the Argonaut soil and limited soil depth. If the Argonaut soil is used for septic tank absorption fields, the very slow permeability can be overcome by increasing the size of the absorption field and providing sandy backfill for the trench. If buildings are constructed on the Argonaut soil, properly designing foundations and footings and diverting runoff away from the buildings help to prevent the structural damage

caused by shrinking and swelling. The cuts needed to provide essentially level building sites can expose bedrock. Because of limited soil depth and very slow permeability, onsite sewage disposal systems often fail or do not function properly during periods of high rainfall. If the density of housing is moderate or high, community sewage systems are needed to prevent the contamination of water supplies caused by seepage from onsite sewage disposal systems. Plans for homesite development should provide for the preservation of as many trees as possible. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

If this unit is used for irrigated pasture, the main management concerns are very slow permeability and limited soil depth. Only the plants adapted to a limited rooting depth should be selected for planting. Because of the very slow permeability in the Argonaut soil, adjustment of the length of irrigation runs is needed to permit adequate infiltration of water. Carefully applying irrigation water helps to prevent the buildup of a water table above the clay layer. A drainage system may be needed. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and control erosion. Periodic mowing and clipping help to maintain uniform growth and discourage selective grazing. Fertilizer is needed to ensure the optimum growth of grasses and legumes.

This unit provides habitat for wildlife, such as deer, birds of prey, game birds, other birds, and small fur-bearing mammals. Planting and maintaining shrubs and other woody plants in wet areas and in areas adjacent to drainageways improve the habitat. Habitat for quail can be improved by building brush piles, especially in areas adjacent to water. Creating openings in areas of dense brush can benefit wildlife. Brush controlled by prescribed burning or mechanical methods produces valuable new growth for wildlife. Oaks should be maintained as a source of feed and cover for wild turkey and deer.

The Auburn and Argonaut soils are in capability unit IVe-8 (18), irrigated and nonirrigated. The Timbuctoo soil is in capability unit IIIe-8 (18), irrigated and nonirrigated.

122—Auburn-Timbuctoo-Argonaut complex, 8 to 15 percent slopes. This unit is on foothills. The native vegetation is mainly blue oak, interior live oak, Digger pine, and scattered ponderosa pine with an understory of brush, annual grasses, and forbs. Elevation is between 300 and 1,900 feet. The average annual precipitation is between 26 and 35 inches, the average annual air temperature is between 58 and 61 degrees F, and the average frost-free period is between 230 and 250 days.

This unit is about 30 percent Auburn gravelly loam, 25 percent Timbuctoo gravelly loam, and 20 percent Argonaut gravelly loam. The Auburn soil is on convex

ridgetops and the upper side slopes; the Timbuctoo soil is on side slopes and toe slopes, generally on north or east aspects; and the Argonaut soil is on ridgetops and side slopes.

Included in this unit are small areas of Sobrante soils; areas of Rock outcrop, generally on ridgetops; areas of soils that are similar to the Argonaut and Timbuctoo soils but have bedrock at a depth of 40 to 60 inches; and small areas of soils that are similar to the Auburn soil but have bedrock at a depth of less than 10 inches or have a subsoil of gravelly clay loam. Included areas make up about 25 percent of the total acreage.

The Auburn soil is shallow or moderately deep and is well drained. It formed in material weathered from basic metavolcanic rocks. Typically, the surface layer is brown gravelly loam about 4 inches thick. The subsoil is brown and reddish brown gravelly loam about 13 inches thick. Hard greenstone is at a depth of 17 inches.

Permeability in the Auburn soil is moderate. Available water capacity is about 2.0 to 2.5 inches. The effective rooting depth is restricted by bedrock at a depth of 10 to 28 inches. Runoff is slow, and the hazard of water erosion is moderate.

The Timbuctoo soil is moderately deep and well drained. It formed in material weathered from basic metavolcanic rocks. Typically, the surface layer is yellowish red gravelly loam about 4 inches thick. The upper 22 inches of the subsoil is red and dark red gravelly clay loam and gravelly clay. The lower 12 inches is dark red gravelly sandy clay loam. Below this is weathered diabase, which extends to a depth of 45 inches. Hard diabase is at a depth of 45 inches. In some areas the surface layer is loam.

Permeability in the Timbuctoo soil is slow. Available water capacity is about 4.0 to 5.5 inches. The effective rooting depth is restricted by bedrock at a depth of 20 to 40 inches. The shrink-swell potential is moderate. Runoff is slow, and the hazard of water erosion is moderate.

The Argonaut soil is moderately deep and well drained. It formed in material weathered from basic metavolcanic rocks. Typically, the surface layer is brown gravelly loam about 7 inches thick. The upper 14 inches of the subsoil is yellowish red clay loam. The lower 10 inches is strong brown clay. Weathered greenstone is at a depth of 31 inches. In some areas the surface layer is loam.

Permeability in the Argonaut soil is very slow. Available water capacity is about 3.5 to 5.0 inches. The effective rooting depth is restricted by bedrock at a depth of 20 to 40 inches. The dense clay subsoil restricts the movement of water and air and root penetration. For insignificant periods after heavy rainstorms from December through April, there is a perched water table above the claypan. The shrink-swell potential is high. Runoff is slow, and the hazard of water erosion is moderate.

This unit is used mainly for woodland and livestock grazing. It also is used for homesite development, irrigated pasture, and wildlife habitat.

Blue oak, interior live oak, and Digger pine are the major tree species. Ponderosa pine is in some areas of the Timbuctoo soil. On the Auburn soil, volumes of 16 to 27 cords per acre of blue oak, interior live oak, and Digger pine with an average diameter of about 14 inches have been measured. On the Timbuctoo soil, volumes of approximately 26 cords per acre of blue oak, interior live oak, and Digger pine with an average diameter of about 8 inches have been measured. A site index of 112 for ponderosa pine has been measured on the Timbuctoo soil on north aspects. On the Argonaut soil, volumes of approximately 47 cords per acre of blue oak and Digger pine with an average diameter of about 10 inches have been measured. Careful harvesting is needed to allow the stand to regenerate through oak stump sprouting and to minimize water erosion when the plant cover is disturbed.

Where this unit is used for livestock grazing, it is limited by a tendency to produce woody species. Fencing and properly located salt and livestock watering facilities help to achieve a uniform distribution of livestock grazing. Brush management improves forage production. Areas where brush is managed by prescribed burning or by chemical or mechanical methods may be subject to an increased hazard of erosion. Grazing should be delayed until the soils are firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. If this unit is grazed by livestock when the soils are too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of the less preferred forage plants increases. Livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. This unit responds well to applications of fertilizer, to range seeding, and to proper grazing use if brush is controlled. The characteristic understory plant community is mainly poison oak, soft chess, wild oat, and filaree on the Auburn and Argonaut soils and poison oak, deerbrush, blue wildrye, and mountain brome on the Timbuctoo soil.

If this unit is used for homesite development, the main management concerns are the very slow permeability and shrink-swell potential of the Argonaut soil and limited soil depth, the slope, and the hazard of water erosion. If the Argonaut soil is used for septic tank absorption fields, the very slow permeability can be overcome by increasing the size of the absorption field and providing sandy backfill for the trench. If buildings are constructed on the Argonaut soil, properly designing foundations and footings and

diverting runoff away from the buildings help to prevent the structural damage caused by shrinking and swelling. The cuts needed to provide essentially level building sites can expose bedrock. Erosion is a hazard on construction sites and on road cuts and fills. Only the part of the site that is used for construction should be disturbed. Preserving the existing plant cover during construction helps to control erosion. Mulching and revegetating as soon as possible in disturbed areas, such as road cuts and fills and construction sites, also help to control erosion. Because of limited soil depth, onsite sewage disposal systems often fail or do not function properly during periods of high rainfall. If the density of housing is moderate or high, community sewage systems are needed to prevent the contamination of water supplies caused by seepage from onsite sewage disposal systems. Plans for homesite development should provide for the preservation of as many trees as possible. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

If this unit is used for irrigated pasture, the main management concerns are very slow permeability and limited soil depth. Only the plants adapted to a limited rooting depth should be selected for planting. Because of the very slow permeability in the Argonaut soil, adjustment of the length of irrigation runs is needed to permit adequate infiltration of water. Carefully applying irrigation water helps to prevent the buildup of a water table above the clay layer. A drainage system may be needed. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and control erosion. Periodic mowing and clipping help to maintain uniform growth and discourage selective grazing. Fertilizer is needed to ensure the optimum growth of grasses and legumes.

This unit provides habitat for wildlife, such as deer, birds of prey, game birds, other birds, and small fur-bearing mammals. Planting and maintaining shrubs and other woody plants in wet areas and in areas adjacent to drainageways improve the habitat. Habitat for quail can be improved by building brush piles, especially in areas adjacent to water. Creating openings in areas of dense brush can benefit wildlife. Brush controlled by prescribed burning or mechanical methods produces valuable new growth for wildlife. Oaks should be maintained as a source of feed and cover for wild turkey and deer.

The Auburn and Argonaut soils are in capability unit IVe-8 (18), irrigated and nonirrigated. The Timbuctoo soil is in capability unit IIIe-8 (18), irrigated and nonirrigated.

123—Boomer gravelly loam, 8 to 15 percent slopes. This deep, well drained soil is on mountains. It formed in material weathered from metavolcanic rocks. The native vegetation is mainly ponderosa pine and

California black oak with an understory of brush and annual grasses and forbs. Elevation is between 1,400 and 2,800 feet. The average annual precipitation is between 35 and 50 inches, the average annual air temperature is between 55 and 59 degrees F, and the average frost-free period is between 190 and 230 days.

Typically, the surface is covered with a mat of partially decomposed needles, leaves, twigs, and bark about 1/2 inch thick. The surface layer is brown and yellowish red gravelly loam about 12 inches thick. The subsoil is reddish brown and red gravelly clay loam about 38 inches thick. Weathered greenstone is at a depth of 50 inches. In some areas the surface layer is loam.

Included in this unit are small areas of Sobrante soils and a soil that is similar to the Boomer soil but has bedrock at a depth of more than 60 inches. Included areas make up about 20 percent of the total acreage.

Permeability in the Boomer soil is moderately slow. Available water capacity is about 6.0 to 7.5 inches. The effective rooting depth is restricted by bedrock at a depth of 40 to 60 inches. The shrink-swell potential is moderate. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used for timber production, livestock grazing, homesite development, irrigated pasture, and wildlife habitat.

Ponderosa pine, California black oak, incense cedar, and Pacific madrone are the major tree species. On the basis of a 100-year site curve, the mean site index is 100 for ponderosa pine. The yield (CMAI) for ponderosa pine is 102 cubic feet per acre in a fully stocked stand of trees 40 years old.

The main concerns in producing and harvesting timber are seasonal wetness and plant competition. Conventional methods of harvesting timber can be used. Use of wheeled and tracked equipment when the soil is moist results in the formation of ruts, causes soil compaction, and can damage the roots of trees. Soil compaction may increase the rate of water runoff and decrease timber production. Unsurfaced roads and skid trails are slippery when wet, and they may be impassable during rainy periods. Roads require suitable surfacing for year-round use. Rock for the construction of roads is not readily available in areas of this unit. Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling, which helps to eliminate unwanted weeds, brush, or trees. The characteristic understory plant community on this unit is mainly sticky whiteleaf manzanita, poison oak, toyon, and blue wildrye.

Where this unit is used for livestock grazing, it is limited by a tendency to produce woody species. Brush

management improves forage production. Grazing should be delayed until the soil is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. If this unit is grazed by livestock when the soil is too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of the less preferred forage plants increases. Livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. Fencing and properly located salt and livestock watering facilities help to achieve a uniform distribution of livestock grazing. This unit responds well to applications of fertilizer, to range seeding, and to proper grazing use.

If this unit is used for homesite development, the main management concerns are the moderately slow permeability and the hazard of water erosion. If the soil is used for septic tank absorption fields, the moderately slow permeability can be overcome by increasing the size of the absorption field. Excavation for roads and buildings increases the hazard of erosion. Erosion is a hazard on construction sites and on road cuts and fills. Only the part of the site that is used for construction should be disturbed. Mulching and revegetating as soon as possible in disturbed areas, such as road cuts and fills and construction sites, help to control erosion. Plans for homesite development should provide for the preservation of as many trees as possible. Properly designing buildings and roads helps to offset the limited ability of the soil to support a load.

This unit is suited to irrigated pasture. Few limitations affect this use. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and control erosion. If this unit is grazed by livestock when the soil is too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. Periodic mowing and clipping help to maintain uniform growth and discourage selective grazing. Fertilizer is needed to ensure the optimum growth of grasses and legumes.

This unit provides habitat for wildlife, such as deer, birds of prey, game birds, other birds, and small fur-bearing animals. Planting and maintaining shrubs and other woody plants in wet areas and in areas adjacent to drainageways improve the habitat. Creating openings in areas of dense brush can benefit wildlife. Brush controlled by prescribed burning or mechanical methods produces valuable new growth for wildlife.

This unit is in capability unit IIIe-1 (22), irrigated and nonirrigated.

124—Boomer gravelly loam, 15 to 30 percent slopes. This deep, well drained soil is on mountains. It formed in material weathered from metavolcanic rocks. The native vegetation is mainly ponderosa pine and California black oak with an understory of brush, annual grasses, and forbs. Elevation is between 1,400 and 2,800 feet. The average annual precipitation is between 35 and 50 inches, the average annual air temperature is between 55 and 59 degrees F, and the average frost-free period is between 190 and 230 days.

Typically, the surface is covered with a mat of partially decomposed needles, leaves, twigs, and bark about 1/2 inch thick. The surface layer is brown and yellowish red gravelly loam about 12 inches thick. The subsoil is reddish brown and red gravelly clay loam about 38 inches thick. Weathered greenstone is at a depth of 50 inches. In some areas the surface layer is loam.

Included in this unit are small areas of Sobrante soils and a soil that is similar to the Boomer soil but has bedrock at a depth of more than 60 inches. Included areas make up about 20 percent of the total acreage.

Permeability in the Boomer soil is moderately slow. Available water capacity is about 5.0 to 7.5 inches. The effective rooting depth is restricted by bedrock at a depth of 40 to 60 inches. The shrink-swell potential is moderate. Runoff is rapid, and the hazard of water erosion is severe.

This unit is used for timber production, livestock grazing, homesite development, irrigated pasture, and wildlife habitat.

Ponderosa pine, California black oak, incense cedar, and Pacific madrone are the major tree species. On the basis of a 100-year site curve, the mean site index is 100 for ponderosa pine. The yield (CMAI) for ponderosa pine is 102 cubic feet per acre in a fully stocked stand of trees 40 years old.

The main concerns in producing and harvesting timber are seasonal wetness, the hazard of water erosion, and plant competition. Conventional methods of harvesting timber can be used. Use of wheeled and tracked equipment when the soil is moist results in the formation of ruts, causes soil compaction, and can damage the roots of trees. Soil compaction may increase the rate of water runoff and decrease timber production. Unsurfaced roads and skid trails are slippery when wet, and they may be impassable during rainy periods. Roads require suitable surfacing for year-round use. Rock for the construction of roads is not readily available in areas of this unit. When trees are harvested, management that minimizes the risk of erosion is essential. Erosion can be controlled by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees. Competing vegetation can be

controlled by properly preparing the site and by spraying, cutting, or girdling, which helps to eliminate unwanted weeds, brush, or trees. The characteristic understory plant community on this unit is mainly sticky whiteleaf manzanita, poison oak, toyon, and blue wildrye.

Where this unit is used for livestock grazing, it is limited by a tendency to produce woody species. Brush management improves forage production. Grazing should be delayed until the soil is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. If this unit is grazed by livestock when the soil is too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of the less preferred forage plants increases. Livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. Fencing and properly located salt and livestock watering facilities help to achieve a uniform distribution of livestock grazing. This unit responds well to applications of fertilizer, to range seeding, and to proper grazing use.

If this unit is used for homesite development, the main management concerns are the moderately slow permeability, the slope, and the hazard of water erosion. If the soil is used for septic tank absorption fields, the moderately slow permeability can be overcome by increasing the size of the absorption field. The cuts needed to provide essentially level building sites can expose bedrock. Erosion is a hazard on construction sites and on road cuts and fills. Only the part of the site that is used for construction should be disturbed. Mulching and revegetating as soon as possible in disturbed areas, such as road cuts and fills and construction sites, help to control erosion. Plans for homesite development should provide for the preservation of as many trees as possible. Properly designing buildings and roads helps to offset the limited ability of the soil to support a load.

This unit is suited to irrigated pasture. Few limitations affect this use. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and control erosion. If this unit is grazed by livestock when the soil is too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. Periodic mowing and clipping help to maintain uniform growth and discourage selective grazing. Fertilizer is needed to ensure the optimum growth of grasses and legumes.

This unit provides habitat for wildlife, such as deer,

birds of prey, game birds, other birds, and small fur-bearing animals. Planting and maintaining shrubs and other woody plants in wet areas and in areas adjacent to drainageways improve the habitat. Creating openings in areas of dense brush can benefit wildlife. Brush controlled by prescribed burning or mechanical methods produces valuable new growth for wildlife.

This unit is in capability unit IVe-1 (22), irrigated and nonirrigated.

125—Boomer gravelly loam, 30 to 50 percent slopes. This deep, well drained soil is on mountains. It formed in material weathered from metavolcanic rocks. The native vegetation is mainly ponderosa pine and California black oak with an understory of brush, annual grasses, and forbs. Elevation is between 1,400 and 2,800 feet. The average annual precipitation is between 35 and 50 inches, the average annual air temperature is between 55 and 59 degrees F, and the average frost-free period is between 190 and 230 days.

Typically, the surface is covered with a mat of partially decomposed needles, leaves, twigs, and bark about 1/2 inch thick. The surface layer is brown and yellowish red gravelly loam about 12 inches thick. The subsoil is reddish brown and red gravelly clay loam about 38 inches thick. Weathered greenstone is at a depth of 50 inches. In some areas the surface layer is loam.

Included in this unit are small areas of Sobrante soils and a soil that is similar to the Boomer soil but has bedrock at a depth of more than 60 inches. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Permeability in the Boomer soil is moderately slow. Available water capacity is about 6.0 to 7.5 inches. The effective rooting depth is restricted by bedrock at a depth of 40 to 60 inches. The shrink-swell potential is moderate. Runoff is rapid, and the hazard of water erosion is severe.

This unit is used for timber production, livestock grazing, and wildlife habitat.

Ponderosa pine, California black oak, incense cedar, and Pacific madrone are the major tree species. On the basis of a 100-year site curve, the mean site index is 100 for ponderosa pine. The yield (CMAI) for ponderosa pine is 102 cubic feet per acre in a fully stocked stand of trees 40 years old.

The main concerns in producing and harvesting timber are the slope, seasonal wetness, the hazard of water erosion, and plant competition. Conventional methods of harvesting timber cannot be easily used because of the slope. Use of wheeled and tracked equipment when the soil is moist results in the formation of ruts, causes soil compaction, and can damage the roots of trees. Soil compaction may increase the rate of water runoff and decrease timber production. Unsurfaced roads and skid

trails are slippery when wet, and they may be impassable during rainy periods. Roads require suitable surfacing for year-round use. Rock for the construction of roads is not readily available in areas of this unit. When trees are harvested, management that minimizes the risk of erosion is essential. Erosion can be controlled by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling, which helps to eliminate unwanted weeds, brush, or trees. The characteristic understory plant community on this unit is mainly sticky whiteleaf manzanita, poison oak, toyon, and blue wildrye.

Where this unit is used for livestock grazing, it is limited by a tendency to produce woody species. Brush management improves forage production. Grazing should be delayed until the soil is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. If this unit is grazed by livestock when the soil is too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of the less preferred forage plants increases. Livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. Fencing and properly located salt and livestock watering facilities help to achieve a uniform distribution of livestock grazing.

This unit provides habitat for wildlife, such as deer birds of prey, game birds, other birds, and small fur-bearing animals. Planting and maintaining shrubs and other woody plants in wet areas and in areas adjacent to drainageways improve the habitat. Creating openings in areas of dense brush can benefit wildlife. Brush controlled by prescribed burning or mechanical methods produces valuable new growth for wildlife. Areas where brush is managed by prescribing burning or by chemical or mechanical methods may be subject to an increased hazard of erosion.

This unit is in capability subclass VIe (22), nonirrigated.

126—Boomer-Pendola complex, 50 to 75 percent slopes. This unit is on side slopes in the inner gorge of river and stream canyons. The native vegetation is mainly mixed conifers and hardwoods with an understory of brush, grasses, and forbs. Elevation is between 1,500 and 3,500 feet. The average annual precipitation is between 50 and 70 inches, the average annual air temperature is

between 53 and 57 degrees F, and the average frost-free period is between 160 and 190 days.

This unit is about 55 percent Boomer sandy loam and 30 percent Pendola cobbly sandy loam.

Included in this unit are small areas of Sites soils and small areas of soils that are similar to the Boomer soil but have bedrock at a depth of less than 40 inches or have a coarser textured subsoil. Included areas make up about 15 percent of the total acreage.

The Boomer soil is deep or very deep and is well drained. It formed in material weathered from basic metavolcanic rocks. Typically, the surface is covered with a mat of partially decomposed leaves, needles, and twigs about 1 inch thick. The surface layer is brown sandy loam about 3 inches thick. The subsoil is light brown and reddish yellow sandy clay loam about 54 inches thick. Weathered greenstone is at a depth of 57 inches.

Permeability in the Boomer soil is moderately slow. Available water capacity is about 8.5 to 10.5 inches. The effective rooting depth is restricted by bedrock at a depth of 40 to 80 inches. The shrink-swell potential is moderate. Runoff is very rapid, and the hazard of water erosion is very severe.

The Pendola soil is very deep and well drained. It formed in material weathered from basic metavolcanic rocks. Typically, the surface is covered with a mat of partially decomposed leaves, needles, and twigs about 1 inch thick. The surface layer is brown cobbly sandy loam about 9 inches thick. The upper 12 inches of the subsoil is red very cobbly loam. The lower 69 inches is red very cobbly clay loam.

Permeability in the Pendola soil is moderate. Available water capacity is about 4.5 to 7.0 inches. The effective rooting depth is more than 60 inches. Runoff is very rapid, and the hazard of water erosion is very severe.

This unit is used mainly for timber production. It also is a watershed.

Ponderosa pine, California black oak, incense cedar, tanoak, and Pacific madrone are the major tree species. On the basis of a 100-year site curve, the mean site index for ponderosa pine is 125 on the Boomer and Pendola soils. The yield (CMAI) for ponderosa pine in a fully stocked stand of trees 40 years old is 154 cubic feet per acre on both soils.

The main concerns in producing and harvesting timber are the slope, seasonal wetness, the hazard of water erosion, and plant competition. The slope restricts the use of wheeled and tracked equipment. Skyline yarding generally is safer than other methods and results in less soil disturbance. Unsurfaced roads and skid trails are slippery when wet, and they may be impassable during rainy periods. Roads require suitable surfacing for year-round use. Rock for the construction of roads is not readily available in areas of this unit. Roads may fail and

landslides may occur following deep soil disturbance. Roads should be confined to ridgetops where possible. When trees are harvested, management that minimizes the risk of erosion is essential. Erosion can be controlled by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Minimizing the number of roads, trails, and landings and harvesting from preplanned skid trails can help to prevent excessive erosion and compaction. Scattering brush on skid trails helps to control erosion. Revegetating as soon as possible in disturbed areas also helps to control erosion. If the site is not adequately prepared, competition from undesirable plants can prevent or delay the natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling, which helps to eliminate unwanted weeds, brush, or trees. Mechanical treatment is not feasible because of the slope. The characteristic understory plant community on this unit is mainly mountain misery, tanoak, sticky whiteleaf manzanita, and poison oak.

This unit is in capability subclass VIIe (22), nonirrigated.

127—Boomer-Pendola-Sites complex, 2 to 30 percent slopes. This unit is on mountains. The native vegetation is mainly mixed conifers and hardwoods with an understory of brush, grasses, and forbs. Elevation is between 2,000 and 3,800 feet. The average annual precipitation is between 50 and 75 inches, the average annual air temperature is between 53 and 57 degrees F, and the average frost-free period is between 160 and 190 days.

This unit is about 55 percent Boomer sandy loam, 20 percent Pendola cobbly sandy loam, and 15 percent Sites clay loam.

Included in this unit are small areas of Jocal soils and a soil that is similar to the Boomer soil but has a coarser textured subsoil. Included areas make up about 10 percent of the total acreage.

The Boomer soil is deep or very deep and is well drained. It formed in material weathered from basic metavolcanic rocks. Typically, the surface is covered with a mat of partially decomposed leaves, needles, and twigs about 1 inch thick. The surface layer is brown sandy loam about 3 inches thick. The subsoil is light brown and reddish yellow sandy clay loam about 54 inches thick. Weathered greenstone is at a depth of 57 inches.

Permeability in the Boomer soil is moderately slow. Available water capacity is about 8.5 to 10.5 inches. The effective rooting depth is restricted by bedrock at a depth of 40 to 80 inches. The shrink-swell potential is moderate. Runoff is medium, and the hazard of water erosion is moderate.

The Pendola soil is very deep and well drained. It formed in material weathered from basic metavolcanic rocks. Typically, the surface is covered with a mat of partially decomposed leaves, needles, and twigs about 1 inch thick. The surface layer is brown cobbly sandy loam about 9 inches thick. The upper 12 inches of the subsoil is red very cobbly loam. The lower 69 inches is red very cobbly clay loam.

Permeability in the Pendola soil is moderate. Available water capacity is about 4.5 to 7.0 inches. The effective rooting depth is more than 60 inches. Runoff is medium, and the hazard of water erosion is moderate.

The Sites soil is deep and well drained. It formed in material weathered from metavolcanic rocks. Typically, the surface is covered with a mat of partially decomposed leaves, needles, and twigs about 2 inches thick. The surface layer is reddish brown clay loam about 9 inches thick. The subsoil is yellowish red clay about 36 inches thick. Weathered schist is at a depth of 45 inches.

Permeability in the Sites soil is moderately slow. Available water capacity is about 6.0 to 7.5 inches. The effective rooting depth is restricted by bedrock at a depth of 40 to 60 inches. The shrink-swell potential is moderate. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for timber production. It also is used for irrigated pasture and is a watershed.

Ponderosa pine, Douglas-fir, California black oak, incense cedar, tanoak, and Pacific madrone are the major tree species. On the basis of a 100-year site curve, the mean site index for ponderosa pine is 125 on the Boomer soil, 125 on the Pendola soil, and 145 on the Sites soil. On the basis of a 100-year site curve, the mean site index for Douglas-fir on the Sites soil is 140 in a fully stocked stand of trees 40 years old. The yield (CMAI) for ponderosa pine is 154 cubic feet per acre on the Boomer and Pendola soils and 199 cubic feet per acre on the Sites soil. The yield (CMAI) for Douglas-fir on the Sites soil is 145 cubic feet per acre in a fully stocked stand of trees 60 years old.

The main concerns in producing and harvesting timber are seasonal wetness, the hazard of water erosion, and plant competition. Conventional methods of harvesting timber can be used. Use of wheeled and tracked equipment when the soils are moist results in the formation of ruts, causes soil compaction, and can damage the roots of trees. Soil compaction may increase the rate of water runoff and decrease timber production. Unsurfaced roads and skid trails are slippery when wet, and they may be impassable during rainy periods. Roads require suitable surfacing for year-round use. Rock for the construction of roads is not readily available in areas of this unit. When trees are harvested, management that minimizes the risk of erosion is essential. Erosion can be

controlled by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Minimizing the number of roads, trails, and landings and harvesting from preplanned skid trails can help to prevent excessive erosion and compaction. Scattering brush on skid trails helps to control erosion. Revegetating as soon as possible in disturbed areas also helps to control erosion. Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling, which helps to eliminate unwanted weeds, brush, or trees. The characteristic understory plant community on this unit is mainly mountain misery, tanoak, sticky whiteleaf manzanita, and poison oak.

This unit is suited to irrigated pasture. Few limitations affect this use. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and control erosion. If this unit is grazed by livestock when the soils are too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. Periodic mowing and clipping help to maintain uniform growth and discourage selective grazing. Fertilizer is needed to ensure the optimum growth of grasses and legumes.

This unit is in capability unit IVe-1 (22), irrigated and nonirrigated.

128—Boomer-Pendola-Sites complex, 30 to 50 percent slopes. This unit is on mountains. The native vegetation is mainly mixed conifers and hardwoods with an understory of brush, grasses, and forbs. Elevation is between 2,000 and 3,800 feet. The average annual precipitation is between 50 and 75 inches, the average annual air temperature is between 53 and 57 degrees F, and the average frost-free period is between 160 and 190 days.

This unit is about 50 percent Boomer sandy loam, 20 percent Pendola cobbly sandy loam, and 15 percent Sites clay loam.

Included in this unit are small areas of Jocal soils and a soil that is similar to the Boomer soil but has a coarser textured subsoil. Included areas make up about 15 percent of the total acreage.

The Boomer soil is deep or very deep and is well drained. It formed in material weathered from basic metavolcanic rocks. Typically, the surface is covered with a mat of partially decomposed leaves, needles, and twigs about 1 inch thick. The surface layer is brown sandy loam about 3 inches thick. The subsoil is light brown and

reddish yellow sandy clay loam about 54 inches thick. Weathered greenstone is at a depth of 57 inches.

Permeability in the Boomer soil is moderately slow. Available water capacity is about 8.5 to 10.5 inches. The effective rooting depth is restricted by bedrock at a depth of 40 to 80 inches. The shrink-swell potential is moderate. Runoff is rapid, and the hazard of water erosion is severe.

The Pendola soil is very deep and well drained. It formed in material weathered from basic metavolcanic rocks. Typically, the surface is covered with a mat of partially decomposed leaves, needles, and twigs about 1 inch thick. The surface layer is brown cobbly sandy loam about 9 inches thick. The upper 12 inches of the subsoil is red very cobbly loam. The lower 69 inches is red very cobbly clay loam.

Permeability in the Pendola soil is moderate. Available water capacity is about 4.5 to 7.0 inches. The effective rooting depth is more than 60 inches. Runoff is rapid, and the hazard of water erosion is severe.

The Sites soil is deep and well drained. It formed in material weathered from metavolcanic rocks. Typically, the surface is covered with a mat of partially decomposed leaves, needles, and twigs about 2 inches thick. The surface layer is reddish brown clay loam about 9 inches thick. The subsoil is yellowish red clay about 36 inches thick. Weathered schist is at a depth of 45 inches.

Permeability in the Sites soil is moderately slow. Available water capacity is about 6.0 to 7.5 inches. The effective rooting depth is restricted by bedrock at a depth of 40 to 60 inches. The shrink-swell potential is moderate. Runoff is rapid, and the hazard of water erosion is severe.

This unit is used mainly for timber production. It also is a watershed.

Ponderosa pine, Douglas-fir, California black oak, incense cedar, tanoak, and Pacific madrone are the major tree species. On the basis of a 100-year site curve, the mean site index for ponderosa pine is 125 on the Boomer and Pendola soils and 145 on the Sites soil. On the basis of a 100-year site curve, the mean site index is 140 for Douglas-fir on the Sites soil. The yield (CMAI) for ponderosa pine in a fully stocked stand of trees 40 years old is 154 cubic feet per acre on the Boomer and Pendola soils and 199 cubic feet per acre on the Sites soil. The yield (CMAI) for Douglas-fir on the Sites soil is 145 cubic feet per acre in a fully stocked stand of trees 60 years old.

The main concerns in producing and harvesting timber are the slope, seasonal wetness, the hazard of water erosion, and plant competition. The slope restricts the use of wheeled and tracked equipment. Skyline yarding generally is safer than other methods and results in less soil disturbance. Unsurfaced roads and skid trails are slippery when wet, and they may be impassable during rainy periods. Roads require suitable surfacing for year-

round use. Rock for the construction of roads is not readily available in areas of this unit. Roads may fail and landslides may occur following deep soil disturbance. Roads should be confined to ridgetops where possible. When trees are harvested, management that minimizes the risk of erosion is essential. Erosion can be controlled by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Minimizing the number of roads, trails, and landings and harvesting from preplanned skid trails can help to prevent excessive erosion and compaction. Scattering brush on skid trails helps to control erosion. Revegetating as soon as possible in disturbed areas also helps to control erosion. If the site is not adequately prepared, competition from undesirable plants can prevent or delay the natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling, which helps to eliminate unwanted weeds, brush, or trees. Mechanical treatment is not feasible because of the slope. The characteristic understory plant community on this unit is mainly mountain misery, tanoak, sticky whiteleaf manzanita, and poison oak.

This unit is in capability subclass VIe (22), nonirrigated.

129—Bruella loam, 0 to 1 percent slopes. This very deep, well drained soil is on stream terraces. It formed in coarse textured alluvium derived from granitic rocks. The vegetation in uncultivated areas is mainly annual grasses, forbs, and valley oaks. Elevation is between 30 and 125 feet. The average annual precipitation is between 18 and 22 inches, the average annual air temperature is between 61 and 63 degrees F, and the average frost-free period is between 270 and 290 days.

Typically, the surface layer is strong brown loam about 13 inches thick. The subsoil to a depth of 70 inches is yellowish red and strong brown sandy clay loam. In some areas the surface layer is sandy loam.

Included in this unit are small areas of soils that are similar to the Bruella soil but have a finer textured subsoil. Also included are small areas of San Joaquin and Kimball soils. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

Permeability in the Bruella soil is moderately slow. Available water capacity is about 8 to 10 inches. The effective rooting depth is 60 inches or more. The shrink-swell potential is moderate. Runoff is slow, and the hazard of water erosion is slight. This soil is protected by levees and is subject to rare flooding.

Most areas of this unit are used for irrigated crops, mainly rice and prunes. The other crops include peaches. Some areas are used for irrigated pasture or homesite development.

This unit is suited to irrigated crops. It is limited mainly by the moderately slow permeability. Depending on the particular crop, furrow, border, corrugation, and sprinkler irrigation systems are suitable. Because of the moderately slow permeability, adjustment of the length of irrigation runs is needed to permit adequate infiltration of water. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake. This practice, however, is not applicable to rice production.

This unit is suited to irrigated pasture. Few limitations affect this use. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and control erosion. If this unit is grazed by livestock when the soil is too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. Periodic mowing and clipping help to maintain uniform growth and discourage selective grazing. Fertilizer is needed to ensure the optimum growth of grasses and legumes.

This unit is not suited to homesite development because of the hazard of flooding. If the soil is used for septic tank absorption fields, the moderately slow permeability can be overcome by increasing the size of the absorption field. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

This unit is in capability class I (17), irrigated, and capability subclass IIIc (17), nonirrigated.

130—Capay clay loam, 0 to 1 percent slopes. This very deep, moderately well drained soil is in basins. It formed in fine textured alluvium derived from mixed sources. The vegetation in uncultivated areas is mainly annual grasses and forbs. Elevation is between 30 and 125 feet. The average annual precipitation is between 18 and 22 inches, the average annual air temperature is between 61 and 63 degrees F, and the average frost-free period is between 270 and 290 days.

Typically, the surface layer is brown clay loam about 9 inches thick. It is underlain by a layer of yellowish brown clay about 6 inches thick. The upper 20 inches of the underlying material is brown clay. The lower part to a depth of 60 inches is yellowish brown clay loam. In some areas the surface layer is clay or silty clay.

Included in this unit are small areas of Kimball and San Joaquin soils and a soil that is similar to the Capay soil but has a hardpan at a depth of 40 to 60 inches. Included areas make up about 15 percent of the total acreage.

Permeability in the Capay soil is slow. Available water capacity is about 9.5 to 10.5 inches. The effective rooting depth is 60 inches or more. The shrink-swell potential is high. Runoff is slow, and the hazard of water erosion is

slight. This soil is protected by levees and is subject to rare flooding.

Most areas of this unit are used for irrigated crops, mainly rice. A few areas are used either for irrigated corn for silage or for irrigated pasture.

This unit is suited to irrigated crops. It is limited mainly by the slow permeability. Depending on the particular crop, furrow, border, corrugation, and sprinkler irrigation systems are suitable. Because of the slow permeability, water applications should be regulated so that water does not stand on the surface and damage the crops. This practice, however, is not applicable to rice production.

If this unit is used for irrigated pasture, the main management concern is the slow permeability. Because of the slow permeability, adjustment of the length of irrigation runs is needed to permit adequate infiltration of water. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and control erosion. If this unit is grazed by livestock when the soil is too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. Periodic mowing and clipping help to maintain uniform growth and discourage selective grazing. Fertilizer is needed to ensure the optimum growth of grasses and legumes.

This unit is in capability units IIs-5 (17), irrigated, and IIIs-5 (17), nonirrigated.

131—Hollenbeck silty clay loam, 0 to 1 percent slopes. This moderately well drained soil is in basins. It is deep to a hardpan. It formed in fine textured alluvium derived from mixed sources. The vegetation in uncultivated areas is mainly annual grasses and forbs. Elevation is between 30 and 125 feet. The average annual precipitation is between 18 and 20 inches, the average annual air temperature is between 61 and 63 degrees F, and the average frost-free period is between 270 and 290 days.

Typically, the surface layer is brown silty clay loam about 8 inches thick. The upper 8 inches of the subsoil is grayish brown silty clay. The next 27 inches is yellowish brown and brown clay. The lower 4 inches is reddish yellow clay loam. An indurated hardpan is at a depth of 47 inches. In some areas the surface layer is silty clay or clay.

Included in this unit are small areas of Kimball and San Joaquin soils and small areas of a soil that is similar to the Hollenbeck soil but has a hardpan below a depth of 60 inches. Included areas make up about 15 percent of the total acreage.

Permeability in the Hollenbeck soil is slow. Available water capacity is about 5.5 to 6.0 inches. The effective rooting depth is restricted by a hardpan at a depth of 40 to

60 inches. The shrink-swell potential is high. Runoff is very slow, and the hazard of water erosion is slight. This soil is protected by levees and is subject to rare flooding.

Most areas of this unit are used for irrigated crops, mainly rice. A few areas are used either for irrigated corn for silage or for irrigated pasture.

This unit is suited to irrigated crops. It is limited mainly by the slow permeability. Depending on the particular crop, furrow, border, and sprinkler irrigation systems are suitable. Because of the slow permeability, water applications should be regulated so that water does not stand on the surface and damage the crops. This practice, however, is not applicable to rice production.

If this unit is used for irrigated pasture, the main management concern is the slow permeability. Because of the slow permeability, adjustment of the length of irrigation runs is needed to permit adequate infiltration of water. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and control erosion. If this unit is grazed by livestock when the soil is too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. Periodic mowing and clipping help to maintain uniform growth and discourage selective grazing. Fertilizer is needed to ensure the optimum growth of grasses and legumes.

This unit is in capability units IIs-5 (17), irrigated, and IIIs-5 (17), nonirrigated.

132—Hollenbeck silty clay loam, 0 to 1 percent slopes, occasionally flooded. This moderately well drained soil is in basins. It is deep to a hardpan. It formed in fine textured alluvium derived from mixed sources. The vegetation in uncultivated areas is mainly annual grasses and forbs. Elevation is between 30 and 125 feet. The average annual precipitation is between 18 and 20 inches, the average annual air temperature is between 61 and 63 degrees F, and the average frost-free period is between 270 and 290 days.

Typically, the surface layer is brown silty clay loam about 8 inches thick. The upper 8 inches of the subsoil is grayish brown silty clay. The next 27 inches is yellowish brown and brown clay. The lower 4 inches is reddish yellow clay loam. An indurated hardpan is at a depth of 47 inches. In some areas the surface layer is silty clay or clay.

Included in this unit are small areas of Conejo, Kimball, and San Joaquin soils and areas of a soil that is similar to the Hollenbeck soil but has a hardpan below a depth of 60 inches. Included areas make up about 15 percent of the total acreage.

Permeability in the Hollenbeck soil is slow. Available water capacity is about 5.5 to 6.0 inches. The effective

rooting depth is restricted by a hardpan at a depth of 40 to 60 inches. The shrink-swell potential is high. Runoff is slow, and the hazard of water erosion is slight. This soil is subject to occasional, brief or long periods of flooding from December through April.

This unit is used for irrigated crops, mainly rice. It also is used for irrigated pasture and wildlife habitat.

This unit is suited to irrigated crops. It is limited mainly by the slow permeability and the hazard of flooding. Depending on the particular crop, furrow, border, and sprinkler irrigation systems are suitable. Because of the slow permeability, water applications should be regulated so that water does not stand on the surface and damage crops. This practice, however, is not applicable to rice production.

If this unit is used for irrigated pasture, the main management concern is the slow permeability. Because of the slow permeability, adjustment of the length of irrigation runs is needed to permit adequate infiltration of water. A drainage system may be needed. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and control erosion. Periodic mowing and clipping help to maintain uniform growth and discourage selective grazing. Fertilizer is needed to ensure the optimum growth of grasses and legumes.

This unit provides habitat for wildlife, such as birds of prey, game birds, other birds, and small fur-bearing animals. Planting and maintaining shrubs and other woody plants in wet areas adjacent to drainageways improve the habitat.

This unit is in capability units IIw-5 (17), irrigated, and IIIw-5 (17), nonirrigated.

133—Hollenbeck clay, 0 to 3 percent slopes. This deep, moderately well drained soil is on hills. It formed in material weathered from siltstone and claystone. The native vegetation is mainly annual grasses and forbs. Elevation is between 120 and 200 feet. The average annual precipitation is between 18 and 20 inches, the average annual air temperature is between 61 and 63 degrees F, and the average frost-free period is between 270 and 290 days.

Typically, 5 to 15 percent of the surface is covered with cobbles and gravel. The surface layer is dark gray clay about 27 inches thick. The upper 21 inches of the subsoil is dark gray and light olive gray clay. The lower 11 inches is light brownish gray silty clay loam. Claystone is at a depth of 59 inches.

Included in this unit are small areas of Redding and San Joaquin soils. Also included are small areas of a soil that is similar to the Hollenbeck soil but has bedrock below a depth of 60 inches. Included areas make up about 15 percent of the total acreage.

Permeability in the Hollenbeck soil is slow. Available water capacity is about 9 to 10 inches. The effective rooting depth is 40 to 60 inches. The shrink-swell potential is high. Runoff is slow, and the hazard of water erosion is slight.

This unit is used for rangeland. Few limitations affect this use. If this unit is grazed by livestock when the soil is too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. This unit responds well to applications of fertilizer, to range seeding, and to proper grazing use. The characteristic plant community on this unit is mainly soft chess, Italian ryegrass, clover, and filaree.

This unit is in capability units IIe-5 (17), irrigated, and IIIe-5 (17), nonirrigated.

134—Hollenbeck-Urban land complex, 0 to 1 percent slopes. This unit is in basins. Elevation is between 50 and 65 feet. The average annual precipitation is between 18 and 20 inches, the average annual air temperature is between 61 and 63 degrees F, and the average frost-free period is between 270 and 290 days.

This unit is about 45 percent Hollenbeck silty clay loam and 40 percent Urban land.

Included in this unit are small areas of San Joaquin soils and a soil that is similar to the Hollenbeck soil but has a duripan below a depth of 60 inches. Included areas make up about 15 percent of the total acreage.

The Hollenbeck soil is deep to a hardpan and is moderately well drained. It formed in clayey alluvium derived from mixed sources. Typically, the surface layer is brown silty clay loam about 8 inches thick. The upper 8 inches of the subsoil is grayish brown silty clay. The next 27 inches is yellowish brown and brown clay. The lower 4 inches is reddish yellow clay loam. An indurated hardpan is at a depth of 47 inches.

Permeability in the Hollenbeck soil is slow. Available water capacity is about 5.5 to 6.0 inches. The effective rooting depth is restricted by a hardpan at a depth of 40 to 60 inches. The shrink-swell potential is high. Runoff is very slow, and the hazard of water erosion is slight. This soil is protected by levees and is subject to rare flooding.

Urban land consists of residential and commercial buildings, streets, and other impermeable surfaces.

This unit is used for urban development. The hazard of flooding severely limits this use. Other limitations affecting urban development are the slow permeability and the high shrink-swell potential. If the Hollenbeck soil is used for septic tank absorption fields, the slow permeability can be overcome by increasing the size of the absorption field. If buildings are constructed on this soil, properly designing foundations and footings and diverting runoff away from the buildings help to prevent the structural damage

caused by shrinking and swelling. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees. Mulch, fertilizer, and irrigation help to establish lawn grasses and other small-seeded plants.

The Hollenbeck soil is in capability units IIs-5 (17), irrigated, and IIIs-5 (17), nonirrigated. Urban land is not assigned to a land capability classification.

135—Chaix-Chawanakee-Hotaw complex, 30 to 50 percent slopes. This unit is on mountains in the inner gorge of stream canyons. The native vegetation is mainly mixed conifers and hardwoods with an understory of brush, grasses, and forbs. Elevation is between 1,200 and 3,100 feet. The average annual precipitation is between 50 and 70 inches, the average annual air temperature is between 53 and 57 degrees F, and the average frost-free period is between 160 and 190 days.

This unit is about 35 percent Chaix coarse sandy loam, 25 percent Chawanakee coarse sandy loam, and 15 percent Hotaw loam.

Included in this unit are small areas of Holland soils and Rock outcrop and areas of Chaix soils that have slopes of less than 30 percent. Included areas make up about 25 percent of the total acreage.

The Chaix soil is moderately deep and somewhat excessively drained. It formed in material weathered from granodiorite. Typically, the surface layer is grayish brown and pale brown coarse sandy loam about 9 inches thick. The subsoil is very pale brown coarse sandy loam about 20 inches thick. Weathered granodiorite is at a depth of 29 inches.

Permeability in the Chaix soil is moderately rapid. Available water capacity is about 2 to 3 inches. The effective rooting depth is restricted by bedrock at a depth of 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is severe.

The Chawanakee soil is shallow and somewhat excessively drained. It formed in material weathered from granodiorite. Typically, the surface layer is grayish brown coarse sandy loam about 5 inches thick. The subsoil is very pale brown coarse sandy loam about 10 inches thick. Weathered granodiorite is at a depth of 15 inches.

Permeability in the Chawanakee soil is moderately rapid. Available water capacity is about 1.0 to 1.5 inches. The effective rooting depth is restricted by bedrock at a depth of 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is severe.

The Hotaw soil is moderately deep and well drained. It formed in material weathered from granodiorite. Typically, the surface is covered with a mat of litter and duff about 1 inch thick. The surface layer is brown loam about 12 inches thick. The subsoil is light yellowish brown sandy clay loam about 22 inches thick. Weathered granodiorite is at a depth of 34 inches.

Permeability in the Hotaw soil is moderate. Available water capacity is about 5 to 6 inches. The effective rooting depth is restricted by bedrock at a depth of 20 to 40 inches. The shrink-swell potential is moderate. Runoff is rapid, and the hazard of water erosion is severe.

This unit is used mainly for timber production. It also is a watershed.

Ponderosa pine, Douglas-fir, canyon live oak, and California black oak are the main tree species. On the basis of a 100-year site curve, the mean site index for ponderosa pine is 87 on the Chaix soil, 81 on the Chawanakee soil, and 102 on the Hotaw soil. On the basis of a 100-year site curve, the mean site index for Douglas-fir is 119 on the Chaix soil, 115 on the Chawanakee soil, and 130 on the Hotaw soil. The yield (CMAI) for ponderosa pine in a fully stocked stand of trees 40 years old is 80 cubic feet per acre on the Chaix soil, 70 cubic feet per acre on the Chawanakee soil, and 106 cubic feet per acre on the Hotaw soil. The yield (CMAI) for Douglas-fir in a fully stocked stand of trees 60 years old is 113 cubic feet per acre on the Chaix soil, 106 cubic feet per acre on the Chawanakee soil, and 129 cubic feet per acre on the Hotaw soil.

