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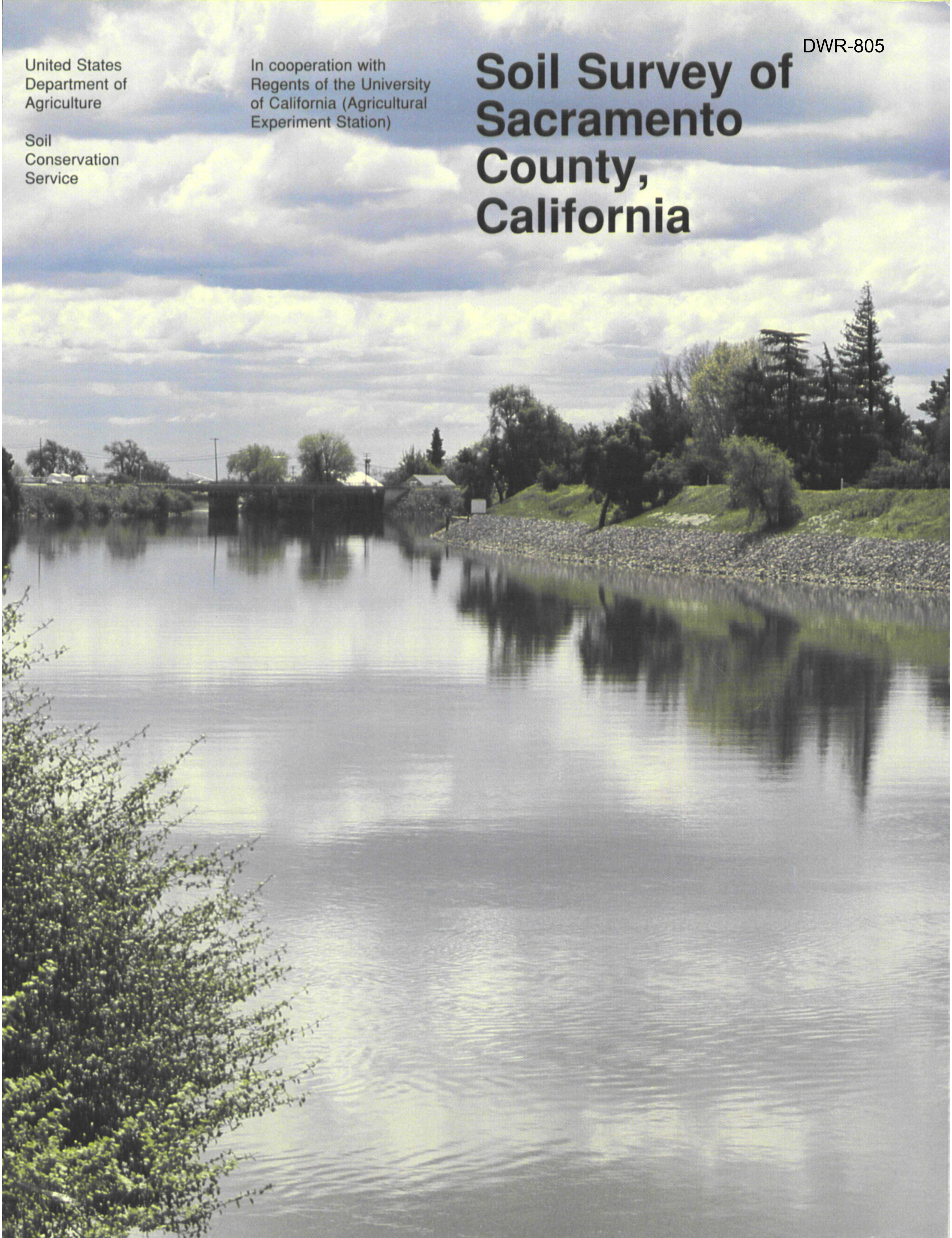
United States
Department of
Agriculture

Soil
Conservation
Service

In cooperation with
Regents of the University
of California (Agricultural
Experiment Station)

Soil Survey of Sacramento County, California



How To Use This Soil Survey

General Soil Map

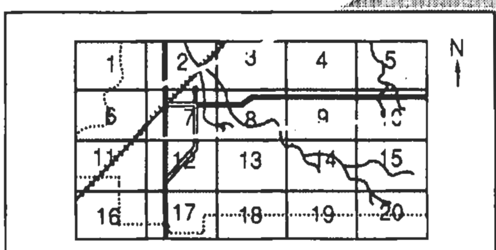
The general soil map, which is the color map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

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.

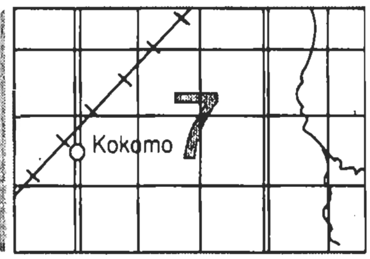
Detailed Soil Maps

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.

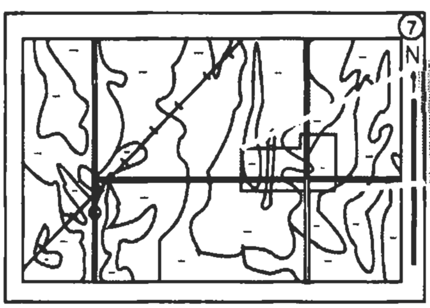


INDEX TO MAP SHEETS



MAP SHEET

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



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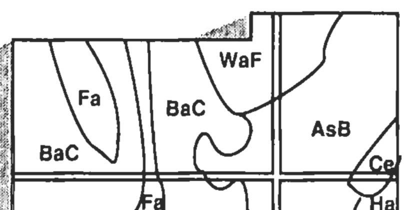

AREA OF INTEREST

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

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

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

Major fieldwork for this soil survey was completed in 1984. Soil names and descriptions were approved in 1987. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1985. This survey was made cooperatively by the Soil Conservation Service and the Regents of the University of California (Agricultural Experiment Station). It is part of the technical assistance furnished to the Lower Cosumnes, Florin, and Sloughhouse Resource Conservation Districts.

Cover: Levees for flood protection have been constructed along the many miles of channels and sloughs in the Delta area along the Sacramento River.

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Issued April 1993

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Foreword

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

This soil survey is designed for many different users. Farmers, ranchers, 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.

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

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

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Soil Survey of Sacramento County, California

By Arlene J. Tugel, Soil Conservation Service

Fieldwork by Arlene J. Tugel, Chuck S. Beutler, Jack Wright, William R. Reed, Wayne B. Sheldon, William T. Neikirk, and Thor D. Thorson, Soil Conservation Service

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

SACRAMENTO COUNTY is in the lower Sacramento Valley of California (fig. 1). The county has a total area of 639,557 acres, of which 629,088 is land and small areas of water. The remaining 10,469 acres is large areas of water that consist of rivers and sloughs more than ⅛ mile wide and reservoirs more than 40 acres in size. The eastern boundary of the survey area extends into El Dorado and Amador Counties. At the time the soil surveys of El Dorado and Amador Counties were made, a strip of land considered to be part of Sacramento County was not included in either report. This report extends beyond the present Sacramento County line to include this area and joins those soil surveys.

Sacramento County is bounded by Sutter and Placer Counties on the north, by El Dorado and Amador Counties on the east, and by San Joaquin County on the south. The southern boundary is along the Dry Creek flood plain, along the north fork of the Mokelumne River, and along the Mokelumne and San Joaquin Rivers. The western boundary is formed by the Sacramento River, Sutter Slough, and portions of Steamboat Slough. Elevation ranges from about 20 feet below sea level in the Delta area, which is in the southwestern part of the county, to about 830 feet above sea level in the foothills of the Sierra Nevada, which are in the northeastern part of the county. The city of Sacramento is the county seat as well as the state capital.

Figure 1.—Location of Sacramento County in California.

Irrigated cropland, livestock grazing, and urban development are the primary land uses in the survey area. In recent years the acreage used for crops and livestock grazing has been reduced by urban development. Most of the land in the county is privately owned.

Several earlier surveys included parts or all of this survey area. These are a survey the Sacramento area published in 1905 *(18)*, a survey of the Marysville area published in 1912 *(46)*, a reconnaissance survey of the Sacramento Valley published in 1916 *(16)*, a survey of the Sacramento-San Joaquin Delta area published in 1941 *(11)*, a survey of the entire county published in 1950 *(52)*, and a survey of the Sacramento area published in 1954 *(10)*. The present survey updates the earlier surveys. It provides additional information and has larger maps, which show the soils in greater detail.

General Nature of the County

The following paragraphs provide general information about Sacramento County. They describe history and development; water supply; agriculture; physiography, relief, and drainage; altered soils; and climate.

History and Development

This section was prepared by Maria S. Dudzak, Soil Conservation Service.

In the autumn of 1808, Gabriel Moraga camped in an area near the lower Feather River. He named the area "Sacramento," a Spanish word meaning "holy sacrament." The name soon came to refer to both the Feather River and the lower Sacramento River. In August of 1839, John A. Sutter arrived at the south bank of the American River, near the junction of the Sacramento and American Rivers. A few miles from this location, he later established the colony of New Helvetia. Sutter envisioned building a great agricultural empire in the central valley and began raising livestock and planting the first wheat crops in the area. In 1849, his son, John A. Sutter, Jr., founded the town of Sacramento on the east bank of the Sacramento River.

The discovery of gold at Sutter's sawmill in 1848 brought many fortune seekers to the area. Prior to this time, the population of Sacramento was sparse. After the gold rush of 1849, however, it had risen to almost 10,000. Sacramento soon became a major trade center and provided supplies for the gold fields of the Sierra Nevada.

Hoping to attain great wealth, many farmers turned to gold mining. As the number of miners increased and the surface gold supply diminished, people realized that food production provided a more stable and substantial income. Many farmers who had left their fields in search of gold returned to the land. Because of increased needs for food, the extent of cultivation increased dramatically. Wheat became one of the most important crops. Fruit crops, especially wine grapes, also became significant. Sacramento was becoming a major agricultural area.

In 1869, the first transcontinental railroad was completed. It linked Sacramento to the East Coast. The city was incorporated in 1850 and became the state capital in 1854. In 1980, it had a population of more than 281,000, making it the largest city in Sacramento County, which had a population of 783,000.

After a rapid increase in population and development in the late 1840's, Sacramento recognized the need to control river water. Disastrous floods occurred in 1849 and again in 1852. Levees were constructed along portions of the American and Sacramento Rivers. In many areas roads and buildings were elevated so that they would be protected from flooding. Areas continued to be inundated during periods of high water, however, because of inadequate levee construction.

Prior to 1850, crops had not been grown in the Delta region. The area was a vast tule marsh lying at approximately mean sea level. The Swamp and Overflow Act of 1850 transferred land titles from the Federal Government to the State of California and gradually to private individuals and organizations that reclaimed the Delta Islands *(47)*. The first levees were built by Chinese labor crews using only shovels and wheelbarrows as tools. These levees, which were made of surface material, were neither high enough nor strong enough to hold back the floodwaters of 1861 and 1862. After the development of the clamshell dredger in the late 1800's, larger and more stable levees were constructed along the Sacramento and American Rivers. While farming was difficult at first, high yields were encouraging. Reclamation efforts continued, and agriculture expanded.

Most of the Delta area, except for a few small islands, is used for crop production. Agricultural activity in the area has resulted in a subsidence of approximately 2 to 3 inches per year *(23)*. Many areas that were once at mean sea level are now 10 to 20 feet below sea level. A complex system of open and closed drains and pumps helps to lower the water table in these subsiding areas.

Agriculture was limited by a lack of water in areas of the county that were not on river bottoms. From the late 1800's to the 1940's, dryland farming was the most common kind of farming. In some areas windmills were used to distribute irrigation water. Wheat and hay were planted on extensive acreages, and a few small areas were used for wine grapes. Hilly areas were used mainly as rangeland. Some ponds were built and springs and seeps were developed to supply water for livestock. The pumping of ground water opened up more areas for irrigated agriculture. Gas engines in the early 1900's and electric motors in the 1920's were used to pump the water. The most significant advances in irrigated agriculture were made after World War II. Improvements in technology converted large areas to irrigated pasture, corn, and sorghum. Strawberries and grapes also became important crops in the Sacramento area.

During the late 1800's Sacramento became an important trading center for California's agricultural products, such as cotton, fruit, and vegetables. Agriculture developed rapidly in the county during the early 1900's as canning and food processing became the chief manufacturing activities. Industrial activity increased during the 1940's. Networks of railroads, highways, and waterways connected Sacramento to other trading centers. In 1963, the port of Sacramento was linked to the San Francisco Bay and the Pacific Ocean by the Sacramento River Deep Water Ship Channel, which allowed agricultural products to be transported efficiently to other areas by ships.

The management of the waters of the Sacramento and American Rivers was greatly affected by passage of the Central Valley Project. The plan had been developed in 1871, when a need for irrigation water was recognized. It was not until 1933, however, that the statewide plan was adopted. The most significant feature of this project affecting Sacramento concerned the construction of dams. Shasta Dam, which regulates the flow of the upper Sacramento River, was completed in 1944. Its construction has made the Sacramento River navigable throughout the year. The dam provides flood protection and irrigation water. It also has helped to stop and reverse the encroachment of salinity in the Sacramento-San Joaquin Delta by maintaining increased summer flows. Saltwater intrusion eastward into the Delta still occurs but only in years of low riverflow. Nimbus and Folsom Dams, which regulate the flow of the American River and provide hydroelectric power, were completed in the 1950's. Folsom South Canal, which diverts water from the American River at Nimbus Dam, was completed in the 1970's.

Water Supply

Water for irrigation and domestic and industrial uses is obtained from wells or from rivers or sloughs. Folsom South Canal extends from the American River at Lake Natoma to the Rancho Seco Nuclear Power Plant, in the southeastern part of the county. A distribution system for the canal water has not been constructed, but some of the canal water is diverted directly into the Cosumnes River for use as irrigation water in downstream areas.

Ground-water levels in wells have declined throughout the county. The annual rate of decline has ranged from an average of 1 foot in some areas to 3 feet in others. Ground-water overdraft has been greatest in areas between Rio Linda and Carmichael, west of Elk Grove and north of Galt *(37)*.

Agriculture

In 1984, approximately 200,000 acres in Sacramento County was used for crops and pasture and about 100,000 acres as rangeland *(36)*. Livestock and dairy and poultry products are the leading commodities.

About 92 percent of the cropland in the county is irrigated. Corn is grown on 50,000 acres, wheat on 20,000 acres, rice on 17,000 acres, and silage corn for the dairy industry on 8,000 acres. Other important field crops are alfalfa hay, sugar beets, and safflower. Dryland field crops, primarily wheat, oat hay, and native hay, are grown on about 15,000 acres in the county. About 30,000 acres is used as irrigated pasture. The main fruit crops are pears and wine grapes. These crops are all irrigated. They are grown on about 11,000 acres in the county. Seed crops, primarily clover, are grown on about 9,000 acres. About 8,000 acres is used for vegetable crops, mainly tomatoes grown for processing. Other vegetable crops are asparagus and sweet corn.

The acreage used for crops and pasture declined by 60,000 acres between 1974 and 1984. Urbanization is the main reason for the decline. As the Sacramento metropolitan area grew, the acreage available for crops and pasture decreased. A decreasing demand for crops, especially for field crops, also contributed to the decline.

Since the early days of agriculture in Sacramento County, physical, cultural, and economic factors have caused significant changes in the types of crops grown. While many of the crops commonly grown in the past are still grown, some have become almost insignificant. When agriculture was first introduced to the survey area, for instance, dryland crops and rangeland were dominant and fruit and vegetable crops were nearly insignificant. Reclamation of the Delta area, advances in irrigation technology, and developing markets, however, have resulted in the production of a wider variety of crops.

Some of the crops that were grown extensively in the past but are now grown on a smaller acreage are barley; oats; fruit and nut trees, including plum, peach, almond, and citrus; hops; table grapes; asparagus; celery; tomatoes; beans; spinach; and strawberries. Field corn, rice, and silage corn were less significant in the first half of this century but are now of major significance. The acreages of some significant crops, such as alfalfa, wheat, pears, sugar beets, and safflower, have fluctuated but have remained substantial since the late 1920's.

Physiography, Relief, and Drainage

Sacramento County is made up of three physiographic regions. The Sierra Nevada foothills are along the northeast edge of the county. They make up about 6 percent of the survey area. The lower Sacramento Valley extends through the western and central parts of the county from north to south. It makes up about 83 percent of the survey area. The Sacramento-San Joaquin Delta is in the southwestern part of the county. It makes up about 11 percent of the survey area.

The foothills of the Sierra Nevada are undulating to hilly. They range from 140 to 830 feet in elevation. The steepest areas are at elevations of more than 400 feet.

The lower Sacramento Valley is dominantly nearly level to gently rolling, although some areas in the eastern part are rolling to hilly. Elevation ranges from about sea level in the southwestern part of the region to about 400 feet above sea level in the eastern part.

The lower Sacramento Valley has many landforms. Nearly level flood plains are along the Sacramento, American, and Cosumnes Rivers and along the smaller creeks. Basin and terrace remnant landforms are in the American Basin, which is north of the American River and east of the Sacramento River. In the early 1900's, the American Basin was the site of intermittent lakes, such as Bush Lake. These lakes filled with floodwater that spread across the basin before the area was protected by levees. A low stream terrace is a minor landform in upstream areas along the American River and along some of the small creeks in the eastern part of the region. The most extensive area is the main valley floor, which extends from the northern county line to the southern county line. It consists primarily of nearly level, low terraces, basin rims, and local basins. The extensive areas have slopes of less than 1 percent. The basin rims and local basins extend along the western edge of the main valley floor from south of Sacramento to the Cosumnes River. Intermediate and high terraces are in the eastern part of the survey area. They are dissected in most areas and are nearly level to gently rolling. Hills are in areas where dissection of the high terraces is so complete that the original surface of the terrace no longer exists. These hills are dominantly gently rolling to hilly, but a few are steep.

The Sacramento-San Joaquin Delta area is made up of many islands and tracts of land surrounded by water on three sides. This area has been reclaimed and is protected from flooding by levees. Much of the area is at or below sea level. Elevations range from 20 feet below to 10 feet above sea level. The islands are commonly dish shaped, having a natural levee on the higher land around the perimeter and a backswamp or reclaimed freshwater marsh in the low central area. Recent flood-plain splays are in areas where the manmade levee has broken. The flood plain in the Sacramento-San Joaquin Delta area consists of nearly level natural levees, flood-plain splays, backswamps, and freshwater marshes. The freshwater marshes and some of the backswamp areas consist of thick deposits of peat, which not only subside naturally but also subside at a greater rate when they are drained and allowed to dry. Since reclamation began, the total subsidence in some areas is estimated to be as much as 20 feet.

The lower Sacramento Valley and the foothills of the Sierra Nevada have patterns of surface drainage and microrelief. One drainage pattern consists of meandering or deranged, intermittent channels. In the areas of deranged drainage patterns, the channels double back on each other or short segments terminate at small, closed basins. These areas often fill with water during the spring and are identified as vernal pools *(53)*. These pools are most common in nearly level to gently sloping areas and are less numerous in the steeper areas. As the slope increases, the deranged drainage pattern becomes more aligned downslope, meanders less, and becomes integrated. Poorly integrated drainage generally occurs in nearly level areas on low terraces, hills, and high terraces where the surface has not been modified by land leveling or grading activities.

Areas that are characterized by mound-intermound microrelief, also referred to as patterned ground, are common in the county (fig. 2). They are mainly in areas that have a deranged drainage pattern. In some areas distinguishing between the patterned ground and the deranged drainage pattern is difficult. The mounds are convex, are generally circular, and are commonly 10 to 20 feet across. The intermound areas, or adjacent depressions, surround the mounds. They are connected and form a drainage network. The mounds are commonly 0.5 foot to 3.0 feet higher in elevation than the adjacent intermound areas. The height of the mounds is greatest in nearly level to gently sloping areas and decreases as the slope increases. Most of the mounds have slopes of less than 15 percent. In areas where slopes are 8 to 15 percent, the mounds generally are aligned in rows up and down the slope.

The mound-intermound topography also is known as "hogwallows" *(24, 25, 26)* or as Mima mounds *(3)*. In the colder climates this type of relief is known as periglacial patterned ground *(20, 31)*. This

Figure 2.—Mound-intermound topography in an area of Amador-Gillender complex, 2 to 15 percent slopes.

microtopography typifies the low terraces, hills, high terraces, and small areas of the foothills. It occurs in areas where the soil has a layer that restricts drainage, such as a claypan, duripan, or shallow bedrock, and in areas where the surface has not been smoothed or leveled.

The natural drainageways in Sacramento County generally flow from east to west or to the southwest. The Sacramento River, which is the major river in the county, however, flows from north to south. Some watersheds extend east of the survey area into the Sierra Nevada. These watersheds contribute to the streamflow of the American and Cosumnes Rivers and of Carson Creek, Deer Creek, Laguna Creek, and, along the southern boundary of the county, Dry Creek. Water flows in the American and Cosumnes Rivers throughout the year. In some years of low rainfall, portions of the channel of the Cosumnes River are dry. Most creeks in the Sierra Nevada and Sacramento Valley regions are intermittent. Dry Creek in the northern part of the county, Arcade Creek, Willow Creek, Morrison Creek, Buffalo Creek, and portions of Deer Creek, however, flow throughout the year.

The numerous sloughs and channels that meander through the Delta area are influenced by tides. Tides extend as far as the mouth of the Cosumnes River and upstream in the Sacramento River as far north as the city of Sacramento. The major rivers that form county boundaries or meander through the Sacramento-San Joaquin Delta are the Sacramento, the North Mokelumne, the Mokelumne, and the San Joaquin.

Upstream dams provide flood protection along all of the rivers in Sacramento County, except for the Cosumnes River. Waterflow in the Sacramento, North Mokelumne, and San Joaquin Rivers is controlled by dams outside the survey area. Folsom Dam and Nimbus Dam control and maintain waterflow in the American River. Folsom Dam creates Folsom Lake, the only major reservoir in the county.

In addition to dams, manmade levees provide flood protection. These levees have been constructed along many channels, including those of the Sacramento, American, and Cosumnes Rivers, to protect the adjacent areas from flooding. If the levees had not been constructed, the flood plains along rivers and creeks in the Sacramento Valley would be flooded after periods of heavy rainfall in winter and early spring. Also, most of the Delta area would be inundated for most of the year because of the subsidence of highly organic soils *(4)*.

Altered Soils

Human activities have had a significant influence on many soils in Sacramento County. Soils used for cultivation and urban development have been modified. In many areas they have been highly altered. Gold dredging destroyed some soils while creating new ones in the process. Drainage systems have been used to lower high water tables and thus have altered the natural wetness of many soils. Levees, which protect areas from flooding, prevent the deposition of new sediments on flood plains.

Extensive leveling also has occurred in some areas of Sacramento County. For example, major leveling of soils on low terraces has produced cut and filled areas. Cuts have removed the original surface layer. The cut areas, which consist mainly of truncated San Joaquin soils, are Durixeralfs. The filled areas, which were once low areas, now consist of as much as 20 inches of physically mixed soil material called Xerarents.

Many soils in urban areas have been drastically altered. For example, more than 23,000 acres of undulating to rolling areas north of the American River, near areas of Fiddyment soils, have been significantly reshaped and graded for urban uses. These areas consist of Urban land-Xerarents-Fiddyment complex, 0 to 8 percent slopes, and Xerarents-Urban land-Fiddyment complex, 8 to 15 percent slopes. Siltstone generally underlies the soils in both map units.

Gold dredging and hydraulic mining activities also have affected many soils in the survey area. Dredging took place intermittently along the American River until 1962 *(54)*. It destroyed more than 20,000 acres of natural soils by excavating the sediments, passing them over a gold-recovery apparatus, and discharging gravel and cobbles in parallel mounds. The resulting dredge tailings are Xerorthents. They have large amounts of gravel and cobbles and have fine-earth material in some layers. Many dredge tailings, or mounds, have low areas between them. Some low areas of older dredge tailings support cottonwoods, berry vines, and annual grasses. Most of the excessively drained mounds, however, support only sparse annual grasses. The most recently deposited spoil piles support very little, if any, vegetation.

Hydraulic mining occurred in the county or in the watersheds of rivers that flow through the county until 1905 *(34)*. These mining activities produced great quantities of sediments that were carried downstream and deposited on many flood plains *(14)*. The parent material of the Sailboat soils in the Delta area was derived from hydraulic mining and gold dredging debris. Also, some of the parent material of Columbia and Cosumnes soils probably results from gold mining activities.

Orthents and Xeropsamments also formed through human activities. Orthents formed in fill material used to elevate land and thus prevent flooding. Xeropsamments formed in sandy material dredged from channels in the Delta area and dumped onto the adjacent land.

Drainage systems have altered the natural wetness of soils on more than 135,000 acres in the county *(6)*. A soil that is saturated for prolonged periods has morphological features, such as mottles or gray colors in the zone of saturation. Where artificially drained, the soil retains these features even though the water table may be lower or may be high for a shorter period. In the American Basin along the Sacramento River and in the Delta area, water tables have been lowered and are managed by a system of field ditches, collector drainage ditches, and pumps that return drainage water to an adjacent channel. In areas along the Cosumnes River, the water table has been lowered to a depth of more than 6 feet as a result of ground-water overdraft.

Climate

By William R. Reed, soil scientist, Soil Conservation Service.

The climate of Sacramento County is mild. It is characterized by hot, dry summers and cool, moist winters. The county is shielded from the extremes of the continental climate to the east by the Sierra Nevada. To the west, the Coast Range has a moderating effect on moisture-laden weather systems from the eastern Pacific. In summer the Coast Range also keeps cool, moist air from the Pacific Ocean from reaching most of the valley, except through the Carquinez Straits. In summer a semipermanent offshore high pressure area keeps virtually all weather systems from entering the county, producing hot, clear weather. A southward shift of the high pressure area in winter allows weather systems to enter the county, producing cool, moist weather.

Tables 1, 2, and 3 give data on temperature and precipitation for the survey area as recorded at the cities of Sacramento, Folsom, and Antioch, respectively *(21)*.

The highest temperature ever recorded in Sacramento was 114 degrees F in July 1925, and the lowest was 17 degrees in December 1932. A cool, moist wind from the Pacific Ocean comes through the Carquinez Straits and up the Sacramento Valley, moderating the maximum temperatures in summer. The differences in July between the average daily maximums of 91.2 degrees at Antioch in the Delta and 97.1 degrees at Folsom shows the cooling effect of the summer winds in the Delta. In summer a high pressure system occasionally produces north winds and blocks the cool Delta breeze, producing low-humidity heat waves that usually last 3 to 5 days.

Growing degree days are shown in tables 1, 2, and 3. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature of 50 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.

Table 4 shows the probable dates of freezing temperatures and the length of the growing season for 32- and 28-degree base temperatures. Growing seasons with a 32-degree base temperature range from 230 to 300 days in Sacramento County. The areas of the county that have fewer than 250 days in the growing season are near Galt and Citrus Heights.

The average yearly precipitation in the survey area is shown in figure 3 *(5)*. Precipitation is lowest in the Delta and the western parts of the county, averaging 13 to 17 inches, because of the rain-shadow effect of the Coast Range.

Rainfall totals increase somewhat as elevation increases in the northeastern and eastern parts of the county. The total amount of annual rainfall is almost 24 inches at Folsom. About 80 percent of the annual rainfall occurs from November to March. Of this, 55 percent falls in December, January, and February. An average of only about 1 percent of the annual rainfall occurs in June, July, and August. The greatest 12-month rainfall ever recorded at Sacramento was 37.49 inches in 1982-83, and the least was 4.71 inches in 1850-51. Because winter and spring storm systems are modified by the Coast Range, intensive rainfall is rare in Sacramento County. The greatest 1-day precipitation was 7.24 inches in April 1880, and the greatest amount in 1 hour was 1.65 inches in April 1935. Snowfall is rare. When it does fall, the snow melts rapidly.

Thunderstorms and hail occur infrequently in Sacramento County, and tornadoes are virtually unknown. Most thunderstorms occur in late winter and early spring. The average number of thunderstorms per year for the period 1978 to 1981 was 4.2. The storms typically include hail, which usually does not damage crops.

Humidity is high during the moist winter months but is quite low on hot summer afternoons. Because of the low humidity, evapotranspiration is high during the growing season and soil moisture reserves drop rapidly. Potential evapotranspiration for a growing season above 32 degrees is the rate at which water is lost to the atmosphere from a soil that has a permanent plant cover. The rate is 31.1 inches at Sacramento and 31.4 inches at Folsom. Actual evapotranspiration from a soil that has the capacity to hold 4 inches of available water in the root zone is 10.9 inches at Antioch, 11.45 inches at Sacramento, and 12.5 inches at Folsom. It is considered to be more than 12 inches for interpretations relating to dryland crops.

Late in fall and early in winter, cold air from the surrounding mountains and radiational cooling produce fog. Under stable atmospheric conditions, the fog can persist for days or weeks during December and January. On an average of 35 days a year at Sacramento, dense fog occurs during some part of the day. Lighter fogs that dissipate early in the day are common during the cool, wet season, especially along the rivers and sloughs.

The prevailing winds are from the southwest, and the average windspeed is 8.2 miles per hour. High winds occur infrequently, usually in winter, and are associated with Pacific storm systems. High winds that damage crops are rare during the growing season.

At Sacramento, the sun shines an average of 46 percent of the time possible in December and January and an average of 96 or 97 percent during the nearly cloudless days of July and August. Sacramento has an annual average of 192 clear days, 74 partly cloudy days, and 99 cloudy days.