The main concerns in producing and harvesting timber are the slope, seasonal wetness, the hazard of water erosion, plant competition, and seedling mortality. The slope restricts the use of wheeled and tracked equipment. Skyline yarding generally is safer than other methods and results in less soil disturbance. Roads require suitable surfacing for year-round use. Rock for the construction of roads is not readily available in areas of this unit. Roads may fail and landslides may occur following deep soil disturbance. Roads should be confined to ridgetops where possible. When trees are harvested, management that minimizes the risk of erosion is essential. Erosion can be controlled by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Minimizing the number of roads, trails, and landings and harvesting from preplanned skid trails can help to prevent excessive erosion and compaction. Scattering brush on skid trails helps to control erosion. Revegetating as soon as possible in disturbed areas also helps to control erosion. If the site is not adequately prepared, competition from undesirable plants can prevent or delay the natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling, which helps to eliminate unwanted weeds, brush, or trees. Mechanical treatment is not feasible because of the slope. The high soil temperature and low content of soil moisture during the growing season cause a high seedling mortality rate, especially on south- and southwest-facing slopes. Reforestation can be accomplished by planting Douglas-fir seedlings on the cooler aspects and ponderosa pine on

the warmer south aspects. The characteristic understory plant community is mainly sticky whiteleaf manzanita, mountain misery, and deerbrush.

The Chaix and Hotaw soils are in capability subclass VIe (22), nonirrigated. The Chawanakee soil is in capability subclass VIIe (22), nonirrigated.

136—Chawanakee-Chaix-Hotaw complex, 30 to 75 percent slopes. This unit is on side slopes in the inner gorge of river and stream canyons. The native vegetation is mainly an open stand of mixed conifers and hardwoods with an understory of brush. Elevation is between 1,200 and 3,100 feet. The average annual precipitation is between 50 and 70 inches, the average annual air temperature is between 53 and 57 degrees F, and the average frost-free period is between 160 and 190 days.

This unit is about 40 percent Chawanakee coarse sandy loam, 20 percent Chaix coarse sandy loam, and 20 percent Hotaw loam.

Included in this unit are small areas of Rock outcrop and Hoda soils and areas of a soil that is similar to the Chaix soil but has bedrock at a depth of more than 40 inches. Also included are small areas of Chaix and Chawanakee soils from which 20 to 40 percent of the surface layer has been removed by erosion. Included areas make up about 20 percent of the total acreage.

The Chawanakee soil is shallow and somewhat excessively drained. It formed in material weathered from granodiorite. Typically, the surface layer is grayish brown coarse sandy loam about 5 inches thick. The subsoil is very pale brown coarse sandy loam about 10 inches thick. Weathered granodiorite is at a depth of 15 inches.

Permeability in the Chawanakee soil is moderately rapid. Available water capacity is about 1.0 to 1.5 inches. The effective rooting depth is restricted by bedrock at a depth of 10 to 20 inches. Runoff is very rapid, and the hazard of water erosion is very severe.

The Chaix soil is moderately deep and somewhat excessively drained. It formed in material weathered from granodiorite. Typically, the surface layer is grayish brown and pale brown coarse sandy loam about 9 inches thick. The subsoil is very pale brown coarse sandy loam about 20 inches thick. Weathered granodiorite is at a depth of 29 inches.

Permeability in the Chaix soil is moderately rapid. Available water capacity is about 2 to 3 inches. The effective rooting depth is restricted by bedrock at a depth of 20 to 40 inches. Runoff is very rapid, and the hazard of water erosion is very severe.

The Hotaw soil is moderately deep and well drained. It formed in material weathered from granodiorite. Typically, the surface layer is brown loam about 12 inches thick. The subsoil is light yellowish brown sandy clay loam about

22 inches thick. Weathered granodiorite is at a depth of 34 inches.

Permeability in the Hotaw soil is moderate. Available water capacity is about 5 to 6 inches. The effective rooting depth is restricted by bedrock at a depth of 20 to 40 inches. The shrink-swell potential is moderate. Runoff is very rapid, and the hazard of water erosion is very severe.

This unit is mainly a watershed. It also is used for timber production.

Ponderosa pine, Douglas-fir, canyon live oak, and California black oak are the main tree species. On the basis of a 100-year site curve, the mean site index for ponderosa pine is 81 on the Chawanakee soil, 87 on the Chaix soil, and 102 on the Hotaw soil. On the basis of a 100-year site curve, the mean site index for Douglas-fir is 115 on the Chawanakee soil, 119 on the Chaix soil, and 130 on the Hotaw soil. The yield (CMAI) for ponderosa pine in a fully stocked stand of trees 40 years old is 70 cubic feet per acre on the Chawanakee soil, 80 cubic feet per acre on the Chaix soil, and 106 cubic feet per acre on the Hotaw soil. The yield (CMAI) for Douglas-fir in a fully stocked stand of trees 60 years old is 106 cubic feet per acre on the Chawanakee soil, 113 cubic feet per acre on the Chaix soil, and 129 cubic feet per acre on the Hotaw soil.

Because of low productivity and the risk that erosion will further lower productivity when timber is harvested, careful consideration should be given to any harvesting plan. The main concerns in producing and harvesting timber are the slope, seasonal wetness, the hazard of water erosion, plant competition, and seedling mortality. The slope restricts the use of wheeled and tracked equipment. Skyline yarding generally is safer than other methods and results in less soil disturbance. Roads require suitable surfacing for year-round use. Rock for the construction of roads is not readily available in areas of this unit. Roads may fail and landslides may occur following deep soil disturbance. Roads should be confined to ridgetops where possible. When trees are harvested, management that minimizes the risk of erosion is essential. Erosion can be controlled by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Minimizing the number of roads, trails, and landings and harvesting from preplanned skid trails can help to prevent excessive erosion and compaction. Scattering brush on skid trails helps to control erosion. Revegetating as soon as possible in disturbed areas also helps to control erosion. If the site is not adequately prepared, competition from undesirable plants can prevent or delay the natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling, which helps to eliminate unwanted

weeds, brush, or trees. Mechanical treatment is not feasible because of the slope. The high soil temperature and low content of soil moisture during the growing season cause a high seedling mortality rate, especially on south- and southwest-facing slopes. Reforestation can be accomplished by planting Douglas-fir seedlings on the cooler aspects and ponderosa pine on the warmer south aspects. The characteristic understory plant community is mainly sticky whiteleaf manzanita, mountain misery, and deerbrush.

This unit is in capability subclass VIe (22), nonirrigated.

137—Columbia fine sandy loam, 0 to 1 percent slopes. This very deep soil is on flood plains. It formed in alluvium derived from mixed sources. The vegetation in uncultivated areas is mainly annual grasses, forbs, and valley oaks. Under natural conditions, this soil is somewhat poorly drained, but drainage has been improved by open ditches and flood-control structures. Elevation is between 30 and 150 feet. The average annual precipitation is between 18 and 22 inches, the average annual air temperature is between 61 and 63 degrees F, and the average frost-free period is between 270 and 290 days.

Typically, the surface layer is light yellowish brown fine sandy loam about 9 inches thick. The upper 9 inches of the underlying material is light yellowish brown, mottled fine sandy loam. The next 12 inches is light gray, mottled fine sand. The lower part to a depth of 68 inches is very pale brown and light yellowish brown, mottled, stratified silt loam, fine sandy loam, very fine sandy loam, and fine sand. In some areas the surface layer is loam or silt loam.

Included in this unit are small areas of Feather, Shanghai, and Holillipah soils. Included areas make up about 15 percent of the total acreage.

Permeability in the Columbia soil is moderately rapid. Available water capacity is about 5 to 7 inches. The effective rooting depth is 60 inches or more. The seasonal high water table is maintained below a depth of 60 inches by drainage measures and flood-control structures. Runoff is slow, and the hazard of water erosion is slight. This soil is protected by levees and is subject to rare flooding.

Most areas of this unit are used for irrigated crops, mainly peaches, walnuts, and prunes. The other crops include kiwis, almonds, and pears. Some areas are used for homesite development.

This unit is suited to irrigated crops. Few limitations affect this use. Depending on the particular crop, furrow, border, and sprinkler irrigation systems are suitable. To prevent excessive water use and the leaching of plant nutrients, applications of irrigation water should be

adjusted to the available water capacity, the rate of water intake, and the needs of the crop. Properly regulating applications of fertilizer helps to prevent the contamination of ground water. Tillth and fertility can be maintained or improved by returning crop residue to the soil.

This unit is not suited to homesite development because of the hazard of flooding.

This unit is in capability units IIs-4 (17), irrigated, and IIIs-4 (17), nonirrigated.

138—Columbia fine sandy loam, 0 to 1 percent slopes, occasionally flooded. This very deep, somewhat poorly drained soil is on flood plains. It formed in alluvium derived from mixed sources. The native vegetation is mainly riparian trees with an understory of dense brush. Elevation is between 45 and 85 feet. The average annual precipitation is between 18 and 22 inches, the average annual air temperature is between 61 and 63 degrees F, and the average frost-free period is between 270 and 290 days.

Typically, the surface layer is light yellowish brown fine sandy loam about 9 inches thick. The upper 9 inches of the underlying material is light yellowish brown, mottled fine sandy loam. The next 12 inches is light gray, mottled fine sand. The lower part to a depth of 68 inches is very pale brown and light yellowish brown, mottled, stratified silt loam, fine sandy loam, very fine sandy loam, and fine sand. In some areas the surface layer is sandy loam or silt loam.

Included in this unit are small areas of Feather, Holillipah, and Shanghai soils. Included areas make up about 15 percent of the total acreage.

Permeability in the Columbia soil is moderately rapid. Available water capacity is about 5 to 7 inches. The effective rooting depth is 60 inches or more. The seasonal high water table is at a depth of 36 to 60 inches from December through April. Runoff is slow, and the hazard of water erosion is severe. This soil is subject to occasional, brief or long periods of flooding from December through April.

This unit is used mainly for irrigated orchards and wildlife habitat. The principal orchard crops are walnuts, peaches, pears, and prunes.

This unit is suited to irrigated orchards. It is limited mainly by the hazard of flooding. Maintaining areas of trees and brush adjacent to streams is important for streambank stabilization and erosion control. Maintaining a cover crop in the orchards helps to control the erosion caused by floodwater. Depending on the particular crop, furrow, border, corrugation, and sprinkler irrigation systems are suitable. To prevent excessive water use and the leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the rate of water intake, and the needs of the crop.

Properly regulating applications of fertilizer helps to prevent the contamination of ground water. Tillage and fertility can be maintained or improved by returning crop residue to the soil.

This unit is suited to wildlife habitat. The diversity of vegetation on this unit supports a variety of wildlife, such as raptors, shore birds, waterfowl, upland game birds, and fur-bearing mammals. Management consists primarily of protecting and maintaining the existing vegetation, especially in areas adjacent to streams.

This unit is in capability units IIw-2 (17), irrigated, and IIIw-2 (17), nonirrigated.

139—Columbia fine sandy loam, 0 to 1 percent slopes, frequently flooded. This very deep, somewhat poorly drained soil is on flood plains. It formed in alluvium derived from mixed sources. The native vegetation is mainly riparian trees with an understory of dense brush. Elevation is between 20 and 60 feet. The average annual precipitation is between 18 and 22 inches, the average annual air temperature is between 61 and 63 degrees F, and the average frost-free period is between 270 and 290 days.

Typically, the surface layer is light yellowish brown fine sandy loam about 9 inches thick. The upper 9 inches of the underlying material is light yellowish brown, mottled fine sandy loam. The next 12 inches is light gray, mottled fine sand. The lower part to a depth of 68 inches is very pale brown and light yellowish brown, mottled, stratified silt loam, fine sandy loam, very fine sandy loam, and fine sand. In some areas the surface layer is sandy loam or silt loam.

Included in this unit are small areas of Holillipah soils and small areas of Columbia soils that are only occasionally flooded. Included areas make up about 15 percent of the total acreage.

Permeability in the Columbia soil is moderately rapid. Available water capacity is about 5 to 7 inches. The effective rooting depth is 60 inches or more. The seasonal high water table is at a depth of 36 to 60 inches from December through April. Runoff is very slow, and the hazard of water erosion is slight. This soil is subject to frequent, brief or long periods of flooding from December through April.

This unit is used mainly for irrigated orchard crops, mainly walnuts, and for recreation and wildlife habitat.

This unit is suited to irrigated orchards. It is limited mainly by the hazard of flooding. Maintaining areas of trees and brush adjacent to streams is important for streambank stabilization and erosion control. Maintaining a cover crop in the orchards helps to control the erosion caused by floodwater. Depending on the particular crop, furrow, border, corrugation, and sprinkler irrigation

systems are suitable. To prevent excessive water use and the leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the rate of water intake, and the needs of the crop. Properly regulating applications of fertilizer helps to prevent the contamination of ground water. Tillage and fertility can be maintained or improved by returning crop residue to the soil.

This unit is suited to off-road vehicle use. It is limited mainly by the hazard of flooding.

This unit is suited to wildlife habitat. The diversity of vegetation on this unit supports a variety of wildlife, such as raptors, shore birds, waterfowl, upland game birds, and fur-bearing mammals. Management consists primarily of protecting and maintaining the existing vegetation, especially in areas adjacent to streams.

This unit is in capability unit IVw-2 (17), irrigated and nonirrigated.

140—Columbia-Urban land complex, 0 to 1 percent slopes. This unit is on flood plains. Under natural conditions, the Columbia soil is somewhat poorly drained and is periodically flooded, but drainage has been improved by ditches and the hazard of flooding has been reduced by flood-control structures. Elevation is between 55 and 75 feet. The average annual precipitation is between 18 and 22 inches, the average annual air temperature is between 61 and 63 degrees F, and the average frost-free period is between 270 and 290 days.

This unit is about 45 percent Columbia fine sandy loam and 45 percent Urban land.

Included in this unit are small areas of San Joaquin, Trainer, and Kilaga soils. Included areas make up about 10 percent of the total acreage.

The Columbia soil is very deep and well drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is light yellowish brown fine sandy loam about 9 inches thick. The upper 9 inches of the underlying material is light yellowish brown, mottled fine sandy loam. The next 12 inches is light gray, mottled fine sand. The lower part to a depth of 68 inches is very pale brown and light yellowish brown, mottled, stratified silt loam, fine sandy loam, very fine sandy loam, and fine sand. In some areas the surface layer is loam or silt loam.

Permeability in the Columbia soil is moderately rapid. Available water capacity is about 5 to 7 inches. The effective rooting depth is 60 inches or more. The seasonal high water table is maintained below a depth of 60 inches by drainage structures. Runoff is very slow, and the hazard of water erosion is slight. This soil is protected by levees and is subject to rare flooding.

Urban land consists of residential and commercial buildings, streets, and other impermeable surfaces.

This unit is used for urban development. The hazard of

flooding severely limits this use. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees. Mulch, fertilizer, and irrigation are needed to establish lawn grasses and other small-seeded plants. Properly regulating applications of fertilizer helps to prevent the contamination of ground water.

The Columbia soil is in capability units IIs-4 (17), irrigated, and IIIs-4 (17), nonirrigated. Urban land is not assigned to a land capability classification.

141—Conejo loam, 0 to 2 percent slopes. This very deep, well drained soil is on stream terraces. It formed in alluvium derived from mixed sources. The vegetation in uncultivated areas is mainly annual grasses, forbs, and valley oaks. Elevation is between 60 and 150 feet. The average annual precipitation is between 18 and 22 inches, the average annual air temperature is between 61 and 63 degrees F, and the average frost-free period is between 270 and 290 days.

Typically, the surface layer is brown loam about 6 inches thick. The upper 8 inches of the subsoil is brown clay loam. The lower part to a depth of 65 inches is brown loam.

Included in this unit are small areas of Perkins and Horst soils. Also included are small areas of soils that are similar to the Conejo soil but have a water table at a depth of 40 to 60 inches or are subject to occasional, brief periods of flooding. Included areas make up about 15 percent of the total acreage.

Permeability in the Conejo soil is moderately slow. Available water capacity is about 8.5 to 11.5 inches. The effective rooting depth is 60 inches or more. The shrink-swell potential is moderate. Runoff is slow, and the hazard of water erosion is slight. This soil is protected by levees and is subject to rare flooding.

Most areas of this unit are used for irrigated crops, mainly walnuts, peaches, prunes, and almonds. Some areas are used for nonirrigated wheat, rangeland, homesite development, or wildlife habitat.

This unit is suited to nonirrigated and irrigated crops. Few limitations affect cropping. Depending on the particular crop, furrow, border, corrugation, and sprinkler irrigation systems are suitable. Crusting of the surface and soil compaction can be minimized by returning crop residue to the soil and by minimizing tillage. Excessive cultivation can result in the formation of a tillage pan. This pan can be broken by subsoiling when the soil is dry.

This unit is suited to rangeland. Few limitations affect this use. This unit responds well to applications of fertilizer, to range seeding, and to proper grazing use. Grazing should be delayed until the soil is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. If this unit is grazed

by livestock when the soil is too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of the less preferred forage plants increases. Livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. The characteristic plant community on this unit is mainly soft chess, wild oat, medusahead, and filaree.

This unit is not suited to homesite development because of the hazard of flooding. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

This unit provides habitat for wildlife, such as waterfowl, birds of prey, other birds, and small fur-bearing mammals. Planting and maintaining shrubs and other woody plants in wet areas and in areas adjacent to drainageways improve the habitat.

This unit is in capability class I (17), irrigated, and capability subclass IIIc (17), nonirrigated.

142—Conejo loam, 0 to 1 percent slopes, occasionally flooded. This very deep, well drained soil is on stream terraces. It formed in alluvium derived from mixed sources. Elevation is between 40 and 100 feet. The average annual precipitation is between 18 and 22 inches, the average annual air temperature is between 61 and 63 degrees F, and the average frost-free period is between 270 and 290 days.

Typically, the surface layer is brown loam about 6 inches thick. The upper 18 inches of the subsoil is brown clay loam. The lower part to a depth of 65 inches is brown loam.

Included in this unit are small areas of Horst soils. Included areas make up about 15 percent of the total acreage.

Permeability in the Conejo soil is moderately slow. Available water capacity is about 8.5 to 11.5 inches. The effective rooting depth is 60 inches or more. The shrink-swell potential is moderate. Runoff is slow, and the hazard of water erosion is slight. This soil is subject to occasional, brief or long periods of flooding from December through April.

This unit is used for irrigated crops, mainly rice and prunes.

This unit is suited to irrigated crops. It is limited mainly by the hazard of flooding. Maintaining areas of trees and brush adjacent to streams and rivers is important for streambank stabilization and erosion control. Maintaining a cover crop helps to control the erosion caused by floodwater. Depending on the particular crop, furrow, border, and sprinkler irrigation systems are suitable. To

prevent excessive water use and the leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the rate of water intake, and the needs of the crop. Tilt and fertility can be improved by returning crop residue to the soil.

This unit is in capability units IIw-2 (17), irrigated, and IIIw-2 (17), nonirrigated.

143—Conejo-Urban land complex, 0 to 1 percent slopes. This unit is on stream terraces. Elevation is between 55 and 65 feet. The average annual precipitation is between 18 and 22 inches, the average annual air temperature is between 61 and 63 degrees F, and the average frost-free period is between 270 and 290 days.

This unit is about 45 percent Conejo loam and 40 percent Urban land.

Included in this unit are small areas of Capay, Columbia, and San Joaquin soils and small areas of a soil that is similar to the Conejo soil but has coarse textures in the subsoil. Included areas make up about 15 percent of the total acreage.

The Conejo soil is very deep and well drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is brown loam about 6 inches thick. The upper 18 inches of the subsoil is brown clay loam. The lower part to a depth of 65 inches is brown loam.

Permeability in the Conejo soil is moderately slow. Available water capacity is about 8.5 to 11.5 inches. The effective rooting depth is 60 inches or more. The shrink-swell potential is moderate. Runoff is slow, and the hazard of water erosion is slight. This soil is protected by levees and is subject to rare flooding.

Urban land consists of residential and commercial buildings, streets, and other impermeable surfaces.

This unit is used for urban development. The hazard of flooding severely limits this use. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees. Mulch, fertilizer, and irrigation are needed to establish lawn grasses and other small-seeded plants.

The Conejo soil is in capability class I (17), irrigated, and capability subclass IIIc (17), nonirrigated. Urban land is not assigned to a land capability classification.

144—Deadwood-Rock outcrop-Hurlbut complex, 30 to 75 percent slopes. This unit is on mountains in the inner gorge of river and stream canyons. The native vegetation is mainly an open stand of mixed conifers and hardwoods with an understory of brush. Elevation is between 1,200 and 3,500 feet. The average annual precipitation is between 50 and 70 inches, the average annual air temperature is between 53 and 57 degrees F, and the average frost-free period is between 160 and 190 days.

This unit is about 50 percent Deadwood very gravelly sandy loam, 25 percent Rock outcrop, and 15 percent Hurlbut gravelly fine sandy loam.

Included in this unit are small areas of soils that are similar to the Deadwood soil but have bedrock at a depth of 40 to 80 inches. Also included are areas, mainly of Rock outcrop, that have slopes of more than 75 percent. Included areas make up about 10 percent of the total acreage.

The Deadwood soil is shallow and somewhat excessively drained. It formed in material weathered from metasedimentary rocks. Typically, the surface layer is brown very gravelly sandy loam about 6 inches thick. The subsoil is brownish yellow very gravelly sandy loam about 8 inches thick. Hard slate is at a depth of 14 inches.

Permeability in the Deadwood soil is moderately rapid. Available water capacity is about 0.5 to 1.0 inch. The effective rooting depth is restricted by bedrock at a depth of 10 to 20 inches. Runoff is very rapid, and the hazard of water erosion is very severe.

Rock outcrop consists of exposures of bare rock that support little or no vegetation.

The Hurlbut soil is moderately deep and well drained. It formed in material weathered from metasedimentary rocks. Typically, the surface is covered with a mat of partially decomposed needles, leaves, and twigs about 1 inch thick. The surface layer is pinkish gray gravelly fine sandy loam about 3 inches thick. The subsoil is reddish yellow and yellow gravelly loam. Weathered slate is at a depth of 23 inches.

Permeability in the Hurlbut soil is moderate. Available water capacity is about 2 to 3 inches. The effective rooting depth is restricted by bedrock at a depth of 20 to 40 inches. Runoff is very rapid, and the hazard of water erosion is very severe.

This unit is mainly a watershed. It also is used for timber production.

Ponderosa pine, canyon live oak, California black oak, Pacific madrone, and tanoak are the main tree species. On the basis of a 100-year site curve, the mean site index for ponderosa pine is 84 on the Deadwood soil and 100 on the Hurlbut soil. On the basis of a 100-year site curve, the mean site index for Douglas-fir is 83 on the Deadwood soil and 150 on the Hurlbut soil. The yield (CMAI) for ponderosa pine in a fully stocked stand of trees 40 years old is 75 cubic feet per acre on the Deadwood soil and 102 cubic feet per acre on Hurlbut soil. The yield (CMAI) for Douglas-fir in a fully stocked stand of trees 60 years old is 62 cubic feet per acre on the Deadwood soil and 159 cubic feet per acre on the Hurlbut soil.

Because of low productivity and the risk that erosion will further lower productivity when timber is harvested, careful consideration should be given to any harvesting plan. The main concerns in producing and harvesting

timber are the slope, seasonal wetness, the hazard of water erosion, plant competition, and seedling mortality. The slope restricts the use of wheeled and tracked equipment. Skyline yarding generally is safer than other methods and results in less soil disturbance. Roads require suitable surfacing for year-round use. Rock for the construction of roads is readily available in areas of this unit. Roads may fail and landslides may occur following deep soil disturbance. Roads should be confined to ridgetops where possible. When trees are harvested, management that minimizes the risk of erosion is essential. Erosion can be controlled by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Minimizing the number of roads, trails, and landings and harvesting from preplanned skid trails can help to prevent excessive erosion and compaction. Scattering brush on skid trails helps to control erosion. Revegetating as soon as possible in disturbed areas also helps to control erosion. If the site is not adequately prepared, competition from undesirable plants can prevent or delay the natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling, which helps to eliminate unwanted weeds, brush, or trees. Mechanical treatment is not feasible because of the slope. The high soil temperature and low content of soil moisture during the growing season cause a high seedling mortality rate, especially on south- and southwest-facing slopes. Reforestation can be accomplished by planting Douglas-fir seedlings on the cooler aspects and ponderosa pine on the warmer south aspects. The characteristic understory plant community is mainly sticky whiteleaf manzanita, poison oak, and canyon live oak.

The Deadwood and Hurlbut soils are in capability subclass VIIe (22), nonirrigated. The Rock outcrop is in capability class VIII (22), nonirrigated

145—Dumps, landfills. This unit consists of refuse disposal sites and the adjoining areas where the soil has been removed for landfill cover.

This unit is in capability class VIII (18).

146—Dumps, mine tailings. This unit consists of very deep material that was dredged from river channels and flood plains during gold mining and was left mounded in long, narrow tailing piles. The tailing piles range from 5 to 40 feet in height. The native vegetation is mainly sparse annual grasses with willows and scattered cottonwoods in areas near water. Elevation is between 90 and 175 feet.

Included in this unit are small areas of ponds and streams. Included areas make up about 15 percent of the total acreage.

This unit is used as a source of construction material, such as sand and gravel. It also is used for wildlife habitat and recreation.

This unit provides habitat for wildlife, such as waterfowl, other birds, and fur-bearing mammals. Planting and maintaining shrubs and other woody plants in wet areas and in areas adjacent to drainageways improve the habitat.

This unit is suited to recreational development. Numerous small ponds in this unit provide opportunities for hunting waterfowl, fishing, and other recreational activities.

This unit is in capability class VIII (18).

147—Feather silt loam, 0 to 2 percent slopes, occasionally flooded. This very deep, well drained soil is on stream terraces. It formed in alluvium derived from mixed sources. The vegetation in uncultivated areas is mainly annual grasses, forbs, shrubs, and valley oaks. Elevation is between 60 and 75 feet. The average annual precipitation is between 18 and 22 inches, the average annual air temperature is between 61 and 63 degrees F, and the average frost-free period is between 270 and 290 days.

Typically, the surface layer is brown silt loam about 26 inches thick. Below this is a buried surface layer of brown and very pale brown silt loam about 34 inches thick. In some areas the surface layer is loam or very fine sandy loam.

Included in this unit are small areas of Columbia and Shanghai soils. Included areas make up about 10 percent of the total acreage.

Permeability in the Feather soil is moderate. Available water capacity is about 9 to 11 inches. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. This soil is subject to occasional, brief or long periods of flooding from December through April.

This unit is used for irrigated orchard crops, mainly peaches, walnuts, and prunes.

This unit is suited to irrigated orchard crops. It is limited mainly by the hazard of flooding. Maintaining areas of trees and brush adjacent to streams is important for streambank stabilization and erosion control. Maintaining a cover crop in the orchards helps to control the erosion caused by floodwater. Depending on the particular crop, furrow, sprinkler, and drip irrigation systems are suitable. To prevent excessive water use and the leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the rate of water intake, and the needs of the crop. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

This unit is in capability units IIw-2 (17), irrigated, and IIIw-2 (17), nonirrigated.

148—Flanly sandy loam, 3 to 8 percent slopes. This moderately deep, well drained soil is on foothills. It formed in material weathered from acid intrusive igneous rocks. The native vegetation is mainly interior live oak, blue oak, Digger pine, and scattered ponderosa pine with an understory of brush, annual grasses, and forbs. Elevation is between 125 and 1,900 feet. The average annual precipitation is between 22 and 35 inches, the average annual air temperature is between 58 and 61 degrees F, and the average frost-free period is between 235 and 250 days.

Typically, the surface layer is brown sandy loam about 3 inches thick. The upper 13 inches of the subsoil is strong brown sandy loam. The lower 18 inches is strong brown loam. Weathered granodiorite is at a depth of 34 inches.

Included in this unit are small areas of Orose and Verjeles soils and small areas of a soil that is similar to the Flanly soil but has bedrock at a depth of 40 to 60 inches. Included areas make up about 20 percent of the total acreage.

Permeability in the Flanly soil is moderately slow. Available water capacity is about 5.5 to 6.0 inches. The effective rooting depth is restricted by bedrock at a depth of 20 to 40 inches. The shrink-swell potential is moderate. Runoff is slow, and the hazard of water erosion is slight.

This unit is used mainly for woodland and livestock grazing. It also is used for homesite development, irrigated pasture, and wildlife habitat.

Interior live oak, blue oak, and Digger pine are the major tree species. On this unit, volumes of approximately 56 to 112 cords per acre of interior live oak, blue oak, and Digger pine with an average diameter of about 8 inches have been measured. Careful harvesting is needed to allow the stand to regenerate through oak stump sprouting and to minimize water erosion when the plant cover is disturbed.

Where this unit is used for livestock grazing, it is limited by a tendency to produce woody species. Brush management improves forage production. Areas where brush is managed by prescribed burning or by chemical or mechanical methods may be subject to an increased hazard of erosion. Grazing should be delayed until the soil is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. If this unit is grazed by livestock when the soil is too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of

the less preferred forage plants increases. Livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. Fencing and properly located salt and livestock watering facilities help to achieve a uniform distribution of livestock grazing. This unit responds well to applications of fertilizer, to range seeding, and to proper grazing use. The characteristic understory plant community on this unit is mainly sticky white leaf manzanita, poison oak, buckbrush, and wild oat.

If this unit is used for homesite development, the main management concern is limited soil depth. The cuts needed to provide essentially level building sites can expose bedrock. Because of limited soil depth, onsite sewage disposal systems often fail or do not function properly during periods of high rainfall. If the density of housing is moderate or high, community sewage systems are needed to prevent the contamination of water supplies caused by seepage from onsite sewage disposal systems. Plans for homesite development should provide for the preservation of as many trees as possible. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

If this unit is used for irrigated pasture, the main management concern is limited soil depth. Only the plants adapted to a limited rooting depth should be selected for planting. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and control erosion. Periodic mowing and clipping help to maintain uniform growth and discourage selective grazing. Fertilizer is needed to ensure the optimum growth of grasses and legumes.

This unit provides habitat for wildlife, such as deer, birds of prey, game birds, other birds, and small fur-bearing mammals. Planting and maintaining shrubs and other woody plants in wet areas and in areas adjacent to drainageways improve the habitat. Habitat for quail can be improved by building brush piles, especially in areas adjacent to water. Creating openings in areas of dense brush can benefit wildlife. Brush controlled by prescribed burning or mechanical methods produces valuable new growth for wildlife. Oaks should be maintained as a source of feed and cover for wild turkey and deer.

This unit is in capability unit IIIe-1 (18), irrigated and nonirrigated.

149—Flanly sandy loam, 8 to 15 percent slopes. This moderately deep, well drained soil is on foothills. It formed in material weathered from acid intrusive igneous rocks. The native vegetation is mainly interior live oak, blue oak, Digger pine, and scattered ponderosa pine with an understory of brush, annual grasses, and forbs. Elevation is between 125 and 1,900 feet. The average

annual precipitation is between 22 and 35 inches, the average annual air temperature is between 58 and 61 degrees F, and the average frost-free period is between 235 and 250 days.

Typically, the surface layer is brown sandy loam about 3 inches thick. The upper 13 inches of the subsoil is strong brown sandy loam. The lower 18 inches is strong brown loam. Weathered granodiorite is at a depth of 34 inches. In some areas as much as 10 percent of the surface is covered with stones.

Included in this unit are small areas of Orose and Verjeles soils and small areas of a soil that is similar to the Flanly soil but has bedrock at a depth of 40 to 60 inches. Included areas make up about 20 percent of the total acreage.

Permeability in the Flanly soil is moderately slow. Available water capacity is about 5.5 to 6.0 inches. The effective rooting depth is restricted by bedrock at a depth of 20 to 40 inches. The shrink-swell potential is moderate. Runoff is slow, and the hazard of water erosion is moderate.

This unit is used mainly for woodland and livestock grazing. It also is used for homesite development, irrigated pasture, and wildlife habitat.

Interior live oak, blue oak, and Digger pine are the major tree species. On this unit, volumes of approximately 56 to 112 cords per acre of interior live oak, blue oak, and Digger pine with an average diameter of about 8 inches have been measured. Careful harvesting is needed to allow the stand to regenerate through oak stump sprouting and to minimize water erosion when the plant cover is disturbed.

Where this unit is used for livestock grazing, it is limited by a tendency to produce woody species. Brush management improves forage production. Areas where brush is managed by prescribed burning or by chemical or mechanical methods may be subject to an increased hazard of erosion. Grazing should be delayed until the soil is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. If this unit is grazed by livestock when the soil is too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of the less preferred forage plants increases. Livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. Fencing and properly located salt and livestock watering facilities help to achieve a uniform distribution of livestock grazing. This unit responds well to applications of fertilizer, to range seeding, and to proper grazing use. The characteristic understory plant community on this unit is

mainly sticky white leaf manzanita, poison oak, buckbrush, and wild oat.

If this unit is used for homesite development, the main management concerns are limited soil depth, the slope, and the hazard of water erosion. The cuts needed to provide essentially level building sites can expose bedrock. Erosion is a hazard on construction sites and on road cuts and fills. Only the part of the site that is used for construction should be disturbed. Preserving the existing plant cover during construction helps to control erosion. Mulching and revegetating as soon as possible in disturbed areas, such as road cuts and fills and construction sites, also help to control erosion. Because of limited soil depth, onsite sewage disposal systems often fail or do not function properly during periods of high rainfall. If the density of housing is moderate or high, community sewage systems are needed to prevent the contamination of water supplies caused by seepage from onsite sewage disposal systems. Plans for homesite development should provide for the preservation of as many trees as possible. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

If this unit is used for irrigated pasture, the main management concern is limited soil depth. Only the plants adapted to a limited rooting depth should be selected for planting. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and control erosion. Periodic mowing and clipping help to maintain uniform growth and discourage selective grazing. Fertilizer is needed to ensure the optimum growth of grasses and legumes.

This unit provides habitat for wildlife, such as deer, birds of prey, game birds, other birds, and small fur-bearing mammals. Planting and maintaining shrubs and other woody plants in wet areas and in areas adjacent to drainageways improve the habitat. Habitat for quail can be improved by building brush piles, especially in areas adjacent to water. Creating openings in areas of dense brush can benefit wildlife. Brush controlled by prescribed burning or mechanical methods produces valuable new growth for wildlife. Oaks should be maintained as a source of feed and cover for wild turkey and deer.

This unit is in capability unit IVe-1 (18), irrigated and nonirrigated.

150—Flanly sandy loam, 15 to 30 percent slopes.

This moderately deep, well drained soil is on foothills. It formed in material weathered from acid intrusive igneous rocks. The native vegetation is mainly interior live oak, blue oak, Digger pine, and scattered ponderosa pine with an understory of brush, annual grasses, and forbs. Elevation is between 1,400 and 1,900 feet. The average annual precipitation is between 26 and 35 inches, the

average annual air temperature is between 58 and 61 degrees F, and the average frost-free period is between 235 and 250 days.

Typically, the surface layer is brown sandy loam about 3 inches thick. The upper 13 inches of the subsoil is strong brown sandy loam. The lower 18 inches is strong brown loam. Weathered granodiorite is at a depth of 34 inches. In some areas as much as 10 percent of the surface is covered with stones.

Included in this unit are small areas of Orose and Verjeles soils and small areas of a soil that is similar to the Flanly soil but has bedrock at a depth of 40 to 60 inches. Included areas make up about 20 percent of the total acreage.

Permeability in the Flanly soil is moderately slow. Available water capacity is about 5.5 to 6.0 inches. The effective rooting depth is restricted by bedrock at a depth of 20 to 40 inches. The shrink-swell potential is moderate. Runoff is rapid, and the hazard of water erosion is severe.

This unit is used mainly for woodland and livestock grazing. It also is used for homesite development, irrigated pasture, and wildlife habitat.

Interior live oak, blue oak, and Digger pine are the major tree species. On this unit, volumes of approximately 56 to 112 cords per acre of interior live oak, blue oak, and Digger pine with an average diameter of about 8 inches have been measured. Careful harvesting is needed to allow the stand to regenerate through oak stump sprouting and to minimize water erosion when the plant cover is disturbed.

Where this unit is used for livestock grazing, it is limited by a tendency to produce woody species. Brush management improves forage production. Areas where brush is managed by prescribed burning or by chemical or mechanical methods may be subject to an increased hazard of erosion. Grazing should be delayed until the soil is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. If this unit is grazed by livestock when the soil is too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of the less preferred forage plants increases. Livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. Fencing and properly located salt and livestock watering facilities help to achieve a uniform distribution of livestock grazing. This unit responds well to applications of fertilizer, to range seeding, and to proper grazing use. The characteristic understory plant community on this unit is mainly sticky whiteleaf manzanita, poison oak, buckbrush, and wild oat.

If this unit is used for homesite development, the main management concerns are limited soil depth, the slope, and the hazard of water erosion. The cuts needed to provide essentially level building sites can expose bedrock. Erosion is a hazard on construction sites and on road cuts and fills. Only the part of the site that is used for construction should be disturbed. Mulching and revegetating as soon as possible in disturbed areas, such as road cuts and fills and construction sites, help to control erosion. Preserving the existing plant cover during construction also helps to control erosion. Because of limited soil depth, onsite sewage disposal systems often fail or do not function properly during periods of high rainfall. Effluent from septic tank absorption fields can surface in downslope areas and thus create a health hazard. If the density of housing is moderate or high, community sewage systems are needed to prevent the contamination of water supplies caused by seepage from onsite sewage disposal systems. Plans for homesite development should provide for the preservation of as many trees as possible. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

If this unit is used for irrigated pasture, the main management concern is limited soil depth. Only the plants adapted to a limited rooting depth should be selected for planting. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and control erosion. Periodic mowing and clipping help to maintain uniform growth and discourage selective grazing. Fertilizer is needed to ensure the optimum growth of grasses and legumes.

This unit provides habitat for wildlife, such as deer, birds of prey, game birds, other birds, and small fur-bearing mammals. Planting and maintaining shrubs and other woody plants in wet areas and in areas adjacent to drainageways improve the habitat. Creating openings in areas of dense brush can benefit wildlife. Brush controlled by prescribed burning or mechanical methods produces valuable new growth for wildlife. Oaks should be maintained as a source of feed and cover for wild turkey and deer.

This unit is in capability subclass VIe (18), nonirrigated.

151—Flanly sandy loam, 30 to 50 percent slopes. This moderately deep, well drained soil is on foothills. It formed in material weathered from acid intrusive igneous rocks. The native vegetation is mainly interior live oak, blue oak, Digger pine, and scattered ponderosa pine with an understory of brush, annual grasses, and forbs. Elevation is between 1,400 and 1,900 feet. The average annual precipitation is between 26 and 35 inches, the average annual air temperature is between 58 and 61

degrees F, and the average frost-free period is between 230 and 250 days.

Typically, the surface layer is brown sandy loam about 3 inches thick. The upper 13 inches of the subsoil is strong brown sandy loam. The lower 18 inches is strong brown loam. Weathered granodiorite is at a depth of 34 inches. In some areas as much as 10 percent of the surface is covered with stones.

Included in this unit are small areas of Orose soils and areas of a soil that is similar to the Flanly soil but has bedrock at a depth of 40 to 60 inches. Included areas make up about 20 percent of the total acreage.

Permeability in the Flanly soil is moderately slow. Available water capacity is about 5.5 to 6.0 inches. The effective rooting depth is restricted by bedrock at a depth of 20 to 40 inches. The shrink-swell potential is moderate. Runoff is rapid, and the hazard of water erosion is severe.

This unit is used mainly for woodland and livestock grazing. It also is used for wildlife habitat.

Interior blue oak, blue oak, and Digger pine are the major tree species. On this unit, volumes of approximately 56 to 112 cords per acre of interior live oak, blue oak, and Digger pine with an average diameter of about 8 inches have been measured. The slope hinders any potential harvesting of trees. Careful harvesting is needed to allow the stand to regenerate through oak stump sprouting and to minimize water erosion when the plant cover is disturbed.

Where this unit is used for livestock grazing, it is limited by a tendency to produce woody species. Brush management improves forage production. Areas where brush is managed by prescribed burning or by chemical methods may be subject to an increased hazard of erosion. Mechanical treatment is not practical because of the slope. Grazing should be delayed until the soil is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. If this unit is grazed by livestock when the soil is too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of the less preferred forage plants increases. Livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. Fencing and properly located salt and livestock watering facilities help to achieve a uniform distribution of livestock grazing. The characteristic understory plant community on this unit is mainly toyon, sticky whiteleaf manzanita, and wild oat.

This unit provides habitat for wildlife, such as deer, birds of prey, game birds, other birds, and small fur-bearing mammals. Planting and maintaining shrubs and other woody plants in wet areas and in areas adjacent to

drainageways improve the habitat. Creating openings in areas of dense brush can benefit wildlife. Brush controlled by prescribed burning produces valuable new growth for wildlife. Oaks should be maintained as a source of feed and cover for wild turkey and deer. Areas where brush is managed by prescribed burning or by chemical methods may be subject to an increased hazard of erosion.

This unit is in capability subclass VIIe (18), nonirrigated.

152—Flanly-Rock outcrop complex, 50 to 75 percent slopes. This unit is on side slopes in the inner gorge of river canyons on foothills. The native vegetation is mainly interior live oak, canyon live oak, and blue oak with an understory of brush and annual grasses and forbs. Elevation is between 300 and 1,900 feet. The average annual precipitation is between 26 and 35 inches, the average annual air temperature is between 58 and 61 degrees F, and the average frost-free period is between 230 and 250 days.

This unit is about 55 percent Flanly sandy loam and 20 percent Rock outcrop.

Included in this unit are small areas of Holland and Orose soils and small areas of a soil that is similar to the Flanly soil but has bedrock at a depth of 40 to 60 inches. Also included are areas, mainly of Rock outcrop, that have slopes of more than 75 percent. Included areas make up about 25 percent of the total acreage.

The Flanly soil is moderately deep and well drained. It formed in material weathered from acid intrusive igneous rocks. Typically, the surface layer is grayish brown sandy loam about 5 inches thick. The subsoil is brown loam about 20 inches thick. Weathered granodiorite is at a depth of 25 inches. In some areas the surface layer is stony or gravelly loam.

Permeability in the Flanly soil is moderate. Available water capacity is about 3.5 to 4.0 inches. The effective rooting depth is restricted by bedrock at a depth of 20 to 40 inches. The shrink-swell potential is moderate. Runoff is very rapid, and the hazard of water erosion is very severe.

Rock outcrop consists of exposures of bare rock that support little or no vegetation.

This unit is a watershed. It used as wildlife habitat. It provides habitat for deer, birds of prey, game birds, other birds, and small fur-bearing mammals. Creating open areas can benefit wildlife. Brush controlled by prescribed burning produces valuable new growth for wildlife. Oaks should be maintained as a source of feed and cover for wild turkey and deer. Areas where brush is managed by prescribed burning may be subject to an increased hazard of erosion.

The characteristic understory plant community on this

unit is mainly canyon live oak, toyon, sticky whiteleaf manzanita, and wild oat.

The Flanly soil is in capability subclass VIIe (22), nonirrigated. The Rock outcrop is in capability class VIII (22), nonirrigated

153—Flanly-Orose-Verjeles complex, 3 to 8 percent slopes. This unit is on foothills. The native vegetation is mainly interior live oak, blue oak, Digger pine, and scattered ponderosa pine with an understory of brush, annual grasses, and forbs. Elevation is between 1,400 and 1,900 feet. The average annual precipitation is between 26 and 35 inches, the average annual air temperature is between 58 and 61 degrees F, and the average frost-free period is between 235 and 250 days.

This unit is about 30 percent Flanly sandy loam, 25 percent Orose sandy loam, and 25 percent Verjeles sandy loam. The Flanly soil is on side slopes and foot slopes, the Orose soil is on the upper side slopes and on narrow ridgetops, and the Verjeles soil is on toe slopes and broad ridgetops.

Included in this unit are small areas of Surnuf soils and small areas of a soil that is similar to the Flanly soil but has bedrock at a depth of 40 to 60 inches. Also included are small areas of a soil that is similar to the Verjeles soil but has bedrock at a depth of 10 to 20 inches or 40 to 60 inches and areas of Verjeles soils that have slopes of less than 3 percent. Included areas make up about 20 percent of the total acreage.

The Flanly soil is moderately deep and well drained. It formed in material weathered from acid intrusive igneous rocks. Typically, the surface layer is brown sandy loam about 3 inches thick. The upper 13 inches of the subsoil is strong brown sandy loam. The lower 18 inches is strong brown loam. Weathered granodiorite is at a depth of 34 inches. In some areas as much as 5 percent of the surface is covered with stones.

Permeability in the Flanly soil is moderately slow. Available water capacity is about 5.5 to 6.0 inches. The effective rooting depth is restricted by bedrock at a depth of 20 to 40 inches. The shrink-swell potential is moderate. Runoff is slow, and the hazard of water erosion is slight.

The Orose soil is shallow and well drained. It formed in material weathered from basic intrusive igneous rocks. Typically, the surface layer is dark yellowish brown sandy loam about 2 inches thick. The subsoil is brown sandy loam about 15 inches thick. Weathered gabbrodiorite is at a depth of 17 inches. In some areas as much as 5 percent of the surface is covered with stones.

Permeability in the Orose soil is moderately rapid. Available water capacity is about 2 inches. The effective rooting depth is restricted by bedrock at a depth of 10 to 20 inches. Runoff is slow, and the hazard of water erosion is slight.

The Verjeles soil is moderately deep and moderately well drained. It formed in material weathered from basic intrusive igneous rocks. Typically, the surface layer is brown sandy loam about 5 inches thick. The upper 15 inches of the subsoil is strong brown and yellowish red loam. The next 11 inches is strong brown clay. The lower 6 inches is light yellowish brown clay loam. Weathered gabbrodiorite is at a depth of 37 inches.

Permeability in the Verjeles soil is very slow. Available water capacity is about 5.5 to 6.5 inches. The effective rooting depth is restricted by bedrock at a depth of 20 to 40 inches. The dense clay subsoil restricts the movement of water and air and root penetration. For insignificant periods after heavy rainstorms from December through April, there is a perched water table above the claypan. The shrink-swell potential is high. Runoff is slow, and the hazard of water erosion is slight.

This unit is used for woodland, livestock grazing, homesite development, irrigated pasture, and wildlife habitat.

Interior live oak, blue oak, and Digger pine are the major tree species. On the Flanly soil, volumes of approximately 56 to 112 cords per acre of interior live oak, blue oak, and Digger pine with an average diameter of about 8 inches have been measured. On the Orose soil, volumes of approximately 38 cords per acre of interior live oak, blue oak, and Digger pine with an average diameter of about 8 inches have been measured. On the Verjeles soil, volumes of approximately 83 cords per acre of interior live oak, blue oak, and Digger pine with an average diameter of about 6 inches have been measured. Careful harvesting is needed to allow the stand to regenerate through oak stump sprouting and to minimize water erosion when the plant cover is disturbed.

Where this unit is used for livestock grazing, it is limited by a tendency to produce woody species. Brush management improves forage production. Areas where brush is managed by prescribed burning or by chemical or mechanical methods may be subject to an increased hazard of erosion. Grazing should be delayed until the soils are firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. If this unit is grazed by livestock when the soils are too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of the less preferred forage plants increases. Livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. Fencing and properly located salt and livestock watering facilities help to achieve a uniform distribution of livestock grazing. This unit responds well to applications of fertilizer,

to range seeding, and to proper grazing use. The characteristic understory plant community on this unit is mainly sticky whiteleaf manzanita, poison oak, soft chess, and wild oat.

If this unit is used for homesite development, the main management concerns are the very slow permeability and high shrink-swell potential of the Verjeles soil and limited soil depth. If the Verjeles soil is used for septic tank absorption fields, the very slow permeability can be overcome by increasing the size of the absorption field. The cuts needed to provide essentially level building sites can expose bedrock. Because of the restrictive clay layer in the Verjeles soil and limited soil depth, onsite sewage disposal systems often fail or do not function properly during periods of high rainfall. If the density of housing is moderate or high, community sewage systems are needed to prevent the contamination of water supplies caused by seepage from onsite sewage disposal systems. If buildings are constructed on the Verjeles soil, properly designing foundations and footings and diverting runoff away from the buildings help to prevent the structural damage caused by shrinking and swelling. Plans for homesite development should provide for the preservation of as many trees as possible. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

If this unit is used for irrigated pasture, the main management concerns are the very slow permeability of the Verjeles soil and limited soil depth. Only the plants adapted to a limited rooting depth should be selected for planting. Because of the very slow permeability in the Verjeles soil, adjustment of the length of irrigation runs is needed to permit adequate infiltration of water. Carefully applying irrigation water helps to prevent the buildup of a high water table. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and control erosion. Periodic mowing and clipping help to maintain uniform growth and discourage selective grazing. Fertilizer is needed to ensure the optimum growth of grasses and legumes.