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 or segment of the landscape. By observing the soils and miscellaneous areas in the survey area and relating their position to

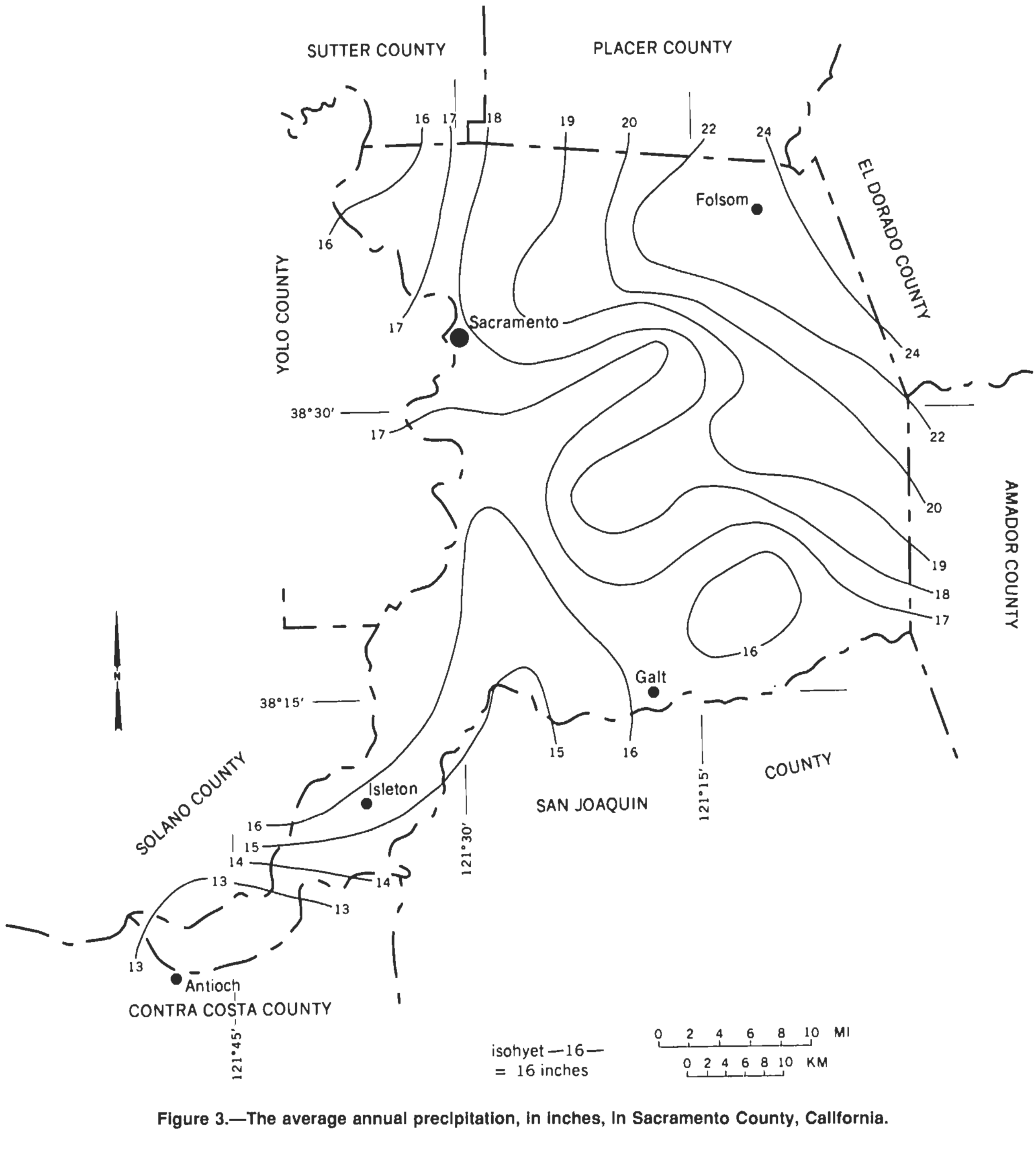

Figure 3.—The average annual precipitation, in inches, in Sacramento County, California.

specific segments of the landscape, 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.

Individual soils on the landscape commonly merge gradually into one another as their characteristics gradually change. To construct an accurate 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, soil 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.

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 soils or miscellaneous areas making up one 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 or miscellaneous areas can be identified on the map. Likewise, areas that 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 names and delineations of the map units on the general soil map of this county do not fully agree with those on the maps of adjacent survey areas. Differences are the result of a better knowledge of soils, modifications in series concepts, and variations in the intensity of mapping or in the extent of the soils in the survey areas. In areas used for urban development, differences also result from the alteration of natural soils by extensive shaping and grading.

The general map units in this survey 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.

Soil Descriptions

Very Deep, Nearly Level to Steep Soils in Areas of Dredge Tailings

These soils are in the northeastern part of the county, near the American River. They are in areas that have been dredged for gold. They make up about 3 percent of the survey area. Elevation ranges from about 80 to 400 feet above sea level. The average annual precipitation ranges from 18 to 24 inches, and the average annual temperature is about 61 degrees F. The average frost-free period ranges from 250 to 285 days. These soils are very deep and are excessively drained and somewhat excessively drained. They are extremely cobbly or extremely gravelly and may have strata of loose gravel or cobbles. The soils are used mainly for wildlife habitat or urban development.

1. Xerorthents

Excessively drained and somewhat excessively drained soils

This map unit is in areas of dredge tailings near the American River. The soils formed in material that has a high content of gravel and cobbles derived from mixed rock sources. The material was deposited as tailings during mining activities. Slope ranges from 0 to 50 percent.

This unit makes up about 3 percent of the survey area. It is about 77 percent Xerorthents and 23 percent soils of minor extent.

Xerorthents are very deep. These soils are extremely cobbly or extremely gravelly and in some areas have strata of loose gravel or cobbles.

Minor in this unit are the well drained Red Bluff and moderately well drained Redding soils on high terraces. Red Bluff soils are very deep and have a subsoil of clay loam and gravelly clay. Redding soils have a gravelly claypan and are moderately deep to a strongly cemented hardpan.

This unit is used mainly for wildlife habitat or urban development. In the areas used for urban development, the main limitations are the slope, rapid or very rapid permeability, and the content of gravel and cobbles. Extensive grading and leveling are required to prepare the unit for urban development. Because of the rapid or very rapid permeability, the effluent from onsite sewage disposal systems can contaminate ground water. Cutbanks of trenches and excavations are subject to sloughing. Topsoil is required in areas used for landscape plants.

Very Deep, Nearly Level Soils in Freshwater Marshes and Backswamps, on Natural Levees, and on Low and High Flood Plains

These soils are in the lowest landscape positions in the county. They are in the Delta area and adjacent to the major rivers and channels in the county. They make up about 19 percent of the survey area. Elevation ranges from about 20 feet below sea level on Brannan Island to 140 feet above sea level along the Cosumnes River near Sloughhouse. The soils either are protected by levees or are subject to flooding. The average annual precipitation ranges from 13 to 20 inches, and the average annual temperature is 59 to 61 degrees F. The average frost-free period ranges from 250 to 300 days.

These soils are very deep and are very poorly drained to somewhat poorly drained. Most have a high water table, which is controlled by pumping of water to drainage outlets. Both mineral and organic soils are in this group. Most of the soils are stratified. The surface layer of the soils in marshes and backswamps is commonly muck, mucky clay, clay loam, or clay. The surface layer of the soils on natural levees and flood plains is commonly silt loam, loam, sandy loam, or clay.

These soils are used mainly for irrigated crops or for wildlife habitat. A few areas are used for irrigated hay and pasture or for urban development.

2. Gazwell-Rindge

Very poorly drained, highly organic mineral soils and organic soils that have a high water table throughout the year and are protected by levees

This map unit is in backswamps along the edge of reclaimed freshwater marshes and in reclaimed freshwater marshes in the Delta area. The soils formed in alluvium underlain by decomposed hydrophytic plant remains and in hydrophytic plant remains. The alluvium is derived from mixed rock sources. The unit is protected against flooding by levees and large upstream dams. Because of seepage from nearby channels, the soils have a fluctuating water table throughout the year. Slope ranges from 0 to 2 percent.

This unit makes up about 6 percent of the survey area. It is about 51 percent Gazwell soils, 29 percent Rindge soils, and 20 percent soils of minor extent. The major soils do not occur together in all delineations.

Gazwell soils are in backswamps along the edge of freshwater marshes. They are very deep. Typically, the surface layer is mucky clay. Below this is a buried soil of peat and mucky peat. A fluctuating high water table is at a depth of 18 to 36 inches in winter and early spring and at a depth of 36 to 60 inches during the rest of the year. The water table is controlled by pumping of water to drainage outlets. These soils are subject to rare flooding.

Rindge soils are in reclaimed freshwater marshes. These organic soils are very deep. Typically, the surface layer is muck. It is underlain by peat. A fluctuating high water table is at a depth of 18 to 36 inches in winter and early spring and at a depth of 36 to 60 inches during the rest of the year. The water table is controlled by pumping of water to drainage outlets. The hazard of soil blowing is moderate or severe. These soils are subject to rare flooding.

Minor in this unit are Columbia and Egbert soils, Medisaprists, and Sailboat soils. Columbia soils are silt loam in the upper part and are underlain by stratified sand to silt loam. They are in the slightly higher landscape positions that have not subsided. Egbert soils formed in material that has a moderate content of organic matter. Medisaprists consist of peat that commonly is stratified with alluvium. They are in unreclaimed tidal marshes. Sailboat soils are silt loam in the upper part and are underlain by stratified clay loam and loam. They are on natural levees on low flood plains.

This unit is used mainly for irrigated crops or for wildlife habitat. The major soils are suited to irrigated crops. The main limitations are subsidence, the depth to a fluctuating high water table, and the hazard of soil blowing. These soils are commonly subirrigated. Perennial, deep-rooted crops are affected by the high water table. Drainage ditches and pumps are needed to maintain the water table below the rooting depth of the crops.

3. Sailboat-Scribner-Cosumnes

Somewhat poorly drained and poorly drained soils that have a seasonal high water table and are protected by levees

This map unit is on natural levees, the edges of backswamps, and low flood plains adjacent to the Sacramento River and to channels and sloughs in the Delta area. The soils formed in alluvium derived dominantly from mixed rock sources. The unit is protected against flooding by levees and large upstream dams. Because of seepage from nearby channels, the soils have a fluctuating high water table in winter and early spring. Slope ranges from 0 to 2 percent.

This unit makes up about 6 percent of the survey area. It is about 22 percent Sailboat soils, 22 percent Scribner soils, 20 percent Cosumnes soils, and 36 percent soils of minor extent. The major soils are not together in all delineations.

Sailboat soils are on natural levees on low flood plains. They are very deep and somewhat poorly drained. Typically, the surface layer is silt loam. The underlying material is stratified clay loam and loam. The seasonal high water table is maintained at a depth of 36 to 60 inches by pumping of water to drainage outlets. These soils are subject to rare flooding.

Scribner soils are on the edges of backswamps. They are very deep and poorly drained. Typically, the surface layer is clay loam. The underlying material is stratified clay loam and sandy clay loam. The seasonal high water table is maintained at a depth of 36 to 60 inches by pumping of water to drainage outlets. These soils are subject to rare flooding.

Cosumnes soils are on low flood plains. They are very deep and somewhat poorly drained. Typically, the surface layer is silt loam. The underlying material is stratified silty clay loam and clay. The seasonal high water table is maintained at a depth of 36 to 60 inches by pumping of water to drainage outlets. These soils are subject to rare flooding.

Minor in this unit are Egbert, Gazwell, Sailboat Variant, and Valpac Variant soils. Egbert soils are on high flood plains and in backswamps. Gazwell soils have a high content of organic matter. They are in backswamps. Sailboat Variant and Valpac Variant soils are underlain by material that has a high content of organic matter. They are on low flood-plain splays.

This unit is used mainly for irrigated crops or for wildlife habitat. A few areas are used for urban development.

The major soils are suited to irrigated crops. The main limitations are the depth to a seasonal high water table and moderately slow or slow permeability. Most perennial, deep-rooted crops are affected by the high water table.

In the areas used for urban development, the main limitations are the depth to a seasonal high water table and the hazard of flooding. The Cosumnes soils also are limited by a high shrink-swell potential, low strength, and slow permeability. Because of the high water table, the effluent from onsite sewage disposal systems can contaminate ground water. Properly designing foundations, buildings, and roads helps to prevent the structural damage caused by shrinking and swelling and low strength in the Cosumnes soils. Because of the slow permeability in the Cosumnes soils, onsite sewage disposal systems may fail. Drainage ditches and pumps are needed to maintain the water table below the rooting depth of plants.

4. Egbert-Valpac

Somewhat poorly drained and poorly drained soils that have a high water table throughout the year or during part of the year and are protected by levees

This map unit is on high flood plains, in backswamps, and on the natural levees of high flood plains, primarily adjacent to the Sacramento River in the central part of the county and in the northern part of the Delta area. These soils formed in alluvium derived dominantly from mixed rock sources. The unit is protected against flooding by levees and large upstream dams. Because of seepage from nearby channels, the soils have a fluctuating water table throughout the year or a seasonal high water table in winter and early spring. Slope ranges from 0 to 2 percent.

This unit makes up about 4 percent of the survey area. It is about 49 percent Egbert soils, 17 percent Valpac soils, and 34 percent soils of minor extent. The major soils are not together in all delineations.

Egbert soils are on high flood plains and in backswamps. They are very deep and poorly drained. Typically, the surface layer is clay. It is underlain by stratified clay loam and sandy clay loam. The seasonal high water table is maintained at a depth of 36 to 60 inches throughout the year by pumping of water to drainage outlets. These soils are subject to rare flooding.

Valpac soils are on the natural levees of high flood plains. They are very deep and somewhat poorly drained. Typically, the surface layer is loam. The underlying material is stratified sandy loam to clay loam. The seasonal high water table is maintained at a depth of 36 to 60 inches by pumping of water to drainage outlets. These soils are subject to rare flooding.

Minor in this unit are Laugenour and Sailboat soils. Laugenour soils are loam in the upper part and stratified fine sandy loam to loam in the lower part. They are on natural levees and low flood-plain splays. Sailboat soils are silt loam in the upper part and stratified clay loam and loam in the lower part. They are on natural levees on low flood plains.

This unit is used mainly for irrigated crops or for wildlife habitat. A few areas are used for urban development.

The major soils are suited to irrigated crops. The main limitations in areas of the Egbert soils are the fine texture of the surface layer, slow permeability, and the depth to a fluctuating water table. The seasonal high water table is a limitation in areas of the Valpac soils. Most perennial, deep-rooted crops are affected by the high water table. Drainage ditches and pumps are needed to maintain the water table below the rooting depth of plants.

In the areas used for urban development, the main limitations are slow permeability, a high shrink-swell potential, low strength, the hazard of flooding, and the depth to a seasonal high water table. Because of the slow permeability and depth to the water table, the effluent from onsite sewage disposal systems can contaminate ground water. Properly designing foundations, buildings, and roads helps to prevent the structural damage caused by shrinking and swelling and low strength in the Egbert soils.

5. Columbia-Cosumnes

Somewhat poorly drained soils that are subject to flooding or are protected by levees

This map unit is on narrow, low flood plains along the Cosumnes River and other streams. The soils formed in alluvium derived dominantly from mixed rock sources. About half of the unit is subject to flooding, and half is protected by levees. Slope ranges from 0 to 2 percent.

This unit makes up about 3 percent of the survey area. It is about 52 percent Columbia soils, 25 percent Cosumnes soils, 11 percent Sailboat soils, and 12 percent other soils of minor extent. The major soils are not together in all delineations.

Columbia soils are on narrow, low flood plains. They are very deep. Typically, the surface layer is sandy loam. The underlying material is stratified sandy loam, silt loam, and loam. In some areas the soils are underlain by clay. The depth to a seasonal high water table is more than 72 inches. These soils are occasionally flooded in some areas but are rarely flooded in areas that are protected by levees.

Cosumnes soils are on narrow, low flood plains commonly downstream from the Columbia soils. They are very deep. Typically, the surface layer is silt loam. The underlying material is stratified silty clay loam and clay. The depth to a seasonal high water table is more than 72 inches. These soils are occasionally flooded in some areas but are rarely flooded in areas that are protected by levees.

Minor in this unit are Sailboat soils. These soils have a surface layer of silt loam. This layer is underlain by stratified silt loam, clay loam, and loam.

This unit is used mainly for irrigated crops, for irrigated hay and pasture, or for wildlife habitat. The major soils are suited to irrigated crops and irrigated hay and pasture. The main management concern is the hazard of flooding. The Cosumnes soils and some areas of the Columbia soils also are limited by slow permeability, which affects most perennial, deep-rooted crops. In areas that are not protected by levees, channeling, deposition, and crop damage can occur during periods of flooding.

Urban Land and Very Deep, Nearly Level Soils on High Flood Plains, Low Stream Terraces, and Low Terraces

These soils are adjacent to the American River, the Cosumnes River, and other streams. They make up about 4 percent of the survey area. Elevation ranges from about 30 feet above sea level near Sacramento to about 200 feet above sea level near Lake Natoma. Most of the soils are protected against flooding by levees or upstream dams, but some are subject to flooding. The average annual precipitation is 17 to 23 inches, and the average annual temperature is 60 to 62 degrees F. The average frost-free period ranges from 250 to 300 days.

These soils are well drained. The soils on high flood plains are fine sandy loam throughout. The soils on terraces have a surface layer of silt loam or loam and a subsoil of silt loam or clay loam.

The areas along the American River are used mainly for urban or recreational development or for wildlife habitat. The other areas of these soils are used mainly for irrigated crops or for wildlife habitat.

6. Rossmoor-Vina

Well drained soils that are protected by levees or are subject to flooding

This map unit is on narrow, high flood plains adjacent to the American River, the Cosumnes River, and other streams. The soils formed in alluvium derived dominantly from mixed and granitic rock sources. About one-third of the unit is subject to flooding, and two-thirds is protected by levees or by large upstream dams, which have reduced the hazard of flooding along the American River. Slope ranges from 0 to 2 percent.

This unit makes up about 2 percent of the survey area. It is about 25 percent Rossmoor soils, 13 percent Vina soils, 11 percent Xerofluvents, 9 percent Coyotecreek soils, 9 percent Reiff soils, 5 percent Liveoak soils, and 28 percent other soils of minor extent. The major soils do not occur together in all delineations.

Rossmoor soils are on narrow, high flood plains. They are very deep. Typically, the surface layer is fine sandy loam. The underlying material is a paler fine sandy loam. These soils are subject to rare flooding.

Vina soils are on narrow, high flood plains. They are very deep. Typically, the surface layer is fine sandy loam. The underlying material is weakly stratified loam and sandy loam. These soils generally are occasionally flooded. Where protected by levees, however, they are rarely flooded.

Minor in this unit are Xerofluvents and Coyotecreek, Reiff, and Liveoak soils, all of which are occasionally flooded. The well drained to excessively drained Xerofluvents are on low flood plains and the dissected remnants of high flood plains, mainly along the American River. These are stratified soils that are coarse textured and moderately coarse textured and may consist of gravelly or very gravelly strata or strata of loose gravel. The well drained Coyotecreek soils are on high flood plains. They have a surface layer of silt loam and are underlain by weakly stratified loam and clay loam. The well drained Reiff soils are on narrow, low flood plains. They have a surface layer of fine sandy loam and are underlain by stratified fine sandy loam, very fine sandy loam, and loam. The well drained Liveoak soils are on narrow, high flood plains. They have a surface layer and subsoil of sandy clay loam and a substratum of sandy loam.

The Rossmoor soils are used primarily for urban or recreational development or for wildlife habitat. The other areas of this unit are used mainly for irrigated crops or for wildlife habitat. Where the major soils are used for urban development, the main management concern is the hazard of flooding.

The major soils are suited to irrigated crops. The main management concern is the occasional flooding in unprotected areas of the Vina soils. The major soils can be used for all of the crops commonly grown in the county. In areas that are not protected by levees, however, channeling, deposition, and crop damage can occur during periods of flooding. The levees should be periodically checked and a proper maintenance program developed.

7. Urban land-Americanos-Natomas

Urban land and well drained soils

This map unit is on low stream terraces along the American River and on other low terraces adjacent to the river. The soils formed in alluvium derived dominantly from mixed rock sources. The unit is not subject to flooding because of the construction of large upstream dams. Slope ranges from 0 to 2 percent.

This unit makes up about 2 percent of the survey area. It is about 33 percent Urban land, 23 percent Americanos soils, 23 percent Natomas soils, and 21 percent soils of minor extent.

Urban land consists of areas covered by impervious surfaces, such as roads, driveways, sidewalks, buildings, and parking lots.

Americanos soils are on low stream terraces. They are deep or very deep. Typically, the surface layer and subsoil are silt loam. Sandy loam that is discontinuously and weakly cemented with silica is at a depth of 50 to 72 inches.

Natomas soils are on low terraces. They are very deep. Typically, the surface layer is loam, the subsoil is clay loam, and the substratum is sandy loam.

Minor in this unit are Pits and Xerarents. Xerarents are soils that formed in fill material mixed during excavation and grading activities associated with urban development.

This unit is used mainly for urban development. Few limitations affect urban uses.

Nearly Level Soils in Basins and on Basin Rims

These soils are in low areas in the western part of the county. They make up about 5 percent of the survey area. Elevation ranges from about sea level near Snodgrass Slough to about 30 feet above sea level in the northwestern part of the county. The soils are protected by levees. The average annual precipitation ranges from 15 to 18 inches, and the average annual temperature is 59 to 61 degrees F. The average frost-free period ranges from 250 to 300 days.

These soils are moderately deep or deep and are somewhat poorly drained. Clear Lake soils have a seasonal high water table at a depth of 60 to 72 inches, and Dierssen soils have a perched water table at a depth of 6 to 36 inches. The soils in basins are clay throughout and have a high shrink-swell potential. The soils on the rims of basins have a surface layer of sandy clay loam, have a subsoil of clay that has a high shrink-swell potential, and have a hardpan.

These soils are used mainly for irrigated crops, for irrigated hay and pasture, or for wildlife habitat. A few areas are used for urban development.

8. Clear Lake

Somewhat poorly drained soils that have a seasonal high water table, are protected by levees, and are very deep or deep over a cemented hardpan

This map unit is in basins mainly in the northwestern part of the county. The soils formed in fine textured alluvium derived dominantly from mixed rock sources. The unit is protected against flooding by levees and large upstream dams. The soils have a seasonal high water table in winter and early spring. Slope is 0 to 1 percent.

This unit makes up about 3 percent of the survey area. It is about 71 percent Clear Lake soils, 10 percent Jacktone soils, and 19 percent other soils of minor extent.

Clear Lake soils are deep. Typically, the surface

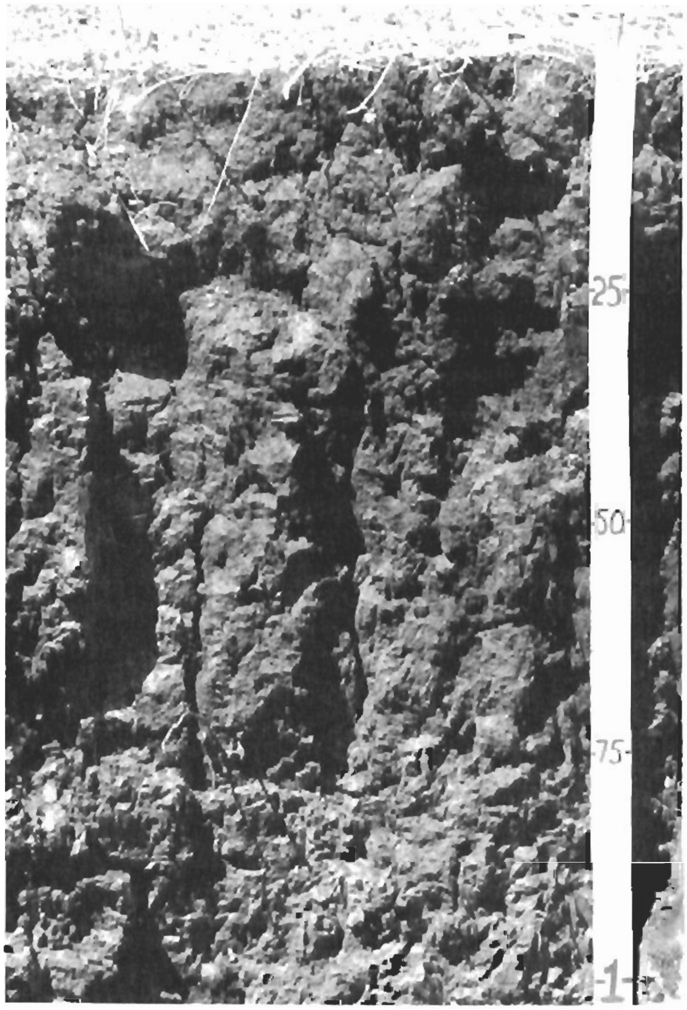

Figure 4.—Cracks extending to a depth of 80 centimeters indicate a high shrink-swell potential in Clear Lake soils.

layer is clay. A weakly cemented hardpan is at a depth of 40 to 60 inches. The seasonal high water table is at a depth of 60 to 72 inches. These soils are subject to rare flooding.

Minor in this unit are Jacktone, Galt, and San Joaquin soils. Jacktone soils are in basins and on the rims of basins. They have a surface layer of clay and have a hardpan at a depth of 20 to 40 inches. Galt and San Joaquin soils are moderately well drained and moderately deep. Galt soils are in basins on low terraces. San Joaquin soils are on low terraces. They have a claypan and a hardpan.

This unit is used mainly for irrigated crops, for irrigated hay and pasture, or for wildlife habitat. A few small areas are used for urban development.

The Clear Lake soils are suited to irrigated crops and irrigated hay and pasture. The main limitations are the fine texture of the surface layer, slow permeability, and very slow runoff. These soils are poorly suited to most perennial, deep-rooted crops.

The main limitations affecting building site development and roads are a high shrink-swell potential, low strength, and very slow runoff. Properly designing foundations, buildings, and roads helps to prevent the structural damage caused by shrinking and swelling and by low strength (fig. 4). Because of the slow permeability and the depth to a seasonal high water table, the effluent from onsite sewage disposal systems can contaminate ground water. The rare flooding is a hazard. The levees should be periodically checked and a proper maintenance program developed. Drainage ditches or drainage pipe and pumps are needed to remove excess surface water and to maintain the water table at a depth of more than 5 feet.

9. Dierssen

Somewhat poorly drained soils that have a perched water table, are protected by levees, and are moderately deep or deep over a cemented hardpan

This map unit is on the rims of basins on the west side of the county. The soils formed in alluvium derived from mixed rock sources, dominantly granite. The unit is protected against flooding by levees and large upstream dams. Slope ranges from 0 to 2 percent.

This unit makes up about 2 percent of the survey area. It is about 84 percent Dierssen soils and 16 percent soils of minor extent.

Dierssen soils are moderately deep or deep. Typically, the surface layer is sandy clay loam. The subsoil is calcareous clay underlain by a hardpan at a depth of 20 to 45 inches. A perched water table is at a depth of 6 to 36 inches in winter and early spring. These soils are subject to rare flooding.

Minor in this unit are Clear Lake, Egbert, and Tinnin soils. The deep and very deep Clear Lake soils are in local basins. They are clay in the upper part and are underlain by a weakly cemented to strongly cemented hardpan. Egbert soils are on high flood plains and in backswamps. They have a surface layer of clay. This layer is underlain by stratified clay loam and sandy clay loam. The very deep Tinnin soils are on ridges and mounds on the rims of basins. They are loamy sand and sand to a depth of 60 inches and formed in eolian material.

This unit is used mainly for irrigated crops, for irrigated hay and pasture, or for wildlife habitat. The Dierssen soils are suited to irrigated crops and irrigated hay and pasture. The main limitations are the moderate depth to a hardpan, slow permeability, the depth to a perched water table, and a low available water capacity.

The soils are poorly suited to deep-rooted crops. The levees should be periodically checked and a proper maintenance program developed. Drainage ditches and pumps are needed to remove excess surface water and to lower the perched water table.

Nearly Level to Gently Rolling Soils on Low Terraces

These soils are in the western and central parts of the county. They extend from the northern county line to the southern county line. They make up about 34 percent of the survey area. Elevation ranges from about 10 to 170 feet above sea level. The average annual precipitation is 15 to 19 inches, and the average annual temperature is 60 to 61 degrees F. The average frost-free period ranges from 250 to 300 days.

These soils are moderately deep and moderately well drained and are underlain by a hardpan. They have a surface layer of silt loam and have a claypan. The claypan has a high shrink-swell potential.

These soils are used mainly for irrigated crops, irrigated hay and pasture, urban development, rangeland, or wildlife habitat.

10. San Joaquin

Moderately well drained soils that are moderately deep over a cemented hardpan

This map unit is on low terraces in the western and central parts of the county. The soils formed in alluvium derived from mixed rock sources, dominantly granite. Slope ranges from 0 to 8 percent.

This unit makes up about 34 percent of the survey area and is the most extensive unit in the county. It is about 72 percent San Joaquin soils and 28 percent soils of minor extent.

San Joaquin soils are moderately deep. Typically, the surface layer is silt loam. The subsoil is a claypan underlain by a cemented hardpan at a depth of 20 to 40 inches.

Minor in this unit are Bruella soils; Durixeralfs; Galt, Kimball, and Tehama soils; Xerarents; and Urban land. The very deep Bruella soils are in the slightly higher areas on intermediate terraces. Durixeralfs are soils that have been truncated during land leveling activities. Galt soils are in basins on low terraces. They are clay in the upper part and are underlain by a hardpan. The very deep Kimball and Tehama soils are in the slightly lower positions on low terraces. They do not have a hardpan. Xerarents are altered soils that formed in fill material moved during land leveling activities.

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

The San Joaquin soils are suited to irrigated crops and irrigated hay and pasture. The main limitations are the moderate depth to a claypan and hardpan, very slow permeability, and a low or moderate available water capacity. These soils are poorly suited to deep-rooted crops.

In the areas used for urban development, the main limitations are a high shrink-swell potential and low strength in the subsoil. Properly designing foundations, buildings, and roads helps to prevent the structural damage caused by these limitations. The limitations affecting onsite sewage disposal are the moderate depth to a hardpan and the very slowly permeable claypan, either of which can cause the failure of poorly designed disposal systems. The depth to a hardpan and the very slowly permeable claypan also can restrict drainage in areas used for landscape plants.

The San Joaquin soils are suited to the production of vegetation used for livestock grazing. The main limitation is the low or moderate available water capacity.

Urban Land and Nearly Level to Steep Soils on Hills and in Filled Areas

These soils are in the eastern part of the county. They extend from the northern end of the county to the southern end. They make up about 15 percent of the survey area. Elevation ranges from about 50 to 400 feet above sea level. The average annual precipitation ranges from 16 to 24 inches, and the average annual temperature is 60 to 62 degrees F. The average frost-free period ranges from 230 to 290 days.

These soils are very shallow to very deep and are moderately well drained or well drained. They are underlain by weakly consolidated sediments or have a cemented hardpan underlain by consolidated sediments. The moderately deep soils have a surface layer of gravelly loam or fine sandy loam and are underlain by a claypan. The very shallow or shallow soils are sandy loam or fine sandy loam. The soils in filled areas vary considerably.

These soils are used mainly for urban development in the areas north of the American River and as rangeland or wildlife habitat in the areas south of the river.

11. Vleck-Mokelumne

Well drained and moderately well drained soils that are moderately deep over a cemented hardpan or over clayey sediments

This map unit is on hills in the eastern part of the county. The soils formed in material weathered from weakly consolidated rhyolitic tuffaceous sediments and clayey or sandy marine sediments. Slope ranges from 2 to 30 percent.

This unit makes up about 2 percent of the survey area. It is about 26 percent Vleck soils, 22 percent Mokelumne soils, 12 percent Creviscreek soils, 10 percent Mokelumne Variant soils, and 30 percent other soils of minor extent.

Vleck soils are on the foot slopes of hills. They are moderately deep to a cemented pan and are moderately well drained. Slope ranges from 2 to 30 percent. Typically, the surface layer is gravelly loam. The subsoil is a claypan underlain by a hardpan at a depth of 20 to 40 inches. Weakly consolidated sediments are below the hardpan.

Mokelumne soils are on hills. They are moderately deep to clayey sediments and are well drained or moderately well drained. Slope ranges from 2 to 15 percent. Typically, the surface layer is gravelly loam. The subsoil is a claypan underlain by weakly consolidated clayey sediments at a depth of 20 to 40 inches.

Minor in this unit are the deep or very deep, moderately well drained Creviscreek soils on stream terraces and the alluvial toe slopes of hills along drainageways. These soils have a surface layer of sandy loam, a subsoil of sandy clay loam and gravelly sandy clay loam, and a highly stratified substratum. They are underlain by weakly consolidated sediments at a depth of 40 to 80 inches. Also of minor extent are Mokelumne Variant, Amador, and Gillender soils. The deep, well drained Mokelumne Variant soils are on high terrace remnants. They have a surface layer of sandy clay loam and a claypan and are underlain by weakly consolidated sediments at a depth of 40 to 60 inches. Amador and Gillender soils are in areas characterized by mound-intermound microrelief. Amador soils are shallow, and Gillender soils are very shallow.

This unit is mainly used as rangeland or wildlife habitat. A few areas of the Mokelumne soils are mined for clay.

The major soils are suited to the production of vegetation used for livestock grazing. The main limitations in areas of the Mokelumne soils are a low available water capacity, the hazard of water erosion, and in many areas a moderate or dense canopy of trees or brush. The Vleck soils are limited by a low available water capacity and the hazard of water erosion. Removing the brush and some of the oaks on the Mokelumne soils increases productivity; however, some trees should be preserved to enhance the habitat for wildlife.

12. Pentz-Hadselville

Well drained and moderately well drained soils that are very shallow or shallow over weakly consolidated sediments

This map unit is on hills characterized by mound-intermound microrelief and on the back slopes of hills in the eastern part of the county. The soils formed in material weathered from weakly consolidated basic andesitic tuffaceous sediments. Slope ranges from 2 to 50 percent.

This unit makes up about 6 percent of the survey area. It is about 27 percent Pentz soils, 23 percent Hadselville soils, 9 percent Amador soils, 7 percent Gillender soils, and 34 percent other soils of minor extent.

Pentz soils are on mounds. They are shallow and well drained. Slope ranges from 2 to 50 percent. Typically, the surface layer is fine sandy loam. The subsoil also is fine sandy loam. It is underlain by weakly consolidated tuffaceous sediments at a depth of 10 to 20 inches.

Hadselville soils are in intermound areas. They are very shallow and moderately well drained. Slope ranges from 2 to 30 percent. Typically, the surface layer is sandy loam. Weakly consolidated tuffaceous sediments are at a depth of 4 to 10 inches.

Minor in this unit are the shallow, well drained Amador and very shallow, moderately well drained Gillender soils on hills characterized by mound-intermound microrelief. Amador soils are on the mounds, and Gillender soils are in the intermound areas. Both have a pale surface layer and are underlain by weakly consolidated rhyolitic tuffaceous sediments. Also of minor extent are Corning, Hicksville, and Keyes soils; Lithic Xerorthents; and Pardee, Peters, Ranchoseco, and Redding soils. Corning and Redding soils are on high terrace remnants. The very deep Corning soils have a claypan. The moderately deep Redding soils have a claypan underlain by a hardpan. The deep and very deep Hicksville soils are on low stream terraces and alluvial flats along drainageways. Keyes soils have a claypan underlain by a hardpan at a depth of 13 to 20 inches. The very shallow Lithic Xerorthents are underlain by very strongly consolidated sediments or tuff-breccia. The shallow Pardee soils have a subsoil of very gravelly loam. The shallow Peters soils have a surface layer of clay. The very shallow Ranchoseco soils have a subsoil of very gravelly loam.

This unit is used mainly as rangeland or wildlife habitat. The major soils are suited to the production of vegetation used for livestock grazing. The Pentz soils are limited by a very low available water capacity, a shallow rooting depth, and a moderate or severe hazard of water erosion. The Hadselville soils, which are in the intermound areas, are limited by the accumulation of water on the surface, a very shallow rooting depth, and a very low available water capacity.

13. Urban land-Xerarents-Fiddyment

Urban land and well drained soils that are moderately deep to very deep over consolidated sediments or are moderately deep over a cemented hardpan

This map unit is in filled areas and in other areas on hills, mainly north of the American River, in the central part of the county. The soils formed in fill material and in material weathered from weakly consolidated or moderately consolidated sandstone and siltstone. Extensive urbanization has resulted in areas of Xerarents. Slope ranges from 0 to 15 percent.

This unit makes up about 7 percent of the survey area. It is about 31 percent Urban land, 27 percent Xerarents, 26 percent Fiddyment soils, and 16 percent soils of minor extent. The major components are not together in all delineations.

Urban land consists of areas covered by impervious surfaces, such as roads, driveways, sidewalks, buildings, and parking lots.

Xerarents are on hills. They are moderately deep to very deep. They formed in fill material mixed by grading and excavation activities. The fill material is derived dominantly from the nearby Fiddyment soils. Xerarents vary considerably. They range from sandy loam to clay loam and may have fragments of siltstone or a hardpan. The thickness of the fill material over a buried soil is commonly 20 to 60 inches, but it is 12 to 20 inches in some areas. The buried soil is underlain by sandstone or siltstone at a depth of 20 to 80 inches.

Fiddyment soils are on hills. They are moderately deep. Typically, the surface layer is fine sandy loam. The subsoil is a claypan underlain by a hardpan at a depth of 20 to 40 inches. Below this is siltstone.

Minor in this unit are Kaseberg and Orangevale soils. Kaseberg soils are shallow. Orangevale soils are very deep. They are on dissected high terraces and on hills.

This unit is used mainly for urban development. The major soils are limited by the moderate depth to a hardpan or consolidated sediments and a moderate hazard of erosion. The Fiddyment soils also are limited by low strength and very slow permeability in the subsoil. Properly designing roads helps to compensate for low strength. Steep slopes that are cut and filled are susceptible to erosion and should be permanently protected by a plant cover or other measures. Mulching and applying fertilizer help to establish plants in areas of the Xerarents. Because of the depth to a hardpan and the very slow permeability in the subsoil, restricted drainage is a limitation in areas used for landscape plants.

Nearly Level To Hilly Soils on High Terraces and Hills

These soils are in the eastern part of the county. In some areas they are on the highest terraces in the county. They make up about 14 percent of the survey area. Elevation ranges from about 40 to 390 feet above sea level. The average annual precipitation ranges from 16 to 24 inches, and the average annual temperature is 60 to 62 degrees F. The average frost-free period ranges from 230 to 290 days.

These soils are moderately deep or very deep and are well drained or moderately well drained. They have a subsoil of sandy clay loam or gravelly clay or have a claypan. Some of the soils are underlain by a cemented hardpan at a depth of 20 to 40 inches.

The areas north of the American River are used mainly for urban development. The areas south of the American River are used mainly as rangeland or wildlife habitat, but a few areas are used for urban development.

14. Orangevale-Fiddyment

Well drained soils that are very deep and well drained soils that are moderately deep over a cemented hardpan

This map unit is on high terrace remnants, dissected high terraces, and hills in the areas north of the American River in the eastern part of the county. The soils formed in coarse textured alluvium derived from granitic rocks and in material weathered from weakly consolidated or moderately consolidated sandstone and siltstone. Slope ranges from 2 to 25 percent.

This unit makes up about 1 percent of the survey area. It is about 39 percent Orangevale soils, 19 percent Fiddyment soils, 31 percent soils of minor extent, and 11 percent Urban land.

Orangevale soils are on high terrace remnants, dissected high terraces, and hills. They are very deep. Slope ranges from 2 to 25 percent. Typically, the surface layer is coarse sandy loam. The subsoil is sandy clay loam in the upper part and coarse sandy loam in the lower part.

Fiddyment soils are on hills. They are moderately deep. Slope ranges from 1 to 8 percent. Typically, the surface layer is fine sandy loam. The subsoil is a claypan underlain by a hardpan at a depth of 20 to 40 inches. Below this is siltstone.

Minor in this unit are areas of Urban land and Xerarents. Xerarents are soils formed in fill material mixed during grading and excavation activities.

This unit is used mainly for urban development. The Orangevale soils are limited as sites for urban uses by a moderate or severe hazard of water erosion. The Fiddyment soils are limited by low strength and very slow permeability in the subsoil, a moderate hazard of water erosion, and the moderate depth to a hardpan. Properly designing local roads helps to compensate for low strength in the subsoil of the Fiddyment soils. Steep slopes that are cut and filled are susceptible to erosion and should be permanently protected by a plant cover or other measures. Because of the depth to a hardpan and very slow permeability in the subsoil of the Fiddyment soils, restricted drainage is a limitation in areas used for landscape plants.

15. Redding-Corning-Red Bluff

Moderately well drained soils that are moderately deep over a cemented hardpan and well drained and moderately well drained soils that are very deep

This map unit is on intermediate and high terraces, terrace remnants, and the side slopes of terraces in the eastern part of the county. The soils formed in alluvium derived dominantly from mixed rock sources. Slope ranges from 0 to 30 percent.

This unit makes up about 13 percent of the survey area. It is about 49 percent Redding soils, 19 percent Corning soils, 14 percent Red Bluff soils, and 18 percent soils of minor extent. The major soils do not occur together in all delineations.

Redding soils are on high terraces and terrace remnants. They are moderately deep and moderately well drained. Slope ranges from 0 to 15 percent. Typically, the surface layer is gravelly loam. The subsoil is a gravelly claypan underlain by a hardpan at a depth of 20 to 40 inches.

Corning soils are on high terraces and terrace remnants characterized by mound-intermound microrelief and on smooth terrace side slopes. They are very deep. They are well drained on the mounds and moderately well drained in the intermound areas. Slope ranges from 0 to 30 percent. Typically, the surface layer is gravelly fine sandy loam. The subsoil is a claypan. The substratum is stratified gravelly sandy clay loam and gravelly sandy loam.

Red Bluff soils are on intermediate and high terraces. They are very deep and well drained. Slope ranges from 0 to 5 percent. Typically, the surface layer is loam. The subsoil is clay loam, gravelly clay, and gravelly clay loam.

Minor in this unit are Hadselville, Hicksville, and Pentz soils and Xerorthents. The very shallow Hadselville soils are on hills. The deep or very deep Hicksville soils are on low stream terraces and alluvial flats along drainageways. The shallow Pentz soils are on hills. Xerorthents are extremely gravelly or extremely cobbly. They are in areas of dredge tailings.

This unit is used mainly as rangeland or wildlife habitat. A few areas are used for urban development.

The major soils are suited to the production of vegetation used for livestock grazing. The main limitations are a low available water capacity and moderate fertility in the Redding and Corning soils. Also, water erosion is a hazard in some areas of the Corning soils. Prevention of overgrazing is needed.

The main limitations affecting urban development are a high shrink-swell potential and low strength in the subsoil of the Redding and Corning soils and low strength in the subsoil of the Red Bluff soils. Also, the Redding soils are limited by the very slowly permeable claypan and the moderate depth to a hardpan, the Corning soils by the very slowly permeable claypan, and the Red Bluff soils by moderately slow permeability. Properly designing foundations, buildings, and roads helps to prevent the structural damage caused by any of these limitations. The restricted permeability and the depth to a hardpan can cause the failure of improperly designed onsite sewage disposal systems. Because of the depth to a hardpan and claypan, restricted drainage is a limitation in areas used for landscape plants.

Undulating to Hilly Soils on Foothills

These soils are in the highest positions on the landscape. They are in the northeastern part of the county, mainly in areas north of the Cosumnes River. They make up about 6 percent of the survey area. Elevation ranges from about 140 feet above sea level near the Cosumnes River to about 830 feet above sea level north of Interstate 50, near the eastern county line. The average annual precipitation ranges from 20 to 40 inches, and the average annual temperature is 61 to 62 degrees F. The average frost-free period ranges from 250 to 275 days.

These soils are very shallow to moderately deep and are somewhat excessively drained and well drained. They are underlain by hard bedrock or by weathered bedrock. They are loam in the upper part. Some of the moderately deep soils have a claypan. The soils are used mainly for rangeland, urban development, or wildlife habitat.

16. Auburn-Whiterock-Argonaut

Somewhat excessively drained and well drained soils that are very shallow to moderately deep

This map unit is on foothills in the northeastern part of the county, mainly in areas north of the Cosumnes River. The soils formed in material weathered from metamorphic and metasedimentary rocks. Slope ranges from 2 to 30 percent.

This unit makes up about 6 percent of the survey area. It is about 35 percent Auburn soils, 29 percent Whiterock soils, 19 percent Argonaut soils, and 17 percent soils of minor extent.

Auburn soils are shallow or moderately deep and are well drained. Slope ranges from 2 to 30 percent. Typically, the surface layer and subsoil are loam. Fractured metabasic and metasedimentary bedrock is at a depth of 10 to 28 inches.

Whiterock soils are very shallow or shallow and are somewhat excessively drained. Slope ranges from 3 to 30 percent. Typically, the surface layer is loam. Highly fractured and vertically tilted metasedimentary bedrock is at a depth of 4 to 14 inches.

Argonaut soils are moderately deep and well drained. Slope ranges from 3 to 30 percent. Typically, the surface layer is loam. The subsoil is a claypan. Highly weathered metaandesitic and metamorphic bedrock is at a depth of 20 to 40 inches.

Minor in this unit are Andregg and Hicksville soils. Andregg soils are on foothills. Typically, they have a surface layer and subsoil of coarse sandy loam, which is underlain by weathered granitic bedrock at a depth of 20 to 40 inches. The deep and very deep Hicksville soils are on low stream terraces and alluvial flats along drainageways.

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

The major soils are suited to the production of vegetation used for livestock grazing. They are limited by a moderate hazard of water erosion. Also, the Auburn soils are limited by a very low or low available water capacity and a shallow rooting depth, the Whiterock soils by a very low available water capacity and a very shallow rooting depth, and the Argonaut soils by a low available water capacity.

In the areas used for urban development, the main limitations are the moderate or shallow depth to hard bedrock in the Auburn soils, the very shallow or shallow depth to hard bedrock in the Whiterock soils, and a high shrink-swell potential and low strength in the subsoil of the Argonaut soils. Properly designing foundations, buildings, and roads helps to prevent the structural damage caused by these limitations. The slope and a moderate hazard of erosion are additional management concerns. Steep slopes that are cut and filled are susceptible to erosion and should be protected by a plant cover or other measures. The limitations affecting onsite sewage disposal are the slope and the soil depth. In areas of the Argonaut soils, the very slowly permeable claypan is an additional limitation. Because of these limitations, the effluent from sewage disposal systems can seep at points downslope.

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 on each map unit is given under "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. The landscape position of the inclusions is described if it differs from that of the named component. 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 segments that have similar use and management requirements. The delineation of such landscape 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 or of the underlying layers, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying layers. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Columbia sandy loam, drained, 0 to 2 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. Amador-Gillender complex, 2 to 15 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.

This survey area was mapped at one level of detail, but different minimum-size delineations were used to meet the anticipated long-term uses in the survey area. Areas that are intensively used for agricultural purposes have a 10-acre minimum delineation. Areas that are less intensively used, such as rangeland, or that are so intensively used that onsite investigation is needed, such as areas used for urban development, have a minimum-size delineation of 20 acres. Contrasting soils with as few as 10 acres, however, were identified in these areas.

The names and delineations of the map units on the detailed soil maps of this county do not fully agree with those on the maps of adjacent survey areas. Differences are the result of a better knowledge of soils, modifications in series concepts, and variations in the intensity of mapping or in the extent of the soils in the survey areas. In areas used for urban development, differences also result from the alteration of natural soils by extensive shaping and grading.

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.

Soil Descriptions

101—Amador-Gillender complex, 2 to 15 percent slopes. This map unit is on hills characterized by mound-intermound microrelief and complex slopes. The native vegetation is mainly annual grasses and forbs. Elevation is 140 to 380 feet. The average annual precipitation is 17 to 20 inches.

This unit is about 45 percent Amador soil and 40 percent Gillender soil. The Amador soil is on mounds. The Gillender soil is in concave areas between the mounds.

Included in this unit are small areas of Lithic Xerorthents and Pardee, Peters, Ranchoseco, and Vleck soils. Lithic Xerorthents and Pardee and Ranchoseco soils are underlain by hard bedrock. Lithic Xerorthents are on the shoulders of hills. Pardee soils are on mounds. Peters soils have a surface layer that is darker than that of the Amador and Gillender soils. They are on the concave side slopes of hills. Ranchoseco soils are in intermound areas. Vleck soils are on concave foot slopes. Included areas make up about 15 percent of the total acreage.

The Amador soil is shallow and well drained. It formed in material weathered from weakly consolidated rhyolitic tuffaceous sediments. Typically, the surface layer is light gray loam about 6 inches thick. The subsoil also is light gray loam. It is about 13 inches thick. White, weakly consolidated tuffaceous sediments are at a depth of about 19 inches. In some areas the surface layer is sandy loam or gravelly sandy loam.

Permeability is moderate in the Amador soil. Available water capacity is low. The effective rooting depth and the depth to weakly consolidated sediments are 10 to 20 inches. Runoff is medium. The hazard of water erosion is slight or moderate.

The Gillender soil is very shallow and moderately well drained. It formed in material weathered from weakly consolidated rhyolitic tuffaceous sediments. Typically, the surface layer is very pale brown loam about 4 inches thick. The substratum is light yellowish brown and pale brown sandy loam about 3 inches thick. Pale yellow, weakly consolidated tuffaceous sediments are at a depth of about 7 inches. In some areas the surface layer is sandy loam.

Permeability is moderate in the Gillender soil. Available water capacity is very low. The effective rooting depth and the depth to weakly consolidated sediments are 4 to 10 inches. Runoff is very slow or slow. The hazard of water erosion is slight or moderate.

This unit is used as rangeland. The main management concerns are the low available water capacity and shallow rooting depth in the Amador soil and the very low available water capacity, very shallow rooting depth, and accumulation of water in areas of the Gillender soil. The characteristic plant community is mainly soft chess, ripgut brome, and foxtail fescue on the Amador soil and mouse barley, annual hairgrass, soft chess, and toad rush on the Gillender soil. Early in the green feed period, livestock grazing is concentrated on the mounds because water accumulates in the intermound areas. Late in the green feed period, grazing is concentrated in the intermound areas. Grazing can continue on the mounds for 2 to 3 weeks after the vegetation in the intermound areas is dry or has been removed, but it should be discontinued when the vegetation on the mounds has a patchy appearance. Proper grazing management helps to maintain the organic matter content, increases the rate of water infiltration, and improves plant growth early in the season.

This unit is in capability subclass VIs, nonirrigated. The MLRA is 18.

102—Americanos-Urban land complex, 0 to 2 percent slopes. This map unit is on low stream terraces. The construction of large upstream dams has protected some areas at the lower elevations from flooding. Slopes are plane or have been shaped for urban uses. The vegetation on the Americanos soil is mainly ornamental plants and scattered oaks. Elevation is 30 to 200 feet. The average annual precipitation is 18 to 23 inches. The unit is about 65 percent Americanos soil and 30 percent Urban land.

Included in this unit are small areas of Natomas and Rossmoor soils. Natomas soils are on the slightly higher terraces. Rossmoor soils are on high flood plains. Included areas make up about 5 percent of the total acreage.

The Americanos soil is very deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is yellowish brown silt loam about 8 inches thick. The subsoil is dark yellowish brown and light yellowish brown silt loam about 38 inches thick. The upper part of the substratum is light yellowish brown silt loam about 8 inches thick. The lower part to a depth of 62 inches is light yellowish brown sandy loam that is weakly cemented with silica. In some areas the surface layer is loam.

Permeability is moderate in the Americanos soil. Available water capacity is high. The effective rooting depth is more than 60 inches. The depth to weak, discontinuous cementation ranges from 50 to 72 inches. Runoff is slow. The hazard of water erosion is slight.

Urban land consists of areas covered by impervious surfaces or structures, such as roads, driveways, sidewalks, buildings, and parking lots. The soil material under the impervious surfaces is similar to that of the Americanos soil, although it may have been truncated or otherwise altered.

This unit is used for urban development. Few limitations affect urban development. Revegetating disturbed areas around construction sites helps to control erosion. During summer irrigation is needed in areas used for lawns, shrubs, vines, or shade and ornamental trees.

No land capability classification is assigned. The MLRA is 17.

103—Andregg coarse sandy loam, 2 to 8 percent slopes. This moderately deep, well drained soil is on foothills. It formed in material weathered from granitic rocks. Slopes are complex. The native vegetation is mainly oaks, annual grasses, and forbs. Elevation is 250 to 450 feet. The average annual precipitation is 23 to 24 inches.

Typically, the surface layer is brown coarse sandy loam about 11 inches thick. The subsoil is light yellowish brown coarse sandy loam about 21 inches thick. Weathered granodiorite is at a depth of about 32 inches. In some areas the surface layer is loamy sand.

Included in this unit are small areas of Auburn, Argonaut, and Fiddyment soils, Rock outcrop, Urban land, and soils that are less than 20 inches or 40 to 60 inches deep over bedrock. Fiddyment soils are in low areas. The Rock outcrop is along ridges and in severely eroded areas along drainageways. Included areas make up about 15 percent of the total acreage.

Permeability is moderately rapid in the Andregg soil. Available water capacity is low. The effective rooting depth and the depth to weathered bedrock are 20 to 40 inches. Runoff is slow or medium. The hazard of water erosion is slight or moderate.

Nearly all areas of this unit are used for urban or recreational development. A few small areas are used for irrigated orchards.

Where this soil is used for urban development, the main limitation is the depth to bedrock. If shallow excavations, such as trenches and holes, or deep cuts are made during construction, the bedrock can be exposed. Heavy equipment may be required to remove the rock. Erosion is a hazard in the steeper areas, and excavating for roads and buildings increases the hazard. Preserving the existing plant cover and revegetating disturbed areas around construction sites help to control erosion. Steep slopes that have been cut and filled are susceptible to erosion and should be permanently protected. Some protective measures that can be used alone or in combination are a cover of turf, ground cover plants, jute netting, soil stabilizer substances, and retaining walls. During summer irrigation is needed in areas used for lawns, shrubs, vines, or shade and ornamental trees. Establishing plants is difficult in areas where the surface layer has been removed. Mulching and applying fertilizer in cut areas help to establish the plants.

This unit is well suited to recreational development. It is limited by the moderate hazard of erosion. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining an adequate plant cover.

This unit is in capability unit IIIe-1, irrigated and nonirrigated. The MLRA is 18.

104—Andregg coarse sandy loam, 8 to 15 percent slopes. This moderately deep, well drained soil is on foothills. It formed in material weathered from granitic rocks. Slopes are complex. The native vegetation is mainly oaks, annual grasses, and forbs. Elevation is 200 to 600 feet. The average annual precipitation is 23 to 24 inches.

Typically, the surface layer is brown coarse sandy loam about 11 inches thick. The subsoil is light yellowish brown coarse sandy loam about 21 inches thick. Weathered granodiorite is at a depth of about 32 inches. In some areas the surface layer is loamy sand, loam, or sandy loam. In other areas the subsoil is sandy clay loam.

Included in this unit are small areas of Auburn and Argonaut soils, Rock outcrop, and Urban land. Also included are soils that are less than 20 inches or 40 to 60 inches deep over bedrock and soils that have slopes of 15 to 25 percent. Included areas make up about 15 percent of the total acreage.

Permeability is moderately rapid in the Andregg soil. Available water capacity is low. The effective rooting depth and the depth to weathered bedrock are 20 to 40 inches. Runoff is medium. The hazard of water erosion is moderate.

Nearly all areas of this unit are used for urban or recreational development. A few small areas are used for irrigated orchards.

Where this soil is used for urban development, the main limitations are the depth to bedrock, the slope, and the hazard of erosion. If shallow excavations, such as trenches and holes, or deep cuts are made during construction, the bedrock can be exposed. Heavy equipment may be required to remove the rock. Excavating for roads and buildings increases the hazard of erosion. Disturbing only the part of the site that is used for construction and revegetating the disturbed areas help to control erosion. Steep slopes that have been cut and filled are susceptible to erosion and should be permanently protected. Some protective measures that can be used alone or in combination are a cover of turf, ground cover plants, jute netting, soil stabilizer substances, and retaining walls. During summer irrigation is needed in areas used for lawns, shrubs, vines, or shade and ornamental trees. Establishing plants is difficult in areas where the surface layer has been removed. Mulching and applying fertilizer in cut areas help to establish the plants.

This unit is well suited to recreational development. It is limited mainly by the slope and the moderate hazard of erosion. Areas that have been cut and filled should be seeded or mulched. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining an adequate plant cover.

This unit is in capability unit IVe-1, irrigated and nonirrigated. The MLRA is 18.

105—Andregg-Urban land complex, 2 to 8 percent slopes. This map unit is on foothills. Slopes are complex and have been shaped for urban uses. The vegetation on the Andregg soil is mainly ornamental plants or oaks, annual grasses, and forbs. Elevation is 300 to 420 feet. The average annual precipitation is 23 to 24 inches. The unit is about 55 percent Andregg soil and 30 percent Urban land.

Included in this unit are small areas of altered soils that have been cut or filled during construction, Rock outcrop, and soils that are less than 20 inches or more than 40 inches deep over bedrock. Included areas make up about 15 percent of the total acreage.

The Andregg soil is moderately deep and well drained. It formed in material weathered from granitic rocks. Typically, the surface layer is brown coarse sandy loam about 11 inches thick. The subsoil is light yellowish brown coarse sandy loam about 21 inches thick. Weathered granodiorite is at a depth of about 32 inches. In some areas the surface layer is loamy sand.

Permeability is moderately rapid in the Andregg soil. Available water capacity is low. The effective rooting depth and the depth to weathered bedrock are 20 to 40 inches. Runoff is slow or medium. The hazard of water erosion is slight or moderate.

Urban land consists of areas covered by impervious surfaces or structures, such as roads, driveways, sidewalks, buildings, and parking lots. The soil material under the impervious surfaces is similar to that of the Andregg soil, although it may have been truncated or otherwise altered.

This unit is used for urban development. The main limitation affecting urban uses is the depth to bedrock. Erosion is a hazard in the steeper areas. It can be controlled by revegetating disturbed areas around construction sites. Steep slopes that have been cut and filled are susceptible to erosion and should be permanently protected. Some protective measures that can be used alone or in combination are a cover of turf, ground cover plants, jute netting, soil stabilizer substances, and retaining walls. During summer irrigation is needed in areas used for lawns, shrubs, vines, or shade and ornamental trees. Establishing plants is difficult in areas where the surface layer has been removed. Mulching and applying fertilizer in cut areas help to establish the plants.

No land capability classification is assigned. The MLRA is 18.

106—Andregg-Urban land complex, 8 to 15 percent slopes. This map unit is on foothills. Slopes are complex and have been shaped for urban uses. The vegetation is mainly ornamental plants or oaks, annual grasses, and forbs. Elevation is 210 to 400 feet. The average annual precipitation is 23 to 24 inches. The unit is about 55 percent Andregg soil and 30 percent Urban land.

Included in this unit are small areas of altered soils that have been cut or filled during construction, Rock outcrop, soils that are less than 20 inches or more than 40 inches deep over bedrock, and small areas of soils that have slopes of 15 to 25 percent. Included areas make up about 15 percent of the total acreage.

The Andregg soil is moderately deep and well drained. It formed in material weathered from granitic rocks. Typically, the surface layer is brown coarse sandy loam about 11 inches thick. The subsoil is light yellowish brown coarse sandy loam about 21 inches thick. Weathered granodiorite is at a depth of about 32 inches. In some areas the surface layer is loamy sand.

Permeability is moderately rapid in the Andregg soil. Available water capacity is low. The effective rooting depth and the depth to weathered bedrock are 20 to 40 inches. Runoff is slow or medium. The hazard of water erosion is moderate.

Urban land consists of areas covered by impervious surfaces or structures, such as roads, driveways, sidewalks, buildings, and parking lots. The soil material under the impervious surfaces is similar to that of the Andregg soil, although it may have been truncated or otherwise altered.

This unit is used for urban development. The main limitations affecting urban uses are the depth to bedrock, the slope, and the hazard of erosion. Shallow excavations, such as trenches and holes, are limited by the depth to bedrock and the slope. Revegetating disturbed areas around construction sites helps to control erosion. Steep slopes that have been cut and filled are susceptible to erosion and should be permanently protected. Some protective measures that can be used alone or in combination are a cover of turf, ground cover plants, jute netting, soil stabilizer substances, and retaining walls. During summer irrigation is needed in areas used for lawns, shrubs, vines, or shade and ornamental trees. Establishing plants is difficult in areas where the surface layer has been removed. Mulching and applying fertilizer in cut areas help to establish the plants.

No land capability classification is assigned. The MLRA is 18.

107—Argonaut-Auburn complex, 3 to 8 percent slopes. This map unit is on foothills. The native vegetation is mainly annual grasses and forbs and a few scattered oaks. Elevation is 160 to 660 feet. The average annual precipitation is 22 to 25 inches.

This unit is about 45 percent Argonaut soil and 35 percent Auburn soil. Slopes in most areas of the Argonaut soil are concave. Those in areas of the Auburn soil are complex.

Included in this unit are small areas of Creviscreek, Hicksville, and Mokelumne soils and Xerorthents and Rock outcrop. Creviscreek soils are along drainageways. Hicksville soils are on low stream terraces. Mokelumne soils are on hills. Xerorthents are in areas of dredge tailings. Also included are soils that have a surface layer of clay and are in swales; moderately deep soils that do not have a claypan; areas that have slopes of 0 to 3 percent or 8 to 15 percent; and, on foothills near Scott Road and at Rancho Murrieta, soils that do not have a dark surface layer, have variegated colors in the claypan, and are underlain by metasedimentary rocks. Included areas make up about 20 percent to the total acreage.

The Argonaut soil is moderately deep and well drained. It formed in material weathered from metaandesite and metamorphic rocks. Typically, the surface layer is reddish yellow and light yellowish brown loam about 8 inches thick. The upper 6 inches of the subsoil is yellowish red gravelly loam. The lower 15 inches is a claypan of variegated strong brown, yellowish brown, and yellowish red clay and clay loam. Highly weathered schist is at a depth of about 29 inches. In some areas the surface layer is gravelly loam or silt loam.

Permeability is very slow in the Argonaut soil. Water is perched above the claypan for short periods after heavy rainfall in winter and early spring. Available water capacity is low. The effective rooting depth is 20 to 40 inches, but roots are restricted to the cracks and faces of peds in the claypan, which is at a depth of 10 to 20 inches. The depth to weathered bedrock is 20 to 40 inches. The shrink-swell potential is high. Runoff is medium. 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 metabasic and metasedimentary rocks. Typically, the surface layer and subsoil are strong brown, reddish yellow, and yellowish red loam. Fractured metabasic bedrock is at a depth of about 14 inches. In some areas the surface layer is gravelly loam or silt loam.

Permeability is moderate in the Auburn soil. Available water capacity is very low or low. The effective rooting depth and the depth to bedrock are 10 to 28 inches. Runoff is medium. The hazard of water erosion is slight.

This unit is used as rangeland (fig. 5). Few limitations affect the use of this unit for livestock grazing. The main management concerns are the low available water capacity in the Argonaut soil and the very low or low available water capacity and shallow rooting depth in the Auburn soil. The characteristic plant community is soft chess, annual ryegrass, and filaree on the Argonaut soil and soft chess, wildoats, and filaree on the Auburn soil. Proper grazing management helps to maintain the organic matter content, increases the rate of water infiltration, and improves plant growth early in the season.