This unit provides habitat for wildlife, such as deer, birds of prey, game birds, other birds, and small fur-bearing mammals. Planting and maintaining shrubs and other woody plants in wet areas and in areas adjacent to drainageways improve the habitat. Creating openings in areas of dense brush can benefit wildlife. Brush controlled by prescribed burning or mechanical methods produces valuable new growth for wildlife. Oaks should be maintained as a source of feed and cover for wild turkey and deer.

The Flanly soil is in capability unit IIIe-8 (18), irrigated and nonirrigated. The Orose and Verjeles soils are in capability unit IVe-8 (18), irrigated and nonirrigated.

154—Flanly-Orose-Verjeles complex, 8 to 15 percent slopes. This unit is on foothills. The native vegetation is mainly interior live oak, blue oak, Digger pine, and scattered ponderosa pine with an understory of brush, annual grasses, and forbs. Elevation is between 1,400 and 1,900 feet. The average annual precipitation is between 26 and 35 inches, the average annual air temperature is between 58 and 61 degrees F, and the average frost-free period is between 235 and 250 days.

This unit is about 30 percent Flanly sandy loam, 25 percent Orose sandy loam, and 25 percent Verjeles sandy loam. The Flanly soil is on side slopes and foot slopes, the Orose soil is on the upper side slopes and on narrow ridgetops, and the Verjeles soil is on toe slopes and broad ridgetops.

Included in this unit are small areas of Surnuf soils and small areas of a soil that is similar to Flanly soil but has bedrock at a depth of 40 to 60 inches. Also included are areas of a soil that is similar to the Verjeles soil but has bedrock at a depth of 10 to 20 inches or 40 to 60 inches and areas of Verjeles soils that have slopes of less than 8 percent. Included areas make up about 20 percent of the total acreage.

The Flanly soil is moderately deep and well drained. It formed in material weathered from acid intrusive igneous rocks. Typically, the surface layer is brown sandy loam about 3 inches thick. The upper 13 inches of the subsoil is strong brown sandy loam. The lower 18 inches is strong brown loam. Weathered granodiorite is at a depth of 34 inches. In some areas as much as 5 percent of the surface is covered with stones.

Permeability in the Flanly soil is moderately slow. Available water capacity is about 5.5 to 6.0 inches. The effective rooting depth is restricted by bedrock at a depth of 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate.

The Orose soil is shallow and well drained. It formed in material weathered from basic intrusive igneous rocks. Typically, the surface layer is dark yellowish brown sandy loam about 2 inches thick. The subsoil is brown sandy loam about 15 inches thick. Weathered gabbrodiorite is at a depth of 17 inches. In some areas as much as 5 percent of the surface is covered with stones.

Permeability in the Orose soil is moderately rapid. Available water capacity is about 2 inches. The effective rooting depth is restricted by bedrock at a depth of 10 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate.

The Verjeles soil is moderately deep and moderately well drained. It formed in material weathered from basic intrusive igneous rocks. Typically, the surface layer is brown sandy loam about 5 inches thick. The upper 15 inches of the subsoil is strong brown and yellowish red loam. The next 11 inches is strong brown clay. The lower

6 inches is light yellowish brown clay loam. Weathered gabbrodiorite is at a depth of 37 inches.

Permeability in the Verjeles soil is very slow. Available water capacity is about 5.5 to 6.5 inches. The effective rooting depth is restricted by bedrock at a depth of 20 to 40 inches. The dense clay subsoil restricts the movement of water and air and the penetration of most roots. For insignificant periods after heavy rainstorms from December through April, there is a perched water table above the claypan. The shrink-swell potential is high in the subsoil. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used for woodland, livestock grazing, homesite development, irrigated pasture, and wildlife habitat.

Interior live oak, blue oak, and Digger pine are the major tree species. On the Flanly soil, volumes of approximately 56 to 112 cords per acre of interior live oak, blue oak, and Digger pine with an average diameter of about 8 inches have been measured. On the Orose soil, volumes of approximately 38 cords per acre of interior live oak, blue oak, and Digger pine with an average diameter of about 8 inches have been measured. On the Verjeles soil, volumes of approximately 83 cords per acre of interior live oak, blue oak, and Digger pine with an average diameter of about 6 inches have been measured. Careful harvesting is needed to allow the stand to regenerate through oak stump sprouting and to minimize water erosion when the plant cover is disturbed.

Where this unit is used for livestock grazing, it is limited by a tendency to produce woody species. Brush management improves forage production. Areas where brush is managed by prescribed burning or by chemical or mechanical methods may be subject to an increased hazard of erosion. Grazing should be delayed until the soils are firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. If this unit is grazed by livestock when the soils are too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of the less preferred forage plants increases. Livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. Fencing and properly located salt and livestock watering facilities help to achieve a uniform distribution of livestock grazing. This unit responds well to applications of fertilizer, to range seeding, and to proper grazing use. The characteristic understory plant community on this unit is mainly sticky whiteleaf manzanita, poison oak, soft chess, and wild oat.

If this unit is used for homesite development, the main

management concerns are the very slow permeability and high shrink-swell potential of the Verjeles soil, limited soil depth, the slope, and the hazard of water erosion. If the Verjeles soil is used for septic tank absorption fields, the very slow permeability can be overcome by increasing the size of the absorption field. The cuts needed to provide essentially level building sites can expose bedrock. Because of the restrictive clay layer in the Verjeles soil and limited soil depth, onsite sewage disposal systems often fail or do not function properly during periods of high rainfall. Effluent from septic tank absorption fields can surface in downslope areas and thus create a health hazard. If the density of housing is moderate or high, community sewage systems are needed to prevent the contamination of water supplies caused by seepage from onsite sewage disposal systems. If buildings are constructed on the Verjeles soil, properly designing foundations and footings and diverting runoff away from the buildings help to prevent the structural damage caused by shrinking and swelling. Erosion is a hazard on construction sites and on road cuts and fills. Only the part of the site that is used for construction should be disturbed. Preserving the existing plant cover during construction helps to control erosion. Mulching and revegetating as soon as possible in disturbed areas, such as road cuts and fills and construction sites, also help to control erosion. Plans for homesite development should provide for the preservation of as many trees as possible. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

If this unit is used for irrigated pasture, the main management concerns are the very slow permeability of the Verjeles soil and limited soil depth. Only the plants adapted to a limited rooting depth should be selected for planting. Because of the very slow permeability in the Verjeles soil, adjustment of the length of irrigation runs is needed to permit adequate infiltration of water. Carefully applying irrigation water helps to prevent the buildup of a high water table. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and control erosion. Periodic mowing and clipping help to maintain uniform growth and discourage selective grazing. Fertilizer is needed to ensure the optimum growth of grasses and legumes.

This unit provides habitat for wildlife, such as deer, birds of prey, game birds, other birds, and small fur-bearing mammals. Planting and maintaining shrubs and other woody plants in wet areas and in areas adjacent to drainageways improve the habitat. Creating openings in areas of dense brush can benefit wildlife. Brush controlled by prescribed burning or mechanical methods produces valuable new growth for wildlife. Oaks should be maintained as a source of feed and cover for wild turkey and deer.

This unit is in capability unit IVe-8 (18), irrigated and nonirrigated.

155—Fluvaquents, 0 to 1 percent slopes. These very deep, very poorly drained soils are on flood plains. They formed in alluvium generated by hydraulic mining operations. The native vegetation is mainly willows, alder, and blackberry with sedges and rushes in the wetter areas. Elevation is between 2,300 and 2,350 feet. The average annual precipitation is between 55 and 60 inches, the average annual air temperature is between 50 and 55 degrees F, and the average frost-free period is between 180 and 220 days.

No single profile is typical of the Fluvaquents, but one commonly observed in the survey area has a surface layer of brown and gray loam about 7 inches thick. The underlying material to a depth of 60 inches is gray and brown, stratified sandy loam to silty clay loam.

Included in this unit are small areas of Sites soils and water. Also included are small areas of a soil that is similar to the Fluvaquents but does not have a water table. Included areas make up about 20 percent of the total acreage.

Permeability in the Fluvaquents is moderate. Available water capacity is about 10.0 to 11.5 inches. The effective rooting depth is 60 inches or more for water-tolerant plants but is limited to a depth of about 5 to 20 inches for other plants. The water table is at a depth of about 6 to 48 inches the entire year. Runoff is very slow, and the hazard of water erosion is slight. These soils are subject to occasional, brief to very long periods of flooding from November to March.

This unit is used for wildlife habitat. It provides habitat for waterfowl, other birds, and small fur-bearing animals. Planting and maintaining shrubs and other woody plants in wet areas and in areas adjacent to drainageways improve the habitat.

This unit is in capability subclass VIIw (18), nonirrigated.

158—Hoda loam, 30 to 50 percent slopes. This very deep, well drained soil is on mountains. It formed in material weathered from granodiorite. The native vegetation is mainly mixed conifers and hardwoods with an understory of brush, grasses, and forbs. Elevation is between 2,000 and 4,200 feet. The average annual precipitation is between 50 and 80 inches, the average annual air temperature is between 53 and 57 degrees F, and the average frost-free period is between 160 and 190 days.

Typically, the surface is covered with a mat of partially decomposed needles, leaves, twigs, and bark about 1 inch thick. The surface layer is strong brown loam about 7 inches thick. The upper 4 inches of the subsoil is

yellowish red clay loam. The lower 66 inches is yellowish red clay and clay loam.

Included in this unit are small areas of Holland and Hotaw soils. Included areas make up about 30 percent of the total acreage.

Permeability in the Hoda soil is moderately slow. Available water capacity is about 8.5 to 9.5 inches. The effective rooting depth is 60 inches or more. The shrink-swell potential is moderate. Runoff is rapid, and the hazard of water erosion is severe.

This unit is used mainly for timber production. It also is a watershed and is used as wildlife habitat.

Ponderosa pine, Douglas-fir, sugar pine, incense cedar, tanoak, Pacific madrone, and California black oak are the major tree species. At an elevation of more than 3,000 feet, white fir becomes significant. On the basis of a 100-year site curve, the mean site index is 141 for ponderosa pine and 140 for Douglas-fir. The yield (CMAI) for ponderosa pine is 190 cubic feet per acre in a fully stocked stand of trees 40 years old. The yield (CMAI) for Douglas-fir is 145 cubic feet per acre in a fully stocked stand of trees 60 years old.

The main concerns in producing and harvesting timber are the slope, seasonal wetness, the hazard of water erosion, and plant competition. Conventional methods of harvesting timber cannot be easily used because of the slope. Use of wheeled and tracked equipment when the soil is moist results in the formation of ruts, causes soil compaction, and can damage the roots of trees. Soil compaction may increase the rate of water runoff and decrease timber production. Unsurfaced roads and skid trails are slippery when wet, and they may be impassable during rainy periods. Roads require suitable surfacing for year-round use. Rock for the construction of roads is not readily available in areas of this unit. Roads may fail and landslides may occur following deep soil disturbance. Roads should be confined to ridgetops, natural benches, and the flatter slopes where possible. When trees are harvested, management that minimizes the risk of erosion is essential. Erosion can be controlled by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Minimizing the number of roads, trails, and landings and harvesting from preplanned skid trails can help to prevent excessive erosion and compaction. Scattering brush on skid trails helps to control erosion. Revegetating as soon as possible in disturbed areas also helps to control erosion. Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling, which helps to eliminate unwanted weeds, brush, or trees. The characteristic understory plant community on this unit is mainly mountain misery,

tanoak, sticky whiteleaf manzanita, and poison oak at the lower elevations and common snowberry and tanoak at the higher elevations.

This unit is in capability subclass VIe (22), nonirrigated.

159—Hoda-Musick complex, 2 to 30 percent slopes. This unit is on mountains. The native vegetation is mainly mixed conifers and hardwoods with an understory of brush, grasses, and forbs. Elevation is between 2,000 and 3,800 feet. The average annual precipitation is between 50 and 70 inches, the average annual air temperature is between 53 and 57 degrees F, and the average frost-free period is between 160 and 190 days.

This unit is about 50 percent Hoda loam and 35 percent Musick loam.

Included in this unit are small areas of Holland and Chaix soils. Included areas make up about 15 percent of the total acreage.

The Hoda soil is very deep and well drained. It formed in material weathered from granodiorite. Typically, the surface is covered with a mat of partially decomposed needles, leaves, and twigs about 1 inch thick. The surface layer is brown loam about 7 inches thick. The upper 7 inches of the subsoil is reddish yellow clay loam. The next 34 inches is yellowish red and reddish yellow clay. The lower part to a depth of 72 inches is reddish yellow clay loam.

Permeability in the Hoda soil is moderately slow. Available water capacity is about 8.5 to 9.5 inches. The effective rooting depth is 60 inches or more. The shrink-swell potential is moderate. Runoff is medium, and the hazard of water erosion is moderate.

The Musick soil is very deep and well drained. It formed in material weathered from granodiorite. Typically, the surface is covered with a mat of partially decomposed leaves, needles, and twigs about 2 inches thick. The surface layer is brown loam about 8 inches thick. The upper 27 inches of the subsoil is reddish brown and red clay loam. The lower 45 inches is red sandy clay loam.

Permeability in the Musick soil is moderate. Available water capacity is about 8 to 10 inches. The effective rooting depth is 60 inches or more. The shrink-swell potential is moderate. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for timber production. It also is a watershed.

Ponderosa pine, Douglas-fir, sugar pine, incense cedar, tanoak, Pacific madrone, and California black oak are the major tree species. At an elevation of more than 3,000 feet, white fir becomes significant. On the basis of a 100-year site curve, the mean site index for ponderosa pine is 141 on the Hoda soil and 164 on the Musick soil. On the

basis of a 100-year site curve, the mean site index for Douglas-fir is 140 on the Hoda soil and 121 on the Musick soil. The yield (CMAI) for ponderosa pine in a fully stocked stand of trees 40 years old is 190 cubic feet per acre on the Hoda soil and 240 cubic feet per acre on the Musick soil. The yield (CMAI) for Douglas-fir in a fully stocked stand of trees 60 years old is 145 cubic feet per acre on the Hoda soil and 116 cubic feet per acre on the Musick soil.

The main concerns in producing and harvesting timber are seasonal wetness, the hazard of water erosion, and plant competition. Conventional methods of harvesting timber can be used. Use of wheeled and tracked equipment when the soils are moist results in the formation of ruts, causes soil compaction, and can damage the roots of trees. Soil compaction may increase the rate of water runoff and decrease timber production. Unsurfaced roads and skid trails are slippery when wet, and they may be impassable during rainy periods. Roads require suitable surfacing for year-round use. Rock for the construction of roads is not readily available in areas of this unit. When trees are harvested, management that minimizes the risk of erosion is essential. Erosion can be controlled by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Minimizing the number of roads, trails, and landings and harvesting from preplanned skid trails can help to prevent excessive erosion and compaction. Scattering brush on skid trails helps to control erosion. Revegetating as soon as possible in disturbed areas also helps to control erosion. Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling, which helps to eliminate unwanted weeds, brush, or trees. The characteristic understory plant community on this unit is mainly mountain misery, tanoak, sticky whiteleaf manzanita, and poison oak at the lower elevations and common snowberry and tanoak at the higher elevations.

This unit is in capability unit IVe-1 (22), nonirrigated.

160—Hoda-Musick complex, 30 to 50 percent slopes. This unit is on mountains. The native vegetation is mainly mixed conifers and hardwoods with an understory of brush, grasses, and forbs. Elevation is between 2,000 and 3,800 feet. The average annual precipitation is between 50 and 70 inches, the average annual air temperature is between 53 and 57 degrees F, and the average frost-free period is between 160 and 190 days.

This unit is about 50 percent Hoda loam and 35 percent Musick loam.

Included in this unit are small areas of Holland, Chaix, and Chawanakee soils. Included areas make up about 15 percent of the total acreage.

The Hoda soil is very deep and well drained. It formed in material weathered from granodiorite. Typically, the surface is covered with a mat of partially decomposed needles, leaves, and twigs about 1 inch thick. The surface layer is brown loam about 7 inches thick. The upper 7 inches of the subsoil is reddish yellow clay loam. The next 34 inches is yellowish red and reddish yellow clay. The lower part to a depth of 72 inches is reddish yellow clay loam.

Permeability in the Hoda soil is moderately slow. Available water capacity is about 8.5 to 9.5 inches. The effective rooting depth is 60 inches or more. The shrink-swell potential is moderate. Runoff is rapid, and the hazard of water erosion is severe.

The Musick soil is very deep and well drained. It formed in material weathered from granodiorite. Typically, the surface is covered with a mat of partially decomposed leaves, needles, and twigs about 2 inches thick. The surface layer is brown loam about 8 inches thick. The upper 27 inches of the subsoil is reddish brown and red clay loam. The lower 45 inches is red sandy clay loam.

Permeability in the Musick soil is moderate. Available water capacity is about 8 to 10 inches. The effective rooting depth is 60 inches or more. The shrink-swell potential is moderate. Runoff is rapid, and the hazard of water erosion is severe.

This unit is used mainly for timber production. It also is a watershed.

Ponderosa pine, Douglas-fir, sugar pine, incense cedar, tanoak, Pacific madrone, and California black oak are the major tree species. At an elevation of more than 3,000 feet, white fir becomes significant. On the basis of a 100-year site curve, the mean site index for ponderosa pine is 141 on the Hoda soil and 164 on the Musick soil. On the basis of a 100-year site curve, the mean site index for Douglas-fir is 140 on the Hoda soil and 121 on the Musick soil. The yield (CMAI) for ponderosa pine in a fully stocked stand of trees 40 years old is 190 cubic feet per acre on the Hoda soil and 240 cubic feet per acre on the Musick soil. The yield (CMAI) for Douglas-fir in a fully stocked stand of trees 60 years old is 145 cubic feet per acre on the Hoda soil and 116 cubic feet per acre on the Musick soil.

The main concerns in producing and harvesting timber are the slope, seasonal wetness, the hazard of water erosion, and plant competition. The slope restricts the use of wheeled and tracked equipment. Skyline yarding generally is safer than other methods and results in less soil disturbance. Unsurfaced roads and skid trails are slippery when wet, and they may be impassable during rainy periods. Roads require suitable surfacing for year-

round use. Rock for the construction of roads is not readily available in areas of this unit. Roads may fail and landslides may occur following deep soil disturbance. Roads should be confined to ridgetops where possible. When trees are harvested, management that minimizes the risk of erosion is essential. Erosion can be controlled by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Minimizing the number of roads, trails, and landings and harvesting from preplanned skid trails can help to prevent excessive erosion and compaction. Scattering brush on skid trails helps to control erosion. Revegetating as soon as possible in disturbed areas also helps to control erosion. If the site is not adequately prepared, competition from undesirable plants can prevent or delay the natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling, which helps to eliminate unwanted weeds, brush, or trees. Mechanical treatment is not feasible because of the slope. The characteristic understory plant community on this unit is mainly mountain misery, tanoak, sticky whiteleaf manzanita, and poison oak at the lower elevations and common snowberry and tanoak at the higher elevations.

This unit is in capability subclass V1e (22), nonirrigated.

161—Holillipah loamy sand, 0 to 1 percent slopes.

This very deep, somewhat excessively drained soil is on flood plains. It formed in alluvium derived from mixed sources. The vegetation in uncultivated areas is mainly annual grasses, forbs, shrubs, and valley oaks. Elevation is between 30 and 150 feet. The average annual precipitation is between 18 and 22 inches, the average annual air temperature is between 61 and 63 degrees F, and the average frost-free period is between 270 and 290 days.

Typically, the surface layer is light yellowish brown loamy sand about 6 inches thick. The upper 14 inches of the underlying material is pale brown and light gray, stratified sand. The next 6 inches is very pale brown, mottled fine sandy loam. The lower part to a depth of 66 inches is light gray and very pale brown, mottled, stratified sand and loamy fine sand. In some areas the surface layer is fine sand or loamy fine sand.

Included in this unit are small areas of Columbia and Shanghai soils. Included areas make up about 15 percent of the total acreage.

Permeability in the Holillipah soil is moderately rapid. Available water capacity is about 3.5 to 5.5 inches. The effective rooting depth is 60 inches or more. Runoff is very slow, and the hazard of water erosion is slight. This soil is protected by levees and is subject to rare flooding.

Most areas of this unit are used for irrigated crops, mainly walnuts, pears, and peaches. The other crops

include almonds and kiwis. Some areas are used for homesite development.

This unit is suited to irrigated crops. It is limited mainly by the low available water capacity. Because the rate of water intake is rapid, sprinkler or drip systems are the best suited methods of irrigation. Because this soil is droughty, applications of irrigation water should be light and frequent. If furrow irrigation is used, water should be applied at frequent intervals and runs should be short. To prevent excessive water use and the leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the rate of water intake, and the needs of the crop. Properly regulating applications of fertilizer helps to prevent the contamination of ground water. Leaving crop residue on or near the surface helps to conserve moisture, maintain tilth, and control erosion.

This unit is not suited to homesite development because of the hazard of flooding. If the density of housing is moderate or high, community sewage systems are needed to prevent the contamination of water supplies caused by seepage from onsite sewage disposal systems.

This unit is in capability units IIIs-4 (17), irrigated, and IVs-4 (17), nonirrigated.

162—Holillipah loamy sand, 0 to 1 percent slopes, occasionally flooded. This very deep, somewhat excessively drained soil is on flood plains. It formed in alluvium derived from mixed sources. The vegetation in uncultivated areas is mainly annual grasses, forbs, shrubs, and valley oaks. Elevation is between 50 and 90 feet. The average annual precipitation is between 18 and 22 inches, the average annual air temperature is between 61 and 63 degrees F, and the average frost-free period is between 270 and 290 days.

Typically, the surface layer is light yellowish brown loamy sand about 6 inches thick. The upper 14 inches of the underlying material is pale brown and light gray, stratified sand. The next 6 inches is very pale brown, mottled fine sandy loam. The lower part to a depth of 66 inches is light gray and very pale brown, mottled, stratified sand and loamy fine sand. In some areas the surface layer is fine sand or loamy fine sand.

Included in this unit are small areas of Columbia and Shanghai soils and areas of Holillipah soils that are frequently flooded. Included areas make up about 15 percent of the total acreage.

Permeability in the Holillipah soil is moderately rapid. Available water capacity is about 3.5 to 5.5 inches. The effective rooting depth is 60 inches or more. Runoff is very slow, and the hazard of water erosion is severe. This soil is subject to occasional, brief or long periods of flooding from December through April.

This unit is used for irrigated crops, mainly pears and walnuts. A few areas are used for wildlife habitat.

This unit is suited to irrigated crops. It is limited mainly by the hazard of flooding and the low available water capacity. Maintaining areas of trees and brush adjacent to streams is important for streambank stabilization and erosion control. Maintaining a cover crop in the orchards helps to control the erosion caused by floodwater, conserves moisture, and helps to maintain tilth. Because the rate of water intake is rapid, sprinkler or drip systems are the best suited methods of irrigation. Because this soil is droughty, applications of irrigation water should be light and frequent. If furrow irrigation is used, water should be applied at frequent intervals and runs should be short. To prevent excessive water use and the leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the rate of water intake, and the needs of the crop. Properly regulating applications of fertilizer helps to prevent the contamination of ground water.

This unit is suited to wildlife habitat. The diversity of vegetation in this unit supports a variety of wildlife, such as raptors, shore birds, waterfowl, upland game birds, and fur-bearing mammals. Management consists primarily of protecting and maintaining the existing vegetation, especially in areas adjacent to streams.

This unit is in capability units IIIs-4 (17), irrigated, and IVs-4 (17) nonirrigated.

163—Holillipah loamy sand, 0 to 1 percent slopes, frequently flooded. This very deep, somewhat excessively drained soil is on flood plains. It formed in alluvium derived from mixed sources. The native vegetation is mainly riparian trees with an understory of dense brush. Elevation is between 20 and 100 feet. The average annual precipitation is between 18 and 22 inches, the average annual air temperature is between 61 and 63 degrees F, and the average frost-free period is between 270 and 290 days.

Typically, the surface layer is light yellowish brown loamy sand about 6 inches thick. The upper 14 inches of the underlying material is pale brown and light gray, stratified sand. The next 6 inches is very pale brown, mottled fine sandy loam. The lower part to a depth of 66 inches is light gray and very pale brown, mottled, stratified sand and loamy fine sand. In some areas the surface layer is fine sand or loamy fine sand.

Included in this unit are small areas of Columbia and Shanghai soils and areas of Holillipah soils that are only occasionally flooded. Included areas make up about 15 percent of the total acreage.

Permeability in the Holillipah soil is moderately rapid. Available water capacity is about 3.5 to 5.5 inches. The effective rooting depth is 60 inches or more. Runoff is

very slow, and the hazard of water erosion is slight. This soil is subject to frequent, brief or long periods of flooding from December through April.

This unit is used for irrigated orchard crops, mainly walnuts, and for wildlife habitat.

This unit is suited to irrigated crops. It is limited mainly by the hazard of flooding and the low available water capacity. Maintaining areas of trees and brush adjacent to streams is important for streambank stabilization and erosion control. Maintaining a cover crop in the orchards helps to control the erosion caused by floodwater, conserves moisture, and helps to maintain tilth. Because the rate of water intake is rapid, sprinkler or drip systems are the best suited methods of irrigation. Because this soil is droughty, applications of irrigation water should be light and frequent. If furrow irrigation is used, water should be applied at frequent intervals and runs should be short. To prevent excessive water use and the leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the rate of water intake, and the needs of the crop. Properly regulating applications of fertilizer helps to prevent the contamination of ground water.

This unit is suited to wildlife habitat. Few limitations affect this use. The diversity of vegetation in this unit supports a variety of wildlife, such as raptors, shore birds, waterfowl, upland game birds, and fur-bearing mammals. Management consists primarily of protecting and maintaining the existing vegetation, especially in areas adjacent to streams.

This unit is in capability unit IVw-2 (17), irrigated and nonirrigated.

164—Holland sandy loam, 30 to 50 percent slopes.

This very deep, well drained soil is on mountains. It formed in material weathered from granodiorite. The native vegetation is mainly mixed conifers and hardwoods with an understory of brush, grasses, and forbs. Elevation is between 1,400 and 2,800 feet. The average annual precipitation is between 35 and 50 inches, the average annual air temperature is between 55 and 59 degrees F, and the average frost-free period is between 190 and 230 days.

Typically, the surface is covered with a mat of partially decomposed needles, leaves, twigs, and bark about 2 inches thick. The upper 18 inches of the surface layer is brown and dark brown sandy loam. The lower 7 inches is yellowish red loam. The subsoil to a depth of 60 inches is yellowish red clay loam. In some areas the surface layer is loam.

Included in this unit are small areas of Sites and Hoda soils and areas of soils that are similar to the Holland soil but have a coarser textured subsoil or have bedrock at a

depth of 40 to 60 inches. Included areas make up about 15 percent of the total acreage.

Permeability in the Holland soil is moderate. Available water capacity is about 7.5 to 9.5 inches. The effective rooting depth is 60 inches or more. The shrink-swell potential is moderate. Runoff is rapid, and the hazard of water erosion is severe.

This unit is used mainly for timber production. It also is a watershed.

Ponderosa pine, California black oak, tanoak, interior live oak, and Pacific madrone are the major tree species. On the basis of a 100-year site curve, the mean site index is 110 for ponderosa pine. The yield (CMAI) for ponderosa pine is 122 cubic feet per acre in a fully stocked stand of trees 40 years old.

The main concerns in producing and harvesting timber are the slope, seasonal wetness, the hazard of water erosion, and plant competition. Conventional methods of harvesting timber cannot be easily used because of the slope. Use of wheeled and tracked equipment when the soil is moist results in the formation of ruts, causes soil compaction, and can damage the roots of trees. Soil compaction may increase the rate of water runoff and decrease timber production. Unsurfaced roads and skid trails are slippery when wet, and they may be impassable during rainy periods. Roads require suitable surfacing for year-round use. Rock for the construction of roads is not readily available in areas of this unit. Roads may fail and landslides may occur following deep soil disturbance. Roads should be confined to ridgetops, natural benches, and the flatter slopes where possible. When trees are harvested, management that minimizes the risk of erosion is essential. Erosion can be controlled by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Minimizing the number of roads, trails, and landings and harvesting from preplanned skid trails can help to prevent excessive erosion and compaction. Scattering brush on skid trails helps to control erosion. Revegetating as soon as possible in disturbed areas also helps to control erosion. Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling, which helps to eliminate unwanted weeds, brush, or trees. The characteristic understory plant community on this unit is mainly poison oak, toyon, sticky whiteleaf manzanita, and blue wildrye.

This unit is in capability subclass VIe (22), nonirrigated.

165—Holland-Hoda-Hotaw complex, 2 to 30 percent slopes. This unit is on mountains. The native vegetation is mainly mixed conifers and hardwoods with

an understory of brush, grasses, and forbs. Elevation is between 2,000 and 3,800 feet. The average annual precipitation is between 50 and 75 inches, the average annual air temperature is between 54 and 57 degrees F, and the average frost-free period is between 160 and 190 days.

This unit is about 40 percent Holland loam, 25 percent Hoda loam, and 20 percent Hotaw loam.

Included in this unit are small areas of Musick and Chaix soils, small areas of seeps, and wet areas. Also included are areas where the surface layer has been displaced into piles or windrows. Included areas make up about 15 percent of the total acreage.

The Holland soil is very deep and well drained. It formed in material weathered from granodiorite. Typically, the surface is covered with a mat of partially decomposed needles, leaves, and twigs about 2 inches thick. The surface layer is brown and reddish brown loam about 15 inches thick. The subsoil is reddish yellow clay loam about 50 inches thick.

Permeability in the Holland soil is moderate. Available water capacity is about 8.5 to 10.5 inches. The effective rooting depth is 60 inches or more. The shrink-swell potential is moderate. Runoff is medium, and the hazard of water erosion is moderate.

The Hoda soil is very deep and well drained. It formed in material weathered from granodiorite. Typically, the surface is covered with a mat of partially decomposed needles, leaves, and twigs about 1 inch thick. The surface layer is brown loam about 7 inches thick. The upper 7 inches of the subsoil is reddish yellow clay loam. The next 34 inches is yellowish red and reddish yellow clay. The lower part to a depth of 72 inches is reddish yellow clay loam.

Permeability in the Hoda soil is moderately slow. Available water capacity is about 8.5 to 9.5 inches. The effective rooting depth is 60 inches or more. The shrink-swell potential is moderate. Runoff is medium, and the hazard of water erosion is moderate.

The Hotaw soil is moderately deep and well drained. It formed in material weathered from granodiorite. Typically, the surface is covered with a mat of litter and duff about 1 inch thick. The surface layer is brown and light brown loam about 12 inches thick. The subsoil is light yellowish brown sandy clay loam about 22 inches thick. Weathered granodiorite is at a depth of 34 inches.

Permeability in the Hotaw soil is moderate. Available water capacity is about 5 to 6 inches. The effective rooting depth is restricted by bedrock at a depth of 20 to 40 inches. The shrink-swell potential is moderate. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for timber production. It also is a watershed.

Ponderosa pine, Douglas-fir, sugar pine, incense cedar,

Pacific madrone, tanoak, and California black oak are the major tree species. On the basis of a 100-year site curve, the mean site index for ponderosa pine is 105 on the Holland soil, 141 on the Hoda soil, and 102 on the Hotaw soil. On the basis of a 100-year site curve, the mean site index for Douglas-fir is 112 on the Holland soil, 140 on the Hoda soil, and 130 on the Hotaw soil. The yield (CMAI) for ponderosa pine in a fully stocked stand of trees 40 years old is 112 cubic feet per acre on the Holland soil, 190 cubic feet per acre on the Hoda soil, and 106 cubic feet per acre on the Hotaw soil. The yield (CMAI) for Douglas-fir in a fully stocked stand of trees 60 years old is 101 cubic feet per acre on the Holland soil, 145 cubic feet per acre on the Hoda soil, and 129 cubic feet per acre on the Hotaw soil.

The main concerns in producing and harvesting timber are seasonal wetness, the hazard of water erosion, and plant competition. Conventional methods of harvesting timber can be used. Use of wheeled and tracked equipment when the soils are moist results in the formation of ruts, causes soil compaction, and can damage the roots of trees. Soil compaction may increase the rate of water runoff and decrease timber production. Unsurfaced roads and skid trails are slippery when wet, and they may be impassable during rainy periods. Roads require suitable surfacing for year-round use. Rock for the construction of roads is not readily available in areas of this unit. When trees are harvested, management that minimizes the risk of erosion is essential. Erosion can be controlled by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Minimizing the number of roads, trails, and landings and harvesting from preplanned skid trails can help to prevent excessive erosion and compaction. Scattering brush on skid trails helps to control erosion. Revegetating as soon as possible in disturbed areas also helps to control erosion. Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling, which helps to eliminate unwanted weeds, brush, or trees. The characteristic understory plant community on this unit is mainly mountain misery, tanoak, sticky whiteleaf manzanita, and poison oak.

The Holland and Hoda soils are in capability subclass IVe (22), nonirrigated. The Hotaw soil is in capability subclass VIe (22), nonirrigated.

166—Holland-Hoda-Hotaw complex, 30 to 50 percent slopes. This unit is on mountains. The native vegetation is mainly mixed conifers and hardwoods with an understory of brush, grasses, and forbs. Elevation is between 2,000 and 3,800 feet. The average annual

precipitation is between 50 and 75 inches, the average annual air temperature is between 54 and 57 degrees F, and the average frost-free period is between 160 and 190 days.

This unit is about 45 percent Holland loam, 25 percent Hoda loam, and 20 percent Hotaw loam.

Included in this unit are small areas of Musick and Chaix soils. Included areas make up about 10 percent of the total acreage.

The Holland soil is very deep and well drained. It formed in material weathered from granodiorite. Typically, the surface is covered with a mat of partially decomposed needles, leaves, and twigs about 2 inches thick. The surface layer is brown and reddish brown loam about 15 inches thick. The subsoil is reddish yellow clay loam about 50 inches thick.

Permeability in the Holland soil is moderate. Available water capacity is about 8.5 to 10.5 inches. The effective rooting depth is 60 inches or more. The shrink-swell potential is moderate. Runoff is rapid, and the hazard of water erosion is severe.

The Hoda soil is very deep and well drained. It formed in material weathered from granodiorite. Typically, the surface is covered with a mat of partially decomposed needles, leaves, and twigs about 1 inch thick. The surface layer is brown loam about 7 inches thick. The upper 7 inches of the subsoil is reddish yellow clay loam. The next 34 inches is yellowish red and reddish yellow clay. The lower part to a depth of 72 inches is reddish yellow clay loam.

Permeability in the Hoda soil is moderately slow. Available water capacity is about 8.5 to 9.5 inches. The effective rooting depth is 60 inches or more. The shrink-swell potential is moderate. Runoff is rapid, and the hazard of water erosion is severe.

The Hotaw soil is moderately deep and well drained. It formed in material weathered from granodiorite. Typically, the surface is covered with a mat of litter and duff about 1 inch thick. The surface layer is brown and light brown loam about 12 inches thick. The subsoil is light yellowish brown sandy clay loam about 22 inches thick. Weathered granodiorite is at a depth of 34 inches.

Permeability in the Hotaw soil is moderate. Available water capacity is about 5 to 6 inches. The effective rooting depth is restricted by bedrock at a depth of 20 to 40 inches. The shrink-swell potential is moderate. Runoff is rapid, and the hazard of water erosion is severe.

This unit is used mainly for timber production. It also is a watershed.

Ponderosa pine, Douglas-fir, sugar pine, incense cedar, tanoak, Pacific madrone, and California black oak are the major tree species. On the basis of a 100-year site curve, the mean site index for ponderosa pine is 105 on the Holland soil, 141 on the Hoda soil, and 102 on the Hotaw

soil. On the basis of a 100-year site curve, the mean site index for Douglas-fir is 112 on the Holland soil, 140 on the Hoda soil, and 130 on the Hotaw soil. The yield (CMAI) for ponderosa pine in a fully stocked stand of trees 40 years old is 112 cubic feet per acre on the Holland soil, 190 cubic feet per acre on the Hoda soil, and 106 cubic feet per acre on the Hotaw soil. The yield (CMAI) for Douglas-fir in a fully stocked stand of trees 60 years old is 101 cubic feet per acre on the Holland soil, 145 cubic feet per acre on the Hoda soil, and 129 cubic feet per acre on the Hotaw soil.

The main concerns in producing and harvesting timber are the slope, seasonal wetness, the hazard of water erosion, and plant competition. The slope restricts the use of wheeled and tracked equipment. Skyline yarding generally is safer than other methods and results in less soil disturbance. Unsurfaced roads and skid trails are slippery when wet, and they may be impassable during rainy periods. Roads require suitable surfacing for year-round use. Rock for the construction of roads is not readily available in areas of this unit. Roads may fail and landslides may occur following deep soil disturbance. Roads should be confined to ridgetops where possible. When trees are harvested, management that minimizes the risk of erosion is essential. Erosion can be controlled by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Minimizing the number of roads, trails, and landings and harvesting from preplanned skid trails can help to prevent excessive erosion and compaction. Scattering brush on skid trails helps to control erosion. Revegetating as soon as possible in disturbed areas also helps to control erosion. If the site is not adequately prepared, competition from undesirable plants can prevent or delay the natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling, which helps to eliminate unwanted weeds, brush, or trees. Mechanical treatment is not feasible because of the slope. The characteristic understory plant community on this unit is mainly mountain misery, tanoak, sticky whiteleaf manzanita, and poison oak.

This unit is in capability subclass V1e (22), nonirrigated.

167—Holland-Hoda-Hotaw complex, 10 to 40 percent slopes, eroded. This unit is on mountains. Part, but generally not all, of the surface layer has been removed from most areas through erosion. The native vegetation is mainly mixed conifers and hardwoods with an understory of brush, grasses, and forbs. Elevation is between 2,000 and 3,800 feet. The average annual precipitation is between 50 and 75 inches, the average annual air temperature is between 54 and 57 degrees F,

and the average frost-free period is between 160 and 190 days.

This unit is about 45 percent Holland loam, 25 percent Hoda loam, and 20 percent Hotaw loam.

Included in this unit are small areas of Musick and Chaix soils. Included areas make up about 10 percent of the total acreage.

The Holland soil is very deep and well drained. It formed in material weathered from granodiorite. Typically, the surface is covered with a mat of partially decomposed needles, leaves, and twigs about 2 inches thick. The surface layer is brown and reddish brown loam about 3 inches thick. The subsoil to a depth of 67 inches is reddish yellow clay loam.

Permeability in the Holland soil is moderate. Available water capacity is about 8.5 to 10.5 inches. The effective rooting depth is 60 inches or more. The shrink-swell potential is moderate. Runoff is medium, and the hazard of water erosion is severe.

The Hoda soil is very deep and well drained. It formed in material weathered from granodiorite. Typically, the surface is covered with a mat of partially decomposed needles, leaves, and twigs about 1 inch thick. The surface layer is brown loam about 7 inches thick. The upper 7 inches of the subsoil is reddish yellow clay loam. The next 34 inches is yellowish red and reddish yellow clay. The lower part to a depth of 72 inches is reddish yellow clay loam.

Permeability in the Hoda soil is moderately slow. Available water capacity is about 8.5 to 9.5 inches. The effective rooting depth is 60 inches or more. The shrink-swell potential is moderate. Runoff is medium, and the hazard of water erosion is severe.

The Hotaw soil is moderately deep and well drained. It formed in material weathered from granodiorite. Typically, the surface is covered with a mat of litter and duff about 1 inch thick. The surface layer is brown loam about 5 inches thick. The subsoil is light yellowish brown sandy clay loam about 16 inches thick. Weathered granodiorite is at a depth of 21 inches.

Permeability in the Hotaw soil is moderate. Available water capacity is about 3.0 to 3.5 inches. The effective rooting depth is restricted by bedrock at a depth of 20 to 40 inches. Runoff is medium, and the hazard of water erosion is severe.

This unit is used mainly for timber production. It also is a watershed.

Ponderosa pine, Douglas-fir, sugar pine, incense cedar, tanoak, Pacific madrone, and California black oak are the major tree species. On the basis of a 100-year site curve, the mean site index for ponderosa pine is 105 on the Holland soil, 141 on the Hoda soil, and 102 on the Hotaw soil. On the basis of a 100-year site curve, the mean site index for Douglas-fir is 112 on the Holland soil, 140 on the

Hoda soil, and 130 on the Hotaw soil. The yield (CMAI) for ponderosa pine in a fully stocked stand of trees 40 years old is 112 cubic feet per acre on the Holland soil, 190 cubic feet per acre on the Hoda soil, and 106 cubic feet per acre on the Hotaw soil. The yield (CMAI) for Douglas-fir in a fully stocked stand of trees 60 years old is 101 cubic feet per acre on the Holland soil, 145 cubic feet per acre on the Hoda soil, and 129 cubic feet per acre on the Hotaw soil.

The main concerns in producing and harvesting timber are seasonal wetness, the hazard of water erosion, and plant competition. Conventional methods of harvesting timber can be used. Use of wheeled and tracked equipment when the soils are moist results in the formation of ruts, causes soil compaction, and can damage the roots of trees. Soil compaction may increase the rate of water runoff and decrease timber production. Unsurfaced roads and skid trails are slippery when wet, and they may be impassable during rainy periods. Roads require suitable surfacing for year-round use. Rock for the construction of roads is not readily available in areas of this unit. When trees are harvested, management that minimizes the risk of erosion is essential. Erosion can be controlled by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Minimizing the number of roads, trails, and landings and harvesting from preplanned skid trails can help to prevent excessive erosion and compaction. Scattering brush on skid trails helps to control erosion. Revegetating as soon as possible in disturbed areas also helps to control erosion. Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling, which helps to eliminate unwanted weeds, brush, or trees. The characteristic understory plant community on this unit is mainly mountain misery, tanoak, sticky whiteleaf manzanita, and poison oak.

This unit is in capability subclass VIe (22), nonirrigated.

168—Horseshoe-Aiken complex, 30 to 50 percent slopes. This unit is on mountains. The native vegetation is mainly mixed conifers and hardwoods with an understory of brush. Elevation is between 3,100 and 4,125 feet. The average annual precipitation is between 50 and 85 inches, the average annual air temperature is between 50 and 57 degrees F, and the average frost-free period is between 140 and 190 days.

This unit is about 45 percent Horseshoe loam and 35 percent Aiken loam.

Included in this unit are small areas of soils that are similar to the Horseshoe soil but have bedrock at a depth of 40 to 60 inches or are gravelly throughout. Also

included are small areas where slopes are less than 30 percent. Included areas make up about 20 percent of the total acreage.

The Horseshoe soil is very deep and well drained. It formed in material weathered from andesitic tuff breccia. Typically, the surface is covered with a mat of twigs, bark, and needles about 3 inches thick. The surface layer is brown and yellowish red loam about 15 inches thick. The subsoil is yellowish red, strong brown, and brown loam about 60 inches thick. Weathered andesitic tuff breccia is at a depth of 75 inches.

Permeability in the Horseshoe soil is moderate. Available water capacity is about 8 to 10 inches. The effective rooting depth is 60 inches or more. The shrink-swell potential is moderate. Runoff is rapid, and the hazard of water erosion is severe.

The Aiken soil is very deep and well drained. It formed in material weathered from andesitic tuff breccia. Typically, the surface is covered with a mat of partially decomposed leaves, twigs, and needles about 3 inches thick. The surface layer is brown and reddish brown loam about 21 inches thick. The upper 8 inches of the subsoil is yellowish red clay loam. The lower 36 inches is yellowish red clay.

Permeability in the Aiken soil is moderately slow. Available water capacity is about 9 to 10 inches. The effective rooting depth is 60 inches or more. The shrink-swell potential is moderate. Runoff is rapid, and the hazard of water erosion is severe.

This unit is used for timber production. It also is a watershed.

Ponderosa pine, Douglas-fir, sugar pine, white fir, California black oak, and incense cedar are the major tree species. On the basis of a 100-year site curve, the mean site index for ponderosa pine is 147 on the Horseshoe soil and 149 on the Aiken soil. On the basis of a 100-year site curve, the mean site index for Douglas-fir is 150 on the Aiken soil. The yield (CMAI) for ponderosa pine in a fully stocked stand of trees 40 years old is 208 cubic feet per acre on the Aiken soil and 203 cubic feet per acre on the Horseshoe soil. The yield (CMAI) for Douglas-fir on the Aiken soil is 158 cubic feet per acre in a fully stocked stand of trees 60 years old.

The main concerns in producing and harvesting timber are the slope, seasonal wetness, the hazard of water erosion, and plant competition. The slope restricts the use of wheeled and tracked equipment. Skyline yarding generally is safer than other methods and results in less soil disturbance. Unsurfaced roads and skid trails are slippery when wet, and they may be impassable during rainy periods. Roads require suitable surfacing for year-round use. Rock for the construction of roads is not readily available in areas of this unit. Roads may fail and landslides may occur following deep soil disturbance.

Roads should be confined to ridgetops where possible. When trees are harvested, management that minimizes the risk of erosion is essential. Erosion can be controlled by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Revegetating as soon as possible in disturbed areas also helps to control erosion. If the site is not adequately prepared, competition from undesirable plants can prevent or delay the natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling, which helps to eliminate unwanted weeds, brush, or trees. Mechanical treatment is not feasible because of the slope. The characteristic understory plant community on this unit is mainly California black oak, tanoak, deerbrush, common snowberry, and mountain misery.

This unit is in capability subclass VIe (22), nonirrigated.

169—Horst sandy loam, 0 to 1 percent slopes. This very deep, well drained soil is on stream terraces. It formed in alluvium derived from mixed sources. The vegetation in uncultivated areas is mainly annual grasses, forbs, and valley oaks. Elevation is between 40 and 95 feet. The average annual precipitation is between 18 and 22 inches, the average annual air temperature is between 61 and 63 degrees F, and the average frost-free period is between 270 and 290 days.

Typically, the upper 10 inches of the surface layer is overburden of pale brown sandy loam. The lower 5 inches is brown loamy sand. Below this is a buried surface layer of dark brown silt loam about 27 inches thick. The subsoil to a depth of 62 inches is brown silt loam. In some areas the surface layer is fine sandy loam or silt loam.

Included in this unit are small areas of Feather, Holillipah, and Columbia soils. Included areas make up about 15 percent of the total acreage.

Permeability in the Horst soil is moderate. Available water capacity is about 9 to 10 inches. The effective rooting depth is 60 inches or more. The shrink-swell potential is moderate. Runoff is slow, and the hazard of water erosion is slight. This soil is protected by levees and is subject to rare flooding.

Most areas of this unit are used for irrigated crops, mainly peaches, almonds, and walnuts. A few areas are used for alfalfa or corn.

This unit is suited to irrigated crops. Depending on the particular crop, sprinkler, drip, and furrow irrigation systems are suitable. Carefully applying irrigation water helps to prevent the buildup of a water table above the buried layer of silt loam. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake. Leaving crop residue on or near the surface helps to conserve moisture, maintain tilth, and control

erosion. Excessive cultivation can result in the formation of a tillage pan. This pan can be broken by subsoiling when the soil is dry.

This unit is in capability class I (17), irrigated, and capability subclass IIIc (17), nonirrigated.

170—Horst silt loam, 0 to 2 percent slopes. This very deep, well drained soil is on stream terraces. It formed in alluvium derived from mixed sources. The vegetation in uncultivated areas is mainly annual grasses, forbs, and valley oaks. Elevation is between 40 and 95 feet. The average annual precipitation is between 18 and 22 inches, the average annual air temperature is between 61 and 63 degrees F, and the average frost-free period is between 270 and 290 days.