Figure 5.—Rangeland in an area of Argonaut-Auburn complex, 3 to 8 percent slopes, in the foreground. Auburn-Argonaut-Rock outcrop complex, 8 to 30 percent slopes, is in the background.

This unit is in capability unit IVe-3, nonirrigated. The MLRA is 18.

108—Argonaut-Auburn-Urban land complex, 3 to 8 percent slopes. This map unit is on foothills. Slopes are complex and have been shaped for urban uses. The vegetation is mainly ornamental plants or annual grasses, forbs, and scattered oaks. Elevation is 170 to 400 feet. The average annual precipitation is 22 to 24 inches.

This unit is about 40 percent Argonaut soil, 30 percent Auburn soil, and 20 percent Urban land. The Urban land is throughout the unit.

Included in this unit are small areas of altered soils that have been cut or filled during construction and small areas of Red Bluff soils on high terraces. Also included are areas of Rock outcrop. Included areas make up about 10 percent of the total acreage.

The Argonaut soil is moderately deep and well drained. It formed in material weathered from metaandesite and metamorphic rocks. Typically, the surface layer is reddish yellow and light yellowish brown loam about 8 inches thick. The upper 6 inches of the subsoil is yellowish red gravelly loam. The lower 15 inches is a claypan of variegated strong brown, yellowish brown, and yellowish red clay and clay loam. Highly weathered schist is at a depth of about 29 inches. In some areas the surface layer is gravelly loam.

Permeability is very slow in the Argonaut soil. Water is perched above the claypan for short periods after heavy rainfall in winter and early spring and when the soil is overirrigated. Available water capacity is low. The effective rooting depth is 20 to 40 inches, but roots are restricted to the cracks and faces of peds in the lower part of the subsoil. The depth to weathered bedrock is

20 to 40 inches. The shrink-swell potential is high. Runoff is medium. 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 metabasic and metasedimentary rocks. Typically, the surface layer and subsoil are strong brown, reddish yellow, and yellowish red loam. Fractured metabasic bedrock is at a depth of about 14 inches. In some areas the surface layer is gravelly loam.

Permeability is moderate in the Auburn soil. Available water capacity is very low or low. The effective rooting depth and the depth to bedrock are 10 to 28 inches. Runoff is medium. The hazard of water erosion is slight.

Urban land consists of areas covered by impervious surfaces or structures, such as roads, driveways, sidewalks, buildings, and parking lots. The soil material under the impervious surfaces is similar to that of the Argonaut and Auburn soils, although it may have been truncated or otherwise altered.

This unit is used for urban development. The main limitation affecting urban uses is the depth to bedrock. Also, the Argonaut soil is limited by the high shrink-swell potential, low strength, the claypan, and the very slow permeability. If shallow excavations, such as trenches and holes, or deep cuts are made during construction, the bedrock can be exposed. Heavy equipment may be required to remove the rock. Properly grading building sites helps to divert water away from the foundations and helps to prevent ponding in the adjacent areas. Properly designing foundations and footings and diverting runoff away from the buildings help to prevent the structural damage caused by shrinking and swelling. Properly designing local roads and streets helps to compensate for the instability of the subsoil in the Argonaut soil.

If this unit is used for septic tank absorption fields, the Argonaut soil is limited by the very slow permeability, the depth to a claypan, and the depth to bedrock. These limitations increase the possibility that improperly designed absorption fields will fail. The slope is a problem when the absorption fields are installed. The absorption lines should be installed on the contour. During the rainy season, the effluent from onsite sewage disposal systems may seep at points downslope.

Excavating increases the hazard of erosion on construction sites. Preserving the existing plant cover and revegetating disturbed areas around the construction sites help to control erosion. Steep slopes that have been cut and filled are susceptible to erosion and should be permanently protected. Some protective measures that can be used alone or in combination are a cover of turf, ground cover plants, jute netting, soil stabilizer substances, and retaining walls. During summer irrigation is needed in areas used for lawns, shrubs, vines, or shade and ornamental trees. Establishing plants is difficult in areas where the surface layer has been removed. Mulching and applying fertilizer in cut areas help to establish the plants.

No land capability classification is assigned. The MLRA is 18.

109—Auburn silt loam, 2 to 30 percent slopes. This shallow, well drained soil is on foothills. It formed in material weathered from metasedimentary rocks. Slopes are complex. The native vegetation is mainly annual grasses, forbs, and scattered stands of blue oak. Elevation is 140 to 560 feet. The average annual precipitation is 20 to 24 inches.

Typically, the surface layer and subsoil are reddish yellow silt loam. Vertically tilted, highly fractured, very pale brown metasedimentary bedrock is at a depth of about 16 inches. In some areas the surface layer is loam or gravelly silt loam. In other areas the subsoil is silty clay.

Included in this unit are small areas of Argonaut, Creviscreek, Hicksville, and Mokelumne soils and Rock outcrop. Also included are soils that are less than 10 inches deep over bedrock and soils along the Cosumnes River that have slopes to 30 to 50 percent. Creviscreek soils are very deep and are along drainageways. Hicksville soils are on low stream terraces. Mokelumne soils are at the base of the slopes. The Rock outcrop occurs as scattered ledges. Included areas make up about 20 percent of the total acreage.

Permeability is moderate in the Auburn soil. Available water capacity is very low. The effective rooting depth and the depth to bedrock are 10 to 20 inches. Runoff is medium or rapid. The hazard of water erosion is slight or moderate.

This unit is used as rangeland. Few limitations affect the use of this unit for livestock grazing. The main management concerns are the very low available water capacity, the shallow rooting depth, and the moderate hazard of erosion. The characteristic plant community is soft chess, wild oats, and filaree. The steeper areas near the Cosumnes River support scattered stands of blue oak. In these areas the understory vegetation is similar to the characteristic plant community but has a large amount of ripgut brome. Proper grazing management helps to maintain the organic matter content, increases the rate of water infiltration, improves plant growth early in the season, and helps to control erosion.

This unit is in capability subclass VIe, nonirrigated. The MLRA is 18.

110—Auburn-Argonaut-Rock outcrop complex, 8 to 30 percent slopes. This map unit is on foothills. The native vegetation is mainly annual grasses, forbs, and scattered oaks. Elevation is 150 to 830 feet. The average annual precipitation is 20 to 24 inches.

This unit is about 40 percent Auburn soil, 35 percent Argonaut soil, and 10 percent Rock outcrop. Slopes in areas of the Auburn soil are complex. Those in most areas of the Argonaut soil are concave. The Rock outcrop is commonly on summits or on slopes of 15 to 30 percent.

Included in this unit are small areas of Mokelumne soils at the base of the slopes, soils that have slopes of more than 30 percent, and soils that have bedrock within a depth of 10 inches. Included areas make up about 15 percent of the total acreage.

The Auburn soil is shallow or moderately deep and is well drained. It formed in material weathered from metabasic and metasedimentary rocks. Typically, the surface layer and subsoil are strong brown, reddish yellow, and yellowish red loam. Fractured metabasic bedrock is at a depth of about 14 inches. In some areas the surface layer is gravelly silt loam, gravelly loam, or silt loam.

Permeability is moderate in the Auburn soil. Available water capacity is very low or low. The effective rooting depth and the depth to bedrock are 10 to 28 inches. Runoff is medium or rapid. The hazard of water erosion is slight or moderate.

The Argonaut soil is moderately deep and well drained. It formed in material weathered from metaandesite and metamorphic rocks. Typically, the surface layer is reddish yellow and light yellowish brown loam about 8 inches thick. The upper 6 inches of the subsoil is yellowish red gravelly loam. The lower 15 inches is a claypan of variegated strong brown, yellowish brown, and yellowish red clay and clay loam. Highly weathered schist is at a depth of about 29 inches. In some areas the surface layer is gravelly loam.

Permeability is very slow in the Argonaut soil. Water is perched above the claypan for short periods after heavy rainfall in winter and early spring. Available water capacity is low. The effective rooting depth is 20 to 40 inches, but roots are restricted to the cracks and faces of peds in the lower part of the subsoil. The depth to weathered bedrock is 20 to 40 inches. The shrink-swell potential is high. Runoff is medium or rapid. The hazard of water erosion is slight or moderate.

This unit is used as rangeland. The main management concerns are the very low or low available water capacity, shallow rooting depth, and moderate hazard of erosion in areas of the Auburn soil and the low available water capacity and moderate hazard of erosion in areas of the Argonaut soil. The characteristic plant community is soft chess, wild oats, and filaree on the Auburn soil and soft chess, annual ryegrass, and filaree on the Argonaut soil. Proper grazing management helps to maintain the organic matter content, increases the rate of water infiltration, improves plant growth early in the season, and helps to control erosion.

This unit is in capability subclass VIe, nonirrigated. The MLRA is 18.

111—Bruella sandy loam, 0 to 2 percent slopes. This very deep, well drained soil is on intermediate terrace remnants. It formed in alluvium derived from granitic rocks. Slopes are plane or slightly convex. The vegetation in uncultivated areas is mainly annual grasses, forbs, and scattered oaks. Elevation is 30 to 125 feet. The average annual precipitation is 16 to 18 inches.

Typically, the surface layer is yellowish brown sandy loam about 18 inches thick. The upper part of the subsoil is brown sandy clay loam about 24 inches thick. The lower part to a depth of 61 inches is yellowish red sandy clay loam. In some areas the surface layer is loam.

Included in this unit are small areas of Kimball and San Joaquin soils and Xerarents. Kimball and San Joaquin soils are on low terraces. Xerarents are in areas that have been filled during land leveling. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the Bruella soil. Available water capacity is high. The effective rooting depth is 60 inches or more. Runoff is slow. Water erosion is a slight hazard or is not a hazard at all.

Nearly all areas of this unit are used for irrigated hay and pasture or for irrigated crops, mainly corn, wheat, grapes, and alfalfa. A few small areas are used as rangeland. These areas are adjacent to fields of irrigated pasture.

This unit is suited to irrigated hay and pasture. It has few limitations. Border and sprinkler irrigation systems are suitable. Leveling helps to ensure a uniform distribution of irrigation water. The application rate should be adjusted to the available water capacity and water intake rate of the soil and to the needs of the crop. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and a lower water intake rate. Proper stocking rates, pasture rotation, and timely grazing help to keep the pasture in good condition.

This unit is suited to irrigated crops. It has few limitations. A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling can break up the pan. Returning all crop residue to the soil and including grasses, legumes, or a grass-legume mixture in the cropping sequence help to maintain fertility and tilth. Growing cover crops during winter also helps to maintain tilth and fertility in orchards and vineyards. Sprinkler, border, furrow, and trickle irrigation systems are suitable.

Few limitations affect the use of this unit for livestock grazing. The vegetation consists mainly of soft chess, wild oats, and filaree. Proper grazing management helps to maintain the organic matter content, increases the rate of water infiltration, and helps to achieve the desired balance of species in the plant community. The unit responds well to range improvement practices, such as range seeding and applications of fertilizer. The plants selected for seeding should be those that meet the seasonal requirements of livestock or wildlife, or both. After the seeds are planted, grazing should be deferred until the plants have set seed.

This unit is in capability class I, irrigated, and capability unit IIIc-1, nonirrigated. The MLRA is 17.

112—Bruella sandy loam, 2 to 5 percent slopes. This very deep, well drained soil is on intermediate terrace remnants. It formed in alluvium derived from granitic rocks. Slopes are plane or slightly convex. The vegetation in uncultivated areas is mainly annual grasses, forbs, and scattered oaks. Elevation is 30 to 125 feet. The average annual precipitation is 16 to 18 inches.

Typically, the surface layer is yellowish brown sandy loam about 18 inches thick. The upper part of the subsoil is brown sandy clay loam about 24 inches thick. The lower part to a depth of 61 inches is yellowish red sandy clay loam. In some areas the surface layer is loam.

Included in this unit are small areas of Kimball and San Joaquin soils on low terraces and small areas of soils that have slopes of 5 to 8 percent. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the Bruella soil. Available water capacity is high. The effective rooting depth is 60 inches or more. Runoff is slow. The hazard of water erosion is slight.

This unit is used mainly for irrigated hay and pasture or for irrigated crops, such as wheat, grapes, and alfalfa. A few small areas are used as rangeland. These areas are adjacent to fields of irrigated pasture.

This unit is suited to irrigated hay and pasture. It is limited mainly by the slope. Sprinkler irrigation is the best method of applying water. Border irrigation is suitable where the border checks are designed for a uniform application and the hay and pasture plants have been established. Irrigation water should be applied at a rate and time that ensure optimum production without increasing the runoff rate or the hazard of erosion. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Proper stocking rates, pasture rotation, and timely grazing help to keep the pasture in good condition and control erosion.

This soil is suited to irrigated crops. It is limited mainly by the slope. Sprinkler, contour border, contour furrow, and trickle irrigation systems are suitable because of the slope. For the efficient application and removal of irrigation water, leveling is needed in sloping areas. A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling can break up the pan. Leaving crop residue on or near the surface helps to conserve moisture, maintain tilth, and control erosion. Growing winter cover crops in orchards and vineyards helps to maintain tilth and fertility and helps to control erosion. The soil should be tilled on the contour or across the slope.

Few limitations affect the use of this unit for livestock grazing. The vegetation consists mainly of soft chess, wild oats, and filaree. Proper grazing management helps to maintain the organic matter content, increases the rate of water infiltration, and helps to achieve the desired balance of species in the plant community. The unit responds well to range improvement practices, such as range seeding and applications of fertilizer. The plants selected for seeding should be those that meet the seasonal requirements of livestock or wildlife, or both. After the seeds are planted, grazing should be deferred until the plants have set seed.

This unit is in capability units IIe-1, irrigated, and IIIe-1, nonirrigated. The MLRA is 17.

113—Capay clay loam, 0 to 2 percent slopes, occasionally flooded. This very deep, moderately well drained soil is on the rims of basins. It formed in alluvium derived from mixed rock sources. The vegetation in uncultivated areas is mainly annual grasses and forbs. Elevation is 15 to 100 feet. The average annual precipitation is 16 to 19 inches.

Typically, the surface layer is brown clay loam about 5 inches thick. The next layer is grayish brown clay about 23 inches thick. The underlying material to a depth of 67 inches is grayish brown and brown clay loam. In some areas the surface layer is silty clay or clay.

Included in this unit are small areas of Cosumnes, Galt, Hicksville, and San Joaquin soils and Xerarents. Cosumnes soils are on low flood plains adjacent to channels. Galt and San Joaquin soils are on low terraces. Hicksville soils are on low stream terraces. Xerarents are in areas that have been filled during land leveling. Also included, north of the American River, are areas that are only rarely flooded. Included areas make up about 15 percent of the total acreage.

Permeability is slow in the Capay soil. Available water capacity is very high. The effective rooting depth is 60 inches or more. A seasonal high water table fluctuates between depths of 60 and 72 inches from January through March. The shrink-swell potential is high. Runoff is slow or very slow. The hazard of water erosion is slight. The soil is occasionally flooded for very brief or brief periods following high-intensity storms.

This unit is used mainly for irrigated pasture and hay or for dryland crops, such as wheat. Some areas are used for irrigated crops, mainly corn, wheat, rice, and tomatoes.

This unit is suited to irrigated hay and pasture. The main limitations are the flooding, the slow permeability, the slow or very slow runoff, the moderately fine texture of the surface layer, and the formation of very deep cracks in the soil during dry periods. A surface drainage system is needed to remove excess surface water. The hazard of flooding can be reduced in some areas by diversions and dikes. Irrigation water can be applied by a border method. A sprinkler system can be used, but a slow application rate is needed to minimize runoff. Leveling helps to ensure a uniform distribution of irrigation water. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Proper stocking rates, pasture rotation, and timely grazing help to keep the pasture in good condition. Periodic mowing and clipping help to maintain a uniform plant cover and minimize selective grazing. The periodic formation of deep cracks in the soil shreds plant roots and thus lowers forage production. It also impedes vehicle traffic on the older stands.

This soil is suited to dryland crops. It is limited mainly by the moderately fine texture of the surface layer, the slow or very slow runoff, and the flooding. Crops can be damaged by floodwater. Therefore, a surface drainage system is needed to remove excess water. The soil should be cultivated only within a narrow range in moisture content. It is too sticky for cultivation when wet and too hard when dry.

This unit is suited to irrigated crops. If the unit is used for crops other than rice, the main limitations are the moderately fine texture of the surface layer, the slow permeability, the slow or very slow runoff, and the flooding. Returning all crop residue, except for rice straw, to the soil and including grasses, legumes, or a grass-legume mixture in the cropping sequence help to maintain fertility and tilth. Subsoiling improves the downward movement of water and the penetration of roots.

Furrow and border irrigation systems are suitable in areas where crops other than rice are grown. Because of the slow permeability, the rate of water application should be regulated so that the water does not stand on the surface and damage the crops.

This unit is suited to rice crops. It is limited mainly by the moderately fine texture of the surface layer, the slow or very slow runoff, and the flooding. These limitations restrict the use of equipment to periods when the soil is dry enough to support heavy loads. Level basin irrigation is suitable in the areas used for rice.

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

114—Clear Lake clay, partially drained, 0 to 2 percent slopes, frequently flooded. This very deep, artificially drained soil is in basins and along drainageways. Ground-water overdraft has altered the drainage of the soil. Standing water covers many areas for intermittent periods. The soil formed in poorly drained, fine textured alluvium derived from mixed rock sources. When the soil is dry, deep cracks form. Slopes are concave. The vegetation in uncultivated areas is mainly annual grasses and forbs. Elevation is 5 to 25 feet. The average annual precipitation is 15 to 17 inches.

Typically, the surface layer is very dark gray and gray clay about 43 inches thick. The underlying material to a depth of 61 inches is gray, stratified sandy clay loam to clay loam. It has brownish yellow mottles in the lower part. In some areas the surface layer is clay loam.

Included in this unit are small areas of Dierssen, Egbert, and San Joaquin soils. Dierssen soils are on the rims of basins. Egbert soils are on high flood plains. San Joaquin soils are on low terraces. Included areas make up about 15 percent of the total acreage.

Permeability is slow in the Clear Lake soil. Available water capacity is high. The effective rooting depth is 60 inches or more. The depth to a seasonal high water table is 36 to 60 inches in winter and early spring. The shrink-swell potential is high. Runoff is slow. The hazard of water erosion is slight. The soil is frequently flooded for brief or long periods following high-intensity storms. Channeling and deposition are common along streambanks.

Nearly all areas of this unit are used for irrigated crops or for irrigated hay and pasture. The commonly grown crops are corn, tomatoes, and sorghum. Nonirrigated safflower also is grown. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is suited to irrigated crops. The main limitations are depth to the water table, the flooding, the fine texture of the surface layer, and the slow permeability and runoff. Furrow and border irrigation systems are suitable. An efficient water application system is needed to prevent the development of a perched water table. Because of the fine texture of the surface layer and the slow permeability, the rate of water application should be regulated so that the water does not stand on the surface and damage the crops. A surface drainage system and open drainage ditches are needed to remove excess surface water and to lower the water table. Crops can be damaged by floodwater. The hazard of flooding can be reduced by levees, dikes, and diversions. The soil should be cultivated only within a narrow range in moisture content. It is too sticky for cultivation when wet and too hard when dry. Returning all crop residue to the soil and including grasses, legumes, or a grass-legume mixture in the cropping sequence help to maintain fertility and tilth. Subsoiling improves the downward movement of water and the penetration of roots.

This unit is suited to irrigated hay and pasture. It is limited mainly by the fine texture of the surface layer, the slow permeability, depth to the water table, and the formation of deep cracks in the soil during dry periods. Irrigation water can be applied by a border method. The grasses and legumes selected for planting should be those that are suited to a moderately deep root zone. The periodic formation of deep cracks in the soil shreds plant roots and thus lowers forage production. It also impedes vehicle traffic on the older stands. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and a lower water intake rate. Proper stocking rates, pasture rotation, and timely grazing help to keep the pasture in good condition.

This unit is in capability unit IVw-2, irrigated and nonirrigated. The MLRA is 17.

115—Clear Lake clay, hardpan substratum, drained, 0 to 1 percent slopes. This very deep and deep, artificially drained soil is in basins. Levees, drainage ditches, and pumps have lowered the water table and altered the drainage of the soil. The soil formed in somewhat poorly drained, fine textured alluvium derived from mixed rock sources. A system of levees and large upstream dams has reduced the hazard of flooding. When the soil is dry, deep cracks form. Slopes are plane because of land leveling. The vegetation in uncultivated areas is mainly annual grasses and forbs. Elevation is 5 to 30 feet. The average annual precipitation is 15 to 18 inches.

Typically, the surface layer is dark gray clay about 15 inches thick. The upper 19 inches of the underlying material is dark gray and yellowish brown clay that has segregated concretions of lime. The lower 14 inches is yellowish brown and gray clay loam that has segregated concretions of lime. Below this to a depth of 64 inches is a hardpan that is cemented with silica. In some areas the surface layer is clay loam.

Included in this unit are small areas of Cosumnes and San Joaquin soils. San Joaquin soils are on low terraces. Included areas make up about 15 percent of the total acreage.

Permeability is slow in the Clear Lake soil. Available water capacity is moderate. The effective rooting depth and the depth to a hardpan are 40 to 80 inches. The depth to a seasonal high water table is mainly 60 to 72 inches in winter and early spring, but it can be at a depth of 48 to 60 inches for short periods. The shrink-swell potential is high. Runoff is very slow. Water erosion is a slight hazard or is not a hazard at all. The soil is subject to rare flooding.

This unit is used mainly for irrigated crops, such as rice, corn, tomatoes, sugar beets, and wheat. Nonirrigated safflower also is grown. Some areas are used for irrigated hay and pasture. A few areas are used for urban development. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is suited to irrigated crops. If the unit is used for crops other than rice, the main limitations are the fine texture of the surface layer, the slow permeability, and the very slow runoff. Furrow and border irrigation systems can be used in areas where crops other than rice are grown. Because of the fine texture of the surface layer and the slow permeability, the rate of water application should be regulated so that the water does not stand on the surface and damage the crops. A surface drainage system and open drainage ditches are needed to remove excess surface water and to maintain the water table. The soil should be cultivated only within a narrow range in moisture content. It is too sticky for cultivation when wet and too hard when dry. Returning all crop residue, except for rice straw, to the soil and including grasses, legumes, or a grass-legume mixture in the cropping sequence help to maintain fertility and tilth. Subsoiling improves the downward movement of water and the penetration of roots.

This unit is suited to rice crops. It is limited mainly by the fine texture of the surface layer and the very slow runoff. Equipment should be used only during periods when the soil is dry enough to support heavy loads. Level basin irrigation is suitable in the areas used for rice.

This unit is suited to irrigated hay and pasture. It is limited mainly by the fine texture of the surface layer, the slow permeability, and the very slow runoff.

Irrigation water can be applied by a border method. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and a lower water intake rate. Proper stocking rates, pasture rotation, and timely grazing help to keep the pasture in good condition.

The main limitations affecting urban uses are the high shrink-swell potential, low strength, the depth to a seasonal high water table, the slow permeability, the very slow runoff, the flooding, and sloughing. Sloughing is a hazard in shallow excavations, such as trenches and holes. Properly grading building sites helps to divert water away from the foundations and helps to prevent ponding in the adjacent areas. Excess runoff can be removed by a system of suitably designed drainage ditches or drainage pipe. If buildings are constructed on this clayey soil, properly designing foundations and footings and diverting runoff away from the buildings help to prevent the structural damage caused by shrinking and swelling. Properly designing roads and streets helps to compensate for the instability of the soil. The slow permeability increases the possibility that improperly designed septic tank absorption fields will fail. Offsite systems should be considered.

An adequate drainage system should be provided in areas used for landscape plants. During summer irrigation is needed in areas used for lawns, shrubs, vines, or shade and ornamental trees.

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

116—Columbia sandy loam, partially drained, 0 to 2 percent slopes. This very deep, artificially drained soil is on natural levees on low flood plains along rivers and sloughs. Levees, open and closed drains, and pumps have lowered the water table and altered the drainage of the soil. The soil formed in somewhat poorly drained alluvium derived from mixed rock sources. A system of levees and large upstream dams has reduced the hazard of flooding. Slopes are plane and descend from the levees or channels. The vegetation in uncultivated areas is mainly annual grasses, forbs, and scattered oaks. Elevation is 5 to 25 feet. The average annual precipitation is 14 to 17 inches.

Typically, the surface layer is light yellowish brown sandy loam about 11 inches thick. The underlying material to a depth of 60 inches is light yellowish brown, stratified sandy loam, silt loam, and loam and pale brown sand. In some areas the surface layer is loam, silt loam, or fine sandy loam. In other areas the upper 20 inches is mottled.

Included in this unit are small areas of the Columbia soils that have a clayey substratum and small areas of Sailboat and Valpac soils. Valpac soils are on high flood plains. Included areas make up about 15 percent of the total acreage.

Permeability is moderately rapid in the Columbia soil. Available water capacity is moderate. The effective rooting depth is limited by a seasonal high water table in winter and early spring. The water table is high because of seepage and generally is maintained below a depth of 36 inches by pumping. It can be at a depth of 20 to 36 inches for short periods. Runoff is very slow or slow. Water erosion is a slight hazard or is not a hazard at all. The hazard of soil blowing is moderate. The soil is subject to rare flooding.

This unit is used for irrigated crops, such as corn, wheat, tomatoes, and pears. Alfalfa can be grown in areas where the water table is carefully managed and maintained below a depth of 36 inches. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is suited to irrigated crops. It is limited mainly by depth to the seasonal high water table, the moderate hazard of soil blowing, and the moderate available water capacity. The water table in winter and early spring limits the suitability for deep-rooted crops. Pear trees, however, can tolerate some wetness. In areas where a suitable outlet is available, tile drainage can lower the water table. Returning all crop residue to the soil and including grasses, legumes, or a grass-legume mixture in the cropping sequence help to maintain fertility and control soil blowing.

Furrow, border, sprinkler, and trickle irrigation systems are suitable. To avoid overirrigating and the leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity and water intake rate of the soil and to the needs of the crop. Pipe, ditch lining, or drop structures in irrigation ditches facilitate irrigation and reduce the hazard of ditch erosion.

This unit is in capability units IIw-2, irrigated, and IIIw-2, nonirrigated. The MLRA is 16 or 17.

117—Columbia sandy loam, drained, 0 to 2 percent slopes. This very deep, artificially drained soil is on narrow, low flood plains along rivers and streams. Levees and ground-water overdraft have altered the drainage of the soil. The soil formed in somewhat poorly drained alluvium derived from mixed rock sources. Levees have reduced the hazard of flooding. Slopes are plane. The vegetation in uncultivated areas is mainly annual grasses, forbs, and scattered oaks. Elevation is 10 to 140 feet. The average annual precipitation is 16 to 20 inches.

Typically, the surface layer is light yellowish brown sandy loam about 11 inches thick. The underlying material to a depth of 60 inches is light yellowish brown, stratified sandy loam, silt loam, and loam and pale brown sand. In some areas the surface layer is loamy sand, loam, or silt loam. In other areas it is thicker and darker.

Included in this unit are small areas of the Columbia soils that have a clayey substratum and small areas of Cosumnes, Sailboat, and Vina soils. Vina soils are on high flood plains. Included areas are occasionally flooded. They make up about 15 percent of the total acreage.

Permeability is moderately rapid in the Columbia soil. Available water capacity is moderate. The effective rooting depth is 60 inches or more. Depth to the water table is more than 72 inches. Runoff is very slow or slow. Water erosion is a slight hazard or is not a hazard at all. The hazard of soil blowing is slight. The soil is subject to rare flooding.

This unit is used for irrigated crops or for irrigated hay and pasture. The commonly grown crops include corn, tomatoes, alfalfa, and wheat. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is suited to irrigated crops. It is limited mainly by the moderate available water capacity. Returning all crop residue to the soil and including grasses, legumes, or a grass-legume mixture in the cropping sequence help to maintain fertility and tilth.

Furrow, border, and sprinkler irrigation systems are suitable. To avoid overirrigating and the leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity and water intake rate of the soil and to the needs of the crop. Pipe, ditch lining, or drop structures in irrigation ditches facilitate irrigation and reduce the hazard of ditch erosion.

This unit is suited to irrigated hay and pasture. It is limited mainly by the moderate available water capacity. Irrigation water can be applied by sprinkler and border methods. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and a lower water intake rate. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition.

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

118—Columbia sandy loam, drained, 0 to 2 percent slopes, occasionally flooded. This very deep, artificially drained soil is on narrow, low flood plains along rivers and streams. Ground-water overdraft has altered the drainage of the soil. The soil formed in somewhat poorly drained alluvium derived from mixed rock sources. Slopes are plane. The vegetation in uncultivated areas is mainly annual grasses and forbs, scattered oaks, and willows. Elevation is 10 to 120 feet. The average annual precipitation is 16 to 18 inches.

Typically, the surface layer is light yellowish brown sandy loam about 11 inches thick. The underlying material to a depth of 60 inches is stratified, yellowish brown sandy loam, silt loam, and loam and pale brown sand. In some areas the surface layer is loamy sand, loam, or silt loam. In other areas it is thicker and darker.

Included in this unit are small areas of the Columbia soils that have a clayey substratum and small areas of Cosumnes, Hicksville, and Sailboat soils. Hicksville soils are on low stream terraces. Also included are areas along channels that are protected by levees and are subject to rare flooding; unprotected areas that are frequently flooded; and, near the mouth of the American River, soils that have a seasonal high water table at a depth of 36 to 72 inches and are frequently flooded. Included areas make up about 15 percent of the total acreage.

Permeability is moderately rapid in the Columbia soil. Available water capacity is moderate. The effective rooting depth is 60 inches or more. Depth to the water table is more than 72 inches. Runoff is very slow or slow. Water erosion is a slight hazard or is not a hazard at all. The hazard of soil blowing is slight. The soil is occasionally flooded for very brief or brief periods during prolonged, high-intensity storms (fig. 6). Channeling and deposition are common along streambanks.

Most areas of this unit are used for irrigated crops or for irrigated hay and pasture. The commonly grown crops include corn, wheat, alfalfa, and tomatoes. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is suited to irrigated crops. It is limited mainly by the flooding during winter and early spring and the moderate available water capacity. Crops can be damaged by floodwater. The hazard of flooding can be reduced in some areas by diversions and dikes. Returning all crop residue to the soil and including grasses, legumes, or a grass-legume mixture in the cropping sequence help to maintain fertility and tilth.

Furrow, border, and sprinkler irrigation systems are suitable. To avoid overirrigating and the leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity and water intake rate of the soil and to the needs of the crop.

Figure 6.—A flooded area of Columbia sandy loam, drained, 0 to 2 percent slopes, occasionally flooded. San Joaquin soils are on the low terrace in the background.

Pipe, ditch lining, or drop structures in irrigation ditches facilitate irrigation and reduce the hazard of ditch erosion.

This unit is suited to irrigated hay and pasture. It is limited mainly by the moderate available water capacity and the flooding during winter and early spring. Irrigation water can be applied by sprinkler and border methods. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and a lower water intake rate. Proper stocking rates, pasture rotation, and timely grazing help to keep the pasture in good condition.

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

119—Columbia sandy loam, clayey substratum, partially drained, 0 to 2 percent slopes. This very deep, artificially drained soil is on natural levees on low flood plains along rivers and sloughs. Levees, open and closed drains, and pumps have lowered the water table and altered the drainage of the soil. The soil formed in somewhat poorly drained alluvium derived from mixed rock sources. A system of levees and large upstream dams has reduced the hazard of flooding. Slopes are plane and descend from the levees or channels. The vegetation in uncultivated areas is mainly annual grasses, forbs, and scattered oaks. Elevation is 5 to 30 feet. The average annual precipitation is 16 to 17 inches.

Typically, the surface layer is light yellowish brown sandy loam about 11 inches thick. The underlying material is about 32 inches of stratified, light yellowish brown sandy loam, silt loam, and loam and pale brown sand. Below this to a depth of 64 inches is a buried surface layer of dark gray clay. In some areas the surface layer is loam, silt loam, or fine sandy loam.

Included in this unit are small areas of Sailboat and Valpac soils and soils that are similar to the Columbia soil but do not have a buried surface layer of clay loam or clay. Valpac soils are on high flood plains. Included areas make up about 15 percent of the total acreage.

Permeability is moderately rapid above the clayey buried layer in the Columbia soil and slow in the buried layer, which is at a depth of 40 to 60 inches. Available water capacity is moderate. The effective rooting depth is limited by a seasonal high water table in winter and early spring. The water table is high because of seepage. Because of pumping, it generally is maintained at a depth of 36 to 60 inches from December through April and below a depth of 60 inches during the rest of the year. It can be at a depth of 20 to 36 inches for short periods. Runoff is very slow or slow. Water erosion is a slight hazard or is not a hazard at all. The shrink-swell potential is high in the clayey buried layer. The hazard of soil blowing is slight. The soil is subject to rare flooding.

This unit is used for irrigated crops, such as corn, wheat, and tomatoes. Alfalfa can be grown in areas where the water table is carefully managed. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is suited to irrigated crops. It is limited mainly by the depth to a seasonal high water table, the slow permeability in the clayey buried layer, and the moderate available water capacity. The water table during the rainy period in winter and early spring generally limits the suitability for deep-rooted crops. Tile drainage can lower the water table if a suitable outlet is available. Returning all crop residue to the soil and including grasses, legumes, or a grass-legume mixture in the cropping sequence help to maintain fertility and tilth.

Furrow, border, and sprinkler irrigation systems are suitable. An efficient water application system is needed to prevent the development of a perched water table on the clayey buried layer. Pipe, ditch lining, or drop structures in irrigation ditches facilitate irrigation and reduce the hazard of ditch erosion.

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

120—Columbia sandy loam, clayey substratum, drained, 0 to 2 percent slopes. This very deep, artificially drained soil is on narrow, low flood plains along rivers and streams. It is protected against flooding by levees. The levees and ground-water overdraft have altered the drainage of the soil. The soil formed in somewhat poorly drained alluvium derived from mixed rock sources. Slopes are plane. The vegetation in uncultivated areas is mainly annual grasses, forbs, and scattered oaks. Elevation is 10 to 85 feet. The average annual precipitation is 16 to 18 inches.

Typically, the surface layer is light yellowish brown sandy loam about 11 inches thick. The underlying material is about 32 inches of stratified, light yellowish brown sandy loam, silt loam, and loam and pale brown sand. Below this to a depth of 64 inches is a buried surface layer of dark gray clay. In some areas the surface layer is loamy sand, loam, or silt loam. In other areas it is thicker and darker.

Included in this unit are small areas of Cosumnes and Sailboat soils and soils that do not have a buried surface layer of clay loam or clay. Also included are areas that are occasionally flooded. Included areas make up about 15 percent of the total acreage.

Permeability is moderately rapid above the clayey buried layer in the Columbia soil and slow in the buried layer, which is at a depth of 40 to 60 inches. Available water capacity is moderate. The effective rooting depth is 60 inches or more. Depth to the water table is more than 72 inches. Runoff is very slow or slow. The shrink-swell potential is high. Water erosion is a slight hazard or is not a hazard at all. The hazard of soil blowing is slight. The soil is subject to rare flooding.

This unit is used for irrigated crops or for irrigated hay and pasture. The commonly grown crops include corn, wheat, alfalfa, and tomatoes. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is suited to irrigated crops. It is limited mainly by the slow permeability in the clayey buried layer and the moderate available water capacity. Returning all crop residue to the soil and including grasses, legumes, or a grass-legume mixture in the cropping sequence help to maintain fertility and tilth.

Furrow, border, and sprinkler irrigation systems are suitable. An efficient water application system is needed to prevent the development of a perched water table on the clayey buried layer. Pipe, ditch lining, or drop structures in irrigation ditches facilitate irrigation and reduce the hazard of ditch erosion.

This unit is suited to irrigated hay and pasture. It is limited mainly by the slow permeability in the clayey buried layer and the moderate available water capacity. Irrigation water can be applied by sprinkler and border methods. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and a lower water intake rate. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition.

This unit is in capability units IIs-3, irrigated, and IIIs-3, nonirrigated. The MLRA is 17.

121—Columbia sandy loam, clayey substratum, drained, 0 to 2 percent slopes, occasionally flooded. This very deep, artificially drained soil is on narrow, low flood plains along rivers and streams. Ground-water overdraft has altered the drainage of the soil. The soil formed in somewhat poorly drained alluvium derived from mixed rock sources. Slopes are plane. The vegetation in uncultivated areas is mainly annual grasses, forbs, scattered oaks, and willows. Elevation is 10 to 120 feet. The average annual precipitation is 16 to 18 inches.

Typically, the surface layer is light yellowish brown sandy loam about 11 inches thick. The underlying material is about 32 inches of stratified, light yellowish brown sandy loam, silt loam, and loam and pale brown sand. Below this to a depth of 64 inches is a buried surface layer of dark gray clay. In some areas the surface layer is loamy sand, loam, or silt loam. In other areas it is thicker and darker.

Included in this unit are small areas of Cosumnes and Sailboat soils and soils that do not have a buried surface layer of clay loam or clay. Also included are areas that are protected by levees and are subject to rare flooding and unprotected areas along channels that are frequently flooded. Included areas make up about 15 percent of the total acreage.

Permeability is moderately rapid above the clayey buried layer in the Columbia soil and slow in the buried layer, which is at a depth of 40 to 60 inches. Available water capacity is moderate. The effective rooting depth is 60 inches or more. Depth to the water table is more than 72 inches. Runoff is very slow or slow. The shrink-swell potential is high. Water erosion is a slight hazard or is not a hazard at all. The hazard of soil blowing is slight. The soil is occasionally flooded for very brief or brief periods during prolonged, high-intensity storms. Channeling and deposition are common along streambanks.

Most areas of this unit are used for irrigated crops or for irrigated hay and pasture. The commonly grown crops include corn, wheat, alfalfa, and tomatoes. A few areas are used as rangeland. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is suited to irrigated crops. It is limited mainly by the moderate available water capacity, the slow permeability in the clayey buried layer, and the flooding during winter and early spring. Crops can be damaged by floodwater. The hazard of flooding can be reduced in some areas by diversions and dikes. Returning all crop residue to the soil and including grasses, legumes, or a grass-legume mixture in the cropping sequence help to maintain fertility and tilth.

Furrow, border, and sprinkler irrigation systems are suitable. An efficient water application system is needed to prevent the development of a perched water table on the clayey buried layer. Pipe, ditch lining, or drop structures in irrigation ditches facilitate irrigation and reduce the hazard of ditch erosion.

This unit is suited to irrigated hay and pasture. It is limited mainly by the moderate available water capacity, the slow permeability in the clayey buried layer, and the flooding during winter and early spring. Irrigation water can be applied by sprinkler and border methods. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and a lower water intake rate. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition.

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

122—Columbia fine sandy loam, partially drained, 0 to 2 percent slopes. This very deep, artificially drained soil is on flood-plain splays. Levees, open and closed drains, and pumps have lowered the water table and altered the drainage of the soil. The soil formed in somewhat poorly drained alluvium derived from mixed rock sources. The alluvium is underlain by organic material that has a high content of hydrophytic plant remains. A system of levees and large upstream dams has reduced the hazard of flooding. Slopes are plane. The vegetation in uncultivated areas is mainly annual grasses and forbs. Elevation is 10 feet below sea level to sea level. The average annual precipitation is 13 to 14 inches.

Typically, the surface layer is brown fine sandy loam about 14 inches thick. The upper part of the underlying material is stratified, pale brown sandy loam, fine sandy loam, and silt loam about 28 inches thick. The lower part is stratified, pale brown silt loam and silty clay loam about 12 inches thick. Below this to a depth of 67 inches is a buried surface layer of dark gray and gray mucky clay loam. In some areas the surface layer is loamy fine sand.

Included in this unit are small areas of soils that are similar to the Columbia soil but do not have a buried surface layer. Included areas make up about 10 percent of the total acreage.

Permeability is moderately slow in the Columbia soil. Available water capacity is high. The effective rooting depth is limited by a seasonal high water table in winter and early spring. The water table is high because of seepage and is maintained below a depth of 48 inches by pumping. The soil is subject to subsidence. Runoff is very slow. Water erosion is a slight hazard or is not a hazard at all. The hazard of soil blowing is severe. The soil is subject to rare flooding.

This unit is used for irrigated crops, including alfalfa, asparagus, wheat, and pears. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is suited to irrigated crops. It is limited mainly by the seasonal high water table, a rapid water intake rate, the moderate available water capacity, subsidence, and the hazard of soil blowing. The water table during winter and early spring limits the suitability for some deep-rooted crops. Pear trees, however, can tolerate some wetness. Because of the buried surface layer, which is high in organic matter content, the soil is subject to differential subsidence. Frequently leveling the fields improves the efficiency of irrigation. Soil blowing can be controlled by planting a close-growing cover crop. Returning all crop residue to the soil and including grasses, legumes, or a grass-legume mixture in the cropping sequence help to maintain fertility and control soil blowing.

Border, sprinkler, and trickle irrigation systems are suitable. Because of the rapid water intake rate, short runs should be used. To avoid overirrigating and the leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity and water intake rate of the soil and to the needs of the crop. Pipe, ditch lining, or drop structures in irrigation ditches facilitate irrigation and reduce the hazard of ditch erosion.

This unit is in capability units IIw-10, irrigated, and IIIw-10, nonirrigated. The MLRA is 16.

123—Columbia silt loam, drained, 2 to 5 percent slopes. This very deep, artificially drained soil is in narrow remnant channels that are elevated above the surrounding flood plain, which has subsided. Levees, drainage ditches, and pumps have lowered the water table and altered the drainage of the soil. The soil formed in somewhat poorly drained alluvium derived from mixed rock sources. A system of levees and large upstream dams has reduced the hazard of flooding. Slopes are convex. The vegetation in uncultivated areas is mainly annual grasses and forbs. Elevation is 10 feet below sea level to sea level. The average annual precipitation is 13 to 15 inches.

Typically, the surface layer is pale brown silt loam about 12 inches thick. The underlying material to a depth of 60 inches is very pale brown, stratified silt loam and fine sandy loam and thin layers of fine sand. In some areas the surface layer is sandy loam or loam. In other areas the soil is stratified silt loam and loam to a depth of 60 inches.

Included in this unit are small areas of Sailboat and Scribner soils and soils that have slopes of 5 to 8 percent. Scribner soils are on the edges of backswamps. Included areas make up about 15 percent of the total acreage.

Permeability is moderately rapid in the Columbia soil. Available water capacity is moderate. The effective rooting depth is limited by a seasonal high water table in winter and early spring. The water table is high because of seepage and is maintained below a depth of 60 inches by pumping. The soil is subject to subsidence. Runoff is slow. The hazard of water erosion is moderate. The hazard of soil blowing is slight. The soil is subject to rare flooding.

This unit is used for dryland crops, mainly wheat. It can be used for irrigated crops if sprinkler or trickle irrigation is used. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is suited to dryland crops. It is limited mainly by subsidence and the hazard of soil blowing. Differential subsidence of underlying organic material in some areas causes an increase in the slope. Leaving crop residue on or near the surface helps to conserve moisture, maintain tilth, and control soil blowing. The soil should be tilled on the contour or across the slope.

This unit is in capability units IIe-1, irrigated, and IIIe-1, nonirrigated. The MLRA is 16.

124—Columbia-Urban land complex, drained, 0 to 2 percent slopes. This map unit is on natural levees on low flood plains along rivers. A system of levees and large upstream dams has reduced the hazard of flooding. Levees, closed drains, and pumps have lowered the water table and altered the drainage of the Columbia soil. Slopes are plane and descend from the levees or channels or have been shaped for urban uses. The vegetation is mainly ornamental plants. Elevation is 10 to 30 feet. The average annual precipitation is 17 to 18 inches. The unit is about 60 percent Columbia soil and 30 percent Urban land.

Included in this unit are small areas of Cosumnes, Rossmoor, and Sailboat soils. Also included are areas that do not have a buried surface layer of clay loam or clay. Included areas make up about 10 percent of the total acreage.

The Columbia soil is very deep and is artificially drained. It formed in somewhat poorly drained alluvium derived from mixed rock sources. Typically, the surface layer is light yellowish brown sandy loam about 11 inches thick. The underlying material is about 32 inches of stratified, light yellowish brown sandy loam, silt loam, and loam and pale brown sand. Below this to a depth of 64 inches is a buried surface layer of dark gray clay. In some areas the surface layer is loam, silt loam, or fine sandy loam. In other areas the upper 20 inches is mottled.

Permeability is moderately rapid above the clayey buried layer in the Columbia soil and slow in the buried layer, which is at a depth of 40 to 60 inches. Available water capacity is moderate. The effective rooting depth is limited by a seasonal high water table in winter and early spring. The water table is high because of seepage and generally is maintained below a depth of 60 inches by pumping. It can be at a depth of 36 to 60 inches for short periods. Runoff is very slow or slow. The shrink-swell potential is high. Water erosion is a slight hazard or is not a hazard at all. The soil is not susceptible to soil blowing. It is subject to rare flooding.

Urban land consists of areas covered by impervious surfaces or structures, such as roads, driveways, sidewalks, buildings, and parking lots. The soil material under the impervious surfaces is similar to that of the Columbia soil, although it may have been truncated or otherwise altered.

This unit is used for urban development. The main limitations affecting urban uses are the slow permeability in the clayey buried layer, the depth to a seasonal high water table, and the hazard of sloughing. Shallow excavations, such as trenches and holes, are limited by the seasonal high water table. The hazard of sloughing, the slow permeability, and the high water table increase the possibility that improperly designed septic tank absorption fields will fail. Offsite sewage disposal systems should be considered. During summer irrigation is needed in areas used for lawns, shrubs, vines, or shade and ornamental trees.

No land capability classification is assigned. The MLRA is 17.

125—Corning complex, 0 to 8 percent slopes. This map unit is on dissected high terraces and terrace remnants characterized by mound-intermound microrelief. Slopes are complex. The native vegetation is mainly annual grasses and forbs. Elevation is 75 to 350 feet. The average annual precipitation is 16 to 22 inches.

This unit is about 45 percent well drained Corning soil and 40 percent moderately well drained Corning soil. The well drained Corning soil is on the mounds. The moderately well drained Corning soil is in concave areas between the mounds. Most areas that have slopes of 0 to 2 percent are east of the Rancho Seco Reservoir.

Included in this unit are small areas of Creviscreek, Hicksville, and Redding soils and soils that have slopes of 8 to 15 percent. Creviscreek soils are on stream terraces. Hicksville soils are on low stream terraces. Included areas make up about 15 percent of the total acreage.

The well drained Corning soil is very deep. It formed in gravelly alluvium derived from mixed rock sources. Typically, the surface layer is about 28 inches of strong brown gravelly loam and yellowish red loam. The subsoil is a claypan of yellowish red gravelly clay loam about 19 inches thick. The substratum to a depth of 62 inches is yellowish red, stratified gravelly loamy coarse sand to gravelly sandy clay loam. In some areas the surface layer is gravelly sandy loam, loam, or sandy loam. In other areas the subsoil and substratum are very gravelly. In places the subsoil is clay or clay loam.

Permeability is very slow in the well drained Corning soil. Water is perched above the claypan for very brief periods after heavy rainfall in winter and early spring and when the soil is overirrigated. Available water capacity is moderate. The effective rooting depth is more than 60 inches, but roots are restricted to the cracks and faces of peds in the claypan, which is at a depth of 20 to 40 inches. Runoff is medium. The hazard of water erosion is slight or moderate.

The moderately well drained Corning soil is very deep. It formed in gravelly alluvium derived dominantly from mixed rock sources. Typically, the surface layer is brown gravelly fine sandy loam and reddish brown, yellowish red, and light brown loam, which extends to a depth of about 20 inches. The subsoil is a claypan of yellowish red clay about 12 inches thick. The substratum to a depth of 60 inches is yellowish red, stratified gravelly sandy clay loam to gravelly sandy loam. In some areas, the surface layer is gravelly loam, sandy loam, or loam and the subsoil and substratum are very gravelly. In other areas the subsoil does not have coarse fragments and is grayish brown clay and clay loam.

Permeability is very slow in the moderately well drained Corning soil. Water is perched above the claypan for short periods after heavy rainfall in winter and early spring and when the soil is overirrigated. Available water capacity is low. The effective rooting depth is more than 60 inches, but roots are restricted to the cracks and faces of peds in the claypan, which is at a depth of 15 to 30 inches. Runoff generally is slow or very slow but is ponded in nearly level areas. The shrink-swell potential is high in the subsoil. The hazard of water erosion is slight or moderate.

Most areas of this unit are used for rangeland or dryland crops. A few areas have been leveled and are used for irrigated pasture. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

Few limitations affect the use of this unit for livestock grazing. Management concerns include the moderate available water capacity and a moderate level of fertility. Also, the moderately well drained Corning soil is limited by the accumulation of water in the intermound areas. The characteristic plant community is mainly soft chess, foxtail fescue, and filaree on the well drained Corning soil and soft chess, foxtail fescue, and toad rush on the moderately well drained Corning soil. Early in the green feed period, livestock grazing is concentrated on the mounds because water accumulates in the intermound areas. Late in the green feed period, grazing is concentrated in the intermound areas. Grazing can continue on the mounds for 2 to 3 weeks after the vegetation in the intermound areas is dry or has been removed, but it should be discontinued when the vegetation on the mounds has a patchy appearance. Proper grazing management helps to maintain fertility and the organic matter content, increases the rate of water infiltration, and improves plant growth early in the season.

The use of this unit for dryland crops is limited mainly by the hazard of erosion, surface drainage, the available water capacity, the moderate level of fertility, and the content of coarse fragments in the surface layer. Because runoff accumulates in the intermound areas during winter and early spring, yields of the crops grown during this period can be reduced. Land smoothing is needed to minimize the accumulation of runoff in concave areas. A tillage pan forms easily if the soils are tilled when wet. Chiseling or subsoiling can break up the tillage pan. Coarse fragments in the surface layer cause rapid wear of tillage equipment. Leaving crop residue on or near the surface helps to conserve moisture, maintain tilth and fertility, and control erosion. The soils should be tilled on the contour or across the slope.

This unit is suited to irrigated pasture. The main limitations are the moderate depth to a claypan, the very slow permeability, the low available water capacity, the moderate level of fertility, the complex slopes, and the moderate hazard of water erosion. Subsoiling improves the downward movement of water and the penetration of roots in the very slowly permeable claypan. Seedbeds should be prepared on the contour or across the slope where practical. Pasture plants respond well to nitrogen and phosphorus fertilizer.

Because of the slope, the depth to a claypan, and the very slow permeability, sprinkler irrigation is the best method of applying water. Leveling or land smoothing is needed to prevent the accumulation of water in the concave areas. Because of the low available water capacity, applications of water should be light and frequent. An efficient water application system is needed to prevent the development of a perched water table on the claypan and ponding in the intermound areas.

Only shallow-rooted grasses and legumes should be planted on this unit. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and control erosion.

This unit is in capability units IIe-3, irrigated, and IIIe-3, nonirrigated. The MLRA is 17.

126—Corning-Redding complex, 8 to 30 percent slopes. This map unit is on dissected high terraces and high terrace remnants. Slopes are complex. The native vegetation is mainly annual grasses and forbs. Elevation is 75 to 350 feet. The average annual precipitation is 16 to 20 inches.

This unit is about 50 percent Corning soil and 35 percent Redding soil. The Corning soil is on the side slopes of high terraces and has slopes of 8 to 30 percent. The Redding soil is on the summits of high terrace remnants and has slopes of 8 to 15 percent.

Included in this unit are small areas of the moderately well drained Corning soils. These soils are in the intermound areas that have slopes of 8 to 15 percent. Also included are soils that do not have a claypan and soils that have slopes of 0 to 8 percent or 30 to 50 percent. Included areas make up about 15 percent of the total acreage.

The Corning soil is very deep and well drained. It formed in gravelly alluvium derived from mixed rock sources. Typically, the surface layer is about 28 inches of strong brown gravelly loam and yellowish red loam. The subsoil is a claypan of yellowish red gravelly clay loam about 19 inches thick. The substratum to a depth of 62 inches is yellowish red, stratified gravelly loamy coarse sand to gravelly sandy clay loam. In some areas the surface layer is gravelly sandy loam, loam, or sandy loam. In other areas the subsoil and substratum are very gravelly.

Permeability is very slow in the Corning soil. Water is perched above the claypan for short periods after heavy rainfall in winter and early spring. Available water capacity is moderate. The effective rooting depth is more than 60 inches, but roots are restricted to the cracks and faces of peds in the claypan, which is at a depth of 20 to 40 inches. Runoff is medium or rapid. The shrink-swell potential is high. The hazard of water erosion is moderate or severe.

The Redding soil is moderately deep and moderately well drained. It formed in gravelly and cobbly alluvium derived from mixed rock sources. Typically, the surface layer is strong brown gravelly loam about 7 inches thick. The upper 13 inches of the subsoil is yellowish red gravelly clay loam and gravelly loam. The lower 8 inches is a claypan of reddish brown and yellowish red gravelly clay. Below this to a depth of 66 inches is a very gravelly hardpan that is strongly cemented or weakly cemented with silica. The depth to a hardpan ranges from 20 to 40 inches. In some areas the surface layer is gravelly sandy loam or loam.

Permeability is very slow in the Redding soil. Water is perched above the claypan for short periods after heavy storms in winter and early spring. Available water capacity is low. The effective rooting depth is 20 to 40 inches, but roots are restricted to the cracks and faces of peds in the claypan, which is at a depth of 17 to 30 inches. Runoff is medium. The hazard of water erosion is moderate.

This unit is used as rangeland. Few limitations affect the use of this unit for livestock grazing. Management concerns include the limited available water capacity and the level of fertility. The Corning soil also is limited by the severe hazard of erosion. The characteristic plant community on both soils is mainly soft chess, foxtail fescue, and filaree. Proper grazing management helps to maintain fertility and the organic matter content, increases the rate of water infiltration, improves plant growth early in the season, and helps to control erosion.

This unit is in capability subclass VIe, nonirrigated. The MLRA is 17.

127—Cosumnes silt loam, partially drained, 0 to 2 percent slopes. This very deep, artificially drained soil is on low flood plains. Levees, open and closed drains, and pumps have lowered the water table and altered the drainage of the soil. The soil formed in somewhat poorly drained alluvium derived from mixed rock sources. A system of levees and large upstream dams has reduced the hazard of flooding. Slopes are plane and in some areas descend from the levees or channels. The vegetation in uncultivated areas is mainly annual grasses and forbs. Elevation is 5 to 20 feet. The average annual precipitation is 16 to 19 inches.

Typically, the surface layer is pale brown silt loam about 8 inches thick. The next 13 inches is pale brown silty clay loam and clay. The next 22 inches is a buried surface layer of gray clay. Below this to a depth of 60 inches is gray and pale brown clay loam. In some areas the surface layer is clay loam or silty clay loam. In other areas depth to the buried layer is 12 to 20 inches.

Included in this unit are small areas of Clear Lake, Columbia, Egbert, and Sailboat soils. Clear Lake soils are in basins. Columbia and Sailboat soils are on natural levees. Egbert soils are in backswamps. Also included are soils that are stratified silt loam and silty clay loam to a depth of 60 inches. Included areas make up about 15 percent of the total acreage.

Permeability is slow in the Cosumnes soil. Available water capacity is high. The effective rooting depth is limited by a seasonal high water table in winter and early spring. The water table is high because of seepage and generally is maintained below a depth of 36 inches by pumping. It can be at a depth of 20 to 36 inches for short periods. The shrink-swell potential is high. Runoff is slow. The hazard of water erosion is slight. The soil is subject to rare flooding.

Nearly all areas of this unit are used for irrigated crops, such as corn, wheat, tomatoes, sugar beets, and rice. Nonirrigated safflower also is grown. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is suited to irrigated crops. If the unit is used for crops other than rice, the main limitations are the depth to a seasonal high water table and the slow permeability in the clayey buried layer. The water table, which is perched on the clayey buried layer during the rainy period in winter and early spring, generally limits the suitability for deep-rooted crops. A surface drainage system and open drainage ditches are needed to remove excess surface water and to lower the water table. Subsoiling improves the downward movement of water and the penetration of roots in the slowly permeable buried layer. Returning all crop residue, except for rice straw, to the soil and including grasses, legumes, or a grass-legume mixture in the cropping sequence help to maintain fertility and tilth.

Furrow, border, and sprinkler irrigation systems are suitable in areas where crops other than rice are grown. An efficient water application system is needed to prevent the development of a perched water table on the clayey buried layer. Applying irrigation water at a slow rate over a long period helps to ensure that the root zone is properly wetted.

This unit is suited to rice crops. It has few limitations. Level basin irrigation is suitable in the areas used for rice.

This unit is in capability units IIw-3, irrigated, and IIIw-3, nonirrigated. The MLRA is 17.

128—Cosumnes silt loam, drained, 0 to 2 percent slopes. This very deep, artificially drained soil is on narrow, low flood plains. It is protected against flooding by a system of levees and large upstream dams. The levees and ground-water overdraft have altered the drainage of the soil. The soil formed in somewhat poorly drained alluvium derived from mixed rock sources. Slopes are plane. The vegetation in uncultivated areas is mainly annual grasses, forbs, and scattered oaks and other hardwoods. Elevation is 5 to 25 feet. The average annual precipitation is 15 to 17 inches.

Typically, the surface layer is pale brown silt loam about 8 inches thick. The next 13 inches is pale brown silty clay loam and clay. The next 22 inches is a buried surface layer of gray clay. Below this to a depth of 60 inches is gray and pale brown clay loam. In some areas depth to the buried layer is 12 to 20 inches.

Included in this unit are small areas of Columbia, Dierssen, Egbert, Sailboat, and San Joaquin soils. Dierssen soils are on the narrow rims of basins. Egbert soils are in backswamps. San Joaquin soils are on low terraces. Also included are soils that have strata of sand between depths of 10 and 40 inches and frequently flooded soils along the Cosumnes River. Included areas make up about 15 percent of the total acreage.

Permeability is slow in the Cosumnes soil. Available water capacity is high. The effective rooting depth is 60 inches or more. Depth to the water table is more than 72 inches. The shrink-swell potential is high. Runoff is slow. The hazard of water erosion is slight. The soil is subject to rare flooding.

Nearly all areas of this unit are used for irrigated crops. The commonly grown crops include corn, wheat, tomatoes, sugar beets, and rice. A few areas are used for irrigated pasture. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is suited to irrigated crops. If it is used for crops other than rice, the main limitation is the slow permeability in the clayey buried layer. A surface drainage system and open drainage ditches are needed to remove excess surface water. Subsoiling improves the penetration of roots and water in the slowly permeable buried layer. Returning all crop residue, except for rice straw, to the soil and including grasses, legumes, or a grass-legume mixture in the cropping sequence help to maintain fertility and tilth.

Furrow, border, and sprinkler irrigation systems are suitable where crops other than rice are grown. An efficient water application system is needed to prevent the development of a perched water table on the clayey buried layer. Applying irrigation water at a slow rate over a long period helps to ensure that the root zone is properly wetted.

This unit is suited to rice crops. It has few limitations. Level basin irrigation is suitable in the areas used for rice.

This unit is in capability units IIs-3, irrigated, and IIIs-3, nonirrigated. The MLRA is 17.

129—Cosumnes silt loam, drained, 0 to 2 percent slopes, occasionally flooded. This very deep, artificially drained soil is on narrow, low flood plains along rivers. Ground-water overdraft has altered the drainage of the soil. The soil formed in somewhat poorly drained alluvium derived from mixed rock sources. Slopes are plane. The vegetation in uncultivated areas is mainly annual grasses, forbs, shrubs, and scattered oaks and other hardwoods. Elevation is 5 to 125 feet. The average annual precipitation is 15 to 19 inches.

Typically, the surface layer is pale brown silt loam about 8 inches thick. The next 13 inches is pale brown silty clay loam and clay. The next 22 inches is a buried surface layer of gray clay. Below this to a depth of 60 inches is gray and pale brown clay loam. In some areas the surface layer is silty clay loam or clay loam.

Included in this unit are small areas of Clear Lake, Columbia, Dierssen, Galt, and Sailboat soils. Clear Lake soils are in basins. Dierssen soils are on the rims of basins. Galt soils are on low terraces. Also included are soils that have strata of sand between depths of 10 and 40 inches and frequently flooded soils. Included areas make up about 15 percent of the total acreage.

Permeability is slow in the Cosumnes soil. Available water capacity is high. The effective rooting depth is 60 inches or more. The shrink-well potential is high. Depth to the water table is more than 72 inches. Runoff is slow. The hazard of water erosion is slight. The soil is occasionally flooded for brief or long periods during prolonged, high-intensity storms. Channeling and deposition are common along streambanks.

This unit is used for irrigated crops or for irrigated hay and pasture. The commonly grown crops include corn, tomatoes, and wheat. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is suited to irrigated crops. It is limited mainly by the flooding during winter and early spring and the slow permeability in the clayey buried layer. Crops can be damaged by floodwater. The hazard of flooding can be reduced in some areas by diversions and dikes. A surface drainage system and open drainage ditches may be needed to remove excess surface water. Subsoiling improves the downward movement of water and the penetration of roots in the slowly permeable buried layer. Returning all crop residue to the soil and including grasses, legumes, or a grass-legume mixture in the cropping sequence help to maintain fertility and tilth.

Furrow, border, and sprinkler irrigation systems are suitable. An efficient water application system is needed to prevent the development of a perched water table on the clayey buried layer. Applying irrigation water at a slow rate over a long period helps to ensure that the root zone is properly wetted.

This unit is suited to irrigated hay and pasture. It is limited mainly by the slow permeability in the clayey buried layer and the flooding during winter and early spring. Irrigation water can be applied by sprinkler and border methods. The grasses and legumes selected for planting should be those that are suited to a slowly permeable soil. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and a lower water intake rate. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition.