Typically, the surface layer is brown silt loam about 26 inches thick. The upper 34 inches of the subsoil is brown silt loam. The lower 10 inches is brown loam. In some areas the surface layer is loam.

Included in this unit are small areas of Conejo, Columbia, and Feather soils. Included areas make up about 10 percent of the total acreage.

Permeability in the Horst soil is moderate. Available water capacity is about 10.0 to 11.5 inches. The effective rooting depth is 60 inches or more. The shrink-swell potential is moderate. Runoff is slow, and the hazard of water erosion is slight. This soil is protected by levees and is subject to rare flooding.

Most areas of this unit are used for irrigated crops, mainly peaches, almonds, and walnuts. A few areas are used for alfalfa, corn, or wheat.

This unit is suited to irrigated crops. Depending on the particular crop, furrow, border, corrugation, and sprinkler irrigation systems are suitable. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake. Excessive cultivation can result in the formation of a tillage pan. This pan can be broken by subsoiling when the soil is dry.

This unit is in capability class I (17), irrigated, and capability subclass IIIc (17), nonirrigated.

171—Hotaw sandy loam, 15 to 30 percent slopes. This moderately deep, well drained soil is on mountains. It formed in material weathered from granodiorite. The native vegetation is mainly mixed conifers and hardwoods with an understory of brush, grasses, and forbs. Elevation is between 2,000 and 4,200 feet. The average annual precipitation is between 50 and 80 inches, the average annual air temperature is between 53 and 57 degrees F, and the average frost-free period is between 160 and 190 days.

Typically, the surface is covered with a mat of partially decomposed needles, leaves, twigs, and bark about 1

inch thick. The surface layer is dark brown sandy loam about 4 inches thick. The subsoil is strong brown and reddish yellow sandy clay loam about 19 inches thick. Weathered granodiorite is at a depth of 23 inches.

Included in this unit are small areas of Hoda, Chaix, and Chawanakee soils and areas of soils that are similar to the Hotaw soil but are 10 to 20 inches deep or have a stony or bouldery surface layer or a subsoil of clay. Included areas make up about 30 percent of the total acreage.

Permeability in the Hotaw soil is moderate. Available water capacity is about 3 to 4 inches. The effective rooting depth is restricted by weathered bedrock at a depth of 20 to 40 inches. The shrink-swell potential is moderate. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for timber production. It also is a watershed and is used for wildlife habitat.

Ponderosa pine, white fir, Douglas-fir, incense cedar, tanoak, Pacific madrone, California black oak, and sugar pine are the main tree species. On the basis of a 100-year site curve, the mean site index is 102 for ponderosa pine, 66 for white fir, and 156 for sugar pine. The yield (CMAI) for ponderosa pine is 106 cubic feet per acre in a fully stocked stand of trees 40 years old. The yield (CMAI) for white fir is 149 cubic feet per acre in a fully stocked stand of trees 70 years old.

The main concerns in producing and harvesting timber are seasonal wetness, the hazard of water erosion, and plant competition. Conventional methods of harvesting timber can be used. Use of wheeled and tracked equipment when the soil is moist results in the formation of ruts, causes soil compaction, and can damage the roots of trees. Soil compaction may increase the rate of water runoff and decrease timber production. Unsurfaced roads and skid trails are slippery when wet, and they may be impassable during rainy periods. Roads require suitable surfacing for year-round use. Rock for the construction of roads is not readily available in areas of this unit. When trees are harvested, management that minimizes the risk of erosion is essential. Erosion can be controlled by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Minimizing the number of roads, trails, and landings and harvesting from preplanned skid trails can help to prevent excessive erosion and compaction. Scattering brush on skid trails helps to control erosion. Revegetating as soon as possible in disturbed areas also helps to control erosion. Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling, which helps to eliminate unwanted weeds, brush, or trees. Reforestation can be



Figure 6.—An area of Hurlbut-Deadwood-Rock outcrop complex, 30 to 75 percent slopes, to the left of the Yuba River and the New Bullards Bar Reservoir and an area of Hotaw sandy loam, 30 to 50 percent slopes, in the lower right.

accomplished by planting Douglas-fir seedlings on the cooler aspects and ponderosa pine on the warmer south aspects. The characteristic understory plant community on this unit is mainly mountain misery, tanoak, sticky whiteleaf manzanita, and poison oak at the lower elevations and common snowberry and tanoak at the higher elevations.

This unit is in capability subclass VIe (22), nonirrigated.

172—Hotaw sandy loam, 30 to 50 percent slopes.

This moderately deep, well drained soil is on mountains (fig. 6). It formed in material weathered from granodiorite. The native vegetation is mainly mixed conifers and hardwoods with an understory of brush, grasses, and forbs. Elevation is between 2,000 and 4,200 feet. The average annual precipitation is between 50 and 80 inches, the average annual air temperature is between 53 and 57 degrees F, and the average frost-free period is between 160 and 190 days.

Typically, the surface is covered with a mat of partially decomposed needles, leaves, twigs, and bark about 1 inch thick. The surface layer is dark brown sandy loam about 4 inches thick. The subsoil is strong brown and reddish yellow sandy clay loam about 19 inches thick. Weathered granodiorite is at a depth of 23 inches.

Included in this unit are small areas of Hoda, Chaix, and Chawanakee soils and areas of soils that are similar to the Hotaw soil but are 10 to 20 inches deep or have a stony or bouldery surface layer. Included areas make up about 30 percent of the total acreage.

Permeability in the Hotaw soil is moderate. Available water capacity is about 3 to 4 inches. The effective rooting depth is restricted by weathered bedrock at a depth of 20 to 40 inches. The shrink-swell potential is moderate. Runoff is rapid, and the hazard of water erosion is severe.

This unit is used mainly for timber production. It also is a watershed and is used for wildlife habitat.

Ponderosa pine, white fir, Douglas-fir, sugar pine,

incense cedar, tanoak, Pacific madrone, and California black oak are the major tree species. On the basis of a 100-year site curve, the mean site index is 102 for ponderosa pine, 66 for white fir, and 156 for sugar pine. The yield (CMAI) for ponderosa pine is 106 cubic feet per acre in a fully stocked stand of trees 40 years old. The yield (CMAI) for white fir is 149 cubic feet per acre in a fully stocked stand of trees 70 years old.

The main concerns in producing and harvesting timber are the slope, seasonal wetness, the hazard of water erosion, and plant competition. Conventional methods of harvesting timber cannot be easily used because of the slope. Use of wheeled and tracked equipment when the soil is moist results in the formation of ruts, causes soil compaction, and can damage the roots of trees. Soil compaction may increase the rate of water runoff and decrease timber production. Unsurfaced roads and skid trails are slippery when wet, and they may be impassable during rainy periods. Roads require suitable surfacing for year-round use. Rock for the construction of roads is not readily available in areas of this unit. Roads may fail and landslides may occur following deep soil disturbance. Roads should be confined to ridgetops, natural benches, and the flatter slopes where possible. When trees are harvested, management that minimizes the risk of erosion is essential. Erosion can be controlled by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Minimizing the number of roads, trails, and landings and harvesting from preplanned skid trails can help to prevent excessive erosion and compaction. Scattering brush on skid trails helps to control erosion. Revegetating as soon as possible in disturbed areas also helps to control erosion. If the site is not adequately prepared, competition from undesirable plants can prevent or delay the natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling, which helps to eliminate unwanted weeds, brush, or trees. Reforestation can be accomplished by planting Douglas-fir seedlings on the cooler aspects and ponderosa pine on the warmer south aspects. The characteristic understory plant community on this unit is mainly mountain misery, tanoak, sticky whiteleaf manzanita, and poison oak at the lower elevations and common snowberry and tanoak at the higher elevations.

This unit is in capability subclass VIe (22), nonirrigated.

173—Hotaw-Chawanakee-Holland complex, 8 to 30 percent slopes. This unit is on mountains. The native vegetation is mainly mixed conifers and hardwoods with an understory of brush, grasses, and forbs. Elevation is between 1,200 and 3,100 feet. The average annual precipitation is between 50 and 70 inches, the average

annual air temperature is between 54 and 57 degrees F, and the average frost-free period is between 160 and 190 days.

This unit is about 45 percent Hotaw loam, 20 percent Chawanakee coarse sandy loam, and 15 percent Holland loam.

Included in this unit are small areas of Rock outcrop and a soil that is similar to the Chawanakee soil but has bedrock at a depth of less than 10 inches. Included areas make up about 20 percent of the total acreage.

The Hotaw soil is moderately deep and well drained. It formed in material weathered from granodiorite. Typically, the surface is covered with a mat of litter and duff about 1 inch thick. The surface layer is brown loam about 12 inches thick. The subsoil is light yellowish brown sandy clay loam about 22 inches thick. Weathered granodiorite is at a depth of 34 inches.

Permeability in the Hotaw soil is moderate. Available water capacity is about 5 to 6 inches. The effective rooting depth is restricted by weathered bedrock at a depth of 20 to 40 inches. The shrink-swell potential is moderate. Runoff is medium, and the hazard of water erosion is moderate.

The Chawanakee soil is shallow and somewhat excessively drained. It formed in material weathered from granodiorite. Typically, the surface is covered with a mat of partially decomposed needles, leaves, and twigs about 1 inch thick. The surface layer is grayish brown coarse sandy loam about 5 inches thick. The subsoil is very pale brown coarse sandy loam about 10 inches thick. Weathered granodiorite is at a depth of 15 inches.

Permeability in the Chawanakee soil is moderately rapid. Available water capacity is 1.0 to 1.5 inches. The effective rooting depth is restricted by weathered bedrock at a depth of 10 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate.

The Holland soil is very deep and well drained. It formed in material weathered from granodiorite. Typically, the surface is covered with a mat of partially decomposed needles, leaves, and twigs about 2 inches thick. The surface layer is brown and reddish brown loam about 15 inches thick. The subsoil is reddish yellow clay loam about 50 inches thick.

Permeability in the Holland soil is moderate. Available water capacity is about 8.5 to 10.5 inches. The effective rooting depth is restricted by weathered bedrock at a depth of 60 inches or more. The shrink-swell potential is moderate. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for timber production. It also is used for wildlife habitat.

Ponderosa pine, California black oak, canyon live oak, interior live oak, and Pacific madrone are the major tree species. On the basis of a 100-year site curve, the mean

site index for ponderosa pine is 102 on the Hotaw soil, 81 on the Chawanakee soil, and 110 on the Holland soil. The yield (CMAI) for ponderosa pine in a fully stocked stand of trees 40 years old is 106 cubic feet per acre on the Hotaw soil, 70 cubic feet per acre on the Chawanakee soil, and 122 cubic feet per acre on the Holland soil.

The main concerns in producing and harvesting timber are seasonal wetness, the hazard of water erosion, plant competition, and seedling mortality. Conventional methods of harvesting timber can be used. Use of wheeled and tracked equipment when the soils are moist results in the formation of ruts, causes soil compaction, and can damage the roots of trees. Soil compaction may increase the rate of water runoff and decrease timber production. Unsurfaced roads and skid trails are slippery when wet, and they may be impassable during rainy periods. Roads require suitable surfacing for year-round use. Rock for the construction of roads is not readily available in areas of this unit. When trees are harvested, management that minimizes the risk of erosion is essential. Erosion can be controlled by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Scattering brush on skid trails helps control erosion. Revegetating as soon as possible in disturbed areas also helps to control erosion. If the site is not adequately prepared, competition from undesirable plants can prevent or delay the natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling, which helps to eliminate unwanted weeds, brush, or trees. The high soil temperature and low content of soil moisture during the growing season cause a high seedling mortality rate, especially on south- and southwest-facing slopes. Reforestation can be accomplished by planting Douglas-fir seedlings on the cooler aspects and ponderosa pine on the warmer south aspects. The characteristic plant community on this unit is mainly sticky whiteleaf manzanita and poison oak.

This unit provides habitat for wildlife, such as deer, birds of prey, game birds, other birds, and small fur-bearing mammals. Planting and maintaining shrubs and other woody plants in wet areas and in areas adjacent to drainageways improve the habitat. Creating openings in areas of dense brush can benefit wildlife. Brush controlled by prescribed burning or mechanical methods produces valuable new growth for wildlife. Areas where brush is managed by prescribed burning or by chemical or mechanical methods may be subject to an increased hazard of erosion.

The Hotaw soil is in capability subclass VIe (22), nonirrigated. The Chawanakee soil is in capability subclass VIIe (22), nonirrigated. The Holland soil is in capability subclass IVe (22), nonirrigated.

174—Hurlbut-Deadwood-Rock outcrop complex, 30 to 75 percent slopes. This unit is on mountains in the inner gorge of river and stream canyons (fig. 6). The native vegetation is mainly an open stand of mixed conifers and hardwoods with an understory of brush. Elevation is between 1,200 and 3,500 feet. The average annual precipitation is between 50 and 75 inches, the average annual air temperature is between 53 and 57 degrees F, and the average frost-free period is between 160 and 190 days.

This unit is about 40 percent Hurlbut gravelly fine sandy loam; 20 percent Deadwood very gravelly sandy loam, and 15 percent Rock outcrop.

Included in this unit are small areas of soils that are similar to the Hurlbut soil but have more than 35 percent rock fragments throughout and areas of soils that are similar to the Deadwood soil but are more than 40 inches deep. Also included are small areas, mainly of Rock outcrop, that have slopes of more than 75 percent. Included areas make up about 25 percent of the total acreage.

The Hurlbut soil is moderately deep and well drained. It formed in material weathered from medisedimentary rocks. Typically, the surface is covered with a mat of partially decomposed needles, leaves, and twigs about 1 inch thick. The surface layer is pale brown gravelly fine sandy loam about 3 inches thick. The subsoil is brownish yellow and yellow gravelly fine sandy loam about 20 inches thick. Weathered slate is at a depth of 23 inches.

Permeability in the Hurlbut soil is moderate. Available water capacity is about 2 to 3 inches. The effective rooting depth is restricted by weathered bedrock at a depth of 20 to 40 inches. Runoff is very rapid, and the hazard of water erosion is very severe.

The Deadwood soil is shallow and somewhat excessively drained. It formed in material weathered from medisedimentary rocks. Typically, the surface layer is brown very gravelly sandy loam about 6 inches thick. The subsoil is brownish yellow very gravelly sandy loam about 8 inches thick. Hard slate is at a depth of 14 inches.

Permeability in the Deadwood soil is moderately rapid. Available water capacity is about 0.5 to 1.0 inch. The effective rooting depth is restricted by weathered bedrock at a depth of 10 to 20 inches. Runoff is very rapid, and the hazard of water erosion is very severe.

Rock outcrop consists of exposures of bare rock that support little or no vegetation.

This unit is used mainly for timber production. It also is a watershed.

Ponderosa pine, canyon live oak, California black oak, Douglas-fir, and Pacific madrone are the major tree species. On the basis of a 100-year site curve, the mean site index for ponderosa pine is 100 on the Hurlbut soil and 84 on the Deadwood soil. On the basis of a 100-year

site curve, the mean site index for Douglas-fir is 150 on the Hurlbut soil and 83 on the Deadwood soil. The yield (CMAI) for ponderosa pine in a fully stocked stand of trees 40 years old is 102 cubic feet per acre on the Hurlbut soil and 75 cubic feet per acre on the Deadwood soil. The yield (CMAI) for Douglas-fir in a fully stocked stand of trees 60 years old is 159 cubic feet per acre on the Hurlbut soil and 62 cubic feet per acre on the Deadwood soil.

The main concerns in producing and harvesting timber are the slope, seasonal wetness, the hazard of water erosion, plant competition, and seedling mortality. The slope restricts the use of wheeled and tracked equipment. Skyline yarding generally is safer than other methods and results in less soil disturbance. Roads require suitable surfacing for year-round use. Rock for the construction of roads is readily available in areas of this unit. Roads may fail and landslides may occur following deep soil disturbance. Roads should be confined to ridgetops where possible. When trees are harvested, management that minimizes the risk of erosion is essential. Erosion can be controlled by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Revegetating as soon as possible in disturbed areas also helps to control erosion. If the site is not adequately prepared, competition from undesirable plants can prevent or delay the natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling, which helps to eliminate unwanted weeds, brush, or trees. Mechanical treatment is not feasible because of the slope. The high soil temperature and low content of soil moisture during the growing season cause a high seedling mortality rate, especially on south- and southwest-facing slopes. Reforestation can be accomplished by planting Douglas-fir seedlings on the cooler aspects and ponderosa pine on the warmer south aspects. The characteristic understory plant community is mainly sticky whiteleaf manzanita, poison oak, and canyon live oak.

The Hurlbut and Deadwood soils are in capability subclass VIIe (22), nonirrigated. The Rock outcrop is in capability class VIII (22), nonirrigated

175—Jocal loam, 3 to 8 percent slopes. This very deep, well drained soil is on mountains. It formed in material weathered from metasedimentary rocks. The native vegetation is mainly mixed conifers and hardwoods with an understory of brush, grasses, and forbs. Elevation is between 2,700 and 4,200 feet. The average annual precipitation is between 50 and 80 inches, the average annual air temperature is between 53 and 57 degrees F, and the average frost-free period is between 160 and 190 days.

Typically, the surface is covered with a mat of partially

decomposed needles, twigs, and bark about 2 inches thick. The surface layer is brown loam about 4 inches thick. The upper 4 inches of the subsoil is yellowish red loam. The lower 65 inches is reddish yellow, pink, and light red clay loam and silty clay loam.

Included in this unit are small areas of Mariposa and Sites soils and areas of a soil that is similar to the Jocal soil but has bedrock at a depth of 40 to 60 inches. Included areas make up about 20 percent of the total acreage.

Permeability in the Jocal soil is moderate. Available water capacity is about 8.5 to 11.0 inches. The effective rooting depth is 60 inches or more. The shrink-swell potential is moderate. Runoff is slow, and the hazard of water erosion is slight.

Most areas of this unit are used for timber production. A few areas are used for homesite development.

Ponderosa pine, Douglas-fir, sugar pine, incense cedar, tanoak, Pacific madrone, and California black oak are the major tree species. At an elevation of more than 3,000 feet, white fir becomes significant. On the basis of a 100-year site curve, the mean site index is 145 for ponderosa pine and 147 for Douglas-fir. On the basis of a 50-year site curve, the mean site index is 97 for white fir. The yield (CMAI) for ponderosa pine is 199 cubic feet per acre in a fully stocked stand of trees 40 years old. The yield (CMAI) for Douglas-fir is 154 cubic feet per acre in a fully stocked stand of trees 60 years old. The yield (CMAI) for white fir is 234 cubic feet per acre in a fully stocked stand of trees 70 years old.

The main concerns in producing and harvesting timber are seasonal wetness and plant competition. Conventional methods of harvesting timber can be used. Use of wheeled and tracked equipment when the soil is moist results in the formation of ruts, causes soil compaction, and can damage the roots of trees. Soil compaction may increase the rate of water runoff and decrease timber production. Unsurfaced roads and skid trails are slippery when wet, and they may be impassable during rainy periods. Roads require suitable surfacing for year-round use. Rock for the construction of roads is not readily available in areas of this unit. Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling, which helps to eliminate unwanted weeds, brush, or trees. The characteristic understory plant community on this unit is mainly mountain misery, tanoak, sticky whiteleaf manzanita, and poison oak at the lower elevations and common snowberry and tanoak at the higher elevations.

If this unit is used for homesite development, the main management concern is the moderate shrink-swell potential.

This unit is in capability units IIe-1 (22), irrigated, and IIIe-1 (22), nonirrigated.

176—Jocal loam, 8 to 15 percent slopes. This very deep, well drained soil is on mountains. It formed in material weathered from metasedimentary rocks. The native vegetation is mainly mixed conifers and hardwoods with an understory of brush, grasses, and forbs. Elevation is between 2,700 and 4,200 feet. The average annual precipitation is between 50 and 80 inches, the average annual air temperature is between 53 and 57 degrees F, and the average frost-free period is between 160 and 190 days.

Typically, the surface is covered with a mat of partially decomposed needles, twigs, and bark about 2 inches thick. The surface layer is brown loam about 4 inches thick. The upper 4 inches of the subsoil is yellowish red loam. The lower 65 inches is reddish yellow, pink, and light red clay loam and silty clay loam.

Included in this unit are small areas of Mariposa and Sites soils and areas of a soil that is similar to the Jocal soil but has bedrock at a depth of 40 to 60 inches. Included areas make up about 20 percent of the total acreage.

Permeability in the Jocal soil is moderate. Available water capacity is about 8.5 to 11.0 inches. The effective rooting depth is 60 inches or more. The shrink-swell potential is moderate. Runoff is medium, and the hazard of water erosion is moderate.

Most areas of this unit are used for timber production. A few areas are used for homesite development.

Ponderosa pine, Douglas-fir, sugar pine, incense cedar, tanoak, Pacific madrone, and California black oak are the major tree species. At an elevation of more than 3,000 feet, white fir becomes significant. On the basis of a 100-year site curve, the mean site index is 145 for ponderosa pine and 147 for Douglas-fir. On the basis of a 50-year site curve, the mean site index is 97 for white fir. The yield (CMAI) for ponderosa pine is 199 cubic feet per acre in a fully stocked stand of trees 40 years old. The yield (CMAI) for Douglas-fir is 154 cubic feet per acre in a fully stocked stand of trees 60 years old. The yield (CMAI) for white fir is 234 cubic feet per acre in a fully stocked stand of trees 70 years old.

The main concerns in producing and harvesting timber are seasonal wetness and plant competition. Conventional methods of harvesting timber can be used. Use of wheeled and tracked equipment when the soil is moist results in the formation of ruts, causes soil compaction, and can damage the roots of trees. Soil compaction may increase the rate of water runoff and decrease timber production. Unsurfaced roads and skid trails are slippery when wet, and they may be impassable during rainy periods. Roads require suitable surfacing for

year-round use. Rock for the construction of roads is not readily available in areas of this unit. Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling, which helps to eliminate unwanted weeds, brush, or trees. The characteristic understory plant community on this unit is mainly mountain misery, tanoak, sticky whiteleaf manzanita, and poison oak at the lower elevations and common snowberry and tanoak at the higher elevations.

If this unit is used for homesite development, the main management concerns are the moderate shrink-swell potential and the hazard of water erosion. Erosion is a hazard on construction sites and on road cuts and fills. Only the part of the site that is used for construction should be disturbed. Mulching and revegetating as soon as possible in disturbed areas, such as road cuts and fills and construction sites, help to control erosion.

This unit is in capability unit IIIe-1 (22), irrigated and nonirrigated.

177—Jocal loam, 15 to 30 percent slopes. This very deep, well drained soil is on mountains. It formed in material weathered from metasedimentary rocks. The native vegetation is mainly mixed conifers and hardwoods with an understory of brush, grasses, and forbs. Elevation is between 2,700 and 4,200 feet. The average annual precipitation is between 50 and 80 inches, the average annual air temperature is between 53 and 57 degrees F, and the average frost-free period is between 160 and 190 days.

Typically, the surface is covered with a mat of partially decomposed needles, twigs, and bark about 2 inches thick. The surface layer is brown loam about 4 inches thick. The upper 4 inches of the subsoil is yellowish red loam. The lower 65 inches is reddish yellow, pink, and light red clay loam and silty clay loam.

Included in this unit are small areas of Mariposa and Sites soils and areas of a soil that is similar to the Jocal soil but has bedrock at a depth of 40 to 60 inches. Included areas make up about 20 percent of the total acreage.

Permeability in the Jocal soil is moderate. Available water capacity is about 8.5 to 11.0 inches. The effective rooting depth is 60 inches or more. The shrink-swell potential is moderate. Runoff is rapid, and the hazard of water erosion is severe.

This unit is used for timber production. It also is a watershed.

Ponderosa pine, Douglas-fir, sugar pine, incense cedar, tanoak, Pacific madrone, and California black oak are the major tree species. At an elevation of more than 3,000 feet, white fir becomes significant. On the basis of a 100-

year site curve, the mean site index is 145 for ponderosa pine and 147 for Douglas-fir. On the basis of a 50-year site curve, the mean site index is 97 for white fir. The yield (CMAI) for ponderosa pine is 199 cubic feet per acre in a fully stocked stand of trees 40 years old. The yield (CMAI) for Douglas-fir is 154 cubic feet per acre in a fully stocked stand of trees 60 years old. The yield (CMAI) for white fir is 234 cubic feet per acre in a fully stocked stand of trees 70 years old.

The main concerns in producing and harvesting timber are seasonal wetness, the hazard of water erosion, and plant competition. Conventional methods of harvesting timber can be used. Use of wheeled and tracked equipment when the soil is moist results in the formation of ruts, causes soil compaction, and can damage the roots of trees. Soil compaction may increase the rate of water runoff and decrease timber production. Unsurfaced roads and skid trails are slippery when wet, and they may be impassable during rainy periods. Roads require suitable surfacing for year-round use. Rock for the construction of roads is not readily available in areas of this unit. When trees are harvested, management that minimizes the risk of erosion is essential. Erosion can be controlled by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Minimizing the number of roads, trails, and landings and harvesting from preplanned skid trails can help to prevent excessive erosion and compaction. Scattering brush on skid trails helps to control erosion. Revegetating as soon as possible in disturbed areas also helps to control erosion. Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling, which helps to eliminate unwanted weeds, brush, or trees. The characteristic understory plant community on this unit is mainly mountain misery, tanoak, sticky whiteleaf manzanita, and poison oak at the lower elevations and common snowberry and tanoak at the higher elevations.

This unit is in capability unit IVe-1 (22), irrigated and nonirrigated.

178—Jocal loam, cool, 3 to 8 percent slopes. This very deep, well drained soil is on mountains. It formed in material weathered from metasedimentary rocks. The native vegetation is mainly mixed conifers and hardwoods with an understory of brush, grasses, and forbs. Elevation is between 3,700 and 4,700 feet. The average annual precipitation is between 75 and 85 inches, the average annual air temperature is between 50 and 54 degrees F, and the average frost-free period is between 140 and 160 days.

Typically, the surface is covered with a mat of partially decomposed needles, twigs, and bark about 2 inches thick. The surface layer is brown loam about 4 inches thick. The upper 4 inches of the subsoil is yellowish red loam. The lower 65 inches is reddish yellow, pink, and light red clay loam and silty clay loam.

Included in this unit are small areas of Mariposa and Sites soils and areas of a soil that is similar to the Jocal soil but has bedrock at a depth of 40 to 60 inches. Included areas make up about 20 percent of the total acreage.

Permeability in the Jocal soil is moderate. Available water capacity is about 8.5 to 11.0 inches. The effective rooting depth is 60 inches or more. The shrink-swell potential is moderate. Runoff is slow, and the hazard of water erosion is slight.

Most areas of this unit are used for timber production. A few areas are used for livestock grazing.

White fir, Douglas-fir, sugar pine, incense cedar, and California black oak are the major tree species. On the basis of a 50-year site curve, the mean site index is 86 for white fir. On the basis of a 100-year site curve, the mean site index is 124 for Douglas-fir. The yield (CMAI) for white fir is 209 cubic feet per acre in a fully stocked stand of trees 70 years old. The yield (CMAI) for Douglas-fir is 121 cubic feet per acre in a fully stocked stand of trees 60 years old.

The main concerns in producing and harvesting timber are seasonal wetness and plant competition. Conventional methods of harvesting timber can be used. Use of wheeled and tracked equipment when the soil is moist results in the formation of ruts, causes soil compaction, and can damage the roots of trees. Soil compaction may increase the rate of water runoff and decrease forage production. Unsurfaced roads and skid trails are slippery when wet, and they may be impassable during rainy periods. Roads require suitable surfacing for year-round use. Rock for the construction of roads is not readily available in areas of this unit. Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling, which helps to eliminate unwanted weeds, brush, or trees. The characteristic understory plant community on this unit is mainly Pacific dogwood, greenleaf manzanita, tanoak, and deerbrush.

Where this unit is used for livestock grazing, the main management concern is a dense cover of brush. If trees and shrubs are managed so that open areas are created, this unit can produce a good stand of forage plants. Applying fertilizer and seeding can increase forage production if brush is controlled.

This unit is in capability unit IVe-1 (22), nonirrigated.

179—Jocal loam, cool, 8 to 30 percent slopes. This very deep, well drained soil is on mountains. It formed in material weathered from metasedimentary rocks. The native vegetation is mainly mixed conifers and hardwoods with an understory of brush, grasses, and forbs. Elevation is between 3,700 and 4,700 feet. The average annual precipitation is between 75 and 85 inches, the average annual air temperature is between 50 and 54 degrees F, and the average frost-free period is between 140 and 160 days.

Typically, the surface is covered with a mat of partially decomposed needles, twigs, and bark about 2 inches thick. The surface layer is brown loam about 4 inches thick. The upper 4 inches of the subsoil is yellowish red loam. The lower 65 inches is reddish yellow, pink, and light red clay loam and silty clay loam.

Included in this unit are small areas of Mariposa and Sites soils and areas of a soil that is similar to the Jocal soil but has bedrock at a depth of 40 to 60 inches. Included areas make up about 20 percent of the total acreage.

Permeability in the Jocal soil is moderate. Available water capacity is about 8.5 to 11.0 inches. The effective rooting depth is 60 inches or more. The shrink-swell potential is moderate. Runoff is rapid, and the hazard of water erosion is severe.

Most areas of this unit are used for timber production. A few areas are used for livestock grazing.

White fir, Douglas-fir, sugar pine, incense cedar, and California black oak are the major tree species. On the basis of a 50-year site curve, the mean site index is 86 for white fir. On the basis of a 100-year site curve, the mean site index is 124 for Douglas-fir. The yield (CMAI) for white fir is 209 cubic feet per acre in a fully stocked stand of trees 70 years old. The yield (CMAI) for Douglas-fir is 121 cubic feet per acre in a fully stocked stand of trees 60 years old.

The main concerns in producing and harvesting timber are seasonal wetness, the hazard of water erosion, and plant competition. Conventional methods of harvesting timber can be used. Use of wheeled and tracked equipment when the soil is moist results in the formation of ruts, causes soil compaction, and can damage the roots of trees. Soil compaction may increase the rate of water runoff and decrease forage production. Unsurfaced roads and skid trails are slippery when wet, and they may be impassable during rainy periods. Roads require suitable surfacing for year-round use. Rock for the construction of roads is not readily available in areas of this unit. When trees are harvested, management that minimizes the risk of erosion is essential. Erosion can be controlled by carefully planning the construction and maintenance of logging roads, skid trails, and landings.

Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling, which helps to eliminate unwanted weeds, brush, or trees. The characteristic understory plant community on this unit is mainly Pacific dogwood, greenleaf manzanita, tanoak, and deerbrush.

Where this unit is used for livestock grazing, the main management concern is a dense cover of brush. If trees and shrubs are managed so that open areas are created, this unit can produce a good stand of forage plants. Applying fertilizer and seeding can increase forage production if brush is controlled.

This unit is in capability unit IVe-1 (22), nonirrigated.

180—Jocal-Sites-Mariposa complex, 2 to 30 percent slopes. This unit is on mountains. The native vegetation is mainly mixed conifers and hardwoods with an understory of brush, grasses, and forbs. Elevation is between 2,000 and 3,800 feet. The average annual precipitation is between 50 and 75 inches, the average annual air temperature is between 53 and 57 degrees F, and the average frost-free period is between 160 and 190 days.

This unit is about 50 percent Jocal loam, 20 percent Sites clay loam, and 15 percent Mariposa gravelly loam.

Included in this unit are small areas of Hurlbut and Aiken soils. Included areas make up about 15 percent of the total acreage.

The Jocal soil is very deep and well drained. It formed in material weathered from metasedimentary rocks. Typically, the surface is covered with a mat of partially decomposed needles, leaves, and twigs about 3 inches thick. The surface layer is reddish brown loam about 18 inches thick. The subsoil is reddish yellow silty clay loam about 52 inches thick. In some areas the surface layer is gravelly loam.

Permeability in the Jocal soil is moderate. Available water capacity is about 8.5 to 11.0 inches. The effective rooting depth is 60 inches or more. The shrink-swell potential is moderate. Runoff is medium, and the hazard of water erosion is moderate.

The Sites soil is deep and well drained. It formed in material weathered from metamorphic rocks. Typically, the surface is covered with a mat of partially decomposed leaves, needles, and twigs about 2 inches thick. The surface layer is reddish brown clay loam about 9 inches thick. The subsoil is yellowish red clay about 36 inches thick. Weathered schist is at a depth of 45 inches.

Permeability in the Sites soil is moderately slow. Available water capacity is about 7.0 to 8.5 inches. The effective rooting depth is restricted by weathered bedrock.

at a depth of 40 to 60 inches. The shrink-swell potential is moderate. Runoff is medium, and the hazard of water erosion is moderate.

The Mariposa soil is shallow or moderately deep and is well drained. It formed in material weathered from metasedimentary rocks. Typically, the surface is covered with a mat of partially decomposed leaves, needles, and twigs about 1 inch thick. The surface layer is dark brown and strong brown gravelly loam about 6 inches thick. The upper 9 inches of the subsoil is strong brown gravelly loam. The lower 18 inches is yellowish red gravelly clay loam. Hard schist is at a depth of 33 inches.

Permeability in the Mariposa soil is moderate. Available water capacity is about 3.0 to 4.5 inches. The effective rooting depth is restricted by weathered bedrock at a depth of 12 to 35 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for timber production. It also is a watershed.

Ponderosa pine, Douglas-fir, sugar pine, incense cedar, tanoak, Pacific madrone, and California black oak are the major tree species. At an elevation of more than 3,000 feet, white fir becomes significant. On the basis of a 100-year site curve, the mean site index for ponderosa pine is 145 on the Jocal and Sites soils and 105 on the Mariposa soil. On the basis of a 100-year site curve, the mean site index for Douglas-fir is 147 on the Jocal soil, 140 on the Sites soil, and 110 on the Mariposa soil. The yield (CMAI) for ponderosa pine in a fully stocked stand of trees 40 years old is 199 cubic feet per acre on the Jocal and Sites soils and 112 cubic feet per acre on the Mariposa soil. The yield (CMAI) for Douglas-fir in a fully stocked stand of trees 60 years old is 154 cubic feet per acre on the Jocal soil, 145 cubic feet per acre on the Sites soil, and 98 cubic feet per acre on the Mariposa soil.

The main concerns in producing and harvesting timber are seasonal wetness, the hazard of water erosion, and plant competition. Conventional methods of harvesting timber can be used. Use of wheeled and tracked equipment when the soils are moist results in the formation of ruts, causes soil compaction, and can damage the roots of trees. Soil compaction may increase the rate of water runoff and decrease timber production. Unsurfaced roads and skid trails are slippery when wet, and they may be impassable during rainy periods. Roads require suitable surfacing for year-round use. Rock for the construction of roads is not readily available in areas of this unit. When trees are harvested, management that minimizes the risk of erosion is essential. Erosion can be controlled by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Minimizing the number of roads, trails, and landings and harvesting from preplanned skid trails can help to

prevent excessive erosion and compaction. Scattering brush on skid trails helps to control erosion. Revegetating as soon as possible in disturbed areas also helps to control erosion. Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling, which helps to eliminate unwanted weeds, brush, or trees. The characteristic understory plant community on this unit is mainly mountain misery, tanoak, sticky whiteleaf manzanita, and poison oak at the lower elevations and common snowberry and tanoak at the higher elevations.

This unit is in capability unit IVe-1 (22), irrigated and nonirrigated.

181—Jocal-Sites-Mariposa complex, 30 to 50 percent slopes. This unit is on mountains. The native vegetation is mainly mixed conifers and hardwoods with an understory of brush, grasses, and forbs. Elevation is between 2,000 and 3,800 feet. The average annual precipitation is between 50 and 75 inches, the average annual air temperature is between 53 and 57 degrees F, and the average frost-free period is between 160 and 190 days.

This unit is about 50 percent Jocal loam, 20 percent Sites clay loam, and 15 percent Mariposa gravelly loam.

Included in this unit are small areas of Hurlbut and Aiken soils. Included areas make up about 15 percent of the total acreage.

The Jocal soil is very deep and well drained. It formed in material weathered from metasedimentary rocks. Typically, the surface is covered with a mat of partially decomposed needles, leaves, and twigs about 3 inches thick. The surface layer is reddish brown loam about 18 inches thick. The subsoil is reddish yellow silty clay loam about 52 inches thick. In some areas the surface layer is gravelly loam.

Permeability in the Jocal soil is moderate. Available water capacity is about 8.5 to 11.0 inches. The effective rooting depth is 60 inches or more. The shrink-swell potential is moderate. Runoff is rapid, and the hazard of water erosion is severe.

The Sites soil is deep and well drained. It formed in material weathered from metamorphic rocks. Typically, the surface is covered with a mat of partially decomposed leaves, needles, and twigs about 2 inches thick. The surface layer is reddish brown clay loam about 9 inches thick. The subsoil is yellowish red clay about 36 inches thick. Weathered schist is at a depth of 45 inches.

Permeability in the Sites soil is moderately slow. Available water capacity is about 7.0 to 8.5 inches. The effective rooting depth is restricted by weathered bedrock

at a depth of 40 to 60 inches. The shrink-swell potential is moderate. Runoff is rapid, and the hazard of water erosion is severe.

The Mariposa soil is shallow or moderately deep and is well drained. It formed in material weathered from metasedimentary rocks. Typically, the surface is covered with a mat of partially decomposed leaves, needles, and twigs about 1 inch thick. The surface layer is dark brown and strong brown gravelly loam about 6 inches thick. The upper 9 inches of the subsoil is strong brown gravelly loam. The lower 18 inches is yellowish red gravelly clay loam. Hard schist is at a depth of 33 inches. In some areas the surface layer is loam.

Permeability in the Mariposa soil is moderate. Available water capacity is about 3.0 to 4.5 inches. The effective rooting depth is restricted by weathered bedrock at a depth of 12 to 35 inches. Runoff is rapid, and the hazard of water erosion is severe.

This unit is used mainly for timber production. It also is a watershed.

Ponderosa pine, Douglas-fir, sugar pine, incense cedar, tanoak, Pacific madrone, and California black oak are the major tree species. At an elevation of more than 3,000 feet, white fir becomes significant. On the basis of a 100-year site curve, the mean site index for ponderosa pine is 145 on the Jocal and Sites soils and 105 on the Mariposa soil. On the basis of a 100-year site curve, the mean site index for Douglas-fir is 147 on the Jocal soil, 140 on the Sites soil, and 110 on the Mariposa soil. The yield (CMAI) for ponderosa pine in a fully stocked stand of trees 40 years old is 199 cubic feet per acre on the Jocal and Sites soils and 112 cubic feet per acre on the Mariposa soil. The yield (CMAI) for Douglas-fir in a fully stocked stand of trees 60 years old is 154 cubic feet per acre on the Jocal soil, 145 cubic feet per acre on the Sites soil, and 98 cubic feet per acre on the Mariposa soil.

The main concerns in producing and harvesting timber are the slope, seasonal wetness, the hazard of water erosion, and plant competition. The slope restricts the use of wheeled and tracked equipment. Skyline yarding generally is safer than other methods and results in less soil disturbance. Unsurfaced roads and skid trails are slippery when wet, and they may be impassable during rainy periods. Roads require suitable surfacing for year-round use. Rock for the construction of roads is not readily available in areas of this unit. Roads may fail and landslides may occur following deep soil disturbance. Roads should be confined to ridgetops where possible. When trees are harvested, management that minimizes the risk of erosion is essential. Erosion can be controlled by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Minimizing the number of roads, trails, and landings and harvesting from preplanned skid trails can help to prevent excessive

erosion and compaction. Scattering brush on skid trails helps to control erosion. Revegetating as soon as possible in disturbed areas also helps to control erosion. If the site is not adequately prepared, competition from undesirable plants can prevent or delay the natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling, which helps to eliminate unwanted weeds, brush, or trees. Mechanical treatment is not feasible because of the slope. The characteristic plant community on this unit is mainly mountain misery, tanoak, sticky whiteleaf manzanita, and poison oak at the lower elevations and common snowberry and tanoak at the higher elevations.

This unit is in capability subclass V1e (22), nonirrigated.

182—Kilaga clay loam, 0 to 1 percent slopes. This very deep, well drained soil is on stream terraces. It formed in alluvium derived from mixed sources. The vegetation in uncultivated areas is mainly annual grasses and forbs. Elevation is between 55 and 90 feet. The average annual precipitation is between 18 and 22 inches, the average annual air temperature is between 61 and 63 degrees F, and the average frost-free period is between 270 and 290 days.

Typically, the surface layer is brown clay loam about 9 inches thick. The upper 12 inches of the subsoil is yellowish brown clay loam. The lower 39 inches is yellowish brown clay loam and clay. In some areas the surface layer is loam or silty clay loam.

Included in this unit are small areas of Conejo and Marysville soils and areas of a soil that is similar to the Kilaga soil but has siltstone at a depth of 40 to 60 inches. Included areas make up about 20 percent of the total acreage.

Permeability in the Kilaga soil is slow. Available water capacity is about 8.5 to 10.5 inches. The effective rooting depth is 60 inches or more. For insignificant periods after heavy rainstorms from December through April, there is a perched water table above the lower part of the subsoil. The shrink-swell potential is high. Runoff is slow, and the hazard of water erosion is slight. This soil is protected by levees and is subject to rare flooding.

This unit is used for irrigated crops, mainly peaches and prunes. The other crops include almonds and walnuts. Some areas are used for irrigated pasture.

This unit is suited to irrigated crops. It is limited mainly by the slow permeability. Depending on the particular crop, furrow, border, corrugation, and sprinkler irrigation systems are suitable. Because of the slow permeability, water applications should be regulated so that water does not stand on the surface and damage the crops. Returning crop residue to the soil or regularly adding other

organic material improves fertility, minimizes crusting, and increases the rate of water intake.

If this unit is used for irrigated pasture, the main management concern is the slow permeability. Because of the slow permeability, adjustment of the length of irrigation runs is needed to permit adequate infiltration of water. A drainage system may be needed. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and control erosion. Periodic mowing and clipping help to maintain uniform growth and discourage selective grazing. Fertilizer is needed to ensure the optimum growth of grasses and legumes.

This unit is in capability units IIs-3 (17), irrigated, and IIIs-3 (17), nonirrigated.

183—Kilaga clay loam, hardpan substratum 0 to 1 percent slopes. This well drained soil is on stream terraces. It is deep to a hardpan. It formed in alluvium derived from mixed sources. The vegetation in uncultivated areas is mainly annual grasses and forbs. Elevation is between 50 and 125 feet. The average annual precipitation is between 18 and 22 inches, the average annual air temperature is between 61 and 63 degrees F, and the average frost-free period is between 270 and 290 days.

Typically, the surface layer is brown clay loam about 9 inches thick. The upper 12 inches of the subsoil is yellowish brown clay loam. The lower 34 inches is yellowish brown silty clay loam and silty clay. The next layer is a hardpan about 5 inches thick. Siltstone is at a depth of 60 inches. In some areas the surface layer is loam or silty clay loam.

Included in this unit are small areas of Conejo, San Joaquin, and Kimball soils. Also included are small areas of soils that are similar to the Kilaga soil but have a hardpan below a depth of 60 inches. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Permeability in the Kilaga soil is slow. Available water capacity is about 8.0 to 9.5 inches. The effective rooting depth is restricted by a hardpan at a depth of 40 to 60 inches. For insignificant periods after heavy rainstorms from December through April, there is a perched water table above the lower part of the subsoil. The shrink-swell potential is high. Runoff is slow, and the hazard of water erosion is slight. This soil is protected by levees and is subject to rare flooding.

Most areas of this unit are used for irrigated crops, mainly peaches, prunes, and rice. The other crops include almonds. Some areas are used for irrigated pasture or homesite development.

This unit is suited to irrigated crops. It is limited mainly by the slow permeability. Depending on the particular

crop, furrow, border, corrugation, and sprinkler irrigation systems are suitable. Because of the slow permeability, water applications should be regulated so that water does not stand on the surface and damage the crops. This practice, however, is not applicable to rice production. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

If this unit is used for irrigated pasture, the main management concern is the slow permeability. Because of the slow permeability, adjustment of the length of irrigation runs is needed to permit adequate infiltration of water. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and control erosion. If this unit is grazed by livestock when the soil is too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. Periodic mowing and clipping help to maintain uniform growth and discourage selective grazing. Fertilizer is needed to ensure the optimum growth of grasses and legumes.

If this unit is used for homesite development, the main management concerns are the hazard of flooding, the slow permeability, and the high shrink-swell potential. If the soil is used for septic tank absorption fields, the slow permeability can be overcome by increasing the size of the absorption field. If buildings are constructed on this soil, properly designing foundations and footings and diverting runoff away from the buildings help to prevent the structural damage caused by shrinking and swelling. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

This unit is in capability units IIs-3 (17), irrigated, and IIIs-3 (17), nonirrigated.

184—Kilaga clay loam, 0 to 1 percent slopes, occasionally flooded. This very deep, well drained soil is on stream terraces. It formed in alluvium derived from mixed sources. The vegetation in uncultivated areas is mainly annual grasses and forbs. Elevation is between 75 and 85 feet. The average annual precipitation is between 18 and 22 inches, the average annual air temperature is between 61 and 63 degrees F, and the average frost-free period is between 270 and 290 days. Under natural conditions, this soil is not flooded; however, the pattern of flooding has been altered by levee construction.

Typically, the surface layer is brown clay loam about 9 inches thick. The upper 12 inches of the subsoil is yellowish brown clay loam. The lower 39 inches is yellowish brown clay loam and clay. In some areas the surface layer is loam or silty clay loam.

Included in this unit are small areas of Conejo, Marysville, and Trainer soils and areas of a soil that is

similar to the Kilaga soil but has siltstone at a depth of 40 to 60 inches. Included areas make up about 20 percent of the total acreage.

Permeability in the Kilaga soil is slow. Available water capacity is about 8.0 to 9.5 inches. The effective rooting depth is 60 inches or more. For insignificant periods after heavy rainstorms from December through April, there is a perched water table above the lower part of the subsoil. The shrink-swell potential is high. Runoff is slow, and the hazard of water erosion is slight. This soil is subject to occasional, brief periods of flooding from December through March.

This unit is used for irrigated crops, mainly prunes and rice. It is suited to irrigated crops. It is limited mainly by the slow permeability and the hazard of flooding. Depending on the particular crop, furrow, border, corrugation, and sprinkler irrigation systems are suitable. Because of the slow permeability, water applications should be regulated so that water does not stand on the surface and damage the crops. This practice, however, is not applicable to rice production. Tillth and fertility can be improved by returning crop residue to the soil.

This unit is in capability units Ilw-2 (17), irrigated, and Illw-2 (17), nonirrigated.

185—Kimball loam, 0 to 1 percent slopes. This very deep, well drained soil is on low fan terraces. It formed in alluvium derived from mixed sources. The vegetation in uncultivated areas is mainly annual grasses and forbs. Elevation is between 30 and 150 feet. The average annual precipitation is between 18 and 22 inches, the average annual air temperature is between 61 and 63 degrees F, and the average frost-free period is between 270 and 290 days.

Typically, the surface layer is light yellowish brown and pale brown loam about 16 inches thick. The upper 26 inches of the subsoil is light brown clay loam. The lower part to a depth of 60 inches is very pale brown loam and pale brown sandy clay loam. In some areas the surface layer is clay loam.

Included in this unit are small areas of San Joaquin soils and areas of a soil that is similar to the Kimball soil but has a hardpan at a depth of 40 to 60 inches. Also included are areas of Kimball soils that have a surface layer as thin as 5 inches or as thick as 35 inches because of leveling. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

Permeability in the Kimball soil is very slow. Available water capacity is about 6.5 to 7.5 inches. The effective rooting depth is 60 inches or more. A dense subsoil restricts the movement of water and air and root penetration. For insignificant periods after heavy rainstorms from December through April, there is a

perched water table above the claypan. The shrink-swell potential is high. Runoff is slow, and the hazard of water erosion is slight. This soil is protected by levees and is subject to rare flooding.

Most areas of this unit are used for irrigated crops, mainly rice, corn for silage, and prunes. The other crops include wheat. Some areas are used for irrigated pasture or homesite development.