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

130—Cosumnes-Urban land complex, partially drained, 0 to 2 percent slopes. This map unit is on low flood plains. It is protected against flooding by a system of levees and large upstream dams. Levees, open and closed drains, and pumps have lowered the water table and altered the drainage of the Cosumnes soil. Slopes have been shaped for urban uses. The vegetation is mainly ornamental plants. Elevation is 5 to 20 feet. The average annual precipitation is 17 to 19 inches. The unit is about 55 percent Cosumnes soil and 35 percent Urban land.

Included in this unit are small areas of Clear Lake, Columbia, Sailboat, and San Joaquin soils and soils that have strata of sand between depths of 10 and 40 inches. Clear Lake soils are in basins. San Joaquin soils are on low terraces. Included areas make up about 10 percent of the total acreage.

The Cosumnes soil is very deep and is artificially drained. It formed in somewhat poorly drained alluvium derived from mixed rock sources. Typically, the surface layer is pale brown silt loam about 8 inches thick. The next 13 inches is pale brown silty clay loam and clay. The next 22 inches is a buried surface layer of gray clay. Below this to a depth of 60 inches is gray and pale brown clay loam. In some areas the surface layer is clay loam, silty clay loam, or clayey fill.

Permeability is slow in the Cosumnes soil. Available water capacity is high. The effective rooting depth is limited by a seasonal high water table in winter and early spring. The water table is high because of seepage and is maintained at a depth of 36 to 60 inches by pumping. The shrink-swell potential is high. Runoff is slow. The hazard of water erosion is slight. The soil is subject to rare flooding.

Urban land consists of areas covered by impervious surfaces or structures, such as roads, driveways, sidewalks, buildings, and parking lots. The soil material under the impervious surfaces is similar to that of the Cosumnes soil, although it may have been truncated or otherwise altered.

This unit is used for urban development. The main limitations affecting urban uses are the slow permeability, the depth to a seasonal high water table, the flooding, the high shrink-swell potential, and low strength. Shallow excavations, such as trenches and holes, are limited by the seasonal high water table. Properly grading building sites helps to divert water away from the foundations and helps to prevent ponding in the adjacent areas. Excess runoff can be removed by a system of suitably designed drainage ditches or drainage pipe. If buildings are constructed on the Cosumnes soil, properly designing foundations and footings and diverting runoff away from the buildings help to prevent the structural damage caused by shrinking and swelling. Properly designing roads and streets helps to compensate for the instability of the underlying material. The slow permeability and the high water table increase the possibility that improperly designed septic tank absorption fields will fail. Offsite sewage disposal systems should be considered.

An adequate drainage system is needed in areas where deep-rooted trees and shrubs are planted. During summer irrigation is needed in areas used for lawns, shrubs, vines, or shade and ornamental trees.

No land capability classification is assigned. The MLRA is 17.

131—Coyotecreek silt loam, 0 to 2 percent slopes, occasionally flooded. This very deep, well drained soil is on narrow, high flood plains. It formed in alluvium derived from mixed rock sources. Slopes are plane. The native vegetation is mainly annual grasses, forbs, and scattered oaks. Elevation is 95 to 130 feet. The average annual precipitation is 16 to 20 inches.

Typically, the surface layer is dark brown silt loam about 15 inches thick. The next layer is dark brown and brown loam about 43 inches thick. The underlying material to a depth of 65 inches is brown clay loam. In some areas the surface layer is loam. In other areas the soil has a buried subsoil of clay loam.

Included in this unit are small areas of Reiff and Sailboat soils. Also included are protected areas along channels that are subject to rare flooding. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the Coyotecreek soil. Available water capacity is very high. The effective rooting depth is 60 inches or more. Runoff is slow. The hazard of water erosion is slight. The soil is occasionally flooded for very brief or brief periods during prolonged, high-intensity storms. Channeling and deposition are common along streambanks.

This unit is used for irrigated crops or for irrigated hay and pasture. The commonly grown crops include tomatoes, corn, alfalfa, wheat, and beans. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is suited to irrigated crops. It is limited mainly by the flooding during winter and early spring. Crops can be damaged by floodwater. The hazard of flooding can be reduced in some areas by diversions and dikes. Tilth and fertility can be improved by returning crop residue to the soil.

Furrow, border, and sprinkler irrigation systems are suitable. The application rate should be adjusted to the water intake rate of the soil and to the needs of the crop.

This unit is suited to irrigated hay and pasture. It is limited mainly by the flooding during winter and early spring. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and a lower water intake rate. Irrigation water can be applied by border and sprinkler methods. Applications of irrigation water should be adjusted to the water intake rate of the soil and to the needs of the crop. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition.

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

132—Creviscreek sandy loam, 0 to 3 percent slopes. This deep and very deep, moderately well drained soil is on stream terraces and the alluvial toe slopes of hills along drainageways. It formed in local alluvium derived from mixed rock sources and underlain by weakly consolidated, clayey sediments. Slopes are complex and are incised by many small meandering drainageways. The native vegetation is mainly annual grasses and forbs. Elevation is 130 to 250 feet. The average annual precipitation is 18 to 23 inches.

Typically, the surface layer is light yellowish brown and reddish yellow sandy loam about 21 inches thick. The subsoil is about 8 inches of reddish yellow sandy clay loam and brown gravelly sandy clay loam. The substratum is about 28 inches of stratified very pale brown, reddish yellow, yellow, and light gray extremely gravelly sandy loam to very gravelly sandy clay loam. Weakly consolidated, clayey sediments are at a depth of about 57 inches. In some areas the surface layer is gravelly sandy loam. In other areas the subsoil is very gravelly sandy clay loam.

Included in this unit are small areas of Hicksville sandy clay loam on downslope alluvial flats. Also included are soils that are along small drainageways and are 30 to 40 inches deep to consolidated sediments; soils that have a clayey subsoil; soils that are subject to rare flooding; and, about 1 mile north of Carbondale Road, a small area where the subsoil is strongly acid. Included areas make up about 20 percent of the total acreage.

Permeability is moderate in the Creviscreek soil. Available water capacity also is moderate. The effective rooting depth is more than 40 inches. In most areas it is 55 to 70 inches. The depth to consolidated sediments is 40 to 80 inches. Runoff is slow. The hazard of water erosion is slight. A perched water table is at a depth of 36 to 60 inches in winter and early spring and flows laterally through the coarse textured layers in the substratum.

This unit is used mainly as rangeland. Some areas are used for irrigated pasture.

Few limitations affect the use of this unit for livestock grazing. The characteristic plant community is mainly soft chess, wild oats, and filaree. Proper grazing management helps to maintain the organic matter content, increases the rate of water infiltration, and improves plant growth early in the season. The unit responds well to range improvement practices, such as range seeding and applications of fertilizer. The plants selected for seeding should be those that meet the seasonal requirements of livestock or wildlife, or both. After the seeds are planted, grazing should be deferred until the plants have set seed.

This unit is suited to irrigated hay and pasture. The main limitations are the moderate available water capacity and the depth to consolidated sediments. Leveling helps to ensure a uniform application of water. To avoid overirrigating and the leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity and water intake rate of the soil and to the needs of the crop. An efficient water application system is needed to prevent the development of a perched water table. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and a lower water intake rate. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition.

This unit is in capability units IIs-1, irrigated, and IIIs-1, nonirrigated. The MLRA is 17.

133—Dierssen sandy loam, drained, 0 to 2 percent slopes. This moderately deep, artificially drained soil is on the rims of basins. It is protected against flooding by a system of levees and large upstream dams. Levees, open and closed drains, and pumps have lowered the water table and altered the drainage of the soil. The soil formed in somewhat poorly drained alluvium derived from mixed rocks, dominantly granite. Slopes are plane because of land leveling. During leveling activities, sand from the nearby Tinnin soils was moved across this unit and mixed with the surface layer. The vegetation in uncultivated areas is mainly water-tolerant grasses and sedges. Elevation is 5 to 25 feet. The average annual precipitation is 15 to 18 inches.

Typically, the surface layer is dark brown sandy loam about 12 inches thick. Below this is a buried surface layer of dark grayish brown and brown sandy clay loam about 7 inches thick. The subsoil is yellowish brown, calcareous clay about 14 inches thick. A light yellowish brown and very pale brown, continuous hardpan that is weakly cemented with silica is at a depth of about 33 inches. In some areas the surface layer is sandy clay loam.

Included in this unit are small areas of Clear Lake, Egbert, and Tinnin soils. Clear Lake soils are in basins. Egbert soils are on high flood plains. Tinnin soils are on ridges and mounds. Also included are soils that do not have an argillic horizon and have a substratum of loam or clay loam and small areas of soils that are occasionally flooded. Included areas make up about 15 percent of the total acreage.

Permeability is slow in the Dierssen soil. Available water capacity is low. The effective rooting depth is 20 to 40 inches, but it is limited by a perched water table at a depth of 6 to 24 inches in winter and early spring. The depth to a hardpan is 20 to 40 inches. The shrink-swell potential is high. Runoff is very slow. The hazard of water erosion is slight. The soil is subject to rare flooding.

Nearly all areas of this unit are used for irrigated crops or for irrigated hay and pasture. The commonly grown crops include corn, bush beans, wheat, and rice. Alfalfa, tomatoes, and nonirrigated safflower are grown in a few areas. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is suited to irrigated crops. If the unit is used for crops other than rice, the main limitations are the depth to a hardpan, the slow permeability, the depth to a perched water table, and the low available water capacity. Because of the perched water table, crop yields can be reduced during winter and early spring. A surface drainage system and open drainage ditches are needed to remove excess surface water and to lower the perched water table. Subsoiling improves the downward movement of water and the penetration of roots in the slowly permeable subsoil. The organic matter content can be maintained by returning crop residue to the soil.

Furrow, border, and sprinkler irrigation systems are suitable where crops other than rice are grown. An efficient water application system is needed to prevent the development of a perched water table. Applying irrigation water at a slow rate over a long period helps to ensure that the root zone is properly wetted. Pipe, ditch lining, or drop structures in irrigation ditches facilitate irrigation and reduce the hazard of ditch erosion.

This unit is suited to rice crops. It has few limitations. Level basin irrigation is suitable where rice is grown.

This unit is suited to irrigated hay and pasture. It is limited mainly by the moderate depth to a hardpan, the slow permeability, the depth to a perched water table, and the low available water capacity. Irrigation water can be applied by sprinkler and border methods. The perched water table during winter and early spring limits the choice of plants and the period of grazing. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and a lower water intake rate. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition.

This unit is in capability unit IIIw-3, irrigated and nonirrigated. The MLRA is 17.

134—Dierssen sandy clay loam, drained, 0 to 2 percent slopes. This moderately deep, artificially drained soil is on the rims of basins. It is protected against flooding by a system of levees and large upstream dams. Levees, open and closed drains, and pumps have lowered the water table and altered the drainage of the soil. The soil formed in somewhat poorly drained alluvium derived from mixed rocks, dominantly granite. Slopes are plane because of land leveling. The vegetation in uncultivated areas is mainly water-tolerant grasses and sedges. Elevation is sea level to 20 feet above sea level. The average annual precipitation is 15 to 18 inches.

Typically, the surface layer is dark grayish brown and brown sandy clay loam about 14 inches thick. The subsoil is yellowish brown, calcareous clay about 17 inches thick. A light yellowish brown and very pale brown, continuous hardpan that is weakly cemented with silica is at a depth of about 31 inches. In some areas the surface layer is clay loam.

Included in this unit are small areas of Clear Lake, Cosumnes, Egbert, Galt, Scribner, and Tinnin soils.

Clear Lake soils are on flood plains and in basins. Cosumnes soils are on low flood plains. Egbert soils are on high flood plains. Galt soils are on low terraces. Scribner soils are on the edges of backswamps. Tinnin soils are on ridges and mounds. Also included are areas of soils that do not have a subsoil of clay and have a substratum of loam or clay loam and small areas of occasionally flooded soils. Included areas make up about 15 percent of the total acreage.

Permeability is slow in the Dierssen soil. Available water capacity is low. The effective rooting depth is 20 to 40 inches, but it is limited by a perched water table at a depth of 6 to 24 inches in winter and early spring. The depth to a hardpan is 20 to 40 inches. The shrink-swell potential is high. Runoff is very slow. Water erosion is a slight hazard or is not a hazard at all. The soil is subject to rare flooding.

Nearly all areas of this unit are used for irrigated crops or for irrigated hay and pasture. The commonly grown crops include corn, wheat, rice, and bush beans. Alfalfa, tomatoes, and nonirrigated safflower are grown in a few areas. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is suited to irrigated crops. If the unit is used for crops other than rice, the main limitations are the depth to a hardpan, the slow permeability, the depth to a perched water table, and the low available water capacity. Because of the perched water table, crop yields can be reduced during winter and early spring. A surface drainage system and open drainage ditches are needed to remove excess surface water and to lower the perched water table. Subsoiling improves the downward movement of water and the penetration of roots in the slowly permeable subsoil. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the water intake rate.

Furrow, border, and sprinkler irrigation systems are suitable where crops other than rice are grown. An efficient water application system is needed to prevent the development of a perched water table. Applying irrigation water at a slow rate over a long period helps to ensure that the root zone is properly wetted.

This unit is suited to rice crops. It has few limitations. Level basin irrigation is suitable in the areas used for rice.

This unit is suited to irrigated hay and pasture. It is limited mainly by the depth to a hardpan, the slow permeability, the depth to a perched water table, and the low available water capacity. Irrigation water can be applied by sprinkler and border methods. The perched water table during winter and early spring limits the choice of plants and the period of grazing. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and a lower water intake rate. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition.

This unit is in capability unit IIIw-3, irrigated and nonirrigated. The MLRA is 17.

135—Dierssen clay loam, deep, drained, 0 to 2 percent slopes. This deep, artificially drained soil is on the rims of basins. It is protected against flooding by a system of levees and large upstream dams. Levees, open and closed drains, and pumps have lowered the water table and altered the drainage of the soil. The soil formed in somewhat poorly drained alluvium derived from mixed granitic rocks. Slopes are plane. The vegetation in uncultivated areas is mainly water-tolerant grasses and sedges. Elevation is sea level to 20 feet above sea level. The average annual precipitation is 15 to 17 inches.

Typically, the surface layer is brown clay loam about 15 inches thick. The upper part of the subsoil is grayish brown and brown clay about 9 inches thick. The lower part is brown, calcareous clay about 17 inches thick. The substratum to a depth of 60 inches or more is a strong brown and pale brown, continuous hardpan that is strongly cemented with silica. In some areas the surface layer is sandy clay loam.

Included in this unit are small areas of Clear Lake and Egbert soils. Clear Lake soils are in basins. Egbert soils are on high flood plains. Also included are areas of soils that do not have a subsoil of clay and have a substratum of loam or clay loam and areas of occasionally flooded soils. Included areas make up about 15 percent of the total acreage.

Permeability is slow in the Dierssen soil. Available water capacity is moderate. The effective rooting depth is 40 to 60 inches during the growing season but is limited by a perched water table at a depth of 6 to 36 inches in winter and early spring. The depth to a hardpan is 40 to 60 inches. Runoff is very slow. Water erosion is a slight hazard or is not a hazard at all. The soil is subject to rare flooding.

Nearly all areas of this unit are used for irrigated crops or for irrigated hay and pasture. The commonly grown crops include corn and wheat. Rice, tomatoes, alfalfa, and nonirrigated safflower are grown in a few areas. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is suited to irrigated crops. It is limited mainly by the perched water table and the slow permeability. Because of the perched water table, crop yields can be reduced during winter and early spring. A surface drainage system and open drainage ditches are needed to remove excess surface water and to lower the perched water table. Subsoiling improves the downward movement of water and the penetration of roots in the slowly permeable subsoil. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the water intake rate.

Furrow, border, and sprinkler irrigation systems are suitable. An efficient water application system is needed to prevent the development of a perched water table. Applying irrigation water at a slow rate over a long period helps to ensure that the root zone is properly wetted.

This unit is suited to irrigated hay and pasture. It is limited mainly by the perched water table and the slow permeability. Irrigation water can be applied by sprinkler and border methods. The perched water table during winter and early spring limits the choice of plants and the period of grazing. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and a lower water intake rate. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition.

This unit is in capability unit IIIw-3, irrigated and nonirrigated. The MLRA is 17.

136—Dumps. This map unit consists of open areas used for solid waste disposal. Slopes are complex. Areas are irregular in shape. Natural drainage, permeability, the erosion hazard, and available water capacity vary from one area to another. Elevation is 15 to 210 feet. The average annual precipitation is 16 to 23 inches.

No land capability classification is assigned because the soil properties vary considerably. The MLRA is 17.

137—Durixeralfs, 0 to 1 percent slopes. These shallow or moderately deep, well drained, altered soils are on low terraces. They are in cut areas from which most or all of the original surface layer has been removed. The soils formed in alluvium derived from mixed granitic rocks. Slopes are plane because of leveling. The vegetation in uncultivated areas is mainly annual grasses and forbs. Elevation is 20 to 150 feet. The average annual precipitation is 15 to 18 inches.

The texture, color, and thickness of the layers of these soils vary from one area to another. In a reference pedon, the surface layer is brown clay about 6 inches thick. The subsoil also is brown clay. It is about 14 inches thick. The next 35 inches is a continuous hardpan that is strongly cemented with silica. Below this to a depth of 69 inches is an indurated hardpan. In some areas the surface layer is sandy clay loam or clay loam.

Included in this unit are small areas of Galt and Redding soils and Xerarents. Galt soils are in basins. Redding soils are on high terraces. Xerarents are in areas that have been filled during leveling. Also included are very shallow, loamy soils, which are in areas of fill material laid down during leveling activities and are underlain by a hardpan. Included areas make up about 20 percent of the total acreage.

Permeability is slow or very slow in the Durixeralfs. Available water capacity is very low or low. The effective rooting depth and the depth to a hardpan are 10 to 30 inches. Runoff is very slow. Water erosion is a slight hazard or is not a hazard at all.

This unit is used for irrigated hay and pasture or for irrigated crops. The commonly grown crops include corn, ladino clover for seed, wheat, rice, and sudangrass.

This unit is suited to irrigated hay and pasture. The main limitations are the depth to a hardpan, the fine texture of the surface layer, the slow or very slow permeability, and the very low or low available water capacity. Chiseling or subsoiling improves the downward movement of water and the penetration of roots. Border irrigation is suitable. Because of the slow permeability, adjustments in the length of the runs are needed to permit adequate infiltration of water. An efficient water application system is needed to prevent the development of a perched water table.

The grasses and legumes selected for planting should be those that are suited to a shallow or moderately deep soil. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and a lower water intake rate. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition.

This unit is suited to irrigated crops. If the unit is used for crops other than rice, the main limitations are the depth to a hardpan, the fine texture of the surface layer, the slow or very slow permeability, the very low or low available water capacity, and the very slow runoff. A surface drainage system and open drainage ditches are needed to remove excess surface water.

These soils should be cultivated only within a narrow range in moisture content. They are too sticky for cultivation when wet and too hard when dry. Returning all crop residue, except for rice straw, to the soil and including grasses, legumes, or a grass-legume mixture in the cropping sequence help to maintain fertility and tilth.

Furrow and border irrigation systems are suitable where crops other than rice are grown. Because of the slow or very slow permeability, the rate of water application should be regulated so that the water does not stand on the surface and damage the crops.

This unit is suited to rice crops. It is limited mainly by the fine texture of the surface layer. The use of equipment is restricted to periods when the soil is dry enough to support heavy loads. Level basin irrigation is suitable where rice is grown.

This unit is in capability unit IVs-5, irrigated and nonirrigated. The MLRA is 17.

138—Durixeralfs-Galt complex, 0 to 2 percent slopes. This map unit is on low terraces. It is in a borrow area used during the construction of Interstate Highway 5. Slopes are complex and disturbed. The vegetation is mainly annual grasses and forbs. Elevation is 5 to 15 feet. The average annual precipitation is 15 to 16 inches.

This unit is about 50 percent Durixeralfs and 40 percent Galt soil. The Durixeralfs are in cut areas from which most or all of the original surface layer has been removed. The Galt soil is in nearly undisturbed areas. Much of the subsoil was removed from some areas that are now Durixeralfs. The material that was cut away has been removed from the unit.

Included in this unit are small areas of Dierssen and San Joaquin soils and Urban land. Dierssen soils are on the rims of basins. San Joaquin soils are on low terraces. Also included are truncated soils that are less than 10 inches deep to a hardpan and soils that are subject to rare flooding. Included areas make up about 10 percent of the total acreage.

The Durixeralfs are shallow or moderately deep and are moderately well drained or well drained. They formed in alluvium derived from mixed granitic rocks. The texture, color, and thickness of the layers of these soils vary from one area to another. In a reference pedon, the surface layer is brown clay about 6 inches thick. The subsoil also is brown clay. It is about 14 inches thick. The next 35 inches is a light yellowish brown and reddish yellow, continuous hardpan that is strongly cemented with silica. Below this to a depth of 69 inches is an indurated hardpan. In some areas the surface layer is sandy clay loam or clay loam.

Permeability is slow or very slow in the Durixeralfs. Available water capacity is very low or low. The effective rooting depth and the depth to a hardpan are 10 to 30 inches. Runoff is slow or very slow. Water erosion is a slight hazard or is not a hazard at all.

The Galt soil is moderately deep and moderately well drained. It formed in fine textured alluvium derived from dominantly granitic rocks. Typically, the surface layer is grayish brown clay about 13 inches thick. The underlying material is mixed grayish brown and brown clay about 19 inches thick. A variegated yellowish red, light yellowish brown, and white, calcareous hardpan that is weakly cemented with silica is at a depth of about 32 inches. In some areas the surface layer is silty clay, silty clay loam, or clay loam. In other areas the depth to a hardpan is 40 to 60 inches.

Permeability is slow in the Galt soil. Available water capacity is low. The effective rooting depth and the depth to a hardpan are 20 to 40 inches. The shrink-swell potential is high. Runoff is very slow or slow. The hazard of water erosion is slight.

This unit is used as rangeland. The main management concerns are the fine texture of the surface layer and the high shrink-swell potential. The Durixeralfs also are limited by the very low or low available water capacity. The characteristic plant community on the Galt soil is mainly soft chess, annual ryegrass, and foxtail fescue. The vegetation on the Durixeralfs is sparse. If this unit is grazed when the soils are too moist, trampling of the surface causes compaction and the uprooting of plants. Proper grazing management helps to maintain the organic matter content, increases the rate of water infiltration, and improves plant growth early in the season. Excessive shrinking and swelling of the soils can force fenceposts out of the ground. In areas where the surface is bare or vegetation is patchy, revegetation is needed.

This unit is in capability unit IVs-5, nonirrigated. The MLRA is 17.

139—Egbert clay, 0 to 2 percent slopes. This very deep, poorly drained soil is in areas on high flood plains. These areas are elevated above surrounding areas that have subsided. The soil formed in alluvium derived from mixed rock sources. It is protected against flooding by a system of levees and large upstream dams. Levees, open and closed drains, and pumps are used to manage the water table. Slopes are plane. The vegetation in uncultivated areas is mainly hydrophytic plants, such as rushes and sedges. Elevation is 10 feet below to 5 feet above sea level. The average annual precipitation is about 13 inches.

Typically, the surface layer is gray clay about 20 inches thick. The underlying material to a depth of 60 inches is gray and light gray clay and silty clay loam. In some areas the surface layer is silty clay or clay loam.

Included in this unit are small areas of Gazwell, Sailboat, and Scribner soils and soils that are underlain by sand or sandy loam at a depth of 25 to 60 inches. Gazwell and Scribner soils are slightly lower on the landscape than the Egbert soil. Gazwell soils are in backswamps. Scribner soils are on the edges of backswamps. Sailboat soils are on natural levees. Included areas make up about 15 percent of the total acreage.

Permeability is slow in the Egbert soil. Available water capacity is high. The effective rooting depth is limited by a seasonal high water table. The water table is high because of seepage and is maintained at a depth of 12 to 36 inches by pumping. The soil is subject to subsidence. The shrink-swell potential is high. Runoff is very slow. The hazards of water erosion and soil blowing are slight. The soil is subject to rare flooding.

Nearly all areas of this unit are used for irrigated crops or for irrigated hay and pasture. The commonly grown crops include corn and wheat. Some areas are left idle. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is suited to irrigated crops. It is limited mainly by the shallow or moderate depth to the water table, the fine texture of the surface layer, the slow permeability, and subsidence. Because of the depth to a seasonal high water table, the soil is poorly suited to deep-rooted crops. A surface drainage system and open drainage ditches are needed to remove excess surface water and seepage water. Tile drainage can lower the water table if a suitable outlet is available, but differential subsidence is a hazard. Differential subsidence of the underlying organic material may cause an increase in the slope and require modification of irrigation and drainage systems. The soil should be cultivated only within a narrow range in moisture content. Because of the fine texture, it is too sticky for cultivation when wet and is too hard when dry. Tilth and fertility can be improved by returning crop residue to the soil.

Furrow, border, and sprinkler irrigation systems are suitable. Applying irrigation water at a slow rate over a long period helps to ensure that the root zone is properly wetted.

This unit is suited to irrigated hay and pasture. The main limitations are the depth to a seasonal high water table, the fine texture of the surface layer, the slow permeability, and subsidence. Irrigation water can be applied by sprinkler and border methods. The grasses and legumes selected for planting should be those that are suited to the depth to the water table. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and a lower water intake rate. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition.

This unit is in capability unit IVw-2, irrigated and nonirrigated. The MLRA is 16.

140—Egbert clay, drained, 2 to 5 percent slopes. This very deep, artificially drained soil is in areas on high flood plains. These areas are elevated above surrounding areas that have subsided. The soil is protected against flooding by a system of levees and large upstream dams. Levees, drainage ditches, and pumps have lowered the water table and altered the drainage of the soil. The soil formed in poorly drained alluvium derived from mixed rock sources. Slopes are convex. The vegetation in uncultivated areas is mainly annual grasses and forbs. Elevation is 5 feet below sea level to sea level. The average annual precipitation is about 13 inches.

Typically, the surface layer is gray clay about 40 inches thick. The underlying material to a depth of 60 inches or more is light gray clay and silty clay loam. In some areas the surface layer is clay loam.

Included in this unit are small areas of Gazwell, Rindge, and Sailboat soils. Gazwell and Rindge soils are lower on the landscape than the Egbert soil. Gazwell soils are in backswamps. Rindge soils are in reclaimed freshwater marshes. Sailboat soils are on natural levees. Included areas make up about 15 percent of the total acreage.

Permeability is slow in the Egbert soil. Available water capacity is high or very high. The effective rooting depth is 60 inches or more. The water table is maintained below a depth of 72 inches by pumping. The soil is subject to subsidence. The shrink-swell potential is high. Runoff is slow. The hazards of water erosion and soil blowing are slight. The soil is subject to rare flooding.

This unit is used for irrigated crops. Wheat is commonly grown. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

The main limitations affecting the use of this unit for irrigated crops are the slope, the fine texture of the surface layer, the slow permeability, and subsidence. The soil should be tilled on the contour or across the slope. Differential subsidence of underlying organic material may cause an increase in the slope. The soil should be cultivated only within a narrow range in moisture content. Because of the fine texture, it is too sticky for cultivation when wet and is too hard when dry. Leaving crop residue on or near the surface helps to conserve moisture, maintain tilth, and control erosion.

Sprinkler irrigation systems are suitable. Applications of irrigation water should be adjusted to the available water capacity and water intake rate of the soil and to the needs of the crop.

This unit is in capability units IIe-5, irrigated, and IIIe-5, nonirrigated. The MLRA is 16.

141—Egbert clay, partially drained, 0 to 2 percent slopes. This very deep, artificially drained soil is on high flood plains and in backswamps. It is protected against flooding by a system of levees and large upstream dams. Levees, drainage ditches, and pumps have lowered the water table and altered the drainage of the soil. The soil formed in poorly drained alluvium derived from mixed rock sources. Slopes are plane. The vegetation in uncultivated areas is mainly hydrophytic plants, sedges, annual grasses, and forbs. Elevation is 5 feet below to 10 feet above sea level. The average annual precipitation is 14 to 17 inches.

Typically, the surface layer is grayish brown clay about 18 inches thick. Below this is a buried surface layer of gray clay loam about 28 inches thick. The underlying material to a depth of 60 inches is grayish brown clay loam and sandy clay loam. In some areas the surface layer is silty clay. In other areas the dark surface layer is 14 to 24 inches thick.

Included in this unit are small areas of Clear Lake, Gazwell, Laugenour, Scribner, and Valpac soils. Clear Lake soils are in basins. Gazwell soils are in backswamps. Laugenour and Valpac soils are on natural levees. Scribner soils are on the edges of backswamps. Included areas make up about 25 percent of the total acreage.

Permeability is slow in the Egbert soil. Available water capacity is high. The effective rooting depth is limited by a seasonal high water table that fluctuates throughout the year. The water table is high because of seepage and generally is maintained at a depth of 36 to 60 inches by pumping. It can be at a depth of 20 to 36 inches for short periods in winter and early spring. Most areas south of Courtland are subject to subsidence. The shrink-swell potential is high. Runoff is very slow. The hazards of water erosion and soil blowing are slight. The soil is subject to rare flooding.

Most areas of this unit are used for irrigated crops or for irrigated hay and pasture. The commonly grown crops include corn, wheat, tomatoes, and milo. Alfalfa, pears, and nonirrigated safflower also are grown. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is suited to irrigated crops. It is limited mainly by the depth to a fluctuating water table, the fine texture of the surface layer, and the slow permeability. In some areas subsidence is a hazard. The water table limits the suitability for deep-rooted crops. A surface drainage system and open drainage ditches are needed to remove excess surface water and to lower the water table. The soil should be cultivated only within a narrow range in moisture content. It is too sticky for cultivation when wet and is too hard when dry. Differential subsidence can occur because of the underlying organic material in some areas. Frequently planing the fields improves the efficiency of irrigation. Tilth and fertility can be improved by returning crop residue to the soil.

Furrow, border, and sprinkler irrigation systems are suitable. Applying irrigation water at a slow rate over a long period helps to ensure that the root zone is properly wetted.

This unit is suited to irrigated hay and pasture. It is limited mainly by the depth to a fluctuating water table, the fine texture of the surface layer, and the slow permeability. In some areas subsidence is a hazard. Irrigation water can be applied by sprinkler and border methods. The grasses and legumes selected for planting should be those that are suited to a fluctuating water table. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and a lower water intake rate. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition.

This unit is in capability units IIw-2, irrigated, and IIIw-2, nonirrigated. The MLRA is 16 or 17.

142—Egbert clay, partially drained, 0 to 2 percent slopes, frequently flooded. This very deep, artificially drained soil is on high flood plains. Drainage ditches and pumps have lowered the water table and altered the drainage of the soil. The soil formed in poorly drained alluvium derived from mixed rock sources. Slopes are plane. The vegetation in uncultivated areas is mainly hydrophytic plants, sedges, annual grasses, and forbs. Elevation is sea level to 5 feet above sea level. The average annual precipitation is 16 to 17 inches.

Typically, the surface layer is grayish brown clay about 18 inches thick. Below this is a buried surface layer of gray clay loam about 28 inches thick. The underlying material to a depth of 60 inches is stratified, grayish brown clay loam and sandy clay loam. In some areas the surface layer is silty clay. In other areas the dark surface layer is 14 to 24 inches thick.

Included in this unit are small areas of Clear Lake, Dierssen, and Scribner soils. Clear Lake soils are in basins. Dierssen soils are on the rims of basins. Scribner soils are on the edges of backswamps. Included areas make up about 15 percent of the total acreage.

Permeability is slow in the Egbert soil. Available water capacity is high. The effective rooting depth is limited by a seasonal high water table that fluctuates throughout the year. The water table is high because of seepage and generally is maintained at a depth of 36 to

60 inches by pumping. It can be at a depth of 20 to 36 inches for short periods in winter and early spring. The shrink-swell potential is high. Runoff is very slow. The hazards of water erosion and soil blowing are slight. The soil is frequently flooded for brief or long periods following prolonged, high-intensity storms.

This unit is used mainly for irrigated crops or for irrigated hay and pasture. The commonly grown crops include corn, tomatoes, and milo. Nonirrigated safflower also is grown. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is suited to irrigated crops. It is limited mainly by the depth to a high water table, the fine texture of the surface layer, the slow permeability, and the flooding. A surface drainage system and open drainage ditches are needed to remove excess surface water and to lower the water table. The choice of crops is limited by the high water table. Crops can be damaged by floodwater. The soil should be cultivated only within a narrow range in moisture content. It is too sticky for cultivation when wet and is too hard when dry. Tilth and fertility can be improved by returning crop residue to the soil.

Furrow, border, and sprinkler irrigation systems are suitable. Applying irrigation water at a slow rate over a long period helps to ensure that the root zone is properly wetted.

This unit is suited to irrigated hay and pasture. The main limitations are the fine texture of the surface layer, the slow permeability, the depth to a high water table, and the flooding. Irrigation water can be applied by sprinkler and border methods. The grasses and legumes selected for planting should be those that are suited to a fluctuating water table. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and a lower water intake rate. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition.

This unit is in capability unit IVw-2, irrigated and nonirrigated. The MLRA is 17.

143—Egbert-Urban land complex, partially drained, 0 to 2 percent slopes. This map unit is on high flood plains and in backswamps. It is protected against flooding by a system of levees and large upstream dams. Levees, drainage ditches, and pumps have lowered the water table and altered the drainage of the Egbert soil. Slopes have been shaped for urban uses. The vegetation is mainly ornamental plants or annual grasses, forbs, and hydrophytic plants. Elevation is 5 to 10 feet. The average annual precipitation is 16 to 18 inches. The unit is about 60 percent Egbert soil and 30 percent Urban land.

Included in this unit are small areas of Clear Lake, Laugenour, Scribner, and Valpac soils. Clear Lake soils are in basins. Laugenour and Valpac soils are on natural levees. Included areas make up about 10 percent of the total acreage.

The Egbert soil is very deep and is artificially drained. It formed in poorly drained alluvium derived from mixed rock sources. Typically, the surface layer is grayish brown clay about 18 inches thick. Below this is a buried surface layer of gray clay loam about 28 inches thick. The underlying material to a depth of 60 inches is stratified, grayish brown clay loam and sandy clay loam. In some areas the surface layer is silty clay.

Permeability is slow in the Egbert soil. Available water capacity is high. The effective rooting depth is limited by a seasonal high water table that fluctuates throughout the year. The water table is high because of seepage and generally is maintained at a depth of 36 to 60 inches by pumping. It can be at a depth of 20 to 36 inches for short periods in winter and early spring. The shrink-swell potential is high. Runoff is very slow. The hazards of water erosion and soil blowing are slight. The soil is subject to rare flooding.

Urban land consists of areas covered by impervious surfaces or structures, such as roads, driveways, sidewalks, buildings, and parking lots. The soil material under the impervious surfaces is similar to that of the Egbert soil, although it may have been truncated or otherwise altered.

This unit is used for urban development. The main limitations affecting urban uses are the slow permeability, the high shrink-swell potential, low strength, depth to the high water table, and the flooding. These limitations increase the possibility that improperly designed septic tank absorption fields will fail. Onsite investigation is needed when septic systems are designed. Shallow excavations, such as trenches and holes, are limited by the seasonal high water table. Properly grading building sites helps to divert water away from the foundations and helps to prevent ponding in the adjacent areas. Excess runoff can be removed by a system of suitably designed drainage ditches or drainage pipe. The high shrink-swell potential should be considered when foundations, concrete structures, and paved areas are designed and constructed. The effects of shrinking and swelling can be reduced by maintaining a constant moisture content around the foundation area or by backfilling with material that has a low shrink-swell potential. Properly designing roads and streets helps to compensate for the instability of the soil.

An adequate drainage system is needed in areas where deep-rooted trees and shrubs are planted. Selection of suitable vegetation is critical for the establishment of lawns, shrubs, trees, and vegetable gardens. During summer irrigation is needed in areas used for lawns, shrubs, vines, or shade and ornamental trees.

No land capability classification is assigned. The MLRA is 17.

144—Fiddyment fine sandy loam, 0 to 1 percent slopes. This moderately deep, well drained soil is on low terraces. It formed in material weathered from consolidated sandstone or siltstone. Slopes are plane. The native vegetation in uncultivated areas is mainly annual grasses, forbs, and a few scattered oaks. Elevation is 50 to 130 feet. The average annual precipitation is 18 to 20 inches.

Typically, the surface layer is brown fine sandy loam about 8 inches thick. The next layer is yellowish brown loam about 14 inches thick. The subsoil is a claypan of brown clay loam about 8 inches thick. The next 6 inches is a light yellowish brown and very pale brown hardpan that is cemented with silica. Siltstone is at a depth of about 40 inches. In some areas the surface layer is loam or sandy loam. In other areas the subsoil is clay.

Included in this unit are small areas of soils that have a hardpan or consolidated sediments below a depth of 40 inches and soils that have a loamy subsoil. Also included, along drainageways, are soils that are occasionally flooded. Included areas make up about 15 percent of the total acreage.

Permeability is very slow in the Fiddyment soil. Water is perched above the claypan for short periods after heavy rainfall in winter and early spring and when the soil is overirrigated. Available water capacity is low. The effective rooting depth is 20 to 40 inches, but roots are restricted to the cracks and faces of peds in the claypan. The depth to a hardpan is 20 to 40 inches. The depth to consolidated sediments ranges from 21 to 40 inches. The shrink-swell potential is moderate. Runoff is slow. The hazard of water erosion is slight.

This unit is used mainly for irrigated hay and pasture. Some areas are used for urban development.

This unit is suited to irrigated hay and pasture. The main limitations are the depth to a claypan, the depth to a hardpan, the very slow permeability, and the available water capacity. Subsoiling improves the downward movement of water and the penetration of roots in the very slowly permeable subsoil. Sprinkler and border irrigation systems are suitable. Leveling helps to ensure a uniform distribution of irrigation water. An efficient water application system is needed to prevent the development of a perched water table on the claypan. Applications of irrigation water should be adjusted to the available water capacity and water intake rate of the soil and to the needs of the crop.

The grasses and legumes selected for planting should be those that are suited to a moderately deep root zone. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and a lower water intake rate. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition.

Where this soil is used for urban development, the main limitations are the depth to a hardpan and consolidated sediments, low strength, and the very slow permeability. The depth to restrictive layers and the very slow permeability are limitations on sites for septic tank absorption fields. Shallow excavations, such as trenches and holes, are limited by the depth to a hardpan and the depth to bedrock. Properly grading building sites helps to divert water away from the foundations and helps to prevent ponding in the adjacent areas. Excess runoff can be removed by a system of suitably designed drainage ditches or drainage pipe. Properly designing roads and streets helps to compensate for the instability of the subsoil. Revegetating disturbed areas around construction sites helps to control erosion.

An adequate drainage system is needed in areas where deep-rooted trees and shrubs are planted. During summer irrigation is needed in areas used for lawns, shrubs, vines, or shade and ornamental trees.

This unit is in capability unit IIIs-3, irrigated and nonirrigated. The MLRA is 17.

145—Fiddyment fine sandy loam, 1 to 8 percent slopes. This moderately deep, well drained soil is on hills. It formed in material weathered from consolidated sandstone or siltstone. Slopes are complex and are typically 1 to 5 percent. The native vegetation is mainly annual grasses, forbs, and a few scattered oaks. Elevation is 50 to 350 feet. The average annual precipitation is 16 to 24 inches.

Typically, the surface layer is brown fine sandy loam about 8 inches thick. The next layer is yellowish brown loam about 7 inches thick. The subsoil is a claypan of brown clay loam about 13 inches thick. The next 12 inches is a light yellowish brown and very pale brown hardpan that is cemented with silica. Siltstone is at a depth of about 40 inches. In some areas the surface layer is loam or sandy loam. In other areas the subsoil is clay.

Included in this unit are small areas of Andregg, Orangevale, and Redding soils and Xerarents. Andregg soils are on foothills. Orangevale and Redding soils are on terrace remnants. Xerarents are in areas that have been filled during construction. Also included are soils that are more than 40 inches deep to a hardpan or consolidated sediments and soils that have a subsoil of loam. Included areas make up about 15 percent of the total acreage.

Permeability is very slow in the Fiddyment soil. Water is perched above the claypan for short periods after heavy rainfall in winter and early spring and when the soil is overirrigated. Available water capacity is low. The effective rooting depth is 20 to 40 inches, but roots are restricted to the cracks and faces of peds in the claypan, which is at a depth of 15 to 25 inches. The depth to a hardpan is 20 to 40 inches. The depth to bedrock is 21 to 40 inches. The shrink-swell potential is moderate. Runoff is slow or medium. The hazard of water erosion is slight.

Nearly all areas of this unit are used as rangeland, for irrigated hay or pasture, or for dryland crops, such as wheat. A few areas are used for urban development.

Where this soil is used for livestock grazing, the main management concern is the low available water capacity. The characteristic plant community is mainly soft chess, wild oats, and filaree. Proper grazing management helps to maintain the organic matter content, increases the rate of water infiltration, and improves plant growth early in the season.

This unit is suited to dryland crops. It is limited mainly by the depth to a claypan, the low available water capacity, and the complex slopes. A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling breaks up the tillage pan. Leaving crop residue on or near the surface helps to conserve moisture, maintain tilth, and control erosion. The soil should be tilled on the contour or across the slope.

The main limitations affecting the use of this soil for urban development are the depth to a hardpan, the depth to consolidated sediments, low strength, and the very slow permeability. Shallow excavations, such as trenches and holes, are limited by the depth to a hardpan and the depth to bedrock. Properly grading building sites helps to divert water away from the foundations and helps to prevent ponding in the adjacent areas. Excess runoff can be removed by a system of suitably designed drainage ditches or drainage pipe. Properly designing roads and streets helps to compensate for the instability of the subsoil. Excavating for roads and buildings increases the hazard of erosion. Preserving the existing plant cover and revegetating disturbed areas around construction sites help to control erosion. Steep slopes that have been cut and filled are susceptible to erosion and should be permanently protected. Some protective measures that can be used alone or in combination are a cover of turf, ground cover plants, jute netting, soil stabilizer substances, and retaining walls.

If this soil is used as a site for septic tank absorption fields, the very slow permeability and the depth to a hardpan can be overcome by increasing the size of the absorption field. After periods of heavy rainfall, the water table, which is perched above the claypan, can cause the failure of onsite sewage disposal systems.

An adequate drainage system is needed in areas where deep-rooted trees and shrubs are planted. During summer irrigation is needed in areas used for lawns, shrubs, vines, or shade and ornamental trees. Establishing plants is difficult in areas where the claypan or hardpan has been exposed. Mulching and applying fertilizer in cut areas help to establish the plants.

This unit is in capability unit IVe-3, irrigated and nonirrigated. The MLRA is 17.

146—Fiddyment loam, 1 to 15 percent slopes. This moderately deep, well drained soil is on hills. It formed in material weathered from consolidated sandstone or siltstone. Slopes are complex. The native vegetation is mainly annual grasses and forbs. Elevation is 80 to 170 feet. The average annual precipitation is 18 to 22 inches.

Typically, the surface layer is light yellowish brown and pinkish gray loam about 14 inches thick. The subsoil is a claypan of pale brown and brown clay loam and clay. It is about 14 inches thick. The next 6 inches is a light yellowish brown, indurated, silica-cemented hardpan. Siltstone is at a depth of about 34 inches. In some areas the surface layer is sandy loam, fine sandy loam, or gravelly sandy loam.

Included in this unit are small areas of Corning and Kaseberg soils and Xerarents. Kaseberg soils are on the summits of hills. Xerarents are in filled areas. Also included are deep or very deep soils that have a dark surface layer and are along drainageways. Included areas make up about 15 percent of the total acreage.

Permeability is very slow in the Fiddyment soil. Water is perched above the claypan for short periods after heavy rainfall in winter and early spring. Available water capacity is very low or low. The effective rooting depth is 20 to 30 inches, but roots are restricted to the cracks and faces of peds in the claypan. The depth to a hardpan is 20 to 40 inches. The depth to consolidated sediments is 21 to 40 inches. The shrink-swell potential is high. Runoff is slow or medium. The hazard of water erosion is slight or moderate.

Most areas of this unit are used for dryland grain, such as wheat and oats, or for hay crops. A few areas are used for urban development.

This unit is poorly suited to dryland crops. It is limited mainly by the steepness and complexity of the slopes, the depth to a claypan, the very low available water capacity, and the hazard of erosion. A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling breaks up the tillage pan. Leaving crop residue on or near the surface helps to conserve moisture, maintain tilth, and control erosion. The soil should be tilled on the contour or across the slope.

The main limitations affecting urban uses are the shrink-swell potential, low strength, the depth to a hardpan, the very slow permeability, the slope, and the hazard of erosion. Shallow excavations, such as trenches and holes, are limited by the moderate depth to a hardpan and consolidated sediments. Properly designing the foundations and footings of buildings and diverting runoff away from the buildings help to prevent the structural damage caused by shrinking and swelling. Properly designing roads and streets helps to compensate for low strength in the claypan. It also helps to control surface runoff and stabilize cut slopes. Because excavation for roads and buildings increases the hazard of erosion, only the part of the site that is used for construction should be disturbed. Revegetating disturbed areas around construction sites helps to control erosion. Steep slopes that have been cut and filled are susceptible to erosion and should be permanently protected. Some protective measures that can be used alone or in combination are a cover of turf, ground cover plants, jute netting, soil stabilizer substances, and retaining walls.

If this soil is used as a site for septic tank absorption fields, the very slow permeability and the depth to a hardpan increase the possibility that the absorption field will fail. Because of the slope, the effluent may seep at points downslope.

During summer irrigation is needed in areas used for lawns, shrubs, vines, or shade and ornamental trees. Establishing plants is difficult in areas where the claypan or hardpan has been exposed. Mulching and applying fertilizer in cut areas help to establish the plants.

This unit is in capability unit IVe-3, nonirrigated. The MLRA is 17.

147—Fiddyment-Orangevale complex, 2 to 8 percent slopes. This map unit is on intermingled hills and dissected high terraces. Intermittent shallow drainageways are at the base of the slopes. The native vegetation is mainly annual grasses, forbs, and oaks. Elevation is 130 to 250 feet. The average annual precipitation is 20 to 24 inches.

This unit is about 55 percent Fiddyment soil and 30 percent Orangevale soil. The Fiddyment soil is in areas on hills where slopes are complex. The Orangevale soil is dominantly on the summits of the dissected terraces but also is on side slopes and along drainageways. Slopes in areas of this soil are convex.

Included in this unit are small areas of Kaseberg soils, Xerarents, and Urban land. Kaseberg soils are on the summits of hills. Xerarents are in filled areas. Also included are soils that are more than 40 inches deep to a hardpan or consolidated sediments and that have a subsoil of loam or clay loam and areas of soils that have slopes of 8 to 15 percent. Included areas make up about 15 percent of the total acreage.

The Fiddyment soil is moderately deep and well drained. It formed in material weathered from consolidated sandstone or siltstone. Typically, the surface layer is brown fine sandy loam about 8 inches thick. The next layer is yellowish brown loam about 7 inches thick. The subsoil is a claypan of brown clay loam about 13 inches thick. The next 12 inches is a light yellowish brown and very pale brown hardpan that is cemented with silica. Siltstone is at a depth of about 40 inches. In some areas the surface layer is loam or sandy loam.

Permeability is very slow in the Fiddyment soil. Water is perched above the claypan for short periods after heavy rainfall in winter and early spring and when the soil is overirrigated. Available water capacity is low. The effective rooting depth is 20 to 40 inches, but roots are restricted to the cracks and faces of peds in the claypan. The depth to a hardpan is 20 to 40 inches. The depth to consolidated sediments is 21 to 40 inches. The shrink-swell potential is moderate in the subsoil. Runoff is slow or medium. The hazard of water erosion is slight or moderate.

The Orangevale soil is very deep and well drained. It formed in coarse textured alluvium derived from granitic rocks. Typically, the surface layer is yellowish brown coarse sandy loam about 15 inches thick. The next 5 inches is mixed yellowish brown coarse sandy loam and strong brown sandy clay loam. The upper part of the subsoil is strong brown, yellowish red, and dark yellowish brown sandy clay loam about 52 inches thick. The lower part to a depth of 80 inches is yellowish red coarse sandy loam. In some areas the surface layer is loamy coarse sand.

Permeability is moderate in the Orangevale soil. Available water capacity also is moderate. The effective rooting depth is 60 inches or more. Runoff is slow. The hazard of water erosion is moderate.

Nearly all areas of this unit are used for dryland crops, such as wheat. Some areas are used for urban development.

This unit is suited to dryland crops. It is limited mainly by the depth to a claypan, the low available water capacity, the hazard of water erosion, and the complex slopes in areas of the Fiddyment soil. The Orangevale soil is limited by the hazard of water erosion and the complex slopes. A tillage pan forms easily if the Fiddyment soil is tilled when wet. Chiseling or subsoiling breaks up the tillage pan. Leaving crop residue on or near the surface helps to conserve moisture, maintain tilth, and control erosion. The soils should be tilled on the contour or across the slope.

Where this unit is used for urban development, the main limitations in areas of the Fiddyment soil are the depth to a hardpan, the depth to consolidated sediments, low strength, the very slow permeability, and the hazard of water erosion. The Orangevale soil is limited by the hazard of water erosion. Shallow excavations, such as trenches and holes, are limited by the depth to a hardpan and to consolidated sediments. Properly grading building sites helps to divert water away from the foundations and helps to prevent ponding in the adjacent areas. Excess runoff can be removed by a system of suitably designed drainage ditches or drainage pipe. Properly designing roads and streets helps to compensate for the instability of the subsoil. Excavating for roads and buildings increases the hazard of erosion. Preserving the existing plant cover and revegetating disturbed areas around construction sites help to control erosion. Steep slopes that have been cut and filled are susceptible to erosion and should be permanently protected. Some protective measures that can be used alone or in combination are a cover of turf, ground cover plants, jute netting, soil stabilizer substances, and retaining walls.

An adequate drainage system is needed in areas where deep-rooted trees and shrubs are planted on the Fiddyment soil. During summer irrigation is needed in areas used for lawns, shrubs, vines, or shade and ornamental trees. Establishing plants is difficult in areas where the claypan or hardpan in the Fiddyment soil has been exposed. Mulching and applying fertilizer in cut areas help to establish the plants.

This unit is in capability unit IVe-3, irrigated and nonirrigated. The MLRA is 17.

148—Fiddyment-Orangevale-Urban land complex, 2 to 8 percent slopes. This map unit is on intermingled hills and dissected high terraces. Slopes are complex and have been shaped for urban uses. Intermittent shallow drainageways are at the base of the slopes. The vegetation is mainly ornamental plants or annual grasses, forbs, and oaks. Elevation is 100 to 285 feet. The average annual precipitation is 19 to 24 inches.

This unit is about 40 percent Fiddyment soil, 25 percent Orangevale soil, and 20 percent Urban land. The Fiddyment soil is on hills. The Orangevale soil is dominantly on the summits of dissected terraces but also is on side slopes and along drainageways. The Urban land is throughout the unit.

Included in this unit are small areas of Kaseberg soils and Xerarents. Kaseberg soils are on the summits of hills. Xerarents are in filled areas. Also included are areas that have slopes of 8 to 15 percent. Included areas make up about 15 percent of the total acreage.

The Fiddyment soil is moderately deep and well drained. It formed in material weathered from consolidated sandstone or siltstone. Typically, the surface layer is brown fine sandy loam about 8 inches thick. The next layer is yellowish brown loam about 7 inches thick. The subsoil is a claypan of brown clay loam about 13 inches thick. The next 12 inches is a light yellowish brown and very pale brown hardpan that is cemented with silica. Siltstone is at a depth of about 40 inches. In some areas the surface layer is loam or sandy loam. In other areas the subsoil is clay.

Permeability is very slow in the Fiddyment soil. Water is perched above the claypan for short periods after heavy rainfall in winter and early spring and when the soil is overirrigated. Available water capacity is low. The effective rooting depth is 20 to 40 inches, but roots are restricted to the cracks and faces of peds in the claypan. The depth to a hardpan is 20 to 40 inches. The depth to consolidated sediments is 21 to 40 inches. The shrink-swell potential is moderate in the subsoil. Runoff is slow or medium. The hazard of water erosion is slight or moderate.

The Orangevale soil is very deep and well drained It formed in coarse textured alluvium derived from granitic rocks. Typically, the surface layer is yellowish brown coarse sandy loam about 15 inches thick. The next 5 inches is mixed yellowish brown coarse sandy loam and strong brown sandy clay loam. The upper part of the subsoil is strong brown, yellowish red, and dark yellowish brown sandy clay loam about 52 inches thick. The lower part to a depth of 80 inches is yellowish red coarse sandy loam. In some areas the surface layer is loamy coarse sand.

Permeability is moderate in the Orangevale soil. Available water capacity also is moderate. The effective rooting depth is 60 inches or more. Runoff is slow. The hazard of water erosion is moderate.

Urban land consists of areas covered by impervious surfaces or structures, such as roads, driveways, sidewalks, buildings, and parking lots. The soil material under the impervious surfaces is similar to that of the Fiddyment or Orangevale soil, although it may have been truncated or otherwise altered.

Nearly all areas of this unit are used for urban development. A few areas smaller than 10 acres are used for irrigated pasture.

The main limitations affecting the use of the

Fiddyment soil for urban development are the depth to a hardpan or consolidated sediments, the very slow permeability, low strength, and the hazard of erosion. The Orangevale soil is limited by the hazard of erosion. Shallow excavations, such as trenches and holes, are limited by the depth to a hardpan and to consolidated sediments. Properly grading building sites helps to divert water away from the foundations and helps to prevent ponding in the adjacent areas. Excess runoff can be removed by a system of suitably designed drainage ditches or drainage pipe. Properly designing roads and streets helps to compensate for the instability of the subsoil. Excavating for roads and buildings increases the hazard of erosion. Preserving the existing plant cover and revegetating disturbed areas around construction sites help to control erosion. Steep slopes that have been cut and filled are susceptible to erosion and should be permanently protected. Some protective measures that can be used alone or in combination are a cover of turf, ground cover plants, jute netting, soil stabilizer substances, and retaining walls. The water table, which is perched above the claypan, can cause the failure of septic tank absorption fields, especially after periods of heavy rainfall.

An adequate drainage system is needed in areas where deep-rooted trees and shrubs are planted. During summer irrigation is needed in areas used for lawns, shrubs, vines, or shade and ornamental trees. Establishing plants is difficult in areas where the claypan or hardpan in the Fiddyment soil has been exposed. Mulching and applying fertilizer in cut areas help to establish the plants.

The Fiddyment and Orangevale soils are suited to irrigated pasture. The pastured areas in the unit consist of both soils or only one of the two soils. The main limitations in areas of the Fiddyment soil are the depth to a claypan, the depth to a hardpan, the very slow permeability, the low available water capacity, the slope, and the moderate hazard of water erosion. The Orangevale soil is limited by the slope and the hazard of water erosion. Subsoiling improves the downward movement of water and the penetration of roots in the very slowly permeable subsoil of the Fiddyment soil. Seedbeds should be prepared on the contour or across the slope where practical.

Because of the slope, the depth to a claypan, and the very slow permeability, sprinkler irrigation is the best method of applying water. Graded border irrigation can be used in areas that have slopes of less than 5 percent. Because the Fiddyment soil has a low available water capacity, applications of irrigation water should be light and frequent. An efficient water application system is needed to prevent the development of a perched water table.

The grasses and legumes selected for planting on the Fiddyment soil should be those that are suited to a restricted root zone. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and control erosion.

No land capability classification is assigned. The MLRA is 17.

149—Fiddyment-Urban land complex, 1 to 8 percent slopes. This map unit is on hills dissected by intermittent shallow drainageways. Slopes are complex and have been shaped for urban uses. The vegetation is mainly ornamental plants or annual grasses, forbs, and a few scattered oaks. Elevation is 50 to 170 feet. The average annual precipitation is 18 to 20 inches. The unit is about 70 percent Fiddyment soil and 20 percent Urban land.

Included in this unit are small areas of Kaseberg and Orangevale soils and Xerarents. Kaseberg soils are on the summits of hills. Orangevale soils are on dissected terraces. Xerarents are in filled areas. Also included are soils that are more than 40 inches deep to a hardpan or consolidated sediments. Included areas make up about 10 percent of the total acreage.

The Fiddyment soil is moderately deep and well drained. It formed in material weathered from consolidated sandstone or siltstone. Typically, the surface layer is brown fine sandy loam about 8 inches thick. The next layer is yellowish brown loam about 7 inches thick. The subsoil is a claypan of brown clay loam about 13 inches thick. The next 12 inches is a light yellowish brown and very pale brown hardpan that is cemented with silica. Siltstone is at a depth of about 40 inches. In some areas the surface layer is loam or sandy loam.

Permeability is very slow in the Fiddyment soil. Water is perched above the claypan for short periods after heavy rainfall in winter and early spring and when the soil is overirrigated. Available water capacity is low. The effective rooting depth is 20 to 40 inches, but roots are restricted to the cracks and faces of peds in the claypan. The depth to a hardpan is 20 to 40 inches. The depth to consolidated sediments is 21 to 40 inches. The shrink-swell potential is moderate in the subsoil. Runoff is slow or medium. The hazard of water erosion is slight or moderate.

Urban land consists of areas covered by impervious surfaces or structures, such as roads, driveways, sidewalks, buildings, and parking lots. The soil material under the impervious surfaces is similar to that of the Fiddyment soil, although it may have been truncated or otherwise altered.

Nearly all areas of this unit are used for urban development. A few areas smaller than 5 acres are used for irrigated pasture.

The main limitations affecting urban uses are the depth to a hardpan or consolidated sediments, the very slow permeability, low strength, and the hazard of erosion. Shallow excavations, such as trenches and holes, are limited by the moderate depth to a hardpan and the depth to consolidated sediments. Properly grading building sites helps to divert water away from the foundations and helps to prevent ponding in the adjacent areas. Excess runoff can be removed by a system of suitably designed drainage ditches or drainage pipe. Properly designing roads and streets helps to compensate for the instability of the subsoil. Revegetating disturbed areas around construction sites helps to control erosion. Steep slopes that have been cut and filled are susceptible to erosion and should be permanently protected. Some protective measures that can be used alone or in combination are a cover of turf, ground cover plants, jute netting, soil stabilizer substances, and retaining walls. The water table, which is perched above the claypan, can cause the failure of septic tank absorption fields, especially after periods of heavy rainfall.

An adequate drainage system is needed in areas where deep-rooted trees and shrubs are planted on the Fiddyment soil. During summer irrigation is needed in areas used for lawns, shrubs, vines, or shade and ornamental trees. Establishing plants is difficult in areas where the subsoil or hardpan has been exposed. Mulching and applying fertilizer in cut areas help to establish the plants.

The Fiddyment soil is suited to irrigated pasture. The main limitations are the shallowness to a claypan, the depth to a hardpan, the very slow permeability, the low available water capacity, the slope, and the hazard of water erosion. Subsoiling improves the downward movement of water and the penetration of roots in the very slowly permeable subsoil.

Because of the slope, the depth to a claypan, and the very slow permeability, sprinkler irrigation is the best method of applying water. Graded border irrigation can be used in areas that have slopes of less than 5 percent. Because of the low available water capacity, applications of irrigation water should be light and frequent. An efficient water application system is needed to prevent the development of a perched water table.

The grasses and legumes selected for planting should be those that are suited to a shallow root zone. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and control erosion.

No land capability classification is assigned. The MLRA is 17.

150—Fluvaquents, 0 to 2 percent slopes, frequently flooded. These very deep, very poorly drained soils are on low flood plains, on interchannel bars, and in tidal marshes. They formed in alluvium derived from mixed rock sources and are stratified with hydrophytic plant remains. Slopes are plane or complex. The native vegetation is mainly hydrophytic plants, including cattails, tules, willows, and cottonwoods. Scattered oaks are in a few of the higher areas. Elevation is 2 feet below to 5 feet above sea level. The average annual precipitation is 13 to 16 inches.

The texture, color, and thickness of the layers of these soils vary from one area to another. In a reference pedon, the surface is covered with a mat of tall bulrush and cattail roots about 6 inches thick. The surface layer is dark grayish brown mucky clay loam about 8 inches thick. The underlying material to a depth of 60 inches is stratified gray and dark gray sandy loam, light gray silty clay loam, grayish brown sandy loam, light gray loam, very dark gray muck, light gray and dark gray mucky loam, and black and dark gray muck.

Included in this unit are small areas of Medisaprists, Xeropsamments, and remnants of levees. Medisaprists are in the lower areas. Xeropsamments are in areas on dredge piles. Also included are small areas of soils that have a water table below a depth of 24 inches. Included areas make up about 15 percent of the total acreage.

Permeability is moderately rapid to slow in the Fluvaquents. The effective rooting depth is 60 inches or more for water-tolerant plants. A seasonal high water table is within a depth of 12 inches in winter and early spring and is within a depth of 24 inches in summer. Many areas are inundated by high tides. Some areas are subject to saltwater intrusion into the water table from the adjacent river channels. Most areas are affected only in years of low riverflow. Runoff is ponded or very slow. The hazard of water erosion is slight. The soils are subject to frequent freshwater flooding during winter and spring. Channeling and deposition are common along banks.

This unit is used for wildlife habitat. Wildlife that commonly inhabit areas of this unit include shore birds, waterfowl, beaver, muskrat, and marsh hawk. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is suited to wetland wildlife habitat. It has few limitations. The diversity of wetland plants is wide because of tidal fluctuation and a natural variation in relief. Because of the already well established diversity, the best management measures are those that maintain the existing habitat.

This unit is in capability subclass VIIw, nonirrigated. The MLRA is 16.

151—Galt clay, leveled, 0 to 1 percent slopes. This moderately deep, moderately well drained soil is in basins on low terraces. It formed in fine textured alluvium derived from granitic rocks. Slopes are plane. The vegetation in uncultivated areas is mainly annual grasses and forbs. Elevation is 10 to 90 feet. The average annual precipitation is 15 to 18 inches.