This unit is suited to irrigated crops. It is limited mainly by the very slow permeability. Depending on the particular crop, furrow, border, corrugation, and sprinkler irrigation systems are suitable. Because of the very slow permeability, water applications should be regulated so that water does not stand on the surface and damage the crops. This practice, however, is not applicable to rice production. Tillth and fertility can be improved by returning crop residue to the soil.

If this unit is used for irrigated pasture, the main management concern is the very slow permeability. Because of the very slow permeability, adjustment of the length of irrigation runs is needed to permit adequate infiltration of water. Carefully applying irrigation water helps to prevent the buildup of a water table above the dense subsoil. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and control erosion. If this unit is grazed by livestock when the soil is too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. Periodic mowing and clipping help to maintain uniform growth and discourage selective grazing. Fertilizer is needed to ensure the optimum growth of grasses and legumes.

If this unit is used for homesite development, the main management concerns are the very slow permeability and the high shrink-swell potential. Because of the dense subsoil, onsite sewage disposal systems often fail or do not function properly during periods of high rainfall. If the soil is used for septic tank absorption fields, the very slow permeability can be overcome by increasing the size of the absorption field. If buildings are constructed on this soil, properly designing foundations and footings and diverting runoff away from the buildings help to prevent the structural damage caused by shrinking and swelling. The trees and shrubs adapted to a limited rooting depth grow best. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

This unit is in capability unit IIIs-3 (17), irrigated and nonirrigated.

186—Kimball loam, 0 to 1 percent slopes, occasionally flooded. This very deep, well drained soil is low fan terraces. It formed in alluvium derived from mixed

sources. The vegetation in uncultivated areas is mainly annual grasses and forbs. Elevation is between 60 and 80 feet. The average annual precipitation is between 18 and 22 inches, the average annual air temperature is between 61 and 63 degrees F, and the average frost-free period is between 270 and 290 days. Under natural conditions, this soil is not flooded; however, the pattern of flooding has been altered by levee construction.

Typically, the surface layer is light yellowish brown and pale brown loam about 16 inches thick. The upper 26 inches of the subsoil is light brown clay loam. The lower part to a depth of 60 inches is very pale brown loam and pale brown sandy clay loam. In some areas the surface layer is clay loam.

Included in this unit are small areas of San Joaquin soils and a soil that is similar to the Kimball soil but has a hardpan at a depth of 40 to 60 inches. Also included are areas of Kimball soils that have a surface layer as thin as 5 inches or as thick as 35 inches because of leveling. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

Permeability in the Kimball soil is very slow. Available water capacity is about 6 to 8 inches. The effective rooting depth is 60 inches or more. A dense subsoil restricts the movement of water and air and root penetration. For insignificant periods after heavy rainstorms from December through April, there is a perched water table above the claypan. The shrink-swell potential is high. Runoff is slow, and the hazard of water erosion is slight. This soil is subject to occasional, brief or long periods of flooding from December through April.

This unit is used mainly for irrigated crops and irrigated pasture.

This unit is suited to irrigated crops. It is limited mainly by the very slow permeability and the hazard of flooding. Depending on the particular crop, furrow, border, corrugation, and sprinkler irrigation systems are suitable. Because of the very slow permeability, water applications should be regulated so that water does not stand on the surface and damage the crops. This practice, however, is not applicable to rice production. Tilt and fertility can be improved by returning crop residue to the soil.

If this unit is used for irrigated pasture, the main management concern is the very slow permeability. Because of the very slow permeability, adjustment of the length of irrigation runs is needed to permit adequate infiltration of water. Carefully applying irrigation water helps to prevent the buildup of a water table above the dense subsoil. A drainage system may be needed. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and control erosion. Periodic mowing and clipping help to maintain uniform growth and discourage

selective grazing. Fertilizer is needed to ensure the optimum growth of grasses and legumes.

This unit is in capability unit IIIw-2 (17), irrigated and nonirrigated.

187—Mariposa gravelly loam, 8 to 15 percent slopes. This shallow or moderately deep, well drained soil is on mountains. It formed in material weathered from metamorphic rocks. The native vegetation is mainly mixed conifers and hardwoods with an understory of brush, grasses, and forbs. Elevation is between 2,000 and 4,200 feet. The average annual precipitation is between 50 and 80 inches, the average annual air temperature is between 53 and 57 degrees F, and the average frost-free period is between 160 and 190 days.

Typically, the surface is covered with a mat of partially decomposed leaves, twigs, and needles about 2 inches thick. The surface layer is brown gravelly loam about 4 inches thick. The upper 13 inches of the subsoil is reddish brown and yellowish red gravelly loam. The lower 6 inches is yellowish red gravelly clay loam. Hard schist is at a depth of 23 inches. In some areas the surface layer is gravelly clay loam.

Included in this unit are small areas of Boomer, Sobrante, and Timbuctoo soils. Included areas make up about 25 percent of the total acreage.

Permeability in the Mariposa soil is moderate. Available water capacity is about 2.5 to 3.0 inches. The effective rooting depth is restricted by bedrock at a depth of 12 to 35 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for timber production. It also is a watershed.

Ponderosa pine, Douglas-fir, incense cedar, tanoak, Pacific madrone, and California black oak are the main tree species. On the basis of a 100-year site curve, the mean site index is 105 for ponderosa pine and 110 for Douglas-fir. The yield (CMAI) for ponderosa pine is 112 cubic feet per acre in a fully stocked stand of trees 40 years old. The yield (CMAI) for Douglas-fir is 98 cubic feet per acre in a fully stocked stand of trees 60 years old.

The main concerns in producing and harvesting timber are seasonal wetness and plant competition. Conventional methods of harvesting timber can be used. Use of wheeled and tracked equipment when the soil is moist results in the formation of ruts, causes soil compaction, and can damage the roots of trees. Soil compaction may increase the rate of water runoff and decrease timber production. Unsurfaced roads and skid trails are slippery when wet, and they may be impassable during rainy periods. Roads require suitable surfacing for year-round use. Rock for the construction of roads is readily available in areas of this unit. Plant competition

delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling, which helps to eliminate unwanted weeds, brush, or trees. The characteristic understory plant community on this unit is mainly mountain misery, tanoak, sticky whiteleaf manzanita, and poison oak.

This unit is in capability unit IVe-1 (22), irrigated and nonirrigated.

188—Mariposa gravelly loam, 15 to 30 percent slopes. This shallow or moderately deep, well drained soil is on mountains. It formed in material weathered from metamorphic rocks. The native vegetation is mainly mixed conifers and hardwoods with a understory of brush, grasses, and forbs. Elevation is between 2,000 and 4,200 feet. The average annual precipitation is between 50 and 80 inches, the average annual air temperature is between 53 and 57 degrees F, and the average frost-free period is between 160 and 190 days.

Typically, the surface is covered with a mat of partially decomposed leaves, twigs, and needles about 2 inches thick. The surface layer is brown gravelly loam about 4 inches thick. The upper 13 inches of the subsoil is reddish brown and yellowish red gravelly loam. The lower 6 inches is yellowish red gravelly clay loam. Hard schist is at a depth of 23 inches. In some areas the surface layer is gravelly clay loam.

Included in this unit are small areas of Sites soils and Rock outcrop. Included areas make up about 25 percent of the total acreage.

Permeability in the Mariposa soil is moderate. Available water capacity is about 2.5 to 3.0 inches. The effective rooting depth is restricted by bedrock at a depth of 12 to 35 inches. Runoff is rapid, and the hazard of water erosion is severe.

This unit is used mainly for timber production. It also is a watershed.

Ponderosa pine, Douglas-fir, sugar pine, incense cedar, tanoak, and California black oak are the main tree species. At an elevation of more than 3,000 feet, white fir becomes significant. On the basis of a 100-year site curve, the mean site index is 105 for ponderosa pine and 110 for Douglas-fir. The yield (CMAI) for ponderosa pine is 112 cubic feet per acre in a fully stocked stand of trees 40 years old. The yield (CMAI) for Douglas-fir is 98 cubic feet per acre in a fully stocked stand of trees 60 years old.

The main concerns in producing and harvesting timber are seasonal wetness, the hazard of water erosion, and plant competition. Conventional methods of harvesting timber can be used. Use of wheeled and tracked equipment when the soil is moist results in the formation of ruts, causes soil compaction, and can damage the

roots of trees. Soil compaction may increase the rate of water runoff and decrease timber production. Unsurfaced roads and skid trails are slippery when wet, and they may be impassable during rainy periods. Roads require suitable surfacing for year-round use. Rock for the construction of roads is readily available in areas of this unit. When trees are harvested, management that minimizes the risk of erosion is essential. Erosion can be controlled by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Minimizing the number of roads, trails, and landings and harvesting from preplanned skid trails can help to prevent excessive erosion and compaction. Scattering brush on skid trails helps to control erosion. Revegetating as soon as possible in disturbed areas also helps to control erosion. Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling, which helps to eliminate unwanted weeds, brush, or trees. The characteristic understory plant community on this unit is mainly mountain misery, tanoak, sticky whiteleaf manzanita, and poison oak at the lower elevations and common snowberry and tanoak at the higher elevations.

This unit is in capability unit IVe-1 (22), irrigated and nonirrigated.

189—Mariposa gravelly loam, 30 to 50 percent slopes. This shallow or moderately deep, well drained soil is on mountains. It formed in material weathered from metamorphic rocks. The native vegetation is mainly mixed conifers and hardwoods with a understory of brush, grasses, and forbs. Elevation is between 2,000 and 4,200 feet. The average annual precipitation is between 50 and 80 inches, the average annual air temperature is between 53 and 57 degrees F, and the average frost-free period is between 160 and 190 days.

Typically, the surface is covered with a mat of partially decomposed leaves, twigs, and needles about 2 inches thick. The surface layer is brown gravelly loam about 4 inches thick. The upper 13 inches of the subsoil is reddish brown and yellowish red gravelly loam. The lower 6 inches is yellowish red gravelly clay loam. Hard schist is at a depth of 23 inches. In some areas the surface layer is gravelly clay loam.

Included in this unit are small areas of Sites soils and Rock outcrop. Included areas make up about 25 percent of the total acreage.

Permeability in the Mariposa soil is moderate. Available water capacity is about 2.5 to 3.0 inches. The effective rooting depth is restricted by bedrock at a depth of 12 to 35 inches. Runoff is rapid, and the hazard of water erosion is severe.

This unit is used mainly for timber production. It also is a watershed.

Ponderosa pine, Douglas-fir, sugar pine, incense cedar, tanoak, Pacific madrone, and California black oak are the main tree species. At an elevation of more than 3,000 feet, white fir becomes significant. On the basis of a 100-year site curve, the mean site index is 105 for ponderosa pine and 110 for Douglas-fir. The yield (CMAI) for ponderosa pine is 112 cubic feet per acre in a fully stocked stand of trees 40 years old. The yield (CMAI) for Douglas-fir is 98 cubic feet per acre in a fully stocked stand of trees 60 years old.

The main concerns in producing and harvesting timber are the slope, seasonal wetness, the hazard of water erosion, plant competition, and seedling mortality. Conventional methods of harvesting timber cannot be easily used because of the slope. Use of wheeled and tracked equipment when the soil is moist results in the formation of ruts, causes soil compaction, and can damage the roots of trees. Soil compaction may increase the rate of water runoff and decrease timber production. Unsurfaced roads and skid trails are slippery when wet, and they may be impassable during rainy periods. Roads require suitable surfacing for year-round use. Rock for the construction of roads is readily available in areas of this unit. Roads may fail and landslides may occur following deep soil disturbance. Roads should be confined to ridgetops, natural benches, and the flatter slopes where possible. When trees are harvested, management that minimizes the risk of erosion is essential. Erosion can be controlled by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Minimizing the number of roads, trails, and landings and harvesting from preplanned skid trails can help to prevent excessive erosion and compaction. Scattering brush on skid trails helps to control erosion. Revegetating as soon as possible in disturbed areas also helps to control erosion. If the site is not adequately prepared, competition from undesirable plants can prevent or delay the natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling, which helps to eliminate unwanted weeds, brush, or trees. Reforestation can be accomplished by planting Douglas-fir seedlings on the cooler aspects and ponderosa pine on the warmer south aspects. The characteristic understory plant community on this unit is mainly sticky whiteleaf manzanita, tanoak, Pacific madrone, and brackenfern as well as deerbrush on moist sites near drainageways.

This unit is in capability subclass VIe (22), nonirrigated.

190—Mariposa-Jocal complex, 30 to 75 percent slopes. This unit is on mountains. The native vegetation is mainly mixed conifers and hardwoods with an

understory of brush, grasses, and forbs. Elevation is between 2,000 and 3,800 feet. The average annual precipitation is between 50 and 75 inches, the average annual air temperature is between 53 and 57 degrees F, and the average frost-free period is between 160 and 190 days.

This unit is about 55 percent Mariposa gravelly loam and 30 percent Jocal loam.

Included in this unit are small areas of Rock outcrop and Hurlbut and Deadwood soils. Included areas make up about 15 percent of the total acreage.

The Mariposa soil is shallow or moderately deep and is well drained. It formed in material weathered from metasedimentary rocks. Typically, the surface is covered with a mat of partially decomposed leaves, needles, and twigs about 1 inch thick. The surface layer is dark brown and strong brown gravelly loam about 6 inches thick. The upper 9 inches of the subsoil is strong brown gravelly loam. The lower 18 inches is yellowish red gravelly clay loam. Hard schist is at a depth of 33 inches. In some areas the surface layer is loam.

Permeability in the Mariposa soil is moderate. Available water capacity is about 3.0 to 4.5 inches. The effective rooting depth is restricted by bedrock at a depth of 12 to 35 inches. Runoff is rapid or very rapid, and the hazard of water erosion is severe or very severe.

The Jocal soil is very deep and well drained. It formed in material weathered from metasedimentary rocks. Typically, the surface is covered with a mat of partially decomposed needles, leaves, and twigs about 3 inches thick. The surface layer is reddish brown loam about 18 inches thick. The subsoil is reddish yellow silty clay loam about 52 inches thick. In some areas the surface layer is gravelly loam.

Permeability in the Jocal soil is moderate. Available water capacity is about 9 to 12 inches. The effective rooting depth is 60 inches or more. The shrink-swell potential is moderate. Runoff is rapid or very rapid, and the hazard of water erosion is severe or very severe.

This unit is used mainly for timber production. It also is a watershed.

Ponderosa pine, Douglas-fir, sugar pine, incense cedar, tanoak, Pacific madrone, and California black oak are the main tree species. At an elevation of more than 3,000 feet, white fir becomes significant. On the basis of a 100-year site curve, the mean site index for ponderosa pine is 105 on the Mariposa soil and 145 on the Jocal soil. On the basis of a 100-year site curve, the mean site index for Douglas-fir is 110 on the Mariposa soil and 147 on the Jocal soil. The yield (CMAI) for ponderosa pine in a fully stocked stand of trees 40 years old is 112 cubic feet per acre on the Mariposa soil and 199 cubic feet per acre on the Jocal soil. The yield (CMAI) for Douglas-fir in a fully stocked stand of trees 60 years old is 98 cubic feet per

acre on the Mariposa soil and 154 cubic feet per acre on the Jocal soil.

The main concerns in producing and harvesting timber are the slope, seasonal wetness, the hazard of water erosion, and plant competition. The slope restricts the use of wheeled and tracked equipment. Skyline yarding generally is safer than other methods and results in less soil disturbance. Unsurfaced roads and skid trails are slippery when wet, and they may be impassable during rainy periods. Roads require suitable surfacing for year-round use. Rock for the construction of roads is not readily available in areas of this unit. Roads may fail and landslides may occur following deep soil disturbance. Roads should be confined to ridgetops where possible. When trees are harvested, management that minimizes the risk of erosion is essential. Erosion can be controlled by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Minimizing the number of roads, trails, and landings and harvesting from preplanned skid trails can help to prevent excessive erosion and compaction. Scattering brush on skid trails helps to control erosion. Revegetating as soon as possible in disturbed areas also helps to control erosion. If the site is not adequately prepared, competition from undesirable plants can prevent or delay the natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling, which helps to eliminate unwanted weeds, brush, or trees. Mechanical treatment is not feasible because of the slope. The characteristic understory plant community on this unit is mainly mountain misery, tanoak, sticky whiteleaf manzanita, and poison oak at the lower elevations and common snowberry and tanoak at the higher elevations.

This unit is in capability subclass VIe (22), nonirrigated.

191—Mariposa-Rock outcrop complex, 50 to 75 percent slopes. This unit is on mountain side slopes in the inner gorge of river and stream canyons. The native vegetation is mainly mixed conifers and hardwoods with an understory of brush, grasses, and forbs. Elevation is between 1,900 and 4,200 feet. The average annual precipitation is between 75 and 85 inches, the average annual air temperature is between 50 and 54 degrees F, and the average frost-free period is between 140 and 160 days.

This unit is about 60 percent Mariposa stony loam and 25 percent Rock outcrop.

Included in this unit are small areas of Sites soils. Also included are small areas of soils that are similar to the Mariposa soil but have a subsoil of loam or have more than 35 percent rock fragments throughout. Also included

are areas, mainly of Rock outcrop, that have slopes of more than 75 percent. Included areas make up about 15 percent of the total acreage.

The Mariposa soil is shallow or moderately deep and is well drained. It formed in material weathered from metasedimentary rocks. Typically, the surface is covered with a mat of partially decomposed leaves, twigs, and needles about 1/2 inch thick. The surface layer is brown stony loam about 4 inches thick. The upper 8 inches of the subsoil is yellowish red stony loam. The lower 13 inches is yellowish red stony clay loam. Hard slate is at a depth of 25 inches. In some areas the surface layer is gravelly loam.

Permeability in the Mariposa soil is moderate. Available water capacity is about 2.5 to 3.5 inches. The effective rooting depth is restricted by bedrock at a depth of 12 to 35 inches. Runoff is very rapid, and the hazard of water erosion is very severe.

Rock outcrop consists of exposures of bare rock that support little or no vegetation.

This unit is used mainly for timber production. It also is a watershed.

Ponderosa pine, Douglas-fir, sugar pine, incense cedar, tanoak, Pacific madrone, and California black oak are the main tree species. At an elevation of more than 3,000 feet, white fir becomes significant. On the basis of a 100-year site curve, the mean site index is 105 for ponderosa pine and 110 for Douglas-fir. The yield (CMAI) for ponderosa pine is 112 cubic feet per acre in a fully stocked stand of trees 40 years old. The yield (CMAI) for Douglas-fir is 98 cubic feet per acre in a fully stocked stand of trees 60 years old.

The main concerns in producing and harvesting timber are the slope, seasonal wetness, the hazard of water erosion, and plant competition. Conventional methods of harvesting timber cannot be easily used because of the slope. Rock for the construction of roads is readily available in areas of this unit. Roads may fail and landslides may occur following deep soil disturbance. Roads should be confined to ridgetops, natural benches, and the flatter slopes where possible. When trees are harvested, management that minimizes the risk of erosion is essential. Erosion can be controlled by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Minimizing the number of roads, trails, and landings and harvesting from preplanned skid trails can help to prevent excessive erosion and compaction. Scattering brush on skid trails helps to control erosion. Revegetating as soon as possible in disturbed areas also helps to control erosion. If the site is not adequately prepared, competition from undesirable plants can prevent or delay the natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying,

cutting, or girdling, which helps to eliminate unwanted weeds, brush, or trees. Mechanical treatment is not feasible because of the slope. Reforestation can be accomplished by planting Douglas-fir seedlings on the cooler aspects and ponderosa pine on the warmer south aspects. The characteristic understory plant community on this unit is mainly mountain misery, sticky whiteleaf manzanita, tanoak, and poison oak at the lower elevations and common snowberry and tanoak at the higher elevations.

The Mariposa soil is in capability subclass VIIe (22), nonirrigated. The Rock outcrop is in capability class VIII (22), nonirrigated

192—Marysville loam, 0 to 1 percent slopes. This moderately deep, well drained soil is on stream terraces. It formed in alluvium derived from mixed sources. The vegetation in uncultivated areas is mainly annual grasses, forbs, and valley oaks. Elevation is between 50 and 90 feet. The average annual precipitation is between 18 and 22 inches, the average annual air temperature is between 61 and 63 degrees F, and the average frost-free period is between 270 and 290 days.

Typically, the surface layer is brown loam about 6 inches thick. The subsoil is yellowish brown clay loam and silty clay loam about 30 inches thick. Weathered siltstone is at a depth of 36 inches.

Included in this unit are small areas of Conejo soils and areas of a soil that is similar to the Marysville soil but has bedrock at a depth of 40 to 60 inches. Included areas make up about 20 percent of the total acreage.

Permeability in the Marysville soil is moderately slow. Available water capacity is about 6 to 7 inches. The effective rooting depth is restricted by weathered bedrock at a depth of 20 to 40 inches. The shrink-swell potential is moderate. Runoff is slow, and the hazard of water erosion is slight. This soil is protected by levees and is subject to rare flooding.

This unit is used for irrigated crops, mainly almonds, prunes, and peaches, and for irrigated pasture.

This unit is suited to irrigated crops. It is limited mainly by the restricted rooting depth. Depending on the particular crop, furrow, border, and sprinkler irrigation systems are suitable. Tillth and fertility can be improved by returning crop residue to the soil. Excessive cultivation can result in the formation of a tillage pan. This pan can be broken by subsoiling when the soil is dry.

If this unit is used for irrigated pasture, the main management concern is the restricted rooting depth. Only the plants adapted to a limited rooting depth should be selected for planting. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and control erosion. Periodic mowing and clipping help to maintain uniform

growth and discourage selective grazing. Fertilizer is needed to ensure the optimum growth of grasses and legumes.

This unit is in capability unit IIIs-3 (17), irrigated and nonirrigated.

193—Mildred cobbly loam, 3 to 8 percent slopes. This moderately deep, well drained soil is on mountains. It formed in material weathered from basic intrusive igneous rocks. The native vegetation is mainly interior live oak, MacNab cypress, and scattered California black oak and ponderosa pine with a dense understory of brush. Elevation is between 1,500 and 2,500 feet. The average annual precipitation is between 35 and 50 inches, the average annual air temperature is between 55 and 59 degrees F, and the average frost-free period is between 190 and 230 days.

Typically, the surface layer is pale brown cobbly loam about 3 inches thick. The upper 6 inches of the subsoil is light brown cobbly clay loam. The lower 14 inches is reddish brown and brown clay and reddish yellow clay loam. Weathered norite is at a depth of 23 inches. In some areas the surface layer is very cobbly loam.

Included in this unit are small areas of Surnuf and Flanly soils and areas of soils that are similar to the Mildred soil but have bedrock at a depth of 10 to 20 inches or 40 to 60 inches. Included areas make up about 20 percent of the total acreage.

Permeability in the Mildred soil is very slow. Available water capacity is about 3.0 to 3.5 inches. The effective rooting depth is restricted by weathered bedrock at a depth of 20 to 40 inches. The dense clay subsoil restricts the movement of water and air and root penetration. The shrink-swell potential is high. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used for homesite development and wildlife habitat.

If this unit is used for homesite development, the main management concerns are the very slow permeability, limited soil depth, the high shrink-swell potential, and a tendency to produce woody plants. If this soil is used for septic tank absorption fields, the very slow permeability can be overcome by increasing the size of the absorption field. The cuts needed to provide essentially level building sites can expose bedrock. Because of the restrictive clay layer, onsite sewage disposal systems often fail or do not function properly during periods of high rainfall. If the density of housing is moderate or high, community sewage systems are needed to prevent the contamination of water supplies caused by seepage from onsite sewage disposal systems. If buildings are constructed on this soil, properly designing foundations and footings and diverting runoff away from the buildings help to prevent the

structural damage caused by shrinking and swelling. Because of the tendency to produce large amounts of woody plants and because of the fuel load that these plants provide, fire is a continuing hazard on this unit. Plans for homesite development should provide for the preservation of as many trees as possible. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

This unit provides habitat for wildlife, such as deer, birds of prey, game birds, other birds, and small fur-bearing mammals. Planting and maintaining shrubs and other woody plants in wet areas and in areas adjacent to drainageways improve the habitat. Creating openings in areas of dense brush can benefit wildlife. Brush controlled by prescribed burning or mechanical methods produces valuable new growth for wildlife. Areas where brush is managed by prescribed burning or by mechanical methods may be subject to an increased hazard of erosion.

This unit is in capability unit IVe-1 (22), irrigated and nonirrigated.

194—Mildred cobbly loam, 8 to 15 percent slopes.

This moderately deep, well drained soil is on mountains. It formed in material weathered from basic intrusive igneous rocks. The native vegetation is mainly interior live oak, MacNab cypress, and scattered California black oak and ponderosa pine with a dense understory of brush. Elevation is between 1,500 and 2,500 feet. The average annual precipitation is between 35 and 50 inches, the average annual air temperature is between 55 and 59 degrees F, and the average frost-free period is between 190 and 230 days.

Typically, the surface layer is pale brown cobbly loam about 3 inches thick. The upper 6 inches of the subsoil is light brown cobbly clay loam. The lower 14 inches is reddish brown and brown clay and reddish yellow clay loam. Weathered norite is at a depth of 23 inches. In some areas the surface layer is very cobbly loam.

Included in this unit are small areas of Surnuf and Flanly soils and areas of soils that are similar to the Mildred soil but have bedrock at a depth of 10 to 20 inches or 40 to 60 inches. Included areas make up about 20 percent of the total acreage.

Permeability in the Mildred soil is very slow. Available water capacity is about 3.0 to 3.5 inches. The effective rooting depth is restricted by weathered bedrock at a depth of 20 to 40 inches. The dense clay subsoil restricts the movement of water and air and root penetration. The shrink-swell potential is high. Runoff is medium, and the hazard of water erosion is severe.

This unit is used for homesite development and wildlife habitat.

If this unit is used for homesite development, the main

management concerns are the very slow permeability, limited soil depth, the high shrink-swell potential, the hazard of water erosion, and a tendency to produce woody plants. If this soil is used for septic tank absorption fields, the very slow permeability can be overcome by increasing the size of the absorption field. The cuts needed to provide essentially level building sites can expose bedrock. Because of the restrictive clay layer, onsite sewage disposal systems often fail or do not function properly during periods of high rainfall. Effluent from septic tank absorption fields can surface in downslope areas and thus create a health hazard. If the density of housing is moderate or high, community sewage systems are needed to prevent the contamination of water supplies caused by seepage from onsite sewage disposal systems. If buildings are constructed on this soil, properly designing foundations and footings and diverting runoff away from the buildings help to prevent the structural damage caused by shrinking and swelling. Erosion is a hazard on construction sites and on road cuts and fills. Only the part of the site that is used for construction should be disturbed. Preserving the existing plant cover during construction helps to control erosion. Mulching and revegetating as soon as possible in disturbed areas, such as road and fills and construction sites, also help to control erosion. Because of the tendency to produce large amounts of woody plants and because of the fuel load that these plants provide, fire is a continuing hazard on this unit. Plans for homesite development should provide for the preservation of as many trees as possible. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

This unit provides habitat for wildlife, such as deer, birds of prey, game birds, other birds, and small fur-bearing mammals. Planting and maintaining shrubs and other woody plants in wet areas and in areas adjacent to drainageways improve the habitat. Creating openings in areas of dense brush can benefit wildlife. Brush controlled by prescribed burning or mechanical methods produces valuable new growth for wildlife. Areas where brush is managed by prescribed burning or by mechanical methods may be subject to an increased hazard of erosion.

This unit is in capability unit IVe-1 (22), irrigated and nonirrigated.

195—Mildred cobbly loam, 15 to 30 percent slopes.

This moderately deep, well drained soil is on mountains. It formed in material weathered from basic intrusive igneous rocks. The native vegetation is mainly interior live oak, MacNab cypress, and scattered California black oak and ponderosa pine with a dense understory of brush. Elevation is between 1,500 and 2,500 feet. The average

annual precipitation is between 35 and 50 inches, the average annual air temperature is between 55 and 59 degrees F, and the average frost-free period is between 190 and 230 days.

Typically, the surface layer is pale brown cobbly loam about 3 inches thick. The upper 6 inches of the subsoil is light brown cobbly clay loam. The lower 14 inches is reddish brown and brown clay and reddish yellow clay loam. Weathered norite is at a depth of 23 inches. In some areas the surface layer is very cobbly loam.

Included in this unit are small areas of Surnuf and Flanly soils and areas of soils that are similar to the Mildred soil but have bedrock at a depth of 10 to 20 inches or 40 to 60 inches. Included areas make up about 20 percent of the total acreage.

Permeability in the Mildred soil is very slow. Available water capacity is about 3.0 to 3.5 inches. The effective rooting depth is restricted by weathered bedrock at a depth of 20 to 40 inches. The dense clay subsoil restricts the movement of water and air and root penetration. The shrink-swell potential is high. Runoff is rapid, and the hazard of water erosion is very severe.

This unit is used for homesite development and wildlife habitat.

If this unit is used for homesite development, the main management concerns are the very slow permeability, limited soil depth, the high shrink-swell potential, the hazard of water erosion, and a tendency to produce woody plants. If this soil is used for septic tank absorption fields, the very slow permeability can be overcome by increasing the size of the absorption field. The cuts needed to provide essentially level building sites can expose bedrock. Because of the restrictive clay layer, onsite sewage disposal systems often fail or do not function properly during periods of high rainfall. Effluent from septic tank absorption fields can surface in downslope areas and thus create a health hazard. If the density of housing is moderate or high, community sewage systems are needed to prevent the contamination of water supplies caused by seepage from onsite sewage disposal systems. If buildings are constructed on this soil, properly designing foundations and footings and diverting runoff away from the buildings help to prevent the structural damage caused by shrinking and swelling. Erosion is a hazard on construction sites and on road cuts and fills. Only the part of the site that is used for construction should be disturbed. Preserving the existing plant cover during construction helps to control erosion. Mulching and revegetating as soon as possible in disturbed areas, such as road cuts and fills and construction sites, also help to control erosion. Because of the tendency to produce large amounts of woody plants and because of the fuel load that these plants provide, fire is a continuing hazard on this unit. Plans for homesite

development should provide for the preservation of as many trees as possible. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

This unit provides habitat for wildlife, such as deer, birds of prey, game birds, other birds, and small fur-bearing mammals. Planting and maintaining shrubs and other woody plants in wet areas and in areas adjacent to drainageways improve the habitat. Creating openings in areas of dense brush can benefit wildlife. Brush controlled by prescribed burning or mechanical methods produces valuable new growth for wildlife. Areas where brush is managed by prescribed burning or by mechanical methods may be subject to an increased hazard of erosion.

This unit is in capability subclass VIe (22), nonirrigated.

196—Mildred cobbly loam, 30 to 50 percent slopes.

This moderately deep, well drained soil is on mountains. It formed in material weathered from basic intrusive igneous rocks. The native vegetation is mainly interior live oak, MacNab cypress, and scattered California black oak and ponderosa pine with a dense understory of brush. Elevation is between 1,500 and 2,500 feet. The average annual precipitation is between 35 and 50 inches, the average annual air temperature is between 55 and 59 degrees F, and the average frost-free period is between 190 and 230 days.

Typically, the surface layer is pale brown cobbly loam about 3 inches thick. The upper 6 inches of the subsoil is light brown cobbly clay loam. The lower 14 inches is reddish brown and brown clay and reddish yellow clay loam. Weathered norite is at a depth of 23 inches. In some areas the surface layer is very cobbly loam.

Included in this unit are small areas of Surnuf and Flanly soils and areas of soils that are similar to the Mildred soil but have bedrock at a depth of 10 to 20 inches or 40 to 60 inches. Included areas make up about 20 percent of the total acreage.

Permeability in the Mildred soil is very slow. Available water capacity is about 3.0 to 3.5 inches. The effective rooting depth is restricted by weathered bedrock at a depth of 20 to 40 inches. The dense clay subsoil restricts the movement of water and air and root penetration. The shrink-swell potential is high. Runoff is rapid, and the hazard of water erosion is very severe.

This unit is used for wildlife habitat. It also is a watershed.

This unit provides habitat for wildlife, such as deer, birds of prey, game birds, other birds, and small fur-bearing mammals. Planting and maintaining shrubs and other woody plants in wet areas and in areas adjacent to drainageways improve the habitat. Creating openings in areas of dense brush can benefit wildlife. Brush controlled

by prescribed burning or mechanical methods produces valuable new growth for wildlife. Areas where brush is managed by prescribed burning or by chemical methods may be subject to an increased hazard of erosion.

This unit is in capability subclass VIIe (22), nonirrigated.

197—Oakdale sandy loam, 0 to 5 percent slopes.

This very deep, well drained soil is on stream terraces. It formed in alluvium derived from mixed sources. The vegetation in uncultivated areas is mainly annual grasses and scattered valley oaks. Elevation is between 60 and 90 feet. The average annual precipitation is between 18 and 22 inches, the average annual air temperature is between 61 and 63 degrees F, and the average frost-free period is between 270 and 290 days.

Typically, the surface layer is yellowish brown sandy loam about 9 inches thick. The subsoil is brown sandy loam about 44 inches thick. The underlying material to a depth of 70 inches also is brown sandy loam.

Included in this unit are small areas of San Joaquin soils and a soil that is similar to the Oakdale soil but overlies a buried soil similar to San Joaquin soils at a depth of 40 to 60 inches. Also included are small areas of Oakdale soils that have slopes of 5 to 10 percent. Included areas make up about 15 percent of the total acreage.

Permeability in the Oakdale soil is moderately rapid. Available water capacity is about 6.5 to 8.5 inches. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight.

Most areas of this unit are used for irrigated crops, livestock grazing, or homesite development.

This unit is suited to irrigated crops. It is limited mainly by the slope in areas that are not leveled. In leveled areas furrow, border, and sprinkler irrigation systems are suitable. Because of the slope, sprinkler or drip irrigation systems are the best suited methods in some areas. These methods permit the even, controlled application of water, reduce the rate of water runoff, and minimize the risk of erosion. To prevent excessive water use and the leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the rate of water intake, and the needs of the crop. Properly regulating applications of fertilizer helps to prevent the contamination of ground water. Excessive cultivation can result in the formation of a tillage pan. This pan can be broken by subsoiling when the soil is dry. Tilth and fertility can be improved by returning crop residue to the soil.

This unit is suited to livestock grazing. Few limitations affect this use. Grazing should be delayed until the soil is firm and the more desirable forage plants have achieved

sufficient growth to withstand grazing pressure. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of the less preferred forage plants increases. Livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. Range seeding can be beneficial if the range is in poor condition. Fertilizer is needed to ensure the optimum growth of grasses and legumes. Fencing and properly located salt and livestock watering facilities help to achieve a uniform distribution of livestock grazing.

This unit is suited to homesite development. The hazard of erosion on construction sites and on road cuts and fills is the main management concern. Only the part of the site that is used for construction should be disturbed. Mulching and revegetating as soon as possible in disturbed areas, such as road cuts and fills and construction sites, help to control erosion. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

This unit is in capability units IIe-1 (17), irrigated, and IIIe-1 (17), nonirrigated.

198—Oakdale-Urban land complex, 0 to 1 percent slopes. This unit is on stream terraces. Elevation is between 60 and 90 feet. The average annual precipitation is between 18 and 22 inches, the average annual air temperature is between 61 and 63 degrees F, and the average frost-free period is between 270 and 290 days.

This unit is about 45 percent Oakdale sandy loam and 40 percent Urban land.

Included in this unit are small areas of San Joaquin soils and a soil that is similar to the Oakdale soil but has a buried soil similar to San Joaquin soils at a depth of 40 to 60 inches. Included areas make up about 15 percent of the total acreage.

The Oakdale soil is very deep and well drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is yellowish brown sandy loam about 9 inches thick. The subsoil is brown sandy loam about 44 inches thick. The underlying material to a depth of 70 inches also is brown sandy loam.

Permeability in the Oakdale soil is moderately rapid. Available water capacity is about 6.5 to 8.5 inches. The effective rooting depth is 60 inches or more. Runoff is very slow, and the hazard of water erosion is slight.

Urban land consists of residential and commercial buildings, streets, and other impermeable surfaces.

This unit is used for urban development. Few limitations affect homesite development. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade

trees, and ornamental trees. Mulch, fertilizer, and irrigation are needed to establish lawn grasses and other small-seeded plants.

The Oakdale soil is in capability class I (17), irrigated, and capability subclass IIIc (17), nonirrigated. Urban land is not assigned to a land capability classification.

199—Orose sandy loam, 8 to 15 percent slopes.

This shallow, well drained soil is on foothills. It formed in material weathered from basic intrusive igneous rocks. The native vegetation is mainly interior live oak, blue oak, and Digger pine with an understory of brush, annual grasses, and forbs. Elevation is between 125 and 1,900 feet. The average annual precipitation is between 22 and 35 inches, the average annual air temperature is between 58 and 62 degrees F, and the average frost-free period is between 230 and 270 days.

Typically, the surface layer is dark yellowish brown sandy loam about 2 inches thick. The subsoil is brown sandy loam about 15 inches thick. Weathered gabbrodiorite is at a depth of 17 inches. In some areas the surface layer is loam. In other areas as much as 5 percent of the surface is covered with stones.

Included in this unit are small areas of Flanly and Sobrante soils and areas of a soil that is similar to the Orose soil but has bedrock at a depth of less than 10 inches. Included areas make up about 20 percent of the total acreage.

Permeability in the Orose soil is moderately rapid. Available water capacity is about 1 to 2 inches. The effective rooting depth is restricted by weathered bedrock at a depth of 10 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used for woodland, livestock grazing, homesite development, and wildlife habitat.

Interior live oak, blue oak, and Digger pine are the major tree species. On this unit, volumes of approximately 38 cords per acre of interior live oak, blue oak, and Digger pine with an average diameter of about 8 inches have been measured. Careful harvesting is needed to allow the stand to regenerate through oak stump sprouting and to minimize water erosion when the plant cover is disturbed.

Where this unit is used for livestock grazing, it is limited by a tendency to produce woody species. Brush management improves forage production. Areas where brush is managed by prescribed burning or by chemical or mechanical methods may be subject to an increased hazard of erosion. Grazing should be delayed until the soil is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. If this unit is grazed by livestock when the soil is too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction

may increase the rate of water runoff and decrease forage production. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of the less preferred forage plants increases. Livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. Fencing and properly located salt and livestock watering facilities help to achieve a uniform distribution of livestock grazing. This unit responds well to applications of fertilizer, to range seeding, and to proper grazing use. The characteristic understory plant community on this unit is mainly sticky whiteleaf manzanita, poison oak, toyon, and soft ches.

If this unit is used for homesite development, the main management concerns are limited soil depth, the hazard of water erosion, and the slope. The cuts needed to provide essentially level building sites can expose bedrock. Erosion is a hazard on construction sites and on road cuts and fills. Only the part of the site that is used for construction should be disturbed. Preserving the existing plant cover during construction helps to control erosion. Mulching and revegetating as soon as possible in disturbed areas, such as construction sites and road cuts and fills, also help to control erosion. Because of limited soil depth, onsite sewage disposal systems often fail or do not function properly during periods of high rainfall. If the density of housing is moderate or high, community sewage systems are needed to prevent the contamination of water supplies caused by seepage from onsite sewage disposal systems. Plans for homesite development should provide for the preservation of as many trees as possible. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

This unit provides habitat for wildlife, such as deer, birds of prey, game birds, other birds, and small fur-bearing mammals. Planting and maintaining shrubs and other woody plants in wet areas and in areas adjacent to drainageways improve the habitat. Creating openings in areas of dense brush can benefit wildlife. Brush controlled by prescribed burning or mechanical methods produces valuable new growth for wildlife. Oaks should be maintained as a source of feed and cover for wild turkey and deer.

This unit is in capability unit IVe-8 (18), irrigated and nonirrigated.

200—Orose sandy loam, 15 to 30 percent slopes.

This shallow, well drained soil is on foothills. It formed in material weathered from basic intrusive igneous rocks. The native vegetation is mainly interior live oak, blue oak, and Digger pine with an understory of brush, annual grasses, and forbs. Elevation is between 125 and 1,900 feet. The average annual precipitation is between 22 and

35 inches, the average annual air temperature is between 58 and 62 degrees F, and the average frost-free period is between 230 and 270 days.

Typically, the surface layer is dark yellowish brown sandy loam about 2 inches thick. The subsoil is brown sandy loam about 15 inches thick. Weathered gabbrodiorite is at a depth of 17 inches. In some areas the surface layer is loam. In other areas as much as 5 percent of the surface is covered with stones.

Included in this unit are small areas of Flanly and Sobrante soils and areas of a soil that is similar to the Orose soil but has bedrock at a depth of less than 10 inches. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Permeability in the Orose soil is moderately rapid. Available water capacity is about 2 inches. The effective rooting depth is restricted by weathered bedrock at a depth of 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is severe.

This unit is used for woodland, livestock grazing, and wildlife habitat.

Interior live oak, blue oak, and Digger pine are the major tree species. On this unit, volumes of approximately 38 cords per acre of interior live oak, blue oak, and Digger pine with an average diameter of about 8 inches have been measured. Careful harvesting is needed to allow the stand to regenerate through oak stump sprouting and to minimize water erosion when the plant cover is disturbed.

Where this unit is used for livestock grazing, it is limited by a tendency to produce woody species. Brush management improves forage production. Areas where brush is managed by prescribed burning or by chemical or mechanical methods may be subject to an increased hazard of erosion. Grazing should be delayed until the soil is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. If this unit is grazed by livestock when the soil is too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of the less preferred forage plants increases. Livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. Fencing and properly located salt and livestock watering facilities help to achieve a uniform distribution of livestock grazing. This unit responds well to applications of fertilizer, to range seeding, and to proper grazing use. The characteristic understory plant community on this unit is mainly sticky whiteleaf manzanita, poison oak, toyon, and soft ches.

This unit provides habitat for wildlife, such as deer, birds of prey, game birds, other birds, and small fur-bearing mammals. Planting and maintaining shrubs and other woody plants in wet areas and in areas adjacent to drainageways improve the habitat. Creating openings in areas of dense brush can benefit wildlife. Brush controlled by prescribed burning or mechanical methods produces valuable new growth for wildlife. Oaks should be maintained as a source of feed and cover for wild turkey and deer. Areas where brush is managed by prescribed burning or by chemical or mechanical methods may be subject to an increased hazard of erosion.

This unit is in capability subclass VIe (18), nonirrigated.

201—Pardee gravelly loam, 3 to 8 percent slopes.

This shallow, well drained soil is on hills. It formed in gravelly and cobbly alluvium derived from mixed sources and is underlain by unrelated consolidated andesitic tuffaceous conglomerate. The native vegetation is mainly annual grasses. Elevation is between 120 and 250 feet. The average annual precipitation is between 18 and 22 inches, the average annual air temperature is between 61 and 63 degrees F, and the average frost-free period is between 270 and 290 days.

Typically, the surface layer is brown gravelly loam about 4 inches thick. The upper 7 inches of the subsoil is brown very cobbly loam. The lower 6 inches is strong brown very cobbly loam. Hard andesitic tuffaceous conglomerate is at a depth of 17 inches.

Included in this unit are small areas of Ranchoseco soils and areas of a soil that is similar to the Pardee soil but has bedrock below a depth of 20 inches. Included areas make up about 10 percent of the total acreage.

Permeability in the Pardee soil is moderately slow. Available water capacity is about 1.5 to 2.0 inches. The effective rooting depth is restricted by bedrock at a depth of 10 to 20 inches. Runoff is slow or medium, and the hazard of water erosion is slight.

This unit is used for rangeland and urban development and as a source of construction materials.

This unit is suited to rangeland. The production of vegetation suitable for livestock grazing is limited by the very low available water capacity. If this unit is grazed by livestock when the soil is too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of the less preferred forage plants increases. Livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. Range seeding can be beneficial if the plant community does not have desirable

species. The characteristic plant community on this unit is mainly soft chess, mouse barley, medusahead, and filaree.

If this unit is used for urban development, the main management concern is limited soil depth. The cuts needed to provide essentially level building sites can expose bedrock. Because of limited soil depth, onsite sewage disposal systems are not feasible. Removal of pebbles and cobbles in disturbed areas is needed to obtain the best results from landscaping, particularly in areas used for lawns.

The underlying material in this unit is commonly used as a source of gravel and hard rock for construction.

This unit is in capability subclass VIe (17), nonirrigated.

202—Pardee-Ranchoseco complex, 0 to 3 percent slopes. This unit is on hills with mound-intermount microrelief. The native vegetation is mainly annual grasses. Elevation is between 120 and 250 feet. The average annual precipitation is between 18 and 22 inches, the average annual air temperature is between 61 and 63 degrees F, and the average frost-free period is between 270 and 290 days.

This unit is about 50 percent Pardee gravelly loam and 35 percent Ranchoseco very cobbly loam. The Pardee soil is on mounds, and the Ranchoseco soil is in intermount areas.

Included in this unit are small areas of Rock outcrop and soils that are similar to the Pardee soil but 3 to 15 percent of the surface is covered with stones or the subsoil has less than 35 percent rock fragments. Also included are small areas of a soil that is similar to the Ranchoseco soil but is less than 4 inches deep. Included areas make up about 15 percent of the total acreage.

The Pardee soil is shallow and well drained. It formed in gravelly and cobbly alluvium derived from mixed sources and is underlain by unrelated consolidated andesitic tuffaceous conglomerate. Typically, the surface layer is brown gravelly loam about 4 inches thick. The upper 7 inches of the subsoil is brown very cobbly loam. The lower 6 inches is strong brown very cobbly loam. Hard andesitic tuffaceous conglomerate is at a depth of 17 inches.

Permeability in the Pardee soil is moderately slow. Available water capacity is about 1.5 to 2.0 inches. The effective rooting depth is restricted by bedrock at a depth of 10 to 20 inches. For insignificant periods after heavy rainstorms from December through March, there is a perched water table above the bedrock. Runoff is slow, and the hazard of water erosion is slight.

The Ranchoseco soil is very shallow and moderately well drained. It formed in gravelly and cobbly alluvium derived from mixed sources and is underlain by unrelated consolidated andesitic tuffaceous conglomerate. Typically,

the surface layer is brown very cobbly loam about 3 inches thick. The underlying material is reddish yellow very cobbly loam about 5 inches thick. Hard andesitic tuffaceous conglomerate is at a depth of 8 inches.

Permeability in the Ranchoseco soil is moderate. Available water capacity is about 0.5 to 1.0 inch. The effective rooting depth is restricted by bedrock at a depth of 4 to 10 inches. Water is perched above the bedrock from December through March. Runoff is slow, or the soil is ponded. The hazard of water erosion is slight.

This unit is used for rangeland and urban development and as a source of construction materials.

This unit is suited to rangeland. The production of vegetation suitable for livestock grazing is limited by the very low available water capacity. If this unit is grazed by livestock when the soils are too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of the less preferred forage plants increases. Livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. The characteristic plant community on this unit is mainly soft chess, mouse barley, medusahead, and filaree.

If this unit is used for urban development, the main management concern is limited soil depth. The cuts needed to provide essentially level building sites can expose bedrock. Because of limited soil depth, onsite sewage disposal systems are not feasible. Removal of pebbles and cobbles in disturbed areas is needed to obtain the best results from landscaping, particularly in areas used for lawns.

The underlying material in this unit is commonly used as a source of gravel and hard rock for construction.

The Pardee soil is in capability subclass VIIs (17), nonirrigated. The Ranchoseco soil is in capability subclass VIIs (17), nonirrigated.

203—Perkins loam, 0 to 2 percent slopes. This very deep, well drained soil is on stream terraces. It formed in alluvium derived from mixed sources. The vegetation in uncultivated areas is mainly annual grasses and forbs. Elevation is between 60 and 150 feet. The average annual precipitation is between 18 and 22 inches, the average annual air temperature is between 61 and 63 degrees F, and the average frost-free period is between 270 and 290 days.

Typically, the surface layer is brown loam about 5 inches thick. The upper 18 inches of the subsoil is strong brown and yellowish red clay loam. The next 35 inches is yellowish red loam. The lower 8 inches is yellowish red sandy loam. The underlying material to a depth of 72

inches is yellowish red very cobbly sandy loam. In some areas the surface layer is gravelly loam.

Included in this unit are small areas of Conejo loam. Also included are small areas of soils that are similar to the Perkins soil but have a water table at a depth of 40 to 60 inches or are subject to occasional, brief periods of flooding. Included areas make up about 15 percent of the total acreage.

Permeability in the Perkins soil is moderately slow. Available water capacity is about 7.0 to 10.5 inches. The effective rooting depth is 60 inches or more. The shrink-swell potential is moderate. Runoff is slow, and the hazard of water erosion is slight. This soil is subject to rare flooding.

Most areas of this unit are used for rangeland or for wildlife habitat. A few areas are used for irrigated crops, dryland grain crops, or urban development.

This unit is suited to rangeland. It responds well to applications of fertilizer, to range seeding, and to proper grazing use. Grazing should be delayed until the soil is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. If this unit is grazed by livestock when the soil is too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of the less preferred forage plants increases. Livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. The characteristic plant community on this unit is mainly soft chess, wild oat, filaree, and medusahead.

This unit provides habitat for wildlife, such as birds of prey, waterfowl, other birds, and small fur-bearing mammals. Planting and maintaining shrubs and other woody plants in wet areas and in areas adjacent to drainageways improve the habitat.

This unit is suited to irrigated and nonirrigated crops. Depending on the particular crop, furrow, border, and sprinkler irrigation systems are suitable. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake. Excessive cultivation can result in the formation of a tillage pan. This pan can be broken by subsoiling when the soil is dry.

This unit is not suited to urban development because of the hazard of flooding.

This unit is in capability class I (17), irrigated, and capability subclass IIIc (17), nonirrigated.

204—Perkins loam, 0 to 1 percent slopes, occasionally flooded. This very deep, well drained soil is on stream terraces. It formed in alluvium derived from

mixed sources. The vegetation in uncultivated areas is mainly annual grasses and forbs. Elevation is between 50 and 80 feet. The average annual precipitation is between 18 and 22 inches, the average annual air temperature is between 61 and 63 degrees F, and the average frost-free period is between 270 and 290 days. Under natural conditions, this soil is not flooded; however, the pattern of flooding has been altered by levee construction.

Typically, the surface layer is brown loam about 5 inches thick. The upper 18 inches of the subsoil is strong brown and yellowish red clay loam. The next 35 inches is yellowish red loam. The lower 8 inches is yellowish red sandy loam. The underlying material to a depth of 72 inches is yellowish red very cobbly sandy loam. In some areas the surface layer is silt loam.

Included in this unit are small areas of Conejo and Shanghai soils and a soil that is similar to the Perkins soil but has a coarser textured subsoil. Included areas make up about 15 percent of the total acreage.

Permeability in the Perkins soil is moderately slow. Available water capacity is about 7.0 to 10.5 inches. The effective rooting depth is 60 inches or more. The shrink-swell potential is moderate. Runoff is slow, and the hazard of water erosion is slight. This soil is subject to occasional, brief or long periods of flooding from December through April.

This unit is used for irrigated orchard crops, mainly prunes. A few areas are used for irrigated rice.

This unit is suited to irrigated crops. It is limited mainly by the hazard of flooding. Depending on the particular crop, furrow, border, and sprinkler irrigation systems are suitable. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake. Excessive cultivation can result in the formation of a tillage pan. This pan can be broken by subsoiling when the soil is dry.

This unit is in capability units IIw-2 (17), irrigated, and IIIw-2 (17), nonirrigated.

205—Perkins gravelly loam, 15 to 30 percent slopes. This very deep, well drained soil is on stream terraces. It formed in alluvium derived from mixed sources. The native vegetation is mainly annual grasses and forbs. Elevation is between 600 and 1,200 feet. The average annual precipitation is between 26 and 35 inches, the average annual air temperature is between 58 and 61 degrees F, and the average frost-free period is between 230 and 250 days.

Typically, the surface layer is brown gravelly loam about 8 inches thick. The upper 14 inches of the subsoil is brown gravelly loam. The lower 43 inches is brown gravelly clay loam. In some areas the surface layer is very gravelly loam.

Included in this unit are small areas of Sobrante soils and areas of soils that are similar to the Perkins soil but have a very cobbly subsoil. Also included are areas that have been disturbed by hydraulic mining. Included areas make up about 25 percent of the total acreage.

Permeability in the Perkins soil is moderately slow. Available water capacity is about 5 to 9 inches. The effective rooting depth is 60 inches or more. The shrink-swell potential is low. Runoff is rapid, and the hazard of water erosion is severe.

This unit is used for rangeland and homesite development.

This unit is suited to rangeland. Few limitations affect this use. This unit responds well to applications of fertilizer, to range seeding, and to proper grazing use. Grazing should be delayed until the soil is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. If this unit is grazed by livestock when the soil is too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of the less preferred forage plants increases. Livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. The characteristic plant community on this unit is mainly soft chess, ripgut brome, wild oat, and filaree.

If this unit is used for homesite development, the main management concerns are the moderately slow permeability, the hazard of water erosion, and the slope. If the soil is used for septic tank absorption fields, the moderately slow permeability can be overcome by increasing the size of the absorption field. Providing sandy backfill for the trench and installing long absorption lines help to compensate for the moderately slow permeability. Erosion is a hazard on construction sites and on road cuts and fills. Only the part of the site that is used for construction should be disturbed. Preserving the existing plant cover during construction helps to control erosion. If the density of housing is moderate or high, community sewage systems are needed to prevent the contamination of water supplies caused by seepage from onsite sewage disposal systems. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

This unit is in capability unit IVe-1 (18), nonirrigated.

206—Pits, sand. This unit consists of areas from which the soil and underlying material have been removed.

This unit is in capability class VIII (17).

207—Redding gravelly loam, 0 to 3 percent slopes.

This well drained soil is on high fan terraces. It is moderately deep to a hardpan. It formed in alluvium derived from mixed sources. The native vegetation is mainly annual grasses. Elevation is between 75 and 150 feet. The average annual precipitation is between 18 and 22 inches, the average annual air temperature is between 61 and 63 degrees F, and the average frost-free period is between 270 and 290 days.

Typically, the surface layer is brown gravelly loam about 6 inches thick. The upper 13 inches of the subsoil is yellowish red gravelly loam. The lower 14 inches is reddish brown and red clay. An indurated hardpan is at a depth of 33 inches. In some areas the surface layer is loam, very gravelly loam, or very cobbly loam.

Included in this unit are small areas of San Joaquin and Corning soils. Also included are small areas of soils that are similar to the Redding soil but are subject to rare flooding, are less than 20 inches deep, or have a surface layer as thin as 5 inches or as thick as 35 inches because of leveling. Included areas make up about 30 percent of the total acreage.

Permeability in the Redding soil is very slow. Available water capacity is about 2.5 to 3.5 inches. The effective rooting depth is restricted by a hardpan at a depth of 20 to 40 inches. The dense clay subsoil restricts the movement of water and air and root penetration. For insignificant periods after heavy rainstorms from December through April, there is a perched water table above the claypan. The shrink-swell potential is high. Runoff is slow; where this unit has mound-intermound microrelief, however, the intermound areas may be ponded for brief or long periods from December through April. The hazard of water erosion is slight.

Most areas of this unit are used for irrigated crops, mainly rice. A few areas are used for irrigated pasture.

This unit is suited to irrigated crops. For crops other than rice, the main management concern is the very slow permeability. Depending on the particular crop, furrow, border, and sprinkler irrigation systems are suitable. Because of the very slow permeability, water applications should be regulated so that water does not stand on the surface and damage the crops. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

If this unit is used for irrigated pasture, the main management concern is the very slow permeability. Only the plants adapted to a limited rooting depth should be selected for planting. Carefully applying irrigation water helps to prevent the buildup of a perched water table. Because of the very slow permeability, adjustment of the length of irrigation runs is needed to permit adequate

infiltration of water. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and control erosion. Periodic mowing and clipping help to maintain uniform growth and discourage selective grazing. Fertilizer is needed to ensure the optimum growth of grasses and legumes.

This unit is in capability unit IVs-3 (17), irrigated and nonirrigated.

208—Redding gravelly loam, 3 to 8 percent slopes.

This well drained soil is on high fan terraces. It is moderately deep to a hardpan. It formed in alluvium derived from mixed sources. The native vegetation is mainly annual grasses. Elevation is between 70 and 200 feet. The average annual precipitation is between 18 and 22 inches, the average annual air temperature is between 61 and 63 degrees F, and the average frost-free period is between 270 and 290 days.

Typically, the surface layer is brown gravelly loam about 6 inches thick. The upper 13 inches of the subsoil is yellowish red gravelly loam. The lower 14 inches is reddish brown and red clay. An indurated hardpan is at a depth of 33 inches. In some areas the surface layer is loam, very gravelly loam, or very cobbly loam.

Included in this unit are small areas of San Joaquin and Corning soils. Also included are small areas of soils that are similar to the Redding soil but have slopes of less than 3 percent or more than 8 percent. Included areas make up about 30 percent of the total acreage.

Permeability in the Redding soil is very slow. Available water capacity is about 2.5 to 3.5 inches. The effective rooting depth is restricted by a hardpan at a depth of 20 to 40 inches. The dense clay subsoil restricts the movement of water and air and root penetration. For insignificant periods after heavy rainstorms from December through April, there is a perched water table above the claypan. The shrink-swell potential is high in the subsoil. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for rangeland. It also is used for homesite or urban development.

This unit is suited to rangeland. It responds well to applications of fertilizer, to range seeding, and to proper grazing use. The production of vegetation suitable for livestock grazing is limited by the low available water capacity. Soil compaction may increase the rate of water runoff and decrease forage production. If this unit is grazed by livestock when the soil is too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Grazing should be delayed until the soil is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. Rotation grazing helps to maintain the quality of forage. If the range is overgrazed, the proportion of preferred

forage plants decreases and the proportion of the less preferred forage plants increases. Livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. Range seeding may be beneficial if the plant community does not consist of desirable species. Fertilizer is needed to ensure the optimum growth of grasses and legumes. The characteristic plant community on this unit is mainly soft chess, wild oat, foxtail fescue, and filaree.

If this unit is used for homesite or urban development, the main management concerns are limited soil depth, the very slow permeability, the slope, the shrink-swell potential, and low strength in the subsoil. Excavation for building sites is limited by the hardpan. Because of the restrictive clay layer, onsite sewage disposal systems often fail or do not function properly during periods of high rainfall. Effluent from septic tank absorption fields can surface in downslope areas and thus create a health hazard. If the soil is used for septic tank absorption fields, the very slow permeability can be overcome by increasing the size of the absorption field. The slope is a concern when the absorption fields are installed. Absorption lines should be installed on the contour. Properly designing buildings and roads helps to offset the limited ability of the soil to support a load. If the soil is used as a base for roads and streets, mixing the lower part of the soil with the underlying sand and gravel increases soil strength and stability. If buildings are constructed on this soil, properly designing foundations and footings and diverting runoff away from the buildings help to prevent the structural damage caused by shrinking and swelling. Selection of adapted vegetation is critical for the establishment of lawns, shrubs, trees, and vegetable gardens. Establishing plants is difficult in areas where the surface layer has been removed and the hardpan has been exposed. Mulching and applying fertilizer in cut areas help to establish plants. Removal of pebbles and cobbles in disturbed areas is needed to obtain the best results from landscaping, particularly in areas used for lawns. In summer, irrigation is needed for lawn grasses, vines, shrubs, shade trees, and ornamental trees.

This unit is in capability unit IVe-1 (17), irrigated and nonirrigated.

209—Redding-Corning complex, 0 to 3 percent slopes. This unit is on high fan terraces. The native vegetation is mainly annual grasses and forbs. Elevation is between 110 and 200 feet. The average annual precipitation is between 18 and 22 inches, the average annual air temperature is between 61 and 63 degrees F, and the average frost-free period is between 270 and 290 days.

This unit is about 40 percent Redding gravelly loam and 35 percent Corning gravelly loam.

Included in this unit are small areas of Perkins and San Joaquin soils. Also included are small areas of soils that are similar to the Redding and Corning soils but have a very gravelly or very cobbly surface layer and areas of soils that are similar to the Redding soil but are less than 20 inches deep. Included areas make up about 25 percent of the total acreage.

The Redding soil is moderately deep to a hardpan and is well drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is brown gravelly loam about 6 inches thick. The upper 13 inches of the subsoil is yellowish red gravelly loam. The lower 14 inches is reddish brown and red clay. An indurated hardpan is at a depth of 33 inches. In some areas the surface layer is loam.

Permeability in the Redding soil is very slow. Available water capacity is about 2.5 to 3.5 inches. The effective rooting depth is restricted by a hardpan at a depth of 20 to 40 inches. The dense clay subsoil restricts the movement of water and air and root penetration. For insignificant periods after heavy rainstorms from December through April, there is a perched water table above the claypan. The shrink-swell potential is high. Runoff is slow; where this unit has mound-intermound microrelief, however, the intermound areas may be ponded for brief or long periods from December through April. The hazard of water erosion is slight.

The Corning soil is very deep and well drained. It formed in alluvium derived from mixed sources. Typically, the surface layer and the upper part of the subsoil are yellowish red gravelly loam about 24 inches thick. The next 12 inches of the subsoil is dark red and brown gravelly clay. The lower 12 inches is mixed red and reddish brown gravelly sandy clay loam. The underlying material to a depth of 67 inches is mixed strong brown and pale brown very gravelly sandy loam. In some areas the surface layer is loam.

Permeability in the Corning soil is very slow. Available water capacity is about 4.5 to 7.0 inches. The effective rooting depth is 60 inches or more. The dense clay subsoil restricts the movement of water and air and root penetration. For insignificant periods after heavy rainstorms from December through April, there is a perched water table above the claypan. The shrink-swell potential is high. Runoff is slow; where this unit has mound-intermound microrelief, however, the intermound areas may be ponded for brief or long periods from December through April. The hazard of water erosion is slight.

Most areas of this unit are used for rangeland. A few areas are used for homesite or urban development.

This unit is suited to rangeland. It responds well to applications of fertilizer, to range seeding, and to proper grazing use. The production of vegetation suitable for

livestock grazing is limited by the low available water capacity of the Redding soil. If this unit is grazed by livestock when the soils are too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. Grazing should be delayed until the soils are firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. Rotation grazing helps to maintain the quality of forage. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of the less preferred forage plants increases. Livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. Range seeding may be beneficial if the plant community does not consist of desirable species. Fertilizer is needed to ensure the optimum growth of grasses and legumes. The characteristic plant community on this unit is mainly soft chess, wild oat, foxtail fescue, and filaree.

If this unit is used for homesite or urban development, the main management concerns are limited soil depth in the Redding soil, the very slow permeability, the shrink-swell potential, and low strength. Excavation for building sites is limited by the hardpan in the Redding soil. Because of the restrictive clay layer, onsite sewage disposal systems often fail or do not function properly during periods of high rainfall. If this unit is used for septic tank absorption fields, the very slow permeability can be overcome by increasing the size of the absorption field. Properly designing buildings and roads helps to offset the limited ability of the soils to support a load. If these soils are used as a base for roads and streets, mixing the upper part of the soils with the underlying sand and gravel increases soil strength and stability. If buildings are constructed on these soils, properly designing foundations and footings and diverting runoff away from the buildings help to prevent the structural damage caused by shrinking and swelling. Selection of adapted vegetation is critical for the establishment of lawns, shrubs, trees, and vegetable gardens. Establishing plants is difficult in areas where the surface layer has been removed and the hardpan has been exposed. Mulching and applying fertilizer in cut areas help to establish plants. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

This unit is in capability unit IVs-3 (17), irrigated and nonirrigated.

210—Redding-Corning complex, 3 to 8 percent slopes. This unit is on high fan terraces. The native vegetation is mainly annual grasses and forbs. Elevation is between 110 and 250 feet. The average annual precipitation is between 18 and 22 inches, the average

annual air temperature is between 61 and 63 degrees F, and the average frost-free period is between 270 and 290 days.

This unit is about 35 percent Redding gravelly loam and 35 percent Corning gravelly loam.

Included in this unit are small areas of San Joaquin soils. Also included are small areas of soils that are similar to the Redding and Corning soils but have a very gravelly or very cobbly surface layer and areas of soils that are similar to the Redding soil but are less than 20 inches deep. Included areas make up about 30 percent of the total acreage.

The Redding soil is moderately deep to a hardpan and is well drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is brown gravelly loam about 6 inches thick. The upper 13 inches of the subsoil is yellowish red gravelly loam. The lower 14 inches is reddish brown and red clay. An indurated hardpan is at a depth of 33 inches. In some areas the surface layer is loam.

Permeability in the Redding soil is very slow. Available water capacity is about 2.5 to 3.5 inches. The effective rooting depth is restricted by a hardpan at a depth of 20 to 40 inches. The dense clay subsoil restricts the movement of water and air and root penetration. For insignificant periods after heavy rainstorms from December through April, there is a perched water table above the claypan. The shrink-swell potential is moderate. Runoff is medium, and the hazard of water erosion is moderate.

The Corning soil is very deep and well drained. It formed in alluvium derived from mixed sources. Typically, the surface layer and the upper part of the subsoil are yellowish red gravelly loam about 24 inches thick. The next 12 inches of the subsoil is dark red and brown gravelly clay. The lower 12 inches is mixed red and reddish brown gravelly sandy clay loam. The underlying material to a depth of 67 inches is mixed strong brown and pale brown very gravelly sandy loam. In some areas the surface layer is loam.

Permeability in the Corning soil is very slow. Available water capacity is about 4.5 to 7.0 inches. The effective rooting depth is 60 inches or more. The dense clay subsoil restricts the movement of water and air and root penetration. For insignificant periods after heavy rainstorms from December through April, there is a perched water table above the claypan. The shrink-swell potential is high. Runoff is medium, and the hazard of water erosion is moderate.

Most areas of this unit are used for rangeland. A few areas are used for homesite or urban development.

This unit is suited to rangeland. It responds well to applications of fertilizer, to range seeding, and to proper grazing use. The production of vegetation suitable for livestock grazing is limited by the low available water

capacity of the Redding soil. If this unit is grazed by livestock when the soils are too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. Grazing should be delayed until the soils are firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. Rotation grazing helps to maintain the quality of forage. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of the less preferred forage plants increases. Livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. Range seeding may be beneficial if the plant community does not have desirable species. Fertilizer is needed to ensure the optimum growth of grasses and legumes. The characteristic plant community on this unit is mainly soft chess, wild oat, foxtail fescue, and filaree.

If this unit is used for homesite or urban development, the main management concerns are limited soil depth in the Redding soil, the very slow permeability, the slope, the shrink-swell potential, and low strength. Excavation for building sites is limited by the hardpan in the Redding soil. Because of the restrictive clay layer, onsite sewage disposal systems often fail or do not function properly during periods of high rainfall. Effluent from septic tank absorption fields can surface in downslope areas and thus create a health hazard. If this unit is used for septic tank absorption fields, the very slow permeability can be overcome by increasing the size of the absorption field. The slope is a concern when the absorption fields are installed. Absorption lines should be installed on the contour. Properly designing buildings and roads helps to offset the limited ability of the soils to support a load. If these soils are used as a base for roads and streets, mixing the upper part of the soils with the underlying sand and gravel increases soil strength and stability. If buildings are constructed on these soils, properly designing foundations and footings and diverting runoff away from the buildings help to prevent the structural damage caused by shrinking and swelling. Selection of adapted vegetation is critical for the establishment of lawns, shrubs, trees, and vegetable gardens. Establishing plants is difficult in areas where the surface layer has been removed and the hardpan has been exposed. Mulching and applying fertilizer in cut areas help to establish plants. Removal of pebbles and cobbles in disturbed areas is needed to obtain the best results from landscaping, particularly in areas used for lawns. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

This unit is in capability unit IVe-3 (17), irrigated and nonirrigated.

211—Ricecross loam, 0 to 2 percent slopes. This very deep, well drained soil is on steam terraces. It formed in alluvium derived from mixed sources. The native vegetation is mainly annual grasses and valley oaks. Elevation is between 1,400 and 1,900 feet. The average annual precipitation is between 30 and 50 inches, the average annual air temperature is between 58 and 61 degrees F, and the average frost-free period is between 235 and 250 days.

Typically, the surface layer is brown loam about 6 inches thick. The upper 13 inches of the subsoil is brown loam. The lower 53 inches is brown clay loam.

Included in this unit are small areas of Flanly, Orose, Verjeles, and Sobrante soils. Also included are small areas of soils that are similar to the Ricecross soil but have a coarser textured subsoil or have a seasonal water table at a depth of 36 to 60 inches. Included areas make up about 15 percent of the total acreage.

Permeability in the Ricecross soil is moderately slow. Available water capacity is about 9.5 to 11.0 inches. The effective rooting depth is 60 inches or more. The shrink-swell potential is moderate. Runoff is slow, and the hazard of water erosion is slight. This soil is subject to rare flooding.

This unit is used for rangeland, irrigated pasture, homesite development, and wildlife habitat.

This unit is suited to rangeland. Grazing should be delayed until the soil is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. If this unit is grazed by livestock when the soil is too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of the less preferred forage plants increases. Livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. This unit responds well to applications of fertilizer, to range seeding, and to proper grazing use. The characteristic plant community on this unit is mainly soft chess, wild oat, medusahead, and rippgut brome.

This unit is suited to irrigated pasture. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and control erosion. If this unit is grazed by livestock when the soil is too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. Periodic mowing and clipping help to maintain uniform growth and discourage selective grazing. Fertilizer is needed to ensure the optimum growth of grasses and legumes.

If this unit is used for homesite development, the main management concern is the hazard of flooding, which should be carefully considered when homesites are designed and selected. Plans for homesite development should provide for the preservation of as many trees as possible. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

This unit provides habitat for wildlife, such as waterfowl, birds of prey, other birds, and small fur-bearing mammals. Planting and maintaining shrubs and other woody plants in wet areas and in areas adjacent to drainageways improve the habitat.

This unit is in capability class I (17), irrigated, and capability subclass IIIc (17), nonirrigated.

212—Ricecross loam, 0 to 2 percent slopes, occasionally flooded. This very deep, well drained soil is on narrow stream terraces. It formed in alluvium derived from mixed sources. The native vegetation is mainly annual grasses, forbs, and scattered valley oaks. Elevation is between 125 and 1,100 feet. The average annual precipitation is between 22 and 26 inches, the average annual air temperature is between 60 and 62 degrees F, and the average frost-free period is between 250 and 270 days.

Typically, the surface layer is brown loam about 6 inches thick. The upper 21 inches of the underlying material is dark gray clay loam. The next 6 inches is grayish brown sandy clay loam. The lower part to a depth of 60 inches is yellowish brown gravelly sandy clay loam. In some areas the surface layer is clay loam.

Included in this unit are small areas of Sobrante and Auburn soils, areas of Rock outcrop, and areas of a soil that is similar to the Ricecross soil but has a coarser textured subsoil. Included areas make up about 20 percent of the total acreage.

Permeability in the Ricecross soil is moderately slow. Available water capacity is about 8.5 to 10.0 inches. The effective rooting depth is 60 inches or more. The seasonal high water table is at a depth of 24 to 36 inches from November through April. The shrink-swell potential is moderate. Runoff is slow, and the hazard of water erosion is slight. This soil is subject to occasional, very brief periods of flooding from November through May.

This unit is used mainly for rangeland. It also is used for irrigated pasture and wildlife habitat.

This unit is suited to rangeland. Grazing should be delayed until the soil is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. If this unit is grazed by livestock when the soil is too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. If the range is overgrazed,

the proportion of preferred forage plants decreases and the proportion of the less preferred forage plants increases. Livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. This unit responds well to applications of fertilizer, to range seeding, and to proper grazing use. The characteristic plant community on this unit is mainly wild oat, soft chess, ripgut brome, and medusahead.

This unit is suited to irrigated pasture. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and control erosion. If this unit is grazed by livestock when the soil is too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. Periodic mowing and clipping help to maintain uniform growth and discourage selective grazing. Fertilizer is needed to ensure the optimum growth of grasses and legumes.

This unit provides habitat for wildlife, such as birds of prey, upland game birds, and fur-bearing mammals. Habitat for quail can be improved by building brush piles, especially in areas adjacent to water. Planting and maintaining shrubs and other woody plants in wet areas and in areas adjacent to drainageways improve the habitat.

This unit is in capability units IIw-2 (17), irrigated, and IIIw-2 (17), nonirrigated.

213—Riverwash. This unit is on flood plains. It is in areas where sand and gravel have been deposited along stream and river channels. These areas are continually shifting in relation to the water level. The native vegetation is mainly willows and shrubs.

Included in this unit are small areas of ponds and streams. Included areas make up about 20 percent of the total acreage.

This unit is used for wildlife habitat. It provides habitat for waterfowl, other birds, and fur-bearing mammals. Planting and maintaining shrubs and other woody plants in wet areas and in areas adjacent to drainageways improve the habitat.

This unit is in capability class VIII (18).

214—San Joaquin loam, 0 to 1 percent slopes. This moderately well drained soil is on low fan terraces. It is moderately deep to a hardpan. It formed in alluvium derived from mixed sources. The vegetation in uncultivated areas is mainly annual grasses and forbs. Elevation is between 60 and 130 feet. The average annual precipitation is between 18 and 22 inches, the average annual air temperature is between 61 and 63

degrees F, and the average frost-free period is between 270 and 290 days.

Typically, the surface layer is light brown loam about 4 inches thick. The upper 12 inches of the subsoil is strong brown loam. The lower 9 inches is brown clay. An indurated hardpan is at a depth of 25 inches.

Included in this unit are small areas of Perkins and Redding soils and areas of San Joaquin soils that have a surface layer as thin as 5 inches or as thick as 30 inches because of leveling. Also included are small areas of soils that are similar to the San Joaquin soil but have a hardpan at a depth of less than 20 inches or more than 40 inches or are not so well drained. Included areas make up about 20 percent of the total acreage.

Permeability in the San Joaquin soil is very slow. Available water capacity is about 2.5 to 3.0 inches. The effective rooting depth is restricted by a hardpan at a depth of 20 to 40 inches. The dense clay subsoil restricts the movement of water and air and root penetration. For insignificant periods after heavy rainstorms from December through April, there is a perched water table above the claypan. The shrink-swell potential is high. Runoff is very slow. Where this unit has mound-intermound microrelief, water may pond in intermound areas for long periods from December through April. The hazard of water erosion is slight. This soil is subject to rare flooding.

This unit is used mainly for rice and rangeland. It also is used for irrigated corn for silage, irrigated pasture, urban or homesite development, and wildlife habitat.

This unit is suited to irrigated crops, particularly rice. It is limited mainly by the very slow permeability and the limited rooting depth. Depending on the particular crop, furrow, border, and sprinkler irrigation systems are suitable. Because of the very slow permeability, water applications should be regulated so that water does not stand on the surface and damage crops. This practice, however, is not applicable to rice production. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

This unit is suited to rangeland. The production of vegetation suitable for livestock grazing is limited by the very slow permeability and the low available water capacity. Grazing should be delayed until the soil is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. If this unit is grazed by livestock when the soil is too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. Rotation grazing helps to maintain the quality of forage. If the range is overgrazed, the proportion of preferred forage

plants decreases and the proportion of the less preferred forage plants increases. Livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. Range seeding may be beneficial if the plant community does not consist of desirable species. Fertilizer is needed to ensure the optimum growth of grasses and legumes. The characteristic plant community on this unit is mainly soft chess, wild oat, foxtail fescue, and filaree.

If this unit is used for irrigated pasture, the main management concerns are the very slow permeability and limited soil depth. Only the plants adapted to a limited rooting depth should be selected for planting. Because of the very slow permeability, adjustment of the length of irrigation runs is needed to permit adequate infiltration of water. Carefully applying irrigation water helps to prevent the buildup of a water table above the clay layer. A drainage system may be needed. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and control erosion. Periodic mowing and clipping help to maintain uniform growth and discourage selective grazing. Fertilizer is needed to ensure the optimum growth of grasses and legumes.

The hazard of flooding limits homesite development on this unit. Other management concerns are limited soil depth, the very slow permeability, the high shrink-swell potential, and low strength. Excavation for building sites is limited by the hardpan. Because of the restrictive clay layer, onsite sewage disposal systems often fail or do not function properly during periods of high rainfall. If the unit is used for septic tank absorption fields, the very slow permeability can be overcome by increasing the size of the absorption field. Properly designing buildings and roads helps to offset the limited ability of the soil to support a load. If buildings are constructed on this soil, properly designing foundations and footings and diverting runoff away from the buildings help to prevent the structural damage caused by shrinking and swelling. Selection of adapted vegetation is critical for the establishment of lawns, shrubs, trees, and vegetable gardens. Establishing plants is difficult in areas where the surface layer has been removed and the hardpan has been exposed. Mulching and applying fertilizer in cut areas help to establish plants. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

This unit provides habitat for wildlife, such as birds of prey, game birds, other birds, and small fur-bearing mammals. Planting and maintaining shrubs and other woody plants in wet areas and in areas adjacent to drainageways improve the habitat.

This unit is in capability unit IVs-3 (17), irrigated and nonirrigated.

215—San Joaquin loam, 1 to 3 percent slopes. This moderately deep, well drained soil is on low fan terraces with mound-intermound microrelief. It formed in alluvium derived from mixed sources. The native vegetation is mainly annual grasses and forbs. Elevation is between 60 and 130 feet. The average annual precipitation is between 18 and 22 inches, the average annual air temperature is between 61 and 63 degrees F, and the average frost-free period is between 270 and 290 days.

Typically, the surface layer is light brown loam about 4 inches thick. The upper 12 inches of the subsoil is strong brown loam. The lower 9 inches is brown clay. An indurated hardpan is at a depth of 25 inches.

Included in this unit are small areas of Perkins and Redding soils and areas of a soil that is less than 20 inches deep over siltstone bedrock. Also included are small areas of soils that are similar to the San Joaquin soil but have a hardpan at a depth of less than 20 inches or more than 40 inches. Included areas make up about 20 percent of the total acreage.

Permeability in the San Joaquin soil is very slow. Available water capacity is about 2.5 to 3.0 inches. The effective rooting depth is restricted by a hardpan at a depth of 20 to 40 inches. The dense clay subsoil restricts the movement of water and air and root penetration. For insignificant periods after heavy rainstorms from December through April, there is a perched water table above the claypan. The shrink-swell potential is high. Runoff is slow, and the hazard of water erosion is slight.

This unit is used mainly for rangeland. It also is used for urban or homesite development and wildlife habitat. It can be used for rice if it is leveled and irrigated.

This unit is suited to rangeland. The production of vegetation suitable for livestock grazing is limited by the very slow permeability and the susceptibility to compaction. Grazing should be delayed until the soil is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. If this unit is grazed by livestock when the soil is too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. Rotation grazing helps to maintain the quality of forage. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of the less preferred forage plants increases. Livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. Range seeding may be needed if the plant community does not have desirable species. Fertilizer is needed to ensure the optimum growth of grasses and legumes. The characteristic plant community on this unit is mainly soft chess, wild oat, foxtail fescue, and filaree.

If this unit is used for homesite development, the main

management concerns are limited soil depth, the very slow permeability, the high shrink-swell, and low strength in the subsoil. Excavation for building sites is limited by the hardpan. Because of the restrictive clay layer, onsite sewage disposal systems often fail or do not function properly during periods of high rainfall. If the unit is used for septic tank absorption fields, the very slow permeability can be overcome by increasing the size of the absorption field. Properly designing buildings and roads helps to offset the limited ability of the subsoil to support a load. If buildings are constructed on this soil, properly designing foundations and footings and diverting runoff away from the buildings help to prevent the structural damage caused by shrinking and swelling. Selection of adapted vegetation is critical for the establishment of lawns, shrubs, trees, and vegetable gardens. Establishing plants is difficult in areas where the surface layer has been removed and the hardpan has been exposed. Mulching and applying fertilizer in cut areas help to establish plants. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

This unit provides habitat for wildlife, such as birds of prey, game birds, other birds, and small fur-bearing mammals. Planting and maintaining shrubs and other woody plants in wet areas and in areas adjacent to drainageways improve the habitat. Few limitations affect the construction of ponds for livestock watering and improvement of wildlife habitat.

This unit is in capability unit IVe-3 (17), irrigated and nonirrigated.

216—San Joaquin loam, 0 to 1 percent slopes, occasionally flooded. This moderately deep, well drained soil is on low fan terraces with mound-intermound microrelief. It is in areas that have not been leveled. It formed in alluvium derived from mixed sources. The vegetation in uncultivated areas is mainly annual grasses and forbs. Elevation is between 60 and 130 feet. The average annual precipitation is between 18 and 22 inches, the average annual air temperature is between 61 and 63 degrees F, and the average frost-free period is between 270 and 290 days. Under natural conditions, this soil is not flooded; however, the pattern of flooding has been altered by levee construction.

Typically, the surface layer is light brown loam about 4 inches thick. The upper 12 inches of the subsoil is strong brown loam. The lower 9 inches is brown clay. A brown hardpan with many iron and manganese stains is at a depth of 25 inches. In some areas the surface layer is 5 to 30 inches thick because of leveling.

Included in this unit are small areas of Capay and Perkins soils and soils that are similar soils to the San

Joaquin soil but do not have a hardpan, have a weakly cemented hardpan, are less than 20 inches deep to the hardpan, do not have a clay layer above the hardpan, or are moderately well drained or somewhat poorly drained. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Permeability in the San Joaquin soil is moderate to a depth of 16 inches and very slow below this depth. Available water capacity is about 2 to 5 inches. The effective rooting depth is restricted by a hardpan at a depth of 20 to 40 inches. The dense clay subsoil at a depth of 9 to 25 inches restricts the penetration of most roots and reduces the available water capacity. For insignificant periods after heavy rainstorms from December through April, there is a perched water table above the claypan. Runoff is very slow or slow. Where this unit has mound-intermound microrelief, water may pond in intermound areas for long periods from December through April. The hazard of water erosion is slight. This soil is subject to occasional, brief periods of flooding from December through April. The shrink-swell potential is high in the subsoil.

This unit is used mainly for rice. It also is used for irrigated pasture and wildlife habitat.

This unit is suited to irrigated crops, particularly rice. It is limited mainly by the very slow permeability, the hazard of flooding, and a restricted rooting depth. Furrow, border, corrugation, and sprinkler irrigation systems are suitable. The method used generally is governed by the crop. Because of the very slow permeability, water applications should be regulated so that water does not stand on the surface and damage crops. This practice, however, is not applicable to rice production. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

If this unit is used for irrigated pasture, the main management concerns are the very slow permeability and limited soil depth. Only the plants adapted to a limited rooting depth should be selected for planting. Because of the very slow permeability, adjustment of the length of irrigation runs is needed to permit adequate infiltration of water. Carefully applying irrigation water helps to prevent the buildup of a water table above the clay layer. A drainage system may be needed. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and control erosion. Periodic mowing and clipping help to maintain uniform growth and discourage selective grazing. Fertilizer is needed to ensure the optimum growth of grasses and legumes.

This unit provides habitat for wildlife, such as birds of prey, game birds, other birds, and small fur-bearing

mammals. Planting and maintaining shrubs and other woody plants in wet areas and in areas adjacent to drainageways improve the habitat.

This unit is in capability unit IVw-3 (17), irrigated and nonirrigated.

217—San Joaquin-Urban land complex, 0 to 1 percent slopes. This unit is on low fan terraces. Elevation is between 60 and 75 feet. The average annual precipitation is between 18 and 22 inches, the average annual air temperature is between 61 and 63 degrees F, and the average frost-free period is between 270 and 290 days.

This unit is about 45 percent San Joaquin loam and 45 percent Urban land.

Included in this unit are small areas of Kilaga and Perkins soils. Included areas make up about 10 percent of the total acreage.

The San Joaquin soil is moderately deep and well drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is light brown loam about 4 inches thick. The upper 12 inches of the subsoil is strong brown loam. The lower 9 inches is brown clay. A brown hardpan with many iron and manganese stains is at a depth of 25 inches. Because of leveling, the surface layer is 5 to 30 inches thick in some areas.

Permeability in the San Joaquin soil is moderate to a depth of 16 inches and very slow below this depth. Available water capacity is about 2 to 5 inches. The effective rooting depth is restricted by a hardpan at a depth of 20 to 40 inches. The dense clay subsoil at a depth of 9 to 25 inches restricts the penetration of most roots and reduces the available water capacity. For insignificant periods after heavy rainstorms from December through April, there is a perched water table above the claypan. Runoff is slow, and the hazard of water erosion is slight. The shrink-swell potential is high in the subsoil. This soil is protected by levees and is subject to rare flooding.

Urban land consists of residential and commercial buildings, streets, and other impermeable surfaces.

This unit is used for urban development. The main management concerns are limited soil depth, the very slow permeability, the high shrink-swell potential, and low strength in the subsoil. Excavation for building sites is limited by the hardpan. Because of the restrictive clay layer, onsite sewage disposal systems often fail or do not function properly during periods of high rainfall. If the unit is used for septic tank absorption fields, the very slow permeability can be overcome by increasing the size of the absorption field. Properly designing buildings and roads helps to offset the limited ability of the subsoil to support a load. If buildings are constructed on this soil,

properly designing foundations and footings and diverting runoff away from the buildings help to prevent the structural damage caused by shrinking and swelling. Selection of adapted vegetation is critical for the establishment of lawns, shrubs, trees, and vegetable gardens. Establishing plants is difficult in areas where the surface layer has been removed and the hardpan has been exposed. Mulching and applying fertilizer in cut areas help to establish plants. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

The San Joaquin soil is in capability unit IVs-3 (17), irrigated and nonirrigated. Urban land is not assigned a land capability classification.

218—Shanghai silt loam, 0 to 1 percent slopes. This very deep, somewhat poorly drained soil is on flood plains. It formed in alluvium derived from mixed sources. The vegetation in uncultivated areas is mainly annual grasses, forbs, and valley oaks. Under natural conditions, this soil is somewhat poorly drained, but drainage has been improved by open ditches and flood-control structures. Elevation is between 30 and 150 feet. The average annual precipitation is between 18 and 22 inches, the average annual air temperature is between 61 and 63 degrees F, and the average frost-free period is between 270 and 290 days.

Typically, the surface layer is very pale brown and light yellowish brown silt loam about 20 inches thick. The underlying material to a depth of 69 inches is very pale brown, mottled, stratified silty clay loam, silt, silt loam, and fine sandy loam. In some areas the surface layer is very fine sandy loam or loam.

Included in this unit are small areas of Columbia and Holillipah soils. Included areas make up about 15 percent of the total acreage.

Permeability in the Shanghai soil is moderate. Available water capacity is about 9.5 to 11.5 inches. The effective rooting depth is 60 inches or more. The shrink-swell potential is moderate. Runoff is very slow, and the hazard of water erosion is slight. This soil is protected by levees and is subject to rare flooding.

Most areas of this unit are used for irrigated crops, mainly peaches, pears, walnuts, almonds, and prunes.

This unit is suited to irrigated crops. Depending on the particular crop, furrow, border, and sprinkler irrigation systems are suitable. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake. Excessive cultivation can result in the formation of a tillage pan. This pan can be broken by subsoiling when the soil is dry.

This unit is in capability class I (17), irrigated, and capability subclass IIIc (17), nonirrigated.

219—Shanghai silt loam, 0 to 1 percent slopes, occasionally flooded. This very deep, somewhat poorly drained soil is on flood plains. It formed in alluvium derived from mixed sources. Elevation is between 45 and 100 feet. The average annual precipitation is between 18 and 22 inches, the average annual air temperature is between 61 and 63 degrees F, and the average frost-free period is between 270 and 290 days.

Typically, the surface layer is very pale brown and light yellowish brown silt loam about 20 inches thick. The underlying material to a depth of 69 inches is very pale brown, mottled, stratified silty clay loam, silt, silt loam, and fine sandy loam. In some areas the surface layer is very fine sandy loam or fine sandy loam.

Included in this unit are small areas of Columbia and Horst soils. Included areas make up about 15 percent of the total acreage.

Permeability in the Shanghai soil is moderate. Available water capacity is about 9.0 to 11.5 inches. The effective rooting depth is 60 inches or more. The seasonal high water table is at a depth of 36 to 60 inches from December through April. Runoff is very slow, and the hazard of water erosion is slight. This soil is subject to occasional, brief or long periods of flooding from December through April.

This unit is used for irrigated crops, mainly walnuts, peaches, pears, and prunes.

This unit is suited to irrigated orchards. It is limited mainly by the hazard of flooding and the seasonal high water table. Maintaining areas of trees and brush adjacent to streams is important for streambank stabilization and erosion control. Maintaining a cover crop in the orchards helps to control the erosion caused by floodwater. Depending on the particular crop, furrow, border, corrugation, and sprinkler irrigation systems are suitable. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake. Excessive cultivation can result in the formation of a tillage pan. This pan can be broken by subsoiling when the soil is dry.

This unit is in capability units Ilw-2 (17), irrigated, and Illw-2 (17), nonirrigated.

220—Shanghai silt loam, clay substratum, 0 to 1 percent slopes. This very deep soil is on flood plains. It formed in alluvium derived from mixed sources. The vegetation in uncultivated areas is mainly annual grasses, forbs, and valley oaks. Under natural conditions, this soil is somewhat poorly drained, but drainage has been improved by open ditches and flood-control structures. Elevation is between 30 and 40 feet. The average annual precipitation is between 18 and 22 inches, the average annual air temperature is between 61 and 63 degrees F,

and the average frost-free period is between 270 and 290 days.

Typically, the surface layer is light yellowish brown silt loam about 8 inches thick. The underlying material is light yellowish brown, stratified silty clay loam and silt loam about 33 inches thick. Below this to a depth of 60 inches is a buried layer of brown clay. In some areas the surface layer is very fine sandy loam or loam.

Included in this unit are small areas of Conejo and Kilaga soils. Included areas make up about 10 percent of the total acreage.

Permeability in the Shanghai soil is moderate to a depth of 41 inches and slow below this depth. Available water capacity is about 9 to 11 inches. The effective rooting depth is 60 inches or more. The seasonal high water table is at a depth of 48 to 72 inches from December through April. The shrink-swell potential is moderate. Runoff is very slow, and the hazard of water erosion is slight. This soil is protected by levees and is subject to rare flooding.

Most areas of this unit are used for irrigated crops, mainly prunes.

This unit is suited to irrigated crops. It is limited by the seasonal high water table. Depending on the particular crop, furrow, border, and sprinkler irrigation systems are suitable. Carefully applying irrigation water helps to prevent the buildup of a high water table during the growing season. A drainage system may be needed. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake. Excessive cultivation can result in the formation of a tillage pan. This pan can be broken by subsoiling when the soil is dry.

This unit is in capability unit Illw-2, irrigated and nonirrigated.

221—Sites loam, 3 to 8 percent slopes. This very deep, well drained soil is on mountains. It formed in material weathered from metamorphic rocks. The native vegetation is mainly mixed conifers and hardwoods with an understory of brush, grasses, and forbs. Elevation is between 2,000 and 4,200 feet. The average annual precipitation is between 50 and 80 inches, the average annual air temperature is between 53 and 57 degrees F, and the average frost-free period is between 160 and 190 days.

Typically, the surface is covered with a mat of partially decomposed needles, leaves, twigs, and bark about 4 inches thick. The surface layer is strong brown loam about 6 inches thick. The upper 10 inches of the subsoil is yellowish red clay loam. The next 35 inches is yellowish red and red clay. The lower 10 inches of reddish brown clay loam. Weathered schist is at a depth of 61 inches. In some areas the surface layer is clay loam.

Included in this unit are small areas of Mariposa soils and areas of a soil that is similar to the Sites soil but has bedrock at a depth of 40 to 60 inches. Also included are wet spots. Included areas make up about 15 percent of the total acreage.

Permeability in the Sites soil is moderately slow. Available water capacity is about 8.5 to 10.0 inches. The effective rooting depth is 60 inches or more. The shrink-swell potential is moderate. Runoff is slow, and the hazard of water erosion is slight.

Most areas of this unit are used for timber production. A few areas are used for livestock grazing or homesite development.

Ponderosa pine, Douglas-fir, sugar pine, incense cedar, and tanoak are the main tree species. At an elevation of more than 3,000 feet, white fir becomes significant. On the basis of a 100-year site curve, the mean site index is 160 for ponderosa pine and 140 for Douglas-fir. On the basis of a 50-year site curve, the mean site index is 98 for white fir. The yield (CMAI) for ponderosa pine is 234 cubic feet per acre in a fully stocked stand of trees 40 years old. The yield (CMAI) for Douglas-fir is 145 cubic feet per acre in a fully stocked stand of trees 60 years old. The yield (CMAI) for white fir is 236 cubic feet per acre in a fully stocked stand of trees 70 years old.

The main concerns in producing and harvesting timber are seasonal wetness and plant competition. Conventional methods of harvesting timber can be used. Use of wheeled and tracked equipment when the soil is moist results in the formation of ruts, causes soil compaction, and can damage the roots of trees. Soil compaction may increase the rate of water runoff and decrease timber production. Unsurfaced roads and skid trails are slippery when wet, and they may be impassable during rainy periods. Roads require suitable surfacing for year-round use. Rock for the construction of roads is not readily available in areas of this unit. Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling, which helps to eliminate unwanted weeds, brush, or trees. The characteristic understory plant community on this unit is mainly mountain misery, tanoak, sticky whiteleaf manzanita, and poison oak at the lower elevations and common snowberry and tanoak at the higher elevations.

Where this unit is used for livestock grazing, the main management concern is a dense cover of brush. If trees and shrubs are managed so that open areas are created, this unit can produce a good stand of forage plants. Applying fertilizer and seeding can increase forage production if brush is controlled.

If this unit is used for homesite development, the main management concern is the moderately slow permeability.

If the soil is used for septic tank absorption fields, the moderately slow permeability can be overcome by increasing the size of the absorption field. Properly designing buildings and roads helps to offset the limited ability of the soil to support a load.

This unit is in capability units IIe-1 (22), irrigated, and IIIe-1 (22), nonirrigated.

222—Sites loam, 8 to 15 percent slopes. This very deep, well drained soil is on mountains. It formed in material weathered from metamorphic rocks. The native vegetation is mainly mixed conifers and hardwoods with an understory of brush, grasses, and forbs. Elevation is between 2,000 and 4,200 feet. The average annual precipitation is between 50 and 80 inches, the average annual air temperature is between 53 and 57 degrees F, and the average frost-free period is between 160 and 190 days.

Typically, the surface is covered with a mat of partially decomposed needles, leaves, twigs, and bark about 4 inches thick. The surface layer is strong brown loam about 6 inches thick. The upper 10 inches of the subsoil is yellowish red clay loam. The next 35 inches is yellowish red and red clay. The lower 10 inches is reddish brown clay loam. Weathered schist is at a depth of 61 inches. In some areas the surface layer is clay loam.

Included in this unit are small areas of Mariposa soils and areas of a soil that is similar to the Sites soil but has bedrock at a depth of 40 to 60 inches. Also included are wet spots. Included areas make up about 15 percent of the total acreage.

Permeability in the Sites soil is moderately slow. Available water capacity is about 8.5 to 10.0 inches. The effective rooting depth is 60 inches or more. The shrink-swell potential is moderate. Runoff is medium, and the hazard of water erosion is moderate.

Most areas of this unit are used for timber production. A few areas are used for livestock grazing or homesite development.

Ponderosa pine, Douglas-fir, sugar pine, incense cedar, tanoak, and California black oak are the main tree species. At an elevation of more than 3,000 feet, white fir becomes significant. On the basis of a 100-year site curve, the mean site index is 160 for ponderosa pine and 140 for Douglas-fir. On the basis of a 50-year site curve, the mean site index is 98 for white fir. The yield (CMAI) for ponderosa pine is 234 cubic feet per acre in a fully stocked stand of trees 40 years old. The yield (CMAI) for Douglas-fir is 145 cubic feet per acre in a fully stocked stand of trees 60 years old. The yield (CMAI) for white fir is 236 cubic feet per acre in a fully stocked stand of trees 70 years old.

The main concerns in producing and harvesting timber are seasonal wetness and plant competition.

Conventional methods of harvesting timber can be used. Use of wheeled and tracked equipment when the soil is moist results in the formation of ruts, causes soil compaction, and can damage the roots of trees. Soil compaction may increase the rate of water runoff and decrease timber production. Unsurfaced roads and skid trails are slippery when wet, and they may be impassable during rainy periods. Roads require suitable surfacing for year-round use. Rock for the construction of roads is not readily available in areas of this unit. Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling, which helps to eliminate unwanted weeds, brush, or trees. The characteristic understory plant community on this unit is mainly mountain misery, tanoak, sticky whiteleaf manzanita, and poison oak at the lower elevations and common snowberry and tanoak at the higher elevations.

Where this unit is used for livestock grazing, the main management concern is a dense cover of brush. If trees and shrubs are managed so that open areas are created, this unit can produce a good stand of forage plants. Applying fertilizer and seeding can increase forage production if brush is controlled.

If this unit is used for homesite development, the main management concerns are the moderately slow permeability and the hazard of water erosion. If the soil is used for septic tank absorption fields, the moderately slow permeability can be overcome by increasing the size of the absorption field. Erosion is a hazard on construction sites and on road cuts and fills. Only the part of the site that is used for construction should be disturbed. Mulching and revegetating as soon as possible in disturbed areas, such as road cuts and fills and construction sites, help to control erosion. Properly designing buildings and roads helps to offset the limited ability of the soil to support a load.

This unit is in capability unit IIIe-1 (22), irrigated and nonirrigated.

223—Sites gravelly loam, 15 to 30 percent slopes.

This very deep, well drained soil is on mountains. It formed in material weathered from metamorphic rocks. The native vegetation is mainly mixed conifers and hardwoods with an understory of brush, grasses, and forbs. Elevation is between 2,000 and 4,200 feet. The average annual precipitation is between 50 and 80 inches, the average annual air temperature is between 53 and 57 degrees F, and the average frost-free period is between 160 and 190 days.

Typically, the surface is covered with a mat of partially decomposed needles, leaves, twigs, and bark about 1 inch thick. The surface layer is brown gravelly loam about

5 inches thick. The upper 6 inches of the subsoil is yellowish red gravelly clay loam. The next 7 inches is yellowish red gravelly clay. The lower part to a depth of 62 inches is red and dark red clay. In some areas the surface layer is gravelly clay loam.

Included in this unit are small areas of Mariposa soils and areas of a soil that is similar to the Sites soil but has bedrock at a depth of 40 to 60 inches. Also included are wet spots and small areas of landslips. Included areas make up about 15 percent of the total acreage.

Permeability in the Sites soil is moderately slow. Available water capacity is about 8.5 to 10.5 inches. The effective rooting depth is 60 inches or more. The shrink-swell potential is moderate. Runoff is rapid, and the hazard of water erosion is severe.

This unit is used mainly for timber production. It also is a watershed.

Ponderosa pine, Douglas-fir, sugar pine, incense cedar, tanoak, and California black oak are the main tree species. At an elevation of more than 3,000 feet, white fir becomes significant. On the basis of a 100-year site curve, the mean site index is 160 for ponderosa pine and 140 for Douglas-fir. On the basis of a 50-year site curve, the site index is 98 for white fir. The yield (CMAI) for ponderosa pine is 234 cubic feet per acre in a fully stocked stand of trees 40 years old. The yield (CMAI) for Douglas-fir is 145 cubic feet per acre in a fully stocked stand of trees 60 years old. The yield (CMAI) for white fir is 236 cubic feet per acre in a fully stocked stand of trees 70 years old.

The main concerns in producing and harvesting timber are seasonal wetness, the hazard of water erosion, and plant competition. Conventional methods of harvesting timber can be used. Use of wheeled and tracked equipment when the soil is moist results in the formation of ruts, causes soil compaction, and can damage the roots of trees. Soil compaction may increase the rate of water runoff and decrease timber production. Unsurfaced roads and skid trails are slippery when wet, and they may be impassable during rainy periods. Roads require suitable surfacing for year-round use. Rock for the construction of roads is not readily available in areas of this unit. When trees are harvested, management that minimizes the risk of erosion is essential. Erosion can be controlled by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Minimizing the number of roads, trails, and landings and harvesting from preplanned skid trails can help to prevent excessive erosion and compaction. Scattering brush on skid trails helps to control erosion. Revegetating as soon as possible in disturbed areas also helps to control erosion. Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees. Competing vegetation can

be controlled by properly preparing the site and by spraying, cutting, or girdling, which helps to eliminate unwanted weeds, brush, or trees. The characteristic understory plant community on this unit is mainly mountain misery, tanoak, sticky whiteleaf manzanita, and poison oak at the lower elevations and common snowberry and tanoak at the higher elevations.

This unit is in capability unit IVe-1 (22), nonirrigated.

224—Sites gravelly loam, 30 to 50 percent slopes.

This very deep, well drained soil is on mountains. It formed in material weathered from metamorphic rocks. The native vegetation is mainly mixed conifers and hardwoods with an understory of brush, grasses, and forbs. Elevation is between 2,000 and 4,200 feet. The average annual precipitation is between 50 and 80 inches, the average annual air temperature is between 53 and 57 degrees F, and the average frost-free period is between 160 and 190 days.

Typically, the surface is covered with a mat of partially decomposed, needles, leaves, twigs, and bark about 1 inch thick. The surface layer is brown gravelly loam about 5 inches thick. The upper 6 inches of the subsoil is yellowish red gravelly clay loam. The next 7 inches is yellowish red gravelly clay. The lower part to a depth of 62 inches is red and dark red clay. In some areas the surface layer is gravelly clay loam.

Included in this unit are small areas of Mariposa soils, Rock outcrop, and a soil that is similar to the Sites soil but has bedrock at a depth of 40 to 60 inches. Also included are wet spots and small areas of landslips. Included areas make up about 20 percent of the total acreage.

Permeability in the Sites soil is moderately slow. Available water capacity is about 8.5 to 10.5 inches. The effective rooting depth is 60 inches or more. The shrink-swell potential is moderate. Runoff is rapid, and the hazard of water erosion is severe.

This unit is used mainly for timber production. It also is a watershed.

Ponderosa pine, Douglas-fir, sugar pine, incense cedar, tanoak, and California black oak are the main tree species. At an elevation of more than 3,000 feet, white fir becomes significant. On the basis of a 100-year site curve, the mean site index is 160 for ponderosa pine and 140 for Douglas-fir. On the basis of a 50-year site curve, the site index is 98 for white fir. The yield (CMAI) for ponderosa pine is 234 cubic feet per acre in a fully stocked stand of trees 40 years old. The yield (CMAI) for Douglas-fir is 145 cubic feet per acre in a fully stocked stand of trees 60 years old. The yield (CMAI) for white fir is 236 cubic feet per acre in a fully stocked stand of trees 70 years old.

The main concerns in producing and harvesting timber are the slope, seasonal wetness, the hazard of water

erosion, and plant competition. Conventional methods of harvesting timber cannot be easily used because of the slope. Use of wheeled and tracked equipment when the soil is moist results in the formation of ruts, causes soil compaction, and can damage the roots of trees. Soil compaction may increase the rate of water runoff and decrease timber production. Unsurfaced roads and skid trails are slippery when wet, and they may be impassable during rainy periods. Roads require suitable surfacing for year-round use. Rock for the construction of roads is not readily available in areas of this unit. Roads may fail and landslides may occur following deep soil disturbance. Roads should be confined to ridgetops, natural benches, and the flatter slopes where possible. When trees are harvested, management that minimizes the risk of erosion is essential. Erosion can be controlled by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Minimizing the number of roads, trails, and landings and harvesting from preplanned skid trails can help to prevent excessive erosion and compaction. Scattering brush on skid trails helps to control erosion. Revegetating as soon as possible in disturbed areas also helps to control erosion. Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling, which helps to eliminate unwanted weeds, brush, or trees. The characteristic understory plant community on this unit is mainly mountain misery, tanoak, sticky whiteleaf manzanita, and poison oak at the lower elevations and common snowberry and tanoak at the higher elevations.

This unit is in capability subclass VIe (22), nonirrigated.

225—Sites gravelly loam, bedrock substratum, 3 to 8 percent slopes.

This deep, well drained soil is on mountains. It formed in material weathered from metamorphic rocks. The native vegetation is mainly mixed conifers and hardwoods with an understory of brush, grasses, and forbs. Elevation is between 2,000 and 4,200 feet. The average annual precipitation is between 50 and 80 inches, the average annual air temperature is between 53 and 57 degrees F, and the average frost-free period is between 160 and 190 days.

Typically, the surface is covered with a mat of partially decomposed needles, leaves, twigs, and bark about 1 inch thick. The surface layer is brown gravelly loam about 5 inches thick. The upper 19 inches of the subsoil is yellowish red and red gravelly clay loam. The lower 29 inches is yellowish red and red gravelly clay. Weathered schist is at a depth of 53 inches. In some areas the surface layer is gravelly clay loam.

Included in this unit are small areas of Mariposa soils

and a soil that is similar to the Sites soil but has bedrock at a depth of 60 inches or more. Included areas make up about 20 percent of the total acreage.

Permeability in the Sites soil is moderately slow. Available water capacity is about 7.0 to 8.5 inches. The effective rooting depth is restricted by weathered bedrock at a depth of 40 to 60 inches. The shrink-swell potential is moderate. Runoff is slow, and the hazard of water erosion is slight.

Most areas of this unit are used for timber production. A few areas are used for homesite development.

Ponderosa pine, Douglas-fir, sugar pine, incense cedar, tanoak, and California black oak are the main tree species. At an elevation of more than 3,000 feet, white fir becomes significant. On the basis of a 100-year site curve, the mean site index is 145 for ponderosa pine and 140 for Douglas-fir. The yield (CMAI) for ponderosa pine is 199 cubic feet per acre in a fully stocked stand of trees 40 years old. The yield (CMAI) for Douglas-fir is 145 cubic feet per acre in a fully stocked stand of trees 60 years old.

The main concerns in producing and harvesting timber are seasonal wetness and plant competition. Conventional methods of harvesting timber can be used. Use of wheeled and tracked equipment when the soil is moist results in the formation of ruts, causes soil compaction, and can damage the roots of trees. Soil compaction may increase the rate of water runoff and decrease timber production. Unsurfaced roads and skid trails are slippery when wet, and they may be impassable during rainy periods. Roads require suitable surfacing for year-round use. Rock for the construction of roads is not readily available in areas of this unit. Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling, which helps to eliminate unwanted weeds, brush, or trees. The characteristic understory plant community on this unit is mainly mountain misery, sticky whiteleaf manzanita, and poison oak at the lower elevations and common snowberry and tanoak at the higher elevations.

If this unit is used for homesite development, the main management concern is the moderately slow permeability. If the soil is used for septic tank absorption fields, the moderately slow permeability can be overcome by increasing the size of the absorption field. Providing sandy backfill for the trench and installing long absorption lines help to compensate for the moderately slow permeability. The cuts needed to provide essentially level building sites can expose bedrock. Properly designing buildings and roads helps to offset the limited ability of the soil to support a load.

This unit is in capability units IIe-1 (22), irrigated, and IIIe-1 (22), nonirrigated.

226—Sites gravelly loam, bedrock substratum, 8 to 15 percent slopes.

This deep, well drained soil is on mountains. It formed in material weathered from metamorphic rocks. The native vegetation is mainly mixed conifers and hardwoods with an understory of brush, grasses, and forbs. Elevation is between 2,000 and 4,200 feet. The average annual precipitation is between 50 and 80 inches, the average annual air temperature is between 53 and 57 degrees F, and the average frost-free period is between 160 and 190 days.

Typically, the surface is covered with a mat of partially decomposed needles, leaves, twigs, and bark about 1 inch thick. The surface layer is brown gravelly loam about 5 inches thick. The upper 19 inches of the subsoil is yellowish red and red gravelly clay loam. The lower 29 inches is yellowish red and red gravelly clay. Weathered schist is at a depth of 53 inches. In some areas the surface layer is gravelly clay loam.

Included in this unit are small areas of Mariposa and Woodleaf soils and areas of a soil that is similar to the Sites soil but has bedrock at a depth of 60 inches or more. Included areas make up about 20 percent of the total acreage.

Permeability in the Sites soil is moderately slow. Available water capacity is about 7.0 to 8.5 inches. The effective rooting depth is restricted by weathered bedrock at a depth of 40 to 60 inches. The shrink-swell potential is moderate. Runoff is medium, and the hazard of water erosion is moderate.

Most areas of this unit are used for timber production. A few areas are used for homesite development.

Ponderosa pine, Douglas-fir, sugar pine, incense cedar, tanoak, and California black oak are the main tree species. At an elevation of more than 3,000 feet, white fir becomes significant. On the basis of a 100-year site curve, the mean site index is 145 for ponderosa pine and 140 for Douglas-fir. The yield (CMAI) for ponderosa pine is 199 cubic feet per acre in a fully stocked stand of trees 40 years old. The yield (CMAI) for Douglas-fir is 145 cubic feet per acre in a fully stocked stand of trees 60 years old.

The main concerns in producing and harvesting timber are seasonal wetness and plant competition. Conventional methods of harvesting timber can be used. Use of wheeled and tracked equipment when the soil is moist results in the formation of ruts, causes soil compaction, and can damage the roots of trees. Soil compaction may increase the rate of water runoff and decrease timber production. Unsurfaced roads and skid trails are slippery when wet, and they may be impassable during rainy periods. Roads require suitable surfacing for year-round use. Rock for the construction of roads is not readily available in areas of this unit. Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of

trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling, which helps to eliminate unwanted weeds, brush, or trees. The characteristic understory plant community on this unit is mainly mountain misery, tanoak, sticky whiteleaf manzanita, and poison oak at the lower elevations and common snowberry and tanoak at the higher elevations.

If this unit is used for homesite development, the main management concerns are the moderately slow permeability and the hazard of water erosion. If the soil is used for septic tank absorption fields, the moderately slow permeability can be overcome by increasing the size of the absorption field. Providing sandy backfill for the trench and installing long absorption lines help to compensate for the moderately slow permeability. The cuts needed to provide essentially level building sites can expose bedrock. Erosion is a hazard on construction sites and on road cuts and fills. Only the part of the site that is used for construction should be disturbed. Mulching and revegetating as soon as possible in disturbed areas, such as road cuts and fills and construction sites, help to control erosion. Properly designing buildings and roads helps to offset the limited ability of the soil to support a load.

This unit is in capability unit IIIe-1 (22), irrigated and nonirrigated.

227—Sites gravelly loam, bedrock substratum, 15 to 30 percent slopes. This deep, well drained soil is on mountains. It formed in material weathered from metamorphic rocks. The native vegetation is mainly mixed conifers and hardwoods with an understory of brush, grasses, and forbs. Elevation is between 2,000 and 4,200 feet. The average annual precipitation is between 50 and 80 inches, the average annual air temperature is between 53 and 57 degrees F, and the average frost-free period is between 160 and 190 days.

Typically, the surface is covered with a mat of partially decomposed needles, leaves, twigs, and bark about 1 inch thick. The surface layer is brown gravelly loam about 5 inches thick. The upper 19 inches of the subsoil is yellowish red and red gravelly clay loam. The lower 29 inches is yellowish red and red gravelly clay. Weathered schist is at a depth of 53 inches. In some areas the surface layer is gravelly clay loam.

Included in this unit are small areas of Mariposa and Woodleaf soils and areas of a soil that is similar to the Sites soil but has bedrock at a depth of 60 inches or more. Included areas make up about 20 percent of the total acreage.

Permeability in the Sites soil is moderately slow. Available water capacity is about 7.0 to 8.5 inches. The effective rooting depth is restricted by weathered bedrock at a depth of 40 to 60 inches. The shrink-swell potential is

moderate. Runoff is rapid, and the hazard of water erosion is severe.

This unit is used mainly for timber production. It also is a watershed.

Ponderosa pine, Douglas-fir, sugar pine, incense cedar, tanoak, and California black oak are the main tree species. At an elevation of more than 3,000 feet, white fir becomes significant. On the basis of a 100-year site curve, the mean site index is 145 for ponderosa pine and 140 for Douglas-fir. The yield (CMAI) for ponderosa pine is 199 cubic feet per acre in a fully stocked stand of trees 40 years old. The yield (CMAI) for Douglas-fir is 145 cubic feet per acre in a fully stocked stand of trees 60 years old.

The main concerns in producing and harvesting timber are seasonal wetness, the hazard of water erosion, and plant competition. Conventional methods of harvesting timber can be used. Use of wheeled and tracked equipment when the soil is moist results in the formation of ruts, causes soil compaction, and can damage the roots of trees. Soil compaction may increase the rate of water runoff and decrease timber production. Unsurfaced roads and skid trails are slippery when wet, and they may be impassable during rainy periods. Roads require suitable surfacing for year-round use. Rock for the construction of roads is not readily available in areas of this unit. When trees are harvested, management that minimizes the risk of erosion is essential. Erosion can be controlled by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Minimizing the number of roads, trails, and landings and harvesting from preplanned skid trails can help to prevent excessive erosion and compaction. Scattering brush on skid trails helps to control erosion. Revegetating as soon as possible in disturbed areas also helps to control erosion. Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling, which helps to eliminate unwanted weeds, brush, or trees. The characteristic understory plant community on this unit is mainly mountain misery, tanoak, sticky whiteleaf manzanita, and poison oak at the lower elevations and common snowberry and tanoak at the higher elevations.

This unit is in capability unit IVe-1 (22), nonirrigated.

228—Sites gravelly loam, bedrock substratum, 30 to 50 percent slopes. This deep, well drained soil is on mountains. It formed in material weathered from metamorphic rocks. The native vegetation is mainly mixed conifers and hardwoods with a understory of brush, grasses, and forbs. Elevation is between 2,000 and 4,200 feet. The average annual precipitation is between 50 and 80 inches, the average annual air temperature is between

53 and 57 degrees F, and the average frost-free period is between 160 and 190 days.

Typically, the surface is covered with a mat of partially decomposed needles, leaves, twigs, and bark about 1 inch thick. The surface layer is brown gravelly loam about 5 inches thick. The upper 19 inches of the subsoil is yellowish red and red gravelly clay loam. The lower 29 inches is yellowish red and red gravelly clay. Weathered schist is at a depth of 53 inches. In some areas the surface layer is gravelly clay loam.

Included in this unit are small areas of Mariposa and Woodleaf soils and areas of a soil that is similar to the Sites soil but has bedrock at a depth of 60 inches or more. Included areas make up about 20 percent of the total acreage.

Permeability in the Sites soil is moderately slow. Available water capacity is about 7.0 to 8.5 inches. The effective rooting depth is restricted by weathered bedrock at a depth of 40 to 60 inches. The shrink-swell potential is moderate. Runoff is rapid, and the hazard of water erosion is severe.

This unit is used mainly for timber production. It also is a watershed.

Ponderosa pine, Douglas-fir, sugar pine, incense cedar, tanoak, and California black oak are the main tree species. At an elevation of more than 3,000 feet, white fir becomes significant. On the basis of a 100-year site curve, the mean site index is 145 for ponderosa pine and 140 for Douglas-fir. The yield (CMAI) for ponderosa pine is 199 cubic feet per acre in a fully stocked stand of trees 40 years old. The yield (CMAI) for Douglas-fir is 145 cubic feet per acre in a fully stocked stand of trees 60 years old.

The main concerns in producing and harvesting timber are the slope, seasonal wetness, the hazard of water erosion, and plant competition. Conventional methods of harvesting timber cannot be easily used because of the slope. Use of wheeled and tracked equipment when the soil is moist results in the formation of ruts, causes soil compaction, and can damage the roots of trees. Soil compaction may increase the rate of water runoff and decrease timber production. Unsurfaced roads and skid trails are slippery when wet, and they may be impassable during rainy periods. Roads require suitable surfacing for year-round use. Rock for the construction of roads is not readily available in areas of this unit. Roads may fail and landslides may occur following deep soil disturbance. Roads should be confined to ridgetops, natural benches, and the flatter slopes where possible. When trees are harvested, management that minimizes the risk of erosion is essential. Erosion can be controlled by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Minimizing the number of roads, trails, and landings and harvesting from preplanned skid trails can help to prevent excessive erosion and

compaction. Scattering brush on skid trails helps to control erosion. Revegetating as soon as possible in disturbed areas also helps to control erosion. Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling, which helps to eliminate unwanted weeds, brush, or trees. The characteristic understory plant community on this unit is mainly mountain misery, tanoak, sticky whiteleaf manzanita, and poison oak at the lower elevations and common snowberry and tanoak at the higher elevations.

This unit is in capability subclass VIe (22), nonirrigated.

229—Sites loam, cool, 3 to 15 percent slopes. This very deep, well drained soil is on mountains. It formed in material weathered from metamorphic rocks. The native vegetation is mainly mixed conifers and hardwoods with an understory of brush, grasses, and forbs. Elevation is between 4,000 and 4,600 feet. The average annual precipitation is between 75 and 85 inches, the average annual air temperature is between 50 and 54 degrees F, and the average frost-free period is between 140 and 160 days.

Typically, the surface is covered with a mat of partially decomposed needles, leaves, twigs, and bark about 4 inches thick. The surface layer is strong brown loam about 6 inches thick. The upper 10 inches of the subsoil is yellowish red clay loam. The next 35 inches is yellowish red and red clay. The lower part to a depth of 61 inches is reddish brown clay loam. Weathered schist is at a depth of 61 inches. In some areas the surface layer is clay loam.

Included in this unit are small areas of Mariposa and Jocal soils and a soil that is similar to the Sites soil but has bedrock at a depth of 40 to 60 inches. Included areas make up about 15 percent of the total acreage.

Permeability in the Sites soil is moderately slow. Available water capacity is about 8.5 to 10.0 inches. The effective rooting depth is 60 inches or more. The shrink-swell potential is moderate. Runoff is medium, and the hazard of water erosion is moderate.

Most areas of this unit are used for timber production. A few areas are used for livestock grazing.

White fir, Douglas-fir, sugar pine, incense cedar, and California black oak are the main tree species. On the basis of a 50-year site curve, the mean site index is 78 for white fir. On the basis of a 100-year site curve, the mean site index is 144 for Douglas-fir. The yield (CMAI) for white fir is 189 cubic feet per acre in a fully stocked stand of trees 70 years old. The yield (CMAI) for Douglas-fir is 150 cubic feet per acre in a fully stocked stand of trees 60 years old.

The main concerns in producing and harvesting timber are seasonal wetness and plant competition. Conventional methods of harvesting timber can be used. Use of wheeled and tracked equipment when the soil is moist results in the formation of ruts, causes soil compaction, and can damage the roots of trees. Soil compaction may increase the rate of water runoff and decrease timber production. Unsurfaced roads and skid trails are slippery when wet, and they may be impassable during rainy periods. Roads require suitable surfacing for year-round use. Rock for the construction of roads is not readily available in areas of this unit. Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling, which helps to eliminate unwanted weeds, brush, or trees. The characteristic understory plant community on this unit is mainly whitethorn ceanothus, greenleaf manzanita, tanoak, and Pacific dogwood.

Where this unit is used for livestock grazing, the main management concern is a dense cover of brush. If trees and shrubs are managed so that open areas are created, this unit can produce a good stand of forage plants. Applying fertilizer and seeding can increase forage production if brush is controlled.

This unit is in capability unit IVE-1 (22), nonirrigated.

230—Sites-Jocal complex, 2 to 30 percent slopes.

This unit is on mountains. The native vegetation is mainly mixed conifers and hardwoods with an understory of brush, grasses, and forbs. Elevation is between 2,000 and 3,800 feet. The average annual precipitation is between 50 and 75 inches, the average annual air temperature is between 53 and 57 degrees F, and the average frost-free period is between 160 and 190 days.

This unit is about 55 percent Sites clay loam and 35 percent Jocal loam.

Included in this unit are small areas of Mariposa and Boomer soils. Included areas make up about 10 percent of the total acreage.

The Sites soil is deep or very deep and is well drained. It formed in material weathered from metamorphic rocks. Typically, the surface is covered with a mat of partially decomposed leaves, needles, and twigs about 2 inches thick. The surface layer is reddish brown clay loam about 9 inches thick. The subsoil is yellowish red clay about 36 inches thick. Weathered schist is at a depth of 45 inches.

Permeability in the Sites soil is moderately slow. Available water capacity is about 6.0 to 7.5 inches. The effective rooting depth is restricted by weathered bedrock at a depth of 40 to 60 inches. The shrink-swell potential is moderate. Runoff is medium, and the hazard of water erosion is moderate.

The Jocal soil is very deep and well drained. It formed in material weathered from metasedimentary rocks. Typically, the surface is covered with a mat of partially decomposed needles, leaves, and twigs about 3 inches thick. The surface layer is reddish brown loam about 18 inches thick. The subsoil is reddish yellow silty clay loam about 52 inches thick. In some areas the surface layer is gravelly loam.

Permeability in the Jocal soil is moderate. Available water capacity is about 8.5 to 11.0 inches. The effective rooting depth is 60 inches or more. The shrink-swell potential is moderate. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for timber production. It also is a watershed.

Ponderosa pine, Douglas-fir, sugar pine, incense cedar, tanoak, Pacific madrone, and California black oak are the main tree species. At an elevation of more than 3,000 feet, white fir becomes significant. On the basis of a 100-year site curve, the mean site index for ponderosa pine is 145 on the Sites and Jocal soils. On the basis of a 100-year site curve, the mean site index for Douglas-fir is 140 on the Sites soil and 147 on the Jocal soil. The yield (CMAI) for ponderosa pine in a fully stocked stand of trees 40 years old is 199 cubic feet per acre on the Sites and Jocal soils. The yield (CMAI) for Douglas-fir in a fully stocked stand of trees 60 years old is 145 cubic feet per acre on the Sites soil and 154 cubic feet per acre on the Jocal soil.

The main concerns in producing and harvesting timber are seasonal wetness, the hazard of water erosion, and plant competition. Conventional methods of harvesting timber can be used. Use of wheeled and tracked equipment when the soils are moist results in the formation of ruts, causes soil compaction, and can damage the roots of trees. Soil compaction may increase the rate of water runoff and decrease timber production. Unsurfaced roads and skid trails are slippery when wet, and they may be impassable during rainy periods. Roads require suitable surfacing for year-round use. Rock for the construction of roads is not readily available in areas of this unit. When trees are harvested, management that minimizes the risk of erosion is essential. Erosion can be controlled by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Minimizing the number of roads, trails, and landings and harvesting from preplanned skid trails can help to prevent excessive erosion and compaction. Scattering brush on skid trails helps to control erosion. Revegetating as soon as possible in disturbed areas also helps to control erosion. Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees. Competing vegetation can be controlled by properly preparing the site and by

spraying, cutting, or girdling, which helps to eliminate unwanted weeds, brush, or trees. The characteristic understory plant community on this unit is mainly mountain misery, tanoak, sticky whiteleaf manzanita, and poison oak at the lower elevations and common snowberry and tanoak at the higher elevations.

This unit is in capability unit IVe-1 (22), nonirrigated.

231—Sites-Jocal-Mariposa complex, 30 to 50 percent slopes. This unit is on mountains. The native vegetation is mainly mixed conifers and hardwoods with an understory of brush, grasses, and forbs. Elevation is between 2,000 and 3,800 feet. The average annual precipitation is between 50 and 75 inches, the average annual air temperature is between 53 and 57 degrees F, and the average frost-free period is between 160 and 190 days.

This unit is about 45 percent Sites clay loam, 25 percent Jocal loam, and 20 percent Mariposa gravelly loam.

Included in this unit are small areas of Boomer, Pendola, and Hurlbut soils. Included areas make up about 10 percent of the total acreage.

The Sites soil is deep and well drained. It formed in material weathered from metamorphic rocks. Typically, the surface is covered with a mat of partially decomposed leaves, needles, and twigs about 2 inches thick. The surface layer is reddish brown clay loam about 9 inches thick. The subsoil is yellowish red clay about 36 inches thick. Weathered schist is at a depth of 45 inches.

Permeability in the Sites soil is moderately slow. Available water capacity is about 6.0 to 7.5 inches. The effective rooting depth is restricted by weathered bedrock at a depth of 40 to 60 inches. The shrink-swell potential is moderate. Runoff is rapid, and the hazard of water erosion is severe.

The Jocal soil is very deep and well drained. It formed in material weathered from metasedimentary rocks. Typically, the surface is covered with a mat of partially decomposed needles, leaves, and twigs about 3 inches thick. The surface layer is reddish brown loam about 18 inches thick. The subsoil is reddish yellow silty clay loam about 52 inches thick. In some areas the surface layer is gravelly loam.

Permeability in the Jocal soil is moderate. Available water capacity is about 8.5 to 11.0 inches. The effective rooting depth is 60 inches or more. The shrink-swell potential is moderate. Runoff is rapid, and the hazard of water erosion is severe.

The Mariposa soil is shallow or moderately deep and is well drained. It formed in material weathered from metasedimentary rocks. Typically, the surface is covered with a mat of partially decomposed leaves, needles, and twigs about 1 inch thick. The surface layer is dark brown

and strong brown gravelly loam about 6 inches thick. The upper 9 inches of the subsoil is strong brown gravelly loam. The lower 18 inches is yellowish red gravelly clay loam. Hard schist is at a depth of 33 inches. In some areas the surface layer is loam.

Permeability in the Mariposa soil is moderate. Available water capacity is about 2.5 to 3.5 inches. The effective rooting depth is restricted by bedrock at a depth of 12 to 35 inches. Runoff is rapid, and the hazard of water erosion is severe.

This unit is used mainly for timber production. It also is a watershed.

Ponderosa pine, Douglas-fir, sugar pine, incense cedar, tanoak, Pacific madrone, and California black oak are the main tree species. At an elevation of more than 3,000 feet, white fir becomes significant. On the basis of a 100-year site curve, the mean site index for ponderosa pine is 145 on the Sites and Jocal soils and 105 on the Mariposa soil. On the basis of a 100-year site curve, the mean site index for Douglas-fir is 140 on the Sites soil, 147 on the Jocal soil, and 110 on the Mariposa soil. The yield (CMAI) for ponderosa pine in a fully stocked stand of trees 40 years old is 199 cubic feet per acre on the Sites and Jocal soils and 112 cubic feet per acre on the Mariposa soil. The yield (CMAI) for Douglas-fir in a fully stocked stand of trees 60 years old is 145 cubic feet per acre on the Sites soil, 154 cubic feet per acre on the Jocal soil, and 98 cubic feet per acre on the Mariposa soil.

The main concerns in producing and harvesting timber are the slope, seasonal wetness, the hazard of water erosion, and plant competition. The slope restricts the use of wheeled and tracked equipment. Skyline yarding generally is safer than other methods and results in less soil disturbance. Unsurfaced roads and skid trails are slippery when wet, and they may be impassable during rainy periods. Roads require suitable surfacing for year-round use. Rock for the construction of roads is not readily available in areas of this unit. Roads may fail and landslides may occur following deep soil disturbance. Roads should be confined to ridgetops where possible. When trees are harvested, management that minimizes the risk of erosion is essential. Erosion can be controlled by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Minimizing the number of roads, trails, and landings and harvesting from preplanned skid trails can help to prevent excessive erosion and compaction. Scattering brush on skid trails helps to control erosion. Revegetating as soon as possible in disturbed areas also helps to control erosion. If the site is not adequately prepared, competition from undesirable plants can prevent or delay the natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling, which helps to eliminate

unwanted weeds, brush, or trees. Mechanical treatment is not feasible because of the slope. The characteristic understory plant community on this unit is mainly mountain misery, tanoak, sticky whiteleaf manzanita, and poison oak at the lower elevations and common snowberry and tanoak at the higher elevations.

This unit is in capability subclass VIe (22), nonirrigated.

232—Slacreek-Rock outcrop complex, 30 to 75 percent slopes. This unit is on side slopes in the inner gorge of stream canyons. The side slopes have dominantly north and east aspects. The native vegetation is mainly mixed conifers and hardwoods with an understory of brush. Elevation is between 3,400 and 4,850 feet. The average annual precipitation is between 75 and 85 inches, the average annual air temperature is between 47 and 51 degrees F, and the average frost-free period is between 130 and 150 days.

This unit is about 65 percent Slacreek gravelly sandy loam and 20 percent Rock outcrop.

Included in this unit are small areas of soils that are similar to the Slacreek soil but have bedrock at a depth of 40 inches or more or within a depth of 20 inches. Also included are small areas of Rock outcrop that has slopes of more than 75 percent. Included areas make up about 15 percent of the total acreage.

The Slacreek soil is moderately deep and well drained. It formed in material weathered from metavolcanic rocks. Typically, the surface is covered with a mat of partially decomposed twigs and needles about 1/2 inch thick. The surface layer is brown gravelly sandy loam about 6 inches thick. The upper 8 inches of the subsoil is yellowish red gravelly loam. The lower 20 inches is strong brown and reddish yellow very gravelly loam. Hard schist is at a depth of 34 inches.

Permeability in the Slacreek soil is moderate. Available water capacity is about 2.5 to 3.5 inches. The effective rooting depth is restricted by bedrock at a depth of 20 to 40 inches. Runoff is rapid or very rapid, and the hazard of water erosion is severe or very severe.

Rock outcrop consists of exposures of bare rock that support little or no vegetation.

This unit is used mainly for timber production. It also is a watershed.

White fir, Douglas-fir, sugar pine, ponderosa pine, incense cedar, California black oak, and bigleaf maple are the main tree species. On the basis of a 100-year site curve, the mean site index is 84 for white fir and 95 for Douglas-fir. The yield (CMAI) for white fir is 204 cubic feet per acre in a fully stocked stand of trees 70 years old. The yield (CMAI) for Douglas-fir is 77 cubic feet per acre in a fully stocked stand of trees 60 years old.

The main concerns in producing and harvesting timber are the slope, seasonal wetness, the hazard of water

erosion, and plant competition. The slope restricts the use of wheeled and tracked equipment. Skyline yarding generally is safer than other methods and results in less soil disturbance. Roads require suitable surfacing for year-round use. Rock for the construction of roads is readily available in areas of this unit. Roads may fail and landslides may occur following deep soil disturbance. Roads should be confined to ridgetops where possible. When trees are harvested, management that minimizes the risk of erosion is essential. Erosion can be controlled by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Revegetating as soon as possible in disturbed areas also helps to control erosion. If the site is not adequately prepared, competition from undesirable plants can prevent or delay the natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling, which helps to eliminate unwanted weeds, brush, or trees. Mechanical treatment is not feasible because of the slope. The characteristic understory plant community on this unit is mainly Pacific dogwood, tanoak, and deerbrush.

The Slacreek soil is in capability subclass VIIe (22), nonirrigated. The Rock outcrop is in capability class VIII (22), nonirrigated

235—Sobrante gravelly loam, 3 to 8 percent slopes. This moderately deep, well drained soil is on foothills. It formed in material weathered from basic metavolcanic rocks. The native vegetation is mainly blue oak, interior live oak, and Digger pine with an understory of brush, annual grasses, and forbs. Elevation is between 300 and 1,900 feet. The average annual precipitation is between 26 and 35 inches, the average annual air temperature is between 58 and 61 degrees F, and the average frost-free period is between 230 and 250 days.

Typically, the surface layer is brown gravelly loam about 5 inches thick. The subsoil is dark reddish brown gravelly loam about 30 inches thick. Below this is weathered greenstone, which extends to a depth of 40 inches. Hard greenstone is at a depth of 40 inches. In some areas the surface layer is very gravelly loam.

Included in this unit are small areas of Auburn, Argonaut, and Timbuctoo soils and Rock outcrop. Also included are small areas of soils that are similar to the Sobrante soil but have bedrock at a depth of 40 to 60 inches or have a finer textured subsoil. Included areas make up about 20 percent of the total acreage.

Permeability in the Sobrante soil is moderate. Available water capacity is about 4 to 5 inches. The effective rooting depth is restricted by bedrock at a depth of 20 to 40 inches. The shrink-swell potential is moderate. Runoff is slow, and the hazard of water erosion is slight.

This unit is used mainly for woodland and livestock

grazing. It also is used for homesite development, irrigated pasture, and wildlife habitat.

Blue oak, interior live oak, and Digger pine are the major tree species. On this unit, volumes of 38 to 191 cords per acre of blue oak, interior live oak, and Digger pine with an average diameter of about 10 inches have been measured. Careful harvesting is needed to allow the stand to regenerate through oak stump sprouting and to minimize water erosion when the plant cover is disturbed.

Where this unit is used for livestock grazing, it is limited by a tendency to produce woody species. Brush management improves forage production. Areas where brush is managed by prescribed burning or by chemical or mechanical methods may be subject to an increased hazard of erosion. Grazing should be delayed until the soil is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. If this unit is grazed by livestock when the soil is too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of the less preferred forage plants increases. Livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. Fencing and properly located salt and livestock watering facilities help to achieve a uniform distribution of livestock grazing. This unit responds well to applications of fertilizer, to range seeding, and to proper grazing use if brush is controlled. The characteristic understory plant community on this unit is mainly poison oak, soft chess, wild oat, and filaree.

If this unit is used for homesite development, the main management concern is limited soil depth. The cuts needed to provide essentially level building sites can expose bedrock. Because of limited soil depth, onsite sewage disposal systems often fail or do not function properly during periods of high rainfall. If the density of housing is moderate or high, community sewage systems are needed to prevent the contamination of water supplies caused by seepage from onsite sewage disposal systems. Plans for homesite development should provide for the preservation of as many trees as possible. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

If this unit is used for irrigated pasture, the main management concern is limited soil depth. Only the plants adapted to a limited rooting depth should be selected for planting. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and control erosion. Periodic mowing and clipping help to maintain uniform growth and discourage selective grazing. Fertilizer is

needed to ensure the optimum growth of grasses and legumes.

This unit provides habitat for wildlife, such as deer, birds of prey, game birds, other birds, and small fur-bearing mammals. Planting and maintaining shrubs and other woody plants in wet areas and in areas adjacent to drainageways improve the habitat. Habitat for quail can be improved by building brush piles, especially in areas adjacent to water. Creating openings in areas of dense brush can benefit wildlife. Brush controlled by prescribed burning or mechanical methods produces valuable new growth for wildlife. Oaks should be maintained as a source of feed and cover for wild turkey and deer.

This unit is in capability unit IIIe-8 (18), irrigated and nonirrigated.

236—Sobrante gravelly loam, 8 to 15 percent slopes. This moderately deep, well drained soil is on foothills. It formed in material weathered from basic metavolcanic rocks. The native vegetation is mainly blue oak, interior live oak, and Digger pine with an understory of brush, annual grasses, and forbs. Elevation is between 300 and 1,900 feet. The average annual precipitation is between 26 and 35 inches, the average annual air temperature is between 58 and 61 degrees F, and the average frost-free period is between 230 and 250 days.

Typically, the surface layer is brown gravelly loam about 5 inches thick. The subsoil is dark reddish brown gravelly loam about 30 inches thick. Below this is weathered greenstone, which extends to a depth of 40 inches. Hard greenstone is at a depth of 40 inches. In some areas the surface layer is very gravelly loam.

Included in this unit are small areas of Auburn, Argonaut, and Timbuctoo soils and Rock outcrop. Also included are small areas of a soil that is similar to the Sobrante soil but has a finer textured subsoil. Included areas make up about 20 percent of the total acreage.

Permeability in the Sobrante soil is moderate. Available water capacity is about 4 to 5 inches. The effective rooting depth is 20 to 40 inches. The shrink-swell potential is moderate. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for woodland and livestock grazing. It also is used for homesite development, irrigated pasture, and wildlife habitat.

Blue oak, interior live oak, and Digger pine are the major tree species. On this unit, volumes of 38 to 191 cords per acre of blue oak, interior live oak, and Digger pine with an average diameter of about 10 inches have been measured. Careful harvesting is needed to allow the stand to regenerate through oak stump sprouting and to minimize water erosion when the plant cover is disturbed.

Where this unit is used for livestock grazing, it is limited by a tendency to produce woody species. Brush

management improves forage production. Areas where brush is managed by prescribed burning or by chemical or mechanical methods may be subject to an increased hazard of erosion. Grazing should be delayed until the soil is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. If this unit is grazed by livestock when the soil is too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of the less preferred forage plants increases. Livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. Fencing and properly located salt and livestock watering facilities help to achieve a uniform distribution of livestock grazing. This unit responds well to applications of fertilizer, to range seeding, and to proper grazing use if brush is controlled. The characteristic understory plant community on this unit is mainly poison oak, soft chess, wild oat, and filaree.

If this unit is used for homesite development, the main management concerns are limited soil depth, the hazard of water erosion, and the slope. The cuts needed to provide essentially level building sites can expose bedrock. Erosion is a hazard on construction sites and on road cuts and fills. Only the part of the site that is used for construction should be disturbed. Preserving the existing plant cover during construction helps to control erosion. Mulching and revegetating as soon as possible in disturbed areas, such as construction sites and road cuts and fills, also help to control erosion. Because of limited soil depth, onsite sewage disposal systems often fail or do not function properly during periods of high rainfall. If the density of housing is moderate or high, community sewage systems are needed to prevent the contamination of water supplies caused by seepage from onsite sewage disposal systems. Plans for homesite development should provide for the preservation of as many trees as possible. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

If this unit is used for irrigated pasture, the main management concern is limited soil depth. Only the plants adapted to a limited rooting depth should be selected for planting. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and control erosion. Periodic mowing and clipping help to maintain uniform growth and discourage selective grazing. Fertilizer is needed to ensure the optimum growth of grasses and legumes.

This unit provides habitat for wildlife, such as deer, birds of prey, game birds, other birds, and small fur-bearing mammals. Planting and maintaining shrubs and

other woody plants in wet areas and in areas adjacent to drainageways improve the habitat. Habitat for quail can be improved by building brush piles, especially in areas adjacent to water. Creating openings in areas of dense brush can benefit wildlife. Brush controlled by prescribed burning or mechanical methods produces valuable new growth for wildlife. Oaks should be maintained as a source of feed and cover for wild turkey and deer.

This unit is in capability unit IIIe-8 (18), irrigated and nonirrigated.

237—Sobrante gravelly loam, 15 to 30 percent slopes. This moderately deep, well drained soil is on foothills. It formed in material weathered from basic metavolcanic rocks. The native vegetation is mainly blue oak, interior live oak, and Digger pine with an understory of brush, annual grasses, and forbs. Elevation is between 300 and 1,900 feet. The average annual precipitation is between 26 and 35 inches, the average annual air temperature is between 58 and 61 degrees F, and the average frost-free period is between 230 and 250 days.

Typically, the surface layer is brown gravelly loam about 5 inches thick. The subsoil is dark reddish brown gravelly loam about 30 inches thick. Below this is weathered greenstone, which extends to a depth of 40 inches. Hard greenstone is at a depth of 40 inches.

Included in this unit is are small areas of Auburn, Argonaut, and Timbuctoo soils and Rock outcrop. Also included are small areas of soils that are similar to the Sobrante soil but have bedrock at a depth of 40 to 60 inches or have a finer textured or more gravelly subsoil. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Permeability in the Sobrante soil is moderate. Available water capacity is about 4 to 5 inches. The effective rooting depth is restricted by bedrock at a depth 20 to 40 inches. The shrink-swell potential is moderate. Runoff is rapid, and the hazard of water erosion is severe.

This unit is used mainly for woodland and livestock grazing. It also is used for homesite development, irrigated pasture, and wildlife habitat.

Blue oak, interior live oak, and Digger pine are the major tree species. On this unit, volumes of 38 to 191 cords per acre of blue oak, interior live oak, and Digger pine with an average diameter of about 10 inches have been measured. Careful harvesting is needed to allow the stand to regenerate through oak stump sprouting and to minimize water erosion when the plant cover is disturbed.

Where this unit is used for livestock grazing, it is limited by a tendency to produce woody species. Brush management improves forage production. Areas where brush is managed by prescribed burning or by chemical or mechanical methods may be subject to an increased hazard of erosion. Grazing should be delayed until the soil

is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. If this unit is grazed by livestock when the soil is too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of the less preferred forage plants increases. Livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. Fencing and properly located salt and livestock watering facilities help to achieve a uniform distribution of livestock grazing. This unit responds well to applications of fertilizer, to range seeding, and to proper grazing use if brush is controlled. The characteristic understory plant community on this unit is mainly poison oak, soft chess, wild oat, and filaree.

If this unit is used for homesite development, the main management concerns are limited soil depth, the hazard of water erosion, and the slope. The cuts needed to provide essentially level building sites can expose bedrock. Erosion is a hazard on construction sites and on road cuts and fills. Only the part of the site that is used for construction should be disturbed. Preserving the existing plant cover during construction helps to control erosion. Mulching and revegetating as soon as possible in disturbed areas, such as construction sites and road cuts and fills, also help to control erosion. Because of limited soil depth, onsite sewage disposal systems often fail or do not function properly during periods of high rainfall. Effluent from septic tank absorption fields can surface in downslope areas and thus create a health hazard. If the density of housing is moderate or high, community sewage systems are needed to prevent the contamination of water supplies caused by seepage from onsite sewage disposal systems. Plans for homesite development should provide for the preservation of as many trees as possible. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

If this unit is used for irrigated pasture, the main management concern is limited soil depth. Only the plants adapted to a limited rooting depth should be selected for planting. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and control erosion. Periodic mowing and clipping help to maintain uniform growth and discourage selective grazing. Fertilizer is needed to ensure the optimum growth of grasses and legumes.

This unit provides habitat for wildlife, such as deer, birds of prey, game birds, other birds, and small fur-bearing mammals. Planting and maintaining shrubs and other woody plants in wet areas and in areas adjacent to drainageways improve the habitat. Habitat for quail can be

improved by building brush piles, especially in areas adjacent to water. Creating openings in areas of dense brush can benefit wildlife. Brush controlled by prescribed burning or mechanical methods produces valuable new growth for wildlife. Oaks should be maintained as a source of feed and cover for wild turkey and deer.

This unit is in capability unit IVe-8 (18), irrigated and nonirrigated.

238—Sobrante-Rock outcrop complex, 30 to 50 percent slopes. This unit is on foothills. The native vegetation is mainly blue oak, interior live oak, and Digger pine with an understory of brush, annual grasses, and forbs. Elevation is between 300 and 1,900 feet. The average annual precipitation is between 26 and 35 inches, the average annual air temperature is between 58 and 61 degrees F, and the average frost-free period is between 230 and 250 days.

This unit is about 60 percent Sobrante gravelly loam and 25 percent Rock outcrop.

Included in this unit are small areas of Auburn and Timbuctoo soils. Also included are areas, mainly of Rock outcrop, that have slopes of more than 50 percent. Included areas make up about 15 percent of the total acreage.

The Sobrante soil is moderately deep and well drained. It formed in material weathered from basic metavolcanic rocks. Typically, the surface layer is brown gravelly loam about 5 inches thick. The subsoil is dark reddish brown gravelly loam about 30 inches thick. Below this is weathered greenstone, which extends to a depth of 40 inches. Hard greenstone is at a depth of 40 inches.

Permeability in the Sobrante soil is moderate. Available water capacity is about 4 to 5 inches. The effective rooting depth is restricted by bedrock at a depth of 20 to 40 inches. The shrink-swell potential is moderate. Runoff is rapid, and the hazard of water erosion is severe.

Rock outcrop consists of bare exposures of rock that support little or no vegetation.

This unit is used mainly for woodland, livestock grazing, and wildlife habitat.

Blue oak, interior live oak, and Digger pine are the major tree species. On the Sobrante soil, volumes of 38 to 191 cords per acre of blue oak, interior live oak, and Digger pine with an average diameter of about 10 inches have been measured. The slope hinders any potential harvesting of trees. Careful harvesting is needed to allow the stand to regenerate through oak stump sprouting and to minimize water erosion when the plant cover is disturbed.

Where this unit is used for livestock grazing, it is limited by a tendency to produce woody species. Brush management improves forage production. Areas where brush is managed by prescribed burning or by chemical

methods may be subject to an increased hazard of erosion. Mechanical treatment is not practical because of the Rock outcrop and the slope. Grazing should be delayed until the soil is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. If this unit is grazed by livestock when the soil is too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of the less preferred forage plants increases. Livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. Fencing and properly located salt and livestock watering facilities help to achieve a uniform distribution of livestock grazing. The characteristic understory plant community on this unit is mainly poison oak, soft chess, wild oat, and filaree.

This unit provides habitat for wildlife, such as deer, birds of prey, game birds, other birds, and small fur-bearing mammals. Planting and maintaining shrubs and other woody plants in wet areas and in areas adjacent to drainageways improve the habitat. Habitat for quail can be improved by building brush piles, especially in areas adjacent to water. Creating openings in areas of dense brush can benefit wildlife. Brush controlled by prescribed burning or mechanical methods produces valuable new growth for wildlife. Oaks should be maintained as a source of feed and cover for wild turkey and deer.

The Sobrante soil is in capability subclass VIe (18), nonirrigated. The Rock outcrop is in capability class VIII (18), nonirrigated

239—Sobrante-Timbuctoo complex, 8 to 15 percent slopes. This unit is on foothills. The native vegetation is mainly blue oak, interior live oak, Digger pine, and scattered ponderosa pine with an understory of brush, annual grasses, and forbs. Elevation is between 300 and 1,900 feet. The average annual precipitation is between 26 and 35 inches, the average annual air temperature is between 58 and 61 degrees F, and the average frost-free period is between 230 and 250 days.

This unit is about 40 percent Sobrante gravelly loam and 35 percent Timbuctoo gravelly loam.

Included in this unit are small areas of Rock outcrop and Auburn, Argonaut, and Boomer soils. Also included are areas of soils that are similar to the Sobrante and Timbuctoo soils but have bedrock at a depth of 40 to 60 inches and small areas of soils that are similar to the Sobrante soil but have a finer textured subsoil. Included areas make up about 25 percent of the total acreage.

The Sobrante soil is moderately deep and well drained. It formed in material weathered from basic metavolcanic

rocks. Typically, the surface layer is brown gravelly loam about 5 inches thick. The subsoil is dark reddish brown gravelly loam about 30 inches thick. Below this is weathered greenstone, which extends to a depth of 40 inches. Hard greenstone is at a depth of 40 inches.

Permeability in the Sobrante soil is moderate. Available water capacity is about 4 to 5 inches. The effective rooting depth is restricted by bedrock at a depth of 20 to 40 inches. The shrink-swell potential is moderate. Runoff is medium, and the hazard of water erosion is moderate.

The Timbuctoo soil is moderately deep and well drained. It formed in material weathered from basic metavolcanic rocks. Typically, the surface layer is yellowish red gravelly loam about 4 inches thick. The upper 22 inches of the subsoil is red and dark red gravelly clay loam and gravelly clay. The lower 12 inches is dark red gravelly sandy clay loam. Below this is weathered diabase, which extends to a depth of 45 inches. Hard diabase is at a depth of 45 inches. In some areas the surface layer is loam.

Permeability in the Timbuctoo soil is slow. Available water capacity is about 4.0 to 5.5 inches. The effective rooting depth is restricted by bedrock at a depth of 20 to 40 inches. The shrink-swell potential is moderate. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for woodland and livestock grazing. It also is used for homesite development, irrigated pasture, and wildlife habitat.

Blue oak, interior live oak, California black oak, and Digger pine are the major tree species. Ponderosa pine is in some areas of the Timbuctoo soil. On the Sobrante soil, volumes of approximately 38 to 191 cords per acre of blue oak, interior live oak, and Digger pine with an average diameter of about 10 inches have been measured. On the Timbuctoo soil, volumes of approximately 26 cords per acre of blue oak, interior live oak, and Digger pine with an average diameter of about 8 inches have been measured. On a north aspect, a site index of 112 for ponderosa pine was measured on the Timbuctoo soil. Careful harvesting is needed to allow the stand to regenerate through oak stump sprouting and to minimize water erosion when the plant cover is disturbed.

Where this unit is used for livestock grazing, it is limited by a tendency to produce woody species. Brush management improves forage production. Areas where brush is managed by prescribed burning or by chemical or mechanical methods may be subject to an increased hazard of erosion. Grazing should be delayed until the soils are firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. If this unit is grazed by livestock when the soils are too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage

production. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of the less preferred forage plants increases. Livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. Fencing and properly located salt and livestock watering facilities help to achieve a uniform distribution of livestock grazing. This unit responds well to applications of fertilizer, to range seeding, and to proper grazing use if brush is controlled. The characteristic understory plant community is mainly poison oak, soft chess, wild oat, and filaree on the Sobrante soil and poison oak, deerbrush, blue wildrye, and mountain brome on the Timbuctoo soil.

If this unit is used for homesite development, the main management concerns are the slow permeability in the Timbuctoo soil, limited soil depth, the hazard of water erosion, and the slope. If the Timbuctoo soil is used for septic tank absorption fields, the slow permeability can be overcome by increasing the size of the absorption field. The cuts needed to provide essentially level building sites can expose bedrock. Erosion is a hazard on construction sites and on road cuts and fills. Only the part of the site that is used for construction should be disturbed. Preserving the existing plant cover during construction helps to control erosion. Mulching and revegetating as soon as possible in disturbed areas, such as construction sites and road cuts and fills, also help to control erosion. Because of limited soil depth, onsite sewage disposal systems often fail or do not function properly during periods of high rainfall. If the density of housing is moderate or high, community sewage systems are needed to prevent the contamination of water supplies caused by seepage from onsite sewage disposal systems. Plans for homesite development should provide for the preservation of as many trees as possible. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

If this unit is used for irrigated pasture, the main management concern is limited soil depth. Only the plants adapted to a limited rooting depth should be selected for planting. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and control erosion. Periodic mowing and clipping help to maintain uniform growth and discourage selective grazing. Fertilizer is needed to ensure the optimum growth of grasses and legumes.

This unit provides habitat for wildlife, such as deer, birds of prey, game birds, other birds, and small fur-bearing mammals. Planting and maintaining shrubs and other woody plants in wet areas and in areas adjacent to drainageways improve the habitat. Habitat for quail can be improved by building brush piles, especially in areas adjacent to water. Creating openings in areas of dense brush can benefit wildlife. Brush controlled by prescribed

burning or mechanical methods produces valuable new growth for wildlife. Oaks should be maintained as a source of feed and cover for wild turkey and deer.

This unit is in capability unit IIIe-8 (18), irrigated and nonirrigated.

240—Sobrante-Timbuctoo complex, 15 to 30 percent slopes. This unit is on foothills. The native vegetation is mainly blue oak, interior live oak, Digger pine, and scattered ponderosa pine with an understory of brush, annual grasses, and forbs. Elevation is between 300 and 1,900 feet. The average annual precipitation is between 26 and 35 inches, the average annual air temperature is between 58 and 61 degrees F, and the average frost-free period is between 230 and 250 days.

This unit is about 40 percent Sobrante gravelly loam and 35 percent Timbuctoo gravelly loam.

Included in this unit are small areas of Rock outcrop and Auburn, Argonaut, and Boomer soils. Also included are areas of soils that are similar to the Sobrante and Timbuctoo soils but have bedrock at a depth of 40 to 60 inches and small areas of soils that are similar to the Sobrante soil but have a finer textured subsoil. Included areas make up about 25 percent of the total acreage.

The Sobrante soil is moderately deep and well drained. It formed in material weathered from basic metavolcanic rocks. Typically, the surface layer is brown gravelly loam about 5 inches thick. The subsoil is dark reddish brown gravelly loam about 30 inches thick. Below this is weathered greenstone, which extends to a depth of 40 inches. Hard greenstone is at a depth of 40 inches.

Permeability in the Sobrante soil is moderate. Available water capacity is about 4 to 5 inches. The effective rooting depth is restricted by bedrock at a depth of 20 to 40 inches. The shrink-swell potential is moderate. Runoff is rapid, and the hazard of water erosion is severe.

The Timbuctoo soil is moderately deep and well drained. It formed in material weathered from basic metavolcanic rocks. Typically, the surface layer is yellowish red gravelly loam about 4 inches thick. The upper 22 inches of the subsoil is red and dark red gravelly clay loam and gravelly clay. The lower 12 inches is dark red gravelly sandy clay loam. Below this is weathered diabase, which extends to a depth of 45 inches. Hard diabase is at a depth of 45 inches. In some areas the surface layer is loam.

Permeability in the Timbuctoo soil is slow. Available water capacity is about 4.0 to 5.5 inches. The effective rooting depth is restricted by bedrock at a depth of 20 to 40 inches. The shrink-swell potential is moderate. Runoff is rapid, and the hazard of water erosion is severe.

This unit is used mainly for woodland and livestock grazing. It also is used for homesite development, irrigated pasture, and wildlife habitat.

Blue oak, interior live oak, California black oak, and Digger pine are the major tree species. Ponderosa pine is in some areas of the Timbuctoo soil. On the Sobrante soil, volumes of 38 to 191 cords per acre of blue oak, interior live oak, and Digger pine with an average diameter of about 10 inches have been measured. On the Timbuctoo soil, volumes of approximately 26 cords per acre of blue oak, interior live oak, and Digger pine with an average diameter of about 8 inches have been measured. On a north aspect, a site index of 112 for ponderosa pine was measured on the Timbuctoo soil. Careful harvesting is needed to allow the stand to regenerate through oak stump sprouting and to minimize water erosion when the plant cover is disturbed.

Where this unit is used for livestock grazing, it is limited by a tendency to produce woody species. Brush management improves forage production. Areas where brush is managed by prescribed burning or by chemical or mechanical methods may be subject to an increased hazard of erosion. Grazing should be delayed until the soils are firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. If this unit is grazed by livestock when the soils are too moist, trampling of the surface causes soil compaction and can pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of the less preferred forage plants increases. Livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. Fencing and properly located salt and livestock watering facilities help to achieve a uniform distribution of livestock grazing. This unit responds well to applications of fertilizer, to range seeding, and to proper grazing use if brush is controlled. The characteristic understory plant community is mainly poison oak, soft chess, wild oat, and filaree on the Sobrante soil and poison oak, deerbrush, blue wildrye, and mountain brome on the Timbuctoo soil.

If this unit is used for homesite development, the main management concerns are the slow permeability in the Timbuctoo soil, limited soil depth, the hazard of water erosion, and the slope. If the Timbuctoo soil is used for septic tank absorption fields, the slow permeability can be overcome by increasing the size of the absorption field and providing sandy backfill for the trench. The cuts needed to provide essentially level building sites can expose bedrock. Erosion is a hazard on construction sites and on road cuts and fills. Only the part of the site that is used for construction should be disturbed. Preserving the existing plant cover during construction helps to control erosion. Mulching and revegetating as soon as possible in disturbed areas, such as road cuts and fills and construction sites, also help to control erosion. Because

of limited soil depth, onsite sewage disposal systems often fail or do not function properly during periods of high rainfall. If the density of housing is moderate or high, community sewage systems are needed to prevent the contamination of water supplies caused by seepage from onsite sewage disposal systems. Plans for homesite development should provide for the preservation of as many trees as possible. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

If this unit is used for irrigated pasture, the main management concern is limited soil depth. Only the plants adapted to a limited rooting depth should be selected for planting. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and control erosion. Periodic mowing and clipping help to maintain uniform growth and discourage selective grazing. Fertilizer is needed to ensure the optimum growth of grasses and legumes.

This unit provides habitat for wildlife, such as deer, birds of prey, game birds, other birds, and small fur-bearing mammals. Planting and maintaining shrubs and other woody plants in wet areas and in areas adjacent to drainageways improve the habitat. Habitat for quail can be improved by building brush piles, especially in areas adjacent to water. Creating openings in areas of dense brush can benefit wildlife. Brush controlled by prescribed burning or mechanical methods produces valuable new growth for wildlife. Oaks should be maintained as a source of feed and cover for wild turkey and deer.

This unit is in capability unit IVe-8 (18), irrigated and nonirrigated.

241—Sobrante-Timbuctoo complex, 30 to 50 percent slopes. This unit is on foothills. The native vegetation is mainly blue oak, interior live oak, Digger pine, and scattered ponderosa pine with an understory of brush, annual grasses, and forbs. Elevation is between 300 and 900 feet. The average annual precipitation is between 26 and 35 inches, the average annual air temperature is between 58 and 61 degrees F, and the average frost-free period is between 230 and 250 days.

This unit is about 40 percent Sobrante gravelly loam and 35 percent Timbuctoo gravelly loam.

Included in this unit are small areas of Rock outcrop and Auburn and Boomer soils. Also included are areas of soils that are similar to the Sobrante and Timbuctoo soils but have bedrock at a depth of 40 to 60 inches, small areas of a soil that is similar to the Sobrante soil but has a finer textured subsoil, and areas of Sobrante and Timbuctoo soils that have slopes of more than 50 percent. Included areas make up about 25 percent of the total acreage.

The Sobrante soil is moderately deep and well drained.

It formed in material weathered from basic metavolcanic rocks. Typically, the surface layer is brown gravelly loam about 5 inches thick. The subsoil is dark reddish brown gravelly loam about 30 inches thick. Below this is weathered greenstone, which extends to a depth of 40 inches. Hard greenstone is at a depth of 40 inches.

Permeability in the Sobrante soil is moderate. Available water capacity is about 4 to 5 inches. The effective rooting depth is restricted by bedrock at a depth of 20 to 40 inches. The shrink-swell potential is moderate. Runoff is rapid, and the hazard of water erosion is severe.

The Timbuctoo soil is moderately deep and well drained. It formed in material weathered from basic metavolcanic rocks. Typically, the surface layer is yellowish red gravelly loam about 4 inches thick. The upper 22 inches of the subsoil is red and dark red gravelly clay loam and gravelly clay. The lower 12 inches is dark red gravelly sandy clay loam. Below this is weathered diabase, which extends to a depth of 45 inches. Hard diabase is at a depth of 45 inches. In some areas the surface layer is loam.

Permeability in the Timbuctoo soil is slow. Available water capacity is about 4.0 to 5.5 inches. The effective rooting depth is restricted by weathered bedrock at a depth of 20 to 40 inches. The shrink-swell potential is moderate. Runoff is rapid, and the hazard of water erosion is severe.

This unit is used mainly for woodland, livestock grazing, and wildlife habitat.

Blue oak, interior live oak, California black oak, and Digger pine are the major tree species. Ponderosa pine is in some areas of the Timbuctoo soil. On the Sobrante soil, volumes of 38 to 191 cords per acre of blue oak with an average diameter of about 10 inches have been measured. On the Timbuctoo soil, volumes of approximately 26 cords per acre of blue oak, interior live oak, and Digger pine with an average diameter of about 8 inches have been measured. On a north aspect, a site index of 112 for ponderosa pine was measured on the Timbuctoo soil. The slope hinders any potential harvesting of trees. Careful harvesting is needed to allow the stand to regenerate through oak stump sprouting and to minimize water erosion when the plant cover is disturbed.

Where this unit is used for livestock grazing, it is limited by a tendency to produce woody species. Brush management improves forage production. Areas where brush is managed by prescribed burning or by chemical methods may be subject to an increased hazard of erosion. Mechanical treatment is not practical because of the slope. Grazing should be delayed until the soils are firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. If this unit is grazed by livestock when the soils are too moist, trampling of the surface causes soil compaction and can

pull plants out of the ground. Soil compaction may increase the rate of water runoff and decrease forage production. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of the less preferred forage plants increases. Livestock grazing should be managed so that the desired balance of preferred species is maintained in the plant community. Fencing and properly located salt and livestock watering facilities help to achieve a uniform distribution of livestock grazing. The characteristic understory plant community is mainly poison oak, soft chess, wild oat, and filaree on the Sobrante soil and poison oak, deerbrush, blue wildrye, and mountain brome on the Timbuctoo soil.

This unit provides habitat for wildlife, such as deer, birds of prey, game birds, other birds, and small fur-bearing mammals. Planting and maintaining shrubs and other woody plants in wet areas and in areas adjacent to drainageways improve the habitat. Habitat for quail can be improved by building brush piles, especially in areas adjacent to water. Creating openings in areas of dense brush can benefit wildlife. Brush controlled by prescribed burning or mechanical methods produces valuable new growth for wildlife. Oaks should be maintained as a source of feed and cover for wild turkey and deer.

This unit is in capability subclass VIe (18), nonirrigated.

242—Surnuf loam, 8 to 15 percent slopes. This very deep, well drained soil is on mountains. It formed in material weathered from gabbrodiorite. The native vegetation is mainly ponderosa pine, incense cedar, and California black oak with a dense understory of brush. Elevation is between 1,400 and 2,800 feet. The average annual precipitation is between 35 and 50 inches, the average annual air temperature is between 55 and 59 degrees F, and the average frost-free period is between 190 and 230 days.

Typically, the surface is covered with a mat of partially decomposed needles, twigs, and bark about 1 inch thick. The surface layer is reddish yellow loam about 5 inches thick. The upper 7 inches of the subsoil also is reddish yellow loam. The lower 65 inches is red and light red clay and clay loam. In some areas the surface layer is clay loam.

Included in this unit are small areas of Mildred and Sites soils and areas a soil that is similar to the Surnuf soil but has bedrock at a depth of 40 to 60 inches. Included areas make up about 20 percent of the total acreage.

Permeability in the Surnuf soil is moderately slow. Available water capacity is about 9.5 to 10.5 inches. The effective rooting depth is 60 inches or more. The shrink-swell potential is moderate. Runoff is medium, and the hazard of water erosion is moderate.

Most areas of this unit are used for timber production. A

few areas are used for livestock grazing or homesite development.

Ponderosa pine, incense cedar, and California black oak are the major tree species. On the basis of a 100-year site curve, the mean site index is 118 for ponderosa pine. The yield (CMAI) for ponderosa pine is 137 cubic feet per acre in a fully stocked stand of trees 40 years old. Productivity varies considerably on this unit because of plant competition. It generally is lower in areas that have dense stands of brush and on ridgetops.

The main concerns in producing and harvesting timber are seasonal wetness and plant competition. Conventional methods of harvesting timber can be used. Use of wheeled and tracked equipment when the soil is moist results in the formation of ruts, causes soil compaction, and can damage the roots of trees. Soil compaction may increase the rate of water runoff and decrease timber production. Unsurfaced roads and skid trails are slippery when wet, and they may be impassable during rainy periods. Roads require suitable surfacing for year-round use. Rock for the construction of roads is not readily available in areas of this unit. Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling, which helps to eliminate unwanted weeds, brush, or trees. The characteristic understory plant community on this unit is mainly sticky whiteleaf manzanita, poison oak, toyon, and blue wildrye.

Where this unit is used for livestock grazing, the main management concern is a dense cover of brush. If trees and shrubs are managed so that open areas are created, this unit can produce a good stand of forage plants. Applying fertilizer and seeding can increase forage production if brush is controlled.

If this unit is used for homesite development, the main management concerns are the moderately slow permeability and the hazard of water erosion. If the soil is used for septic tank absorption fields, the moderately slow permeability can be overcome by increasing the size of the absorption field. Erosion is a hazard on construction sites and on road cuts and fills. Only the part of the site that is used for construction should be disturbed. Mulching and revegetating as soon as possible in disturbed areas, such as road cuts and fills and construction sites, help to control erosion. Plans for homesite development should provide for the preservation of as many trees as possible. Properly designing buildings and roads helps to offset the limited ability of the soil to support a load.

This unit is in capability unit IIIe-1 (22), irrigated and nonirrigated.

243—Surnuf loam, 15 to 30 percent slopes. This very deep, well drained soil is on mountains. It formed in material weathered from gabbrodiorite. The native vegetation is mainly ponderosa pine, incense cedar, and California black oak with a dense understory of brush. Elevation is between 1,400 and 2,800 feet. The average annual precipitation is between 35 and 50 inches, the average annual air temperature is between 55 and 59 degrees F, and the average frost-free period is between 190 and 230 days.

Typically, the surface is covered with a mat of partially decomposed needles, twigs, and bark about 1 inch thick. The surface layer is reddish yellow loam about 5 inches thick. The upper 7 inches of the subsoil also is reddish yellow loam. The lower 65 inches is red and light red clay and clay loam. In some areas the surface layer is clay loam.

Included in this unit are small areas of Mildred and Sites soils and areas of a soil that is similar to the Surnuf soil but has bedrock at a depth of 40 to 60 inches. Included areas make up about 20 percent of the total acreage.

Permeability in the Surnuf soil is moderately slow. Available water capacity is about 9.5 to 10.5 inches. The effective rooting depth is 60 inches or more. The shrink-swell potential is moderate. Runoff is rapid, and the hazard of water erosion is severe.

Most areas of this unit are used for timber production. A few areas are used for livestock grazing or homesite development.

Ponderosa pine, incense cedar, and California black oak are the major tree species. On the basis of 100-year site curve, the mean site index is 118 for ponderosa pine. The yield (CMAI) for ponderosa pine is 137 cubic feet per acre in a fully stocked stand of trees 40 years old. Productivity varies considerably on this soil because of plant competition. It generally is lower in areas that have dense stands of brush and on ridgetops.

The main concerns in producing and harvesting timber are seasonal wetness, the hazard of water erosion, and plant competition. Soil compaction may increase the rate of water runoff and decrease timber production. Unsurfaced roads and skid trails are slippery when wet, and they may be impassable during rainy periods. Roads require suitable surfacing for year-round use. Rock for the construction of roads is not readily available in areas of this unit. When trees are harvested, management that minimizes the risk of erosion is essential. Erosion can be controlled by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees. Competing vegetation can be

controlled by properly preparing the site and by spraying, cutting, or girdling, which helps to eliminate unwanted weeds, brush, or trees. The characteristic understory plant community on this unit is mainly sticky whiteleaf manzanita, poison oak, toyon, and blue wildrye.

Where this unit is used for livestock grazing, the main management concern is a dense cover of brush. If trees and shrubs are managed so that open areas are created, this unit can produce a good stand of forage plants. Applying fertilizer and seeding can increase forage production if brush is controlled.

If this unit is used for homesite development, the main management concerns are the moderately slow permeability and the hazard of water erosion. If the soil is used for septic tank absorption fields, the moderately slow permeability can be overcome by increasing the size of the absorption field. Excavation for roads and buildings increases the hazard of erosion. Erosion is a hazard on construction sites and on road cuts and fills. Only the part of the site that is used for construction should be disturbed. Mulching and revegetating as soon as possible in disturbed areas, such as road cuts and fills and construction sites, help to control erosion. The cuts needed to provide essentially level building sites can expose bedrock. Effluent from septic tank absorption fields can surface in downslope areas and thus create a health hazard. If the density of housing is moderate or high, community sewage systems are needed to prevent the contamination of water supplies caused by seepage from onsite sewage disposal systems. Properly designing buildings and roads helps to offset the limited ability of the soil to support a load. Plans for homesite development should provide for the preservation of as many trees as possible.

This unit is in capability unit IVe-1 (22), irrigated and nonirrigated.

244—Surnuf loam, 30 to 50 percent slopes. This very deep, well drained soil is on mountains. It formed in material weathered from gabbrodiorite. The native vegetation is mainly ponderosa pine, incense cedar, and California black oak with a dense understory of brush. Elevation is between 1,400 and 2,800 feet. The average annual precipitation is between 35 and 50 inches, the average annual air temperature is between 55 and 59 degrees F, and the average frost-free period is between 190 and 230 days.

Typically, the surface is covered with a mat of partially decomposed needles, leaves, twigs, and bark about 1 inch thick. The surface layer is reddish yellow loam about 5 inches thick. The upper 7 inches of the subsoil also is reddish yellow loam. The lower 65 inches is red and light red clay and clay loam. In some areas the surface layer is clay loam.

Included in this unit are small areas of Mildred and Sites soils and areas of a soil that is similar to the Surnuf soil but has bedrock at a depth of 40 to 60 inches. Included areas make up about 20 percent of the total acreage.

Permeability in the Surnuf soil is moderately slow. Available water capacity is about 9.5 to 10.5 inches. The effective rooting depth is 60 inches or more. The shrink-swell potential is moderate. Runoff is rapid, and the hazard of water erosion is severe.

Most areas of this unit are used for timber production. A few are watershed areas.

Ponderosa pine, incense cedar, and California black oak are the major tree species. On the basis of a 100-year site curve, the mean site index is 118 for ponderosa pine. The yield (CMAI) for ponderosa pine is 137 cubic feet per acre in a fully stocked stand of trees 40 years old. Productivity varies considerably on this soil because of plant competition. It generally is lower in areas that have dense stands of brush and on ridgetops.

The main concerns in producing and harvesting timber are the slope, seasonal wetness, the hazard of water erosion, and plant competition. Conventional methods of harvesting timber cannot be easily used because of the slope. Use of wheeled and tracked equipment when the soil is moist results in the formation of ruts, causes soil compaction, and can damage the roots of trees. Soil compaction may increase the rate of water runoff and decrease timber production. Unsurfaced roads and skid trails are slippery when wet, and they may be impassable during rainy periods. Roads require suitable surfacing for year-round use. Rock for the construction of roads is not readily available in areas of this unit. When trees are harvested, management that minimizes the risk of erosion is essential. Erosion can be controlled by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling, which helps to eliminate unwanted weeds, brush, or trees. The characteristic understory plant community on this unit is mainly sticky whiteleaf manzanita, poison oak, toyon, and blue wildrye.

This unit is in capability subclass VIe (22), nonirrigated.

245—Surnuf cobbly loam, 8 to 15 percent slopes. This very deep, well drained soil is on mountains. It formed in material weathered from gabbrodiorite. The native vegetation is mainly ponderosa pine, incense cedar, and California black oak with a dense understory of brush. Elevation is between 1,400 and 2,800 feet. The average annual precipitation is between 35 and 50 inches,

the average annual air temperature is between 55 and 59 degrees F, and the average frost-free period is between 190 and 230 days.

Typically, the surface is covered with a mat of partially decomposed needles, leaves, twigs, and bark about 1/2 inch thick. The surface layer is reddish brown cobbly loam about 6 inches thick. The upper 9 inches of the subsoil is red cobbly clay loam. The lower 46 inches is red cobbly clay. In some areas the surface layer is very cobbly loam, very gravelly loam, or loam.

Included in this unit are small areas of Mildred and Sites soils and areas of a soil that is similar to the Surnuf soil but has bedrock at a depth of 40 to 60 inches. Included areas make up about 20 percent of the total acreage.

Permeability in the Surnuf soil is moderately slow. Available water capacity is about 6.5 to 8.5 inches. The effective rooting depth is 60 inches or more. The shrink-swell potential is moderate. Runoff is medium, and the hazard of water erosion is moderate.

Most areas of this unit are used for timber production. A few areas are used for livestock grazing or homesite development.

Ponderosa pine, incense cedar, and California black oak are the major tree species. On the basis of a 100-year site curve, the mean site index is 118 for ponderosa pine. The yield (CMAI) for ponderosa pine is 137 cubic feet per acre in a fully stocked stand of trees 40 years old. Productivity varies considerably on this soil because of plant competition. It generally is lower in areas that have dense stands of brush and on ridgetops.

The main concerns in producing and harvesting timber are seasonal wetness, difficulty in planting trees, and plant competition. Conventional methods of harvesting timber can be used. Use of wheeled and tracked equipment when the soil is moist results in the formation of ruts, causes soil compaction, and can damage the roots of trees. Soil compaction may increase the rate of water runoff and decrease timber production. Unsurfaced roads and skid trails are slippery when wet, and they may be impassable during rainy periods. Roads require suitable surfacing for year-round use. Rock for the construction of roads is not readily available in areas of this unit. Tree planting may be difficult because of cobbles and gravel in the soil. Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling, which helps to eliminate unwanted weeds, brush, or trees. The characteristic understory plant community on this unit is mainly sticky whiteleaf manzanita, poison oak, toyon, and blue wildrye.

Where this unit is used for livestock grazing, the main

management concern is a dense cover of brush. If trees and shrubs are managed so that open areas are created, this unit can produce a good stand of forage plants. Applying fertilizer and seeding can increase forage production if brush is controlled.

If this unit is used for homesite development, the main management concerns are the moderately slow permeability and the cobbles and gravel in the soil. If the soil is used for septic tank absorption fields, the moderately slow permeability can be overcome by increasing the size of the absorption field. Removal of gravel and cobbles in disturbed areas is needed to obtain the best results from landscaping, particularly in areas used for lawns. Plans for homesite development should provide for the preservation of as many trees as possible.

This unit is in capability unit IVe-4 (22), irrigated and nonirrigated.

246—Surnuf cobbly loam, 15 to 30 percent slopes.

This very deep, well drained soil is on mountains. It formed in material weathered from gabbrodiorite. The native vegetation is mainly ponderosa pine, incense cedar, and California black oak with a dense understory of brush. Elevation is between 1,400 and 2,800 feet. The average annual precipitation is between 35 and 50 inches, the average annual air temperature is between 55 and 59 degrees F, and the average frost-free period is between 190 and 230 days.

Typically, the surface is covered with a mat of partially decomposed needles, leaves, twigs, and bark about 1/2 inch thick. The surface layer is reddish brown cobbly loam about 6 inches thick. The upper 9 inches of the subsoil is red cobbly clay loam. The lower 46 inches is red cobbly clay. In some areas the surface layer is very cobbly loam, very gravelly loam, or loam.

Included in this unit are small areas of Mildred and Sites soils and areas of a soil that is similar to the Surnuf soil but has bedrock at a depth of 40 to 60 inches. Included areas make up about 20 percent of the total acreage.

Permeability in the Surnuf soil is moderately slow. Available water capacity is about 6.5 to 8.5 inches. The effective rooting depth is 60 inches or more. The shrink-swell potential is moderate. Runoff is rapid, and the hazard of water erosion is moderate.

Most areas of this unit are used for timber production. A few areas are used for livestock grazing or homesite development.

Ponderosa pine, incense cedar, and California black oak are the major tree species. On the basis of a 100-year site curve, the mean site index is 118 for ponderosa pine. The yield (CMAI) for ponderosa pine is 137 cubic feet per acre in a fully stocked stand of trees 40 years old. Productivity varies considerably on this soil because of

plant competition. It generally is lower in areas that have dense stands of brush and on ridgetops.

The main concerns in producing and harvesting timber are seasonal wetness, the hazard of water erosion, difficulty in planting trees, and plant competition. Conventional methods of harvesting timber can be used. Use of wheeled and tracked equipment when the soil is moist results in the formation of ruts, causes soil compaction, and can damage the roots of trees. Soil compaction may increase the rate of water runoff and decrease timber production. Unsurfaced roads and skid trails are slippery when wet, and they may be impassable during rainy periods. Roads require suitable surfacing for year-round use. Rock for the construction of roads is not readily available in areas of this unit. When trees are harvested, management that minimizes the risk of erosion is essential. Erosion can be controlled by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Tree planting may be difficult because of the cobbles and gravel in the soil. Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling, which helps to eliminate unwanted weeds, brush, or trees. The characteristic understory plant community on this unit is mainly sticky whiteleaf manzanita, poison oak, toyon, and blue wildrye.

Where this unit is used for livestock grazing, the main management concern is a dense cover of brush. If trees and shrubs are managed so that open areas are created, this unit can produce a good stand of forage plants. Applying fertilizer and seeding can increase forage production if brush is controlled.

If this unit is used for homesite development, the main management concerns are the moderately slow permeability, the hazard of water erosion, and the cobbles and gravel in the soil. If the soil is used for septic tank absorption fields, the moderately slow permeability can be overcome by increasing the size of the absorption field. Erosion is a hazard on construction sites and on road cuts and fills. Only the part of the site that is used for construction should be disturbed. Mulching and revegetating as soon as possible in disturbed areas, such as road cuts and fills and construction sites, help to control erosion. Removal of gravel and cobbles in disturbed areas is needed to obtain the best results from landscaping, particularly in areas used for lawns. Effluent from septic tank absorption fields can surface in downslope areas and thus create a health hazard. If the density of housing is moderate or high, community sewage systems are needed to prevent the contamination of water supplies caused by seepage from onsite sewage

disposal systems. Plans for homesite development should provide for the preservation of as many trees as possible.

This unit is in capability unit IVe-4 (22), irrigated and nonirrigated.

247—Surnuf cobbly loam, 30 to 50 percent slopes.

This very deep, well drained soil is on mountains. It formed in material weathered from gabbrodiorite. The native vegetation is mainly ponderosa pine, incense cedar, and California black oak with a dense understory of brush. Elevation is between 1,400 and 2,800 feet. The average annual precipitation is between 35 and 50 inches, the average annual air temperature is between 55 and 59 degrees F, and the average frost-free period is between 190 and 230 days.

Typically, the surface is covered with a mat of partially decomposed needles, leaves, twigs, and bark about 1/2 inch thick. The surface layer is reddish brown cobbly loam about 6 inches thick. The upper 9 inches of the subsoil is red cobbly clay loam. The lower 46 inches is red cobbly clay. In some areas the surface layer is very cobbly loam, very gravelly loam, or loam.

Included in this unit are small areas of Mildred and Sites soils and areas of a soil that is similar to the Surnuf soil but has bedrock at a depth of 40 to 60 inches. Included areas make up about 20 percent of the total acreage.

Permeability in the Surnuf soil is moderately slow. Available water capacity is about 6.5 to 8.5 inches. The effective rooting depth is 60 inches or more. The shrink-swell potential is moderate. Runoff is rapid, and the hazard of water erosion is severe.

Most areas of this unit are used for timber production. A few are watershed areas.

Ponderosa pine, incense cedar, and California black oak are the major tree species. On the basis of a 100-year site curve, the mean site index is 118 for ponderosa pine. The yield (CMAI) for ponderosa pine is 137 cubic feet per acre in a fully stocked stand of trees 40 years old. Productivity varies considerably on this soil because of plant competition. It generally is lower in areas that have dense stands of brush and on ridgetops.

The main concerns in producing and harvesting timber are the slope, seasonal wetness, the hazard of water erosion, difficulty in planting trees, and plant competition. Conventional methods of harvesting timber cannot be easily used because of the slope. Use of wheeled and tracked equipment when the soil is moist results in the formation of ruts, causes soil compaction, and can damage the roots of trees. Soil compaction may increase the rate of water runoff and decrease timber production. Unsurfaced roads and skid trails are slippery when wet, and they may be impassable during rainy periods. Roads

require suitable surfacing for year-round use. Rock for the construction of roads is not readily available in areas of this unit. Roads may fail and landslides may occur following deep soil disturbance. Roads should be confined to ridgetops where possible. When trees are harvested, management that minimizes the risk of erosion is essential. Erosion can be controlled by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Tree planting may be difficult because of the cobbles and gravel in the soil. Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling, which helps to eliminate unwanted weeds, brush, or trees. The characteristic understory plant community on this unit is mainly sticky whiteleaf manzanita, poison oak, toyon, and blue wildrye.

This unit is in capability subclass VIe (22), nonirrigated.

248—Trainer loam, 0 to 1 percent slopes, occasionally flooded. This very deep, somewhat poorly drained soil is on stream terraces. It formed in alluvium derived from mixed sources. The vegetation in uncultivated areas is mainly annual grasses and forbs with scattered valley oaks, cottonwoods, and shrubs. Elevation is between 30 and 85 feet. The average annual precipitation is between 18 and 22 inches, the average annual air temperature is between 61 and 63 degrees F, and the average frost-free period is between 270 and 290 days.

Typically, the surface layer is yellowish brown loam about 9 inches thick. It is mottled in the lower part. The upper 14 inches of the subsoil is brown loam. The next 13 inches is very pale brown, mottled sandy loam. The lower 12 inches is reddish yellow sandy loam. The substratum to a depth of 66 inches is reddish yellow sandy loam and coarse sandy loam.

Included in this unit are small areas of Columbia, Kimball, and San Joaquin soils. Also included are small areas of soils that are similar to the Trainer soil but have a seasonal water table within a depth of 20 inches. Included areas make up about 15 percent of the total acreage.

Permeability in the Trainer soil is moderate. Available water capacity is about 6.5 to 8.5 inches. The effective rooting depth is 60 inches or more. The seasonal high water table is at a depth of 36 to 60 inches throughout the year. Runoff is slow, and the hazard of water erosion is slight. This soil is subject to occasional, brief periods of flooding from December through April.

Most areas of this unit are used for rice. A few areas are used for wildlife habitat.

This unit is suited to rice. It is limited mainly by wetness

late in spring. The wetness is caused by flooding. Field ditches and pipe drops or other outlets are needed to remove excess surface water.

This unit provides habitat for wildlife, such as pheasant, waterfowl, birds of prey, other birds, and small fur-bearing mammals. Planting and maintaining shrubs and other woody plants in wet areas and in areas adjacent to drainageways improve the habitat.

This unit is in capability units IIw-2 (17), irrigated, and IIIw-2 (17), nonirrigated.

249—Tujunga sand, 0 to 1 percent slopes. This very deep, excessively drained soil is on flood plains. It formed in alluvium derived from mainly granitic sources. The native vegetation is mainly trees with an understory of dense brush. Elevation is between 20 and 100 feet. The average annual precipitation is between 18 and 22 inches, the average annual air temperature is between 61 and 63 degrees F, and the average frost-free period is between 270 and 290 days.

Typically, the surface layer is light yellowish brown sand about 6 inches thick. The upper 52 inches of the underlying material is light gray sand. The lower part to a depth of 62 inches is light gray gravelly sand. In some areas the surface layer is loamy sand or gravelly sand.

Included in this unit are small areas of Hollipah soils. Included areas make up about 10 percent of the total acreage.

Permeability in the Tujunga soil is rapid. Available water capacity is about 3 to 4 inches. The effective rooting depth is 60 inches or more. Runoff is very slow, and the hazard of water erosion is slight. This soil is protected by levees and is subject to rare flooding.

This unit is used for irrigated crops, mainly walnuts. It is suited to irrigated crops. It is limited mainly by the low available water capacity. Because the rate of water intake is rapid, sprinkler or drip systems are the best suited methods of irrigation. Because this soil is droughty, applications of irrigation water should be light and frequent. To prevent excessive water use and the leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the rate of water intake, and the needs of the crop. Properly regulating applications of fertilizer helps to prevent the contamination of ground water. Leaving crop residue on or near the surface helps to conserve moisture, maintain tilth, and control erosion.

This unit is in capability unit IVs-4 (17), irrigated, and capability subclass VIe (17), nonirrigated.

250—Tujunga gravelly sand, 0 to 2 percent slopes. This very deep, excessively drained soil is on flood plains. It formed in alluvium derived from mainly granite sources.

The native vegetation is mainly valley oaks with an understory of dense brush. Elevation is between 20 and 100 feet. The average annual precipitation is between 18 and 22 inches, the average annual air temperature is between 61 and 63 degrees F, and the average frost-free period is between 270 and 290 days.

Typically, the surface layer is light yellowish brown gravelly sand about 7 inches thick. The upper 48 inches of the underlying material is light gray sand. The lower part to a depth of 65 inches is light gray gravelly sand. In some areas the surface layer is sand.

Included in this unit are small areas of Holillipah soils and areas of Tujunga soils that are occasionally flooded. Included areas make up about 20 percent of the total acreage.

Permeability in the Tujunga soil is rapid. Available water capacity is about 3.0 to 4.5 inches. The effective rooting depth is 60 inches or more. Runoff is very slow, the hazard of water erosion is slight. This soil is protected by levees and is subject to rare flooding.

This unit is used as a source of sand and gravel. A few areas are used for wildlife habitat or irrigated orchard crops, mainly walnuts.

This unit is a good source of roadfill and of sand and gravel. The gravel generally is below a depth of 4 feet.

This unit is suited to wildlife habitat. Management consists primarily of protecting and maintaining the existing vegetation, especially in areas adjacent to streams.

This unit is suited to irrigated crops. It is limited mainly by the low available water capacity. Maintaining areas of trees and brush adjacent to streams is important for streambank stabilization and erosion control. Because the rate of water intake is rapid, sprinkler or drip systems are the best suited methods of irrigation. Because this soil is droughty, applications of irrigation water should be light and frequent. To prevent excessive water use and the leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the rate of water intake, and the needs of the crop. Properly regulating applications of fertilizer helps to prevent the contamination of ground water. Leaving crop residue on or near the surface helps to conserve moisture and maintain tilth.

This unit is in capability unit IVs-4 (17), irrigated, and capability subclass VI (17), nonirrigated.

251—Tujunga sand, 0 to 1 percent slopes, occasionally flooded. This very deep, excessively drained soil is on flood plains. It formed in alluvium derived from granitic sources. The vegetation in uncultivated areas is mainly annual grasses, forbs,

shrubs, and valley oaks. Elevation is between 55 and 90 feet. The average annual precipitation is between 18 and 22 inches, the average annual air temperature is between 61 and 63 degrees, and the average frost-free period is between 270 and 290 days.

Typically, the surface layer is light yellowish brown sand about 6 inches thick. The upper 52 inches of the underlying material is light gray sand. The lower part to a depth of 62 inches is light gray gravelly sand. In some areas the surface layer is loamy sand or gravelly sand.

Included in this unit are small areas of Holillipah soils. Included areas make up about 10 percent of the total acreage.

Permeability in the Tujunga soil is rapid. Available water capacity is about 3 to 5 inches. The effective rooting depth is 60 inches or more. Runoff is very slow, and the hazard of water erosion is slight. This soil is subject to occasional, brief periods of flooding from December through March.

This unit is used for irrigated crops, mainly walnuts. It is suited to irrigated crops. It is limited mainly by the low available water capacity and the hazard of flooding. Because the rate of water intake is rapid, sprinkler and drip systems are the best suited methods of irrigation. Because this soil is droughty, applications of irrigation water should be light and frequent. To prevent excessive water use and the leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the rate of water intake, and the needs of the crop. Properly regulating applications of fertilizer helps to prevent the contamination of ground water. Leaving crop residue on or near the surface helps to conserve moisture, maintain tilth, and control erosion.

This unit is in capability unit IIIw-2 (17), irrigated, and capability subclass VIw (17), nonirrigated.

252—Woodleaf gravelly loam, 3 to 15 percent slopes. This moderately deep, well drained soil is on mountains. It formed in material weathered from ultramafic rocks, dominantly with serpentine minerals. The native vegetation is mainly mixed conifers and hardwoods with an understory of brush, grasses, and forbs. Elevation is between 2,000 and 3,200 feet. The average annual precipitation is between 50 and 70 inches, the average annual air temperature is between 50 and 57 degrees F, and the average frost-free period is between 160 and 190 days.

Typically, the surface is covered with a mat of partially decomposed needles and twigs about 1/2 inch thick. The surface layer is dark yellowish brown and strong brown gravelly loam about 9 inches thick. The subsoil is yellowish red and dark brown very gravelly clay loam

about 19 inches thick. Hard serpentine bedrock is at a depth of 28 inches. In some areas the surface layer is stony or very gravelly loam.

Included in this unit are small areas of Sites and Mariposa soils and Rock outcrop. Also included are small areas of a soil that is similar to the Woodleaf soil but has bedrock at a depth of less than 20 inches. Included areas make up about 20 percent of the total acreage.

Permeability in the Woodleaf soil is slow. Available water capacity is about 4.0 to 4.5 inches. The effective rooting depth is restricted by weathered bedrock at a depth of 20 to 40 inches. The shrink-swell potential is moderate. Runoff is slow or medium, and the hazard of water erosion is slight.

This unit is used mainly for timber production. It also is a watershed.

Ponderosa pine, incense cedar, and Douglas-fir are the major tree species. On the basis of a 100-year site curve, the mean site index is 79 for ponderosa pine. The yield (CMAI) for ponderosa pine is 67 cubic feet per acre in a fully stocked stand of trees 40 years old.

The main concerns in producing and harvesting timber are seasonal wetness, plant competition, and low fertility resulting from an imbalance of calcium to magnesium. Calcium and other nutrients generally are deficient. Conventional methods of harvesting timber can be used. Use of wheeled and tracked equipment when the soil is moist results in the formation of ruts, causes soil compaction, and can damage the roots of trees. Soil compaction may increase the rate of water runoff and decrease timber production. Rock for the construction of roads is readily available in areas of this unit. Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling, which helps to eliminate unwanted weeds, brush, or trees. The characteristic understory plant community on this unit is mainly sticky whiteleaf manzanita, Jepson ceanothus, squirreltail, and blue wildrye.

This unit is in capability subclass VIIe (22), nonirrigated.

253—Woodleaf gravelly loam, 15 to 30 percent slopes. This moderately deep, well drained soil is on mountains. It formed in material weathered from ultramafic rocks with a large amount of serpentine minerals. The native vegetation is mainly mixed conifers and hardwoods with an understory of brush, grasses, and forbs. Elevation is between 2,000 and 3,200 feet. The average annual precipitation is between 50 and 70 inches,

the average annual air temperature is between 50 and 57 degrees F, and the average frost-free period is between 160 and 190 days.

Typically, the surface is covered with a mat of partially decomposed needles and twigs about 1/2 inch thick. The surface layer is dark yellowish brown and strong brown gravelly loam about 9 inches thick. The subsoil is yellowish red and dark brown very gravelly clay loam about 19 inches thick. Hard serpentine bedrock is at a depth of 28 inches. In some areas the surface layer is stony or very gravelly loam.

Included in this unit are small areas of Sites and Mariposa soils and Rock outcrop. Also included are small areas of a soil that is similar to the Woodleaf soil but has bedrock at a depth of less than 20 inches. Included areas make up about 15 percent of the total acreage.

Permeability in the Woodleaf soil is slow. Available water capacity is about 4.0 to 4.5 inches. The effective rooting depth is restricted by weathered bedrock at a depth of 20 to 40 inches. The shrink-swell potential is moderate. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for timber production. It also is a watershed.

Ponderosa pine, incense cedar, and Douglas-fir are the major tree species. On the basis of a 100-year site curve, the mean site index is 79 for ponderosa pine. The yield (CMAI) for ponderosa pine is 67 cubic feet per acre in a fully stocked stand of trees 40 years old.

The main concerns in producing and harvesting timber are seasonal wetness, the hazard of water erosion, plant competition, and a fertility imbalance. Conventional methods of harvesting timber can be used. Use of wheeled and tracked equipment when the soil is moist results in the formation of ruts, causes soil compaction, and can damage the roots of trees. Soil compaction may increase the rate of water runoff and decrease timber production. Rock for the construction of roads is readily available in areas of this unit. When trees are harvested, management that minimizes the risk of erosion is essential. Erosion can be controlled by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Minimizing the number of roads, trails, and landings and harvesting from preplanned skid trails can help to prevent excessive erosion and compaction. Scattering brush on skid trails helps to control erosion. Revegetating as soon as possible in disturbed areas also helps to control erosion. Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees. Competing vegetation can be controlled by properly preparing the site and by spraying,

cutting, or girdling, which helps to eliminate unwanted weeds, brush, or trees. A low ratio of calcium to magnesium inherited from serpentinitic bedrock lowers timber production because of a fertility imbalance. Calcium and other nutrients generally are deficient. The

characteristic understory plant community on this unit is mainly sticky whiteleaf manzanita, Jepson ceanothus, squirreltail, and blue wildrye.

This unit is in capability subclass VIIe (22), nonirrigated.

Prime Farmland

This section defines prime farmland and identifies the soils in the survey area that meet the requirements for prime farmland.

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation's short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is the land that is best suited to food, feed, forage, fiber, and oilseed crops. It may be cultivated land, pasture, woodland, or other land, but it is not urban or built-up land or water areas. It either is used for food or fiber crops or is available for those crops. The soil qualities, growing season, and moisture supply are those needed for a well managed soil to produce a sustained high yield of crops in an economic manner. Prime farmland produces the highest yields with minimal expenditure of energy and economic resources, and farming it results in the least damage to the environment.

Prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation. The

temperature and growing season are favorable. The level of acidity or alkalinity is acceptable. Prime farmland has few or no rocks and is permeable to water and air. It is not excessively erodible or saturated with water for long periods and is not frequently flooded during the growing season. The slope ranges mainly from 0 to 5 percent. Appendix A gives the specific criteria for prime farmland. More detailed information about prime farmland is available at the local office of the Natural Resources Conservation Service.

A recent trend in land use has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on lands that are less productive than prime farmland.

In Yuba County 74,537 acres, or about 18 percent of the total acreage, meets the requirements for prime farmland. The map units that are considered prime farmland are listed in table 6. On the soils included in the list, measures have been used to overcome a hazard or limitation, such as flooding, wetness, and droughtiness. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 5. The location is shown on the detailed soil maps at the back of this publication. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

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