Typically, the surface layer is grayish brown clay about 13 inches thick. Below this is mixed grayish brown and brown clay about 19 inches thick. A variegated yellowish red, light yellowish brown, and white, calcareous hardpan that is weakly cemented with silica is at a depth of about 32 inches. In some areas the surface layer is silty clay loam, clay loam, or silty clay.

Included in this unit are small areas of Clear Lake and San Joaquin soils and Urban land. Clear Lake soils are in basins. San Joaquin soils are in the higher areas on the low terraces. Also included are soils that have overburden of loam fill and a hardpan below a depth of 40 inches and soils that are subject to rare flooding. Included areas make up about 15 percent of the total acreage.

Permeability is slow in the Galt soil. Available water capacity is low. The effective rooting depth and the depth to a hardpan are 20 to 40 inches. The shrink-swell potential is high. Runoff is very slow. Water erosion is a slight hazard or is not a hazard at all.

This unit is used mainly for irrigated hay and pasture. Some areas are used for irrigated crops, such as corn, wheat, rice, and tomatoes. A few areas are used for urban development. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is suited to irrigated hay and pasture. It is limited by the depth to a hardpan, the fine texture of the surface layer, the slow permeability, the low available water capacity, and the very slow runoff. The cemented pan reduces the rooting depth, which affects the yield of deep-rooted plants. Where feasible, deep ripping of the cemented pan helps to overcome this limitation. Because of the slow runoff, a surface drainage system is needed. The soil should be cultivated only within a narrow range in moisture content. It is too sticky for cultivation when wet and is too hard when dry.

Border irrigation is suitable in areas used for hay and pasture. An efficient water application system is needed to prevent the development of a perched water table on the hardpan. Applications of irrigation water should be adjusted to the available water capacity and water intake rate of the soil and to the needs of the crop.

The grasses and legumes selected for planting should be those that are suited to a moderately deep soil. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and a lower water intake rate. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition.

This unit is suited to irrigated crops. If the unit is used for crops other than rice, the main limitations are the depth to a hardpan, the fine texture of the surface layer, the slow permeability, the low available water capacity, and the very slow runoff. The cemented pan reduces the yield of deep-rooted crops. A surface drainage system is needed to remove excess surface water. Returning all crop residue, except for rice straw, to the soil and including grasses, legumes, or a grass-legume mixture in the cropping sequence help to maintain fertility and tilth. Subsoiling improves the downward movement of water and the penetration of roots.

Furrow and border irrigation systems are suitable where crops other than rice are grown. An efficient water application system is needed to prevent the development of a perched water table. Because of the slow permeability, the rate of water application should be regulated so that water does not stand on the surface and damage the crops.

This unit is suited to rice crops. It is limited mainly by the fine texture of the surface layer and the very slow runoff. Because of these limitations, the use of equipment is restricted to short periods when the soil is dry enough to support heavy loads. Level basin irrigation is suitable in the areas used for rice.

If this unit is used for urban development, the main limitations are the very slow runoff, the slow permeability, the depth to a hardpan, sloughing, the high shrink-swell potential, and low strength. Sloughing is a hazard in shallow excavations, such as trenches and holes. Properly grading building sites helps to divert water away from the foundations and helps to prevent ponding in the adjacent areas. Excess surface water can be removed by land shaping where needed and by installing a drainage system. The high shrink-swell potential should be considered when foundations, concrete structures, and paved areas are designed and constructed. The effects of shrinking and swelling can be reduced by maintaining a constant moisture content around the foundation area or by backfilling with material that has a low shrink-swell potential. Properly designing local roads and streets helps to compensate for the instability of the soil. Septic tank absorption fields do not function properly during rainy periods because of the slow permeability. Adding sandy backfill in the trench and extending the length of the absorption lines help to compensate for the depth to a hardpan and the slow permeability. If the density of housing is moderate or high, community sewage systems should be considered.

An adequate drainage system should be provided for landscape plants. Selection of suitable vegetation is critical for the establishment of lawns, shrubs, trees, and vegetable gardens. During summer irrigation is needed in areas used for gardens or landscape plants.

This unit is in capability unit IIIs-5, irrigated and nonirrigated. The MLRA is 17.

152—Galt clay, 0 to 2 percent slopes. This moderately deep, moderately well drained soil is in basins on low terraces. It formed in fine textured alluvium derived from granitic rocks. Slopes are complex. The native vegetation is mainly annual grasses and forbs. Elevation is 10 to 100 feet. The average annual precipitation is 15 to 18 inches.

Typically, the surface layer is grayish brown clay about 13 inches thick. Below this is mixed grayish brown and brown clay about 19 inches thick. A variegated yellowish red, light yellowish brown, and white, calcareous hardpan that is weakly cemented with silica is at a depth of about 32 inches. In some areas the surface layer is clay loam, silty clay loam, or silty clay.

Included in this unit are small areas of Clear Lake, Dierssen, and San Joaquin soils and Urban land. Clear Lake soils are in basins. Dierssen soils are on the rims of basins. San Joaquin soils are in the slightly lower areas. Also included are soils that have slopes of 2 to 5 percent, soils that are ponded during winter and early spring, and soils that are subject to rare flooding. Included areas make up about 15 percent of the total acreage.

Permeability is slow in the Galt soil. Available water capacity is low. The effective rooting depth and the depth to a hardpan are 20 to 40 inches. The shrink-swell potential is high. Runoff is very slow. The hazard of water erosion is slight.

Most areas of this unit are used as rangeland. Some areas are used for dryland crops, such as safflower and wheat. If leveled, the unit can be used for irrigated crops. It may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

Few limitations affect the use of this unit for livestock grazing. The general management concerns include the fine texture of the surface layer and the high shrink-swell potential. The characteristic plant community is soft chess, annual ryegrass, and foxtail fescue. Grazing when the soil is too moist results in compaction and the destruction of plants. Proper grazing management helps to maintain the organic matter content, increases the rate of water infiltration, and improves plant growth early in the season. Fencing is difficult. Excessive shrinking and swelling of the soil forces fenceposts out of the ground.

This unit is suited to dryland crops. It is limited mainly by the fine texture of the surface layer, the low available water capacity, the complex slopes, and the very slow runoff. Because of the runoff that accumulates in concave areas during winter and early spring, yields of the crops grown during this period can be reduced. A surface drainage system is needed to remove excess water. Land smoothing is needed to minimize the accumulation of runoff in concave areas. The soil should be cultivated only within a narrow range in moisture content. It is too sticky for cultivation when wet and is too hard when it is dry. Tilth and fertility can be improved by returning crop residue to the soil.

This unit is in capability unit IIIs-5, irrigated and nonirrigated. The MLRA is 17.

153—Galt clay, 2 to 5 percent slopes. This moderately deep, moderately well drained soil is along drainageways on the dissected side slopes of low terraces. It formed in fine textured alluvium derived from granitic rocks. Slopes are complex. The native vegetation is mainly annual grasses and forbs. Elevation is 10 to 95 feet. The average annual precipitation is 15 to 18 inches.

Typically, the surface layer is grayish brown clay about 13 inches thick. Below this is mixed grayish brown and brown clay about 19 inches thick. A variegated yellowish red, light yellowish brown, and white, calcareous hardpan that is weakly cemented with silica is at a depth of about 32 inches. In some areas the surface layer is clay loam, silty clay loam, or silty clay.

Included in this unit are small areas of Clear Lake and San Joaquin soils. Clear Lake soils are in basins. San Joaquin soils are on the summits of terraces. Also included are areas along drainageways that have slopes of 5 to 8 percent and are subject to rare flooding. Included areas make up about 15 percent of the total acreage.

Permeability is slow in the Galt soil. Available water capacity is low. The effective rooting depth and the depth to a hardpan are 20 to 40 inches. The shrink-swell potential is high. Runoff is slow or medium. The hazard of water erosion is slight.

This unit is used as rangeland. Few limitations affect the use of this unit for livestock grazing. The main management concerns are the fine texture of the surface layer and the high shrink-swell potential. The characteristic plant community is soft chess, annual ryegrass, and foxtail fescue. Grazing when the soil is too moist results in compaction and the destruction of plants. Proper grazing management helps to maintain the organic matter content, increases the rate of water infiltration, and improves plant growth early in the season. Fencing is difficult. Excessive shrinking and swelling of the soil forces fenceposts out of the ground.

This unit is in capability unit IIIe-5, nonirrigated. The MLRA is 17.

154—Galt-Urban land complex, 0 to 2 percent slopes. This map unit is in basins on low terraces. Slopes have been shaped for urban uses. The vegetation is mainly ornamental plants or annual grasses and forbs. Elevation is 10 to 30 feet. The average annual precipitation is 15 to 18 inches. The unit is about 55 percent Galt soil and 35 percent Urban land.

Included in this unit are small areas of Clear Lake and Egbert soils. Also included are soils that have overburden of loam fill and small areas of soils that are subject to rare flooding. Included areas make up about 10 percent of the total acreage.

The Galt soil is moderately deep and moderately well drained. It formed in fine textured alluvium derived from granitic rocks. Typically, the surface layer is grayish brown clay about 13 inches thick. Below this is mixed grayish brown and brown clay about 19 inches thick. A yellowish red, light yellowish brown, and white, calcareous hardpan that is weakly cemented with silica is at a depth of about 32 inches. In some areas the surface layer is silty clay loam, clay loam, or silty clay.

Permeability is slow in the Galt soil. Available water capacity is low. The effective rooting depth and the depth to a hardpan are 20 to 40 inches. The shrink-swell potential is high. Runoff is very slow or slow. The hazard of water erosion is slight.

Urban land consists of areas covered by impervious surfaces or structures, such as roads, driveways, sidewalks, buildings, and parking lots. The soil material under these impervious surfaces is similar to that of the Galt soil, although it may have been truncated or otherwise altered.

This unit is used for urban development. The main limitations affecting urban uses are the very slow runoff, the slow permeability, the depth to a hardpan, the hazard of sloughing, the high shrink-swell potential, and low strength. Sloughing is a hazard in shallow excavations, such as trenches and holes. Excess surface water can be removed by shaping where needed and by installing a drainage system. The high shrink-swell potential and low strength should be considered when foundations, concrete structures, and paved areas are designed and constructed. The effects of shrinking and swelling can be reduced by maintaining a constant moisture content around the foundation area or by backfilling with material that has a low shrink-swell potential.

An adequate drainage system should be provided for landscape plants. Selection of suitable vegetation is critical for the establishment of lawns, shrubs, trees, and vegetable gardens. During summer irrigation is needed in areas used for gardens or landscape plants.

No land capability classification is assigned. The MLRA is 17.

155—Gazwell mucky clay, partially drained, 0 to 2 percent slopes. This very deep, artificially drained soil is in reclaimed backswamps along the edge of freshwater marshes. It is protected against flooding by a system of levees and large upstream dams. Levees, drainage ditches, and pumps have lowered the water table and altered the drainage of the soil. The soil formed in very poorly drained alluvium derived from mixed rock sources and underlain by hydrophytic plant remains. Slopes are plane. The vegetation in uncultivated areas is mainly annual grasses, forbs, and hydrophytic plants. Elevation is 20 feet below sea level to sea level. The average annual precipitation is 13 to 16 inches.

Typically, the surface layer is dark grayish brown mucky clay about 30 inches thick. The next 6 inches is a buried surface layer of very dark gray mucky clay. Below this to a depth 60 inches are buried layers of very dark gray muck and mucky peat. In some areas the surface layer is mucky clay loam.

Included in this unit are small areas of Egbert, Rindge, Sailboat, and Scribner soils. Egbert and Scribner soils are slightly higher on the landscape than the Gazwell soil, and Rindge soils are slightly lower. Sailboat soils are on natural levees. Also included are soils that have a slowly permeable layer of clay below a depth of 20 inches. Included areas make up about 15 percent of the total acreage.

Permeability is moderate to a depth of 30 inches in the Gazwell soil and rapid below that depth. Available water capacity is very high. The effective rooting depth is limited by a fluctuating high water table. The water table is high because of seepage and is controlled by pumping. Depth to the water table ranges from 18 to 36 inches in winter and early spring and from 36 to 60 inches during the rest of the year. The soil is subject to subsidence. When allowed to dry, the buried organic soil shrinks irreversibly. Runoff is very slow. The hazard of water erosion is slight. The hazard of soil blowing is moderate. The soil is subject to rare flooding.

This unit is used for irrigated crops, mainly field corn, wheat, and tomatoes. Some small areas are used for pears, grapes, alfalfa, or asparagus. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is suited to irrigated crops. It is limited mainly by the depth to a fluctuating water table, subsidence, and the moderate hazard of soil blowing. The soil is subject to differential subsidence. Frequently planing the fields improves the efficiency of irrigation. Soil blowing can be controlled by keeping the soil rough and cloddy when it is not protected by vegetation. Tillage should be kept to a minimum. The content of organic matter can be maintained by returning crop residue to the soil.

Subirrigation and furrow, border, and sprinkler irrigation systems are suitable. Subirrigation is more common than other irrigation systems. Large ditches that have small spud ditches between them are used to subirrigate and drain the soil. The water table is raised to a depth of 1 foot at planting time. Then, it is slowly lowered during the growing season until it is at a depth of about 5 feet at harvest time. Salts that accumulate in the upper part of the soil because of subirrigation should be leached every few years in areas where salt-sensitive crops are grown. To minimize the subsidence caused by oxidation, the water table should not be lowered below the rooting depth of the crops.

This unit is in capability unit IIIw-10, irrigated and nonirrigated. The MLRA is 16.

156—Hadselville-Pentz complex, 2 to 30 percent slopes. This map unit is on hills. Slopes are complex and are characterized by mound-intermound microrelief. The native vegetation is mainly annual grasses and forbs. Elevation is 110 to 350 feet. The average annual precipitation is 16 to 22 inches.

This unit is about 45 percent Hadselville soil and 45 percent Pentz soil. The Hadselville soil is in the intermound areas. The Pentz soil is on the mounds.

Included in this unit are small areas of Hicksville, Keyes, Ranchoseco, Pardee, Peters, and Redding soils and Lithic Xerorthents. Hicksville soils are on stream terraces. Keyes and Peters soils are on the concave side slopes of hills. Redding soils are on terrace remnants. Also included are areas that have slopes of 30 to 50 percent and soils that have a subsoil of sandy clay loam and are underlain by weakly consolidated sediments at a depth of 20 to 40 inches. Included areas make up about 10 percent of the total acreage.

The Hadselville soil is very shallow and moderately well drained. It formed in material weathered from weakly consolidated basic andesitic tuffaceous sediments. Typically, the surface layer is grayish brown sandy loam about 7 inches thick. Weakly consolidated tuffaceous sandstone is at a depth of about 7 inches. In some areas the surface layer is gravelly sandy loam. In other areas a thin hardpan caps the bedrock.

Permeability is moderately rapid in the Hadselville soil. Available water capacity is very low. The effective rooting depth and the depth to weakly consolidated bedrock are 4 to 10 inches. Runoff is very slow or medium. The hazard of water erosion is slight or moderate.

The Pentz soil is shallow and well drained. It formed in material weathered from weakly consolidated basic andesitic tuffaceous sediments. Typically, the surface layer is brown fine sandy loam about 9 inches thick. The subsoil also is brown fine sandy loam. It is about 7 inches thick. Weakly consolidated tuffaceous sandstone is at a depth of about 16 inches. In some areas the surface layer is gravelly sandy loam, sandy loam, or loam. In other areas a thin hardpan caps the bedrock.

Permeability is moderately rapid in the Pentz soil. Available water capacity is low. The effective rooting depth and the depth to weakly consolidated bedrock are 10 to 20 inches. Runoff is medium. The hazard of water erosion is slight or moderate.

This unit is used as rangeland. Few limitations affect the use of this unit for livestock grazing. The general management concerns include the very low available water capacity, very shallow rooting depth, and accumulation of water in areas of the Hadselville soil and the low available water capacity and shallow rooting depth in the Pentz soil. The characteristic plant community is mainly soft chess, foxtail fescue, smooth catsear, and toad rush on the Hadselville soil and soft chess, ripgut brome, and filaree on the Pentz soil. Early in the green feed period, livestock grazing is concentrated on the mounds because water accumulates in the intermound areas. Late in the green feed period, grazing is concentrated in the intermound areas. Grazing can continue on the mounds for 2 to 3 weeks after the vegetation in the intermound areas is dry or has been removed, but it should be discontinued when the vegetation on the mounds has a patchy appearance. Proper grazing management helps to maintain the organic matter content, increases the rate of water infiltration, and improves plant growth early in the season.

This unit is in capability subclass VIs, nonirrigated. The MLRA is 18.

157—Hedge loam, 0 to 2 percent slopes. This moderately deep, moderately well drained soil is in low areas on low terraces commonly adjacent to drainageways, on flood plains, and on low stream terraces. It formed in alluvium derived from granitic rocks. Slopes generally are plane. In areas that have not been leveled, however, they are complex and are incised by many, shallow meandering drainageways and depressions. The native vegetation is mainly annual grasses and forbs. Elevation is 15 to 45 feet. The average annual precipitation is 12 to 20 inches.

Typically, the surface layer is light yellowish brown loam about 14 inches thick. The subsurface layer is very pale brown loam about 9 inches thick. It has common black iron-cemented concretions. The upper part of the subsoil is light yellowish brown clay loam about 8 inches thick. The lower part is strong brown loam about 7 inches thick. The next 6 inches is a light yellowish brown and strong brown hardpan that is weakly cemented with silica. The substratum to a depth of 60 inches is light yellowish brown sandy loam. In some areas the surface layer is sandy loam or fine sandy loam.

Included in this unit are small areas of Columbia, Hicksville, Kimball, and San Joaquin soils. Columbia soils are on flood plains. Hicksville soils are on stream terraces. Kimball and San Joaquin soils are in the slightly higher areas. Also included are soils that have a subsoil of loam, soils that have a hardpan at a depth of 10 to 20 inches, and soils that are occasionally flooded. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the Hedge soil. Available water capacity is low or moderate. The effective rooting depth and the depth to a hardpan are 20 to 40 inches. A water table perched above the subsoil is at a depth of 12 to 24 inches for short periods in winter and early spring. Runoff is slow. The hazard of water erosion is slight. The soil is subject to rare flooding during prolonged, high-intensity storms.

This unit is used mainly as rangeland or for dryland crops, such as wheat and oats. Some areas are used for irrigated hay and pasture or for irrigated crops, such as clover for seed. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

Few limitations affect the use of this unit for livestock grazing. The main management concern is the accumulation of water in small drainageways. The characteristic plant community is mainly soft chess, annual ryegrass, and foxtail fescue. Proper grazing management helps to maintain the organic matter content, increases the rate of water infiltration, and improves plant growth early in the season. The unit responds well to some range improvement practices, such as applying fertilizer. Range seeding is impractical, however, because of numerous drainageways.

This unit is suited to dryland crops. It is limited mainly by the complex slopes in unleveled areas and by the moderately slow permeability. Where slopes are complex, leveling is needed to prevent the accumulation of runoff in concave areas. Chiseling or subsoiling improves the downward movement of water and the penetration of roots in the iron-cemented subsurface layer and in the moderately slowly permeable subsoil. Leaving crop residue on or near the surface helps to conserve moisture and maintain tilth.

This unit is suited to irrigated hay and pasture. It is limited mainly by the depth to a hardpan, the complex slopes in unleveled areas, and the moderately slow permeability. Because of the depth to a hardpan, the soil is poorly suited to deep-rooted crops. Where feasible, deep ripping of the cemented hardpan helps to overcome this limitation. Chiseling or subsoiling improves the downward movement of water and the penetration of roots in the iron-cemented subsurface layer and in the moderately slowly permeable subsoil.

Border and sprinkler irrigation systems are suitable in the areas used for hay and pasture. Where slopes are complex, leveling and a surface drainage system are needed to prevent the accumulation of runoff in concave areas. An efficient water application system is needed to prevent the development of a perched water table. Applications of irrigation water should be adjusted to the available water capacity and water intake rate of the soil and to the needs of the crop.

Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and a lower water intake rate. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition.

This unit is suited to irrigated crops. It is limited mainly by the depth to a hardpan, the complex slopes in unleveled areas, and the moderately slow permeability. Where slopes are complex, leveling and a surface drainage system are needed to prevent the accumulation of runoff in concave areas. Returning all crop residue to the soil and including grasses, legumes, or a grass-legume mixture in the cropping sequence help to maintain fertility and tilth. Furrow, border, and sprinkler irrigation systems are suitable.

This unit is in capability unit IIIs-8, irrigated and nonirrigated. The MLRA is 17.

158—Hicksville loam, 0 to 2 percent slopes, occasionally flooded. This very deep, moderately well drained soil is on low stream terraces and the alluvial flats along drainageways on high terraces and hills. It formed in alluvium derived from mixed rock sources. Slopes are plane or convex. The native vegetation is mainly annual grasses and forbs. Elevation is 30 to 180 feet. The average annual precipitation is about 16 to 20 inches.

Typically, the surface layer is grayish brown loam about 13 inches thick. The upper 30 inches of the subsoil is brown clay loam and sandy clay loam. The lower part to a depth of 64 inches is pale brown sandy clay loam. In some areas the surface layer is sandy loam or gravelly loam.

Included in this unit are small areas of Columbia, Corning, Cosumnes, Creviscreek, Pentz, Redding, and San Joaquin soils and areas of Hicksville soils that have consolidated sediments at a depth of 40 to 60 inches. Columbia and Cosumnes soils are on low flood plains. Corning and Redding soils are on high terraces. Creviscreek soils are on the slightly higher stream terraces. Pentz soils are on hills. San Joaquin soils are on low terraces. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the Hicksville soil. Available water capacity is very high. The effective rooting depth is 60 inches or more. A seasonal high water table is at a depth of 60 to 72 inches for intermittent periods in winter and early spring. Runoff is slow. The hazard of water erosion is slight. The soil is occasionally flooded for very brief periods during prolonged, high-intensity storms. Channeling and deposition are common along streambanks.

This unit is used mainly for irrigated hay and pasture. Some areas are used as rangeland or for irrigated crops, mainly corn and wheat. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is suited to irrigated hay and pasture. The main hazard is the flooding. A surface drainage system is needed to remove excess surface water following floods.

Sprinkler and border irrigation systems are suitable. Leveling helps to ensure a uniform distribution of irrigation water. The application rate should be adjusted to the available water capacity and water intake rate of the soil and to the needs of the crop. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and a lower water intake rate. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition.

This unit is suitable for livestock grazing. It has few limitations. The characteristic plant community is mainly soft chess, wild oats, and ripgut brome. In areas of abandoned cropland, the vegetation consists mainly of low-value remnant weedy species. Proper grazing management helps to maintain the organic matter content, increases the rate of water infiltration, and helps to achieve the desired balance of species in the plant community. The unit responds well to range improvement practices, such as range seeding and applications of fertilizer. The plants selected for seeding should be those that meet the seasonal requirements of livestock or wildlife, or both. After the seeds are planted, grazing should be deferred until the plants have set seed.

This unit is suited to irrigated crops. It is limited by the hazard of flooding. Crops can be damaged by floodwater. The hazard of flooding can be reduced in some areas by diversions and dikes. Subsoiling improves the downward movement of water and the penetration of roots. Returning all crop residue to the soil and including grasses, legumes, or a grass-legume mixture in the cropping sequence help to maintain fertility and tilth. Furrow, border, and sprinkler irrigation systems are suitable.

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

159—Hicksville gravelly loam, 0 to 2 percent slopes, occasionally flooded. This very deep, moderately well drained soil is on low stream terraces and the alluvial flats adjacent to drainageways on high terraces and hills. It formed in alluvium derived from mixed rock sources. Slopes are plane or complex in slightly depressed drainage channels. The native vegetation is mainly annual grasses and forbs. Elevation is 75 to 230 feet. The average annual precipitation is 17 to 22 inches.

Typically, the surface layer is grayish brown gravelly loam about 13 inches thick. The subsoil is about 30 inches of brown gravelly clay loam and gravelly sandy clay loam. The substratum to a depth of 65 inches is stratified pale brown and light brownish gray gravelly sandy clay loam to clay loam. In some areas the surface layer is sandy loam, sandy clay loam, or gravelly sandy loam. In other areas the subsoil has very gravelly strata.

Included in this unit are small areas of Columbia, Corning, Creviscreek, Pentz, and Redding soils. Columbia soils are on low flood plains. Corning and Redding soils are on high terraces. Creviscreek soils are on the slightly higher stream terraces. Pentz soils are on hills. Also included are soils that have a hardpan or consolidated sediments at a depth of 30 to 60 inches. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the Hicksville soil. Available water capacity is high. The effective rooting depth is 60 inches or more. A seasonal high water table is at a depth of 60 to 72 inches for intermittent periods in winter and early spring. Runoff is slow. The hazard of water erosion is slight. The soil is occasionally flooded for very brief periods during prolonged, high-intensity storms. Channeling and deposition are common along streambanks.

This unit is used as rangeland. If irrigation water is available, the larger areas of the unit can be used for irrigated crops. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is suited to livestock grazing. It has few limitations. The characteristic plant community is mainly soft chess, wild oats, and ripgut brome. In areas of abandoned cropland, the vegetation consists mainly of low-value remnant weedy species. Proper grazing management helps to maintain the organic matter content, increases the rate of water infiltration, and helps to achieve the desired balance of species in the plant community. The unit responds well to range improvement practices, such as range seeding and applications of fertilizer. The plants selected for seeding should be those that meet the seasonal requirements of livestock or wildlife, or both. After the seeds are planted, grazing should be deferred until the plants have set seed.

This unit is in capability unit IIw-2, irrigated, and IIIw-2, nonirrigated. The MLRA is 17.

160—Hicksville sandy clay loam, 0 to 2 percent slopes, occasionally flooded. This deep, moderately well drained soil is on low stream terraces and the alluvial flats along drainageways on high terraces and hills. It formed in alluvium derived from mixed rock sources. Slopes are plane or complex in slightly depressed drainage channels. The native vegetation is mainly annual grasses and forbs. Elevation is 150 to 230 feet. The average annual precipitation is 18 to 22 inches.

Typically, the surface layer is dark brown sandy clay loam about 6 inches thick. The subsoil is brown sandy clay loam about 22 inches thick. It has pale brown bleached sand grains in the lower part. The underlying material is light olive gray very gravelly sandy clay loam about 14 inches thick. It has yellowish brown mottles. Light gray, weakly consolidated sediments are at a depth of about 42 inches. In some areas the surface layer is sandy loam or gravelly loam. In other areas the surface is covered by overwash of yellowish red loam, sandy loam, or gravelly sandy loam deposited as a result of mining activities.

Included in this unit are small areas of Amador, Columbia, Corning, Creviscreek, Pentz, and Redding soils. Amador and Pentz soils are on hills. Columbia soils are on low flood plains. Corning and Redding soils are on high terraces. Creviscreek soils are on the slightly higher stream terraces. Also included are areas that are frequently flooded. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the Hicksville soil. Available water capacity is moderate. The effective rooting depth and the depth to consolidated sediments are 40 to 60 inches. Runoff is slow. The hazard of water erosion is slight. A perched seasonal high water table is at a depth of 36 to 48 inches in winter and early spring. The soil is occasionally flooded for very brief periods during prolonged, high-intensity storms. Channeling and deposition are common along streambanks.

This unit is used as rangeland. If irrigation water is available, the larger areas of the unit can be used for irrigated crops. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is suited to livestock grazing. It has few limitations. The characteristic plant community is mainly soft chess, wild oats, ripgut brome, and annual ryegrass. In areas of abandoned cropland, the vegetation consists mainly of low-value remnant weedy species. Proper grazing management helps to maintain the organic matter content, increases the rate of water infiltration, and helps to achieve the desired balance of species in the plant community. The unit responds well to range improvement practices, such as range seeding and applications of fertilizer. The plants selected for seeding should be those that meet the seasonal requirements of livestock or wildlife, or both. After the seeds are planted, grazing should be deferred until the plants have set seed.

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

161—Jacktone clay, drained, 0 to 2 percent slopes. This moderately deep, artificially drained soil is in high areas in basins. It is protected against flooding by a system of levees and large upstream dams. Levees, drainage ditches, and pumps have lowered the water table and altered the drainage of the soil. The soil formed in somewhat poorly drained, fine textured alluvium derived from mixed rock sources. Slopes are plane or slightly convex. The vegetation in uncultivated areas is mainly annual grasses and forbs. Elevation is 10 to 25 feet. The average annual precipitation is 16 to 18 inches.

Typically, the surface layer is very dark gray clay about 11 inches thick. Below this is very dark gray and gray clay about 23 inches thick. The next 18 inches is a light brownish gray and light gray hardpan that is weakly cemented with silica. The hardpan has an indurated laminar cap about 2 millimeters thick. The underlying material to a depth of 60 inches is light yellowish brown sandy loam. In some areas the surface layer is clay loam. In other areas the subsoil is clay loam.

Included in this unit are small areas of Clear Lake clay, hardpan substratum; Cosumnes soils; Durixeralfs; San Joaquin soils; and Xerarents. Cosumnes soils are on low flood plains along drainageways. Durixeralfs are in areas that have been cut during leveling. San Joaquin soils are on low terrace remnants. Xerarents are in filled areas. Included areas make up about 15 percent of the total acreage.

Permeability is slow in the Jacktone soil. Available water capacity is moderate. The effective rooting depth and the depth to a hardpan are 20 to 40 inches. The depth to a seasonal high water table is more than 60 inches in winter and early spring. The shrink-swell potential is high. Runoff is very slow. Water erosion is a slight hazard or is not a hazard at all. The soil is subject to rare flooding.

This unit is used mainly for irrigated crops, such as rice, barley, wheat, and corn. Nonirrigated safflower also is grown. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is suited to irrigated crops. If the unit is used for crops other than rice, the main limitations are the depth to a hardpan, the fine texture of the surface layer, the slow permeability, and the very slow runoff. A surface drainage system and open drainage ditches are needed to remove excess surface water. The soil should be cultivated only within a narrow range in moisture content. It is too sticky for cultivation when wet and is too hard when dry. Returning all crop residue, except for rice straw, to the soil and including grasses, legumes, or a grass-legume mixture in the cropping sequence help to maintain fertility and tilth. Subsoiling improves the downward movement of water and the penetration of roots.

Furrow and border irrigation systems are suitable where crops other than rice are grown. An efficient water application system is needed to prevent the development of a perched water table on the hardpan. Because of the slow permeability, the rate of water application should be regulated so that water does not stand on the surface and damage the crops.

This unit is suited to rice crops. It is limited mainly by the fine texture of the surface layer and the very slow runoff. These limitations restrict the use of equipment to short periods when the soil is dry enough to support heavy loads. Level basin irrigation is suitable where rice is grown.

This unit is in capability unit IIIs-5, irrigated and nonirrigated. The MLRA is 17.

162—Kaseberg-Fiddyment-Urban land complex, 2 to 15 percent slopes. This map unit is on hills. Slopes have been shaped for urban uses. The landscape is dissected by intermittent shallow drainageways. The vegetation is mainly ornamental plants or annual grasses, forbs, and oaks. Elevation is 75 to 250 feet. The average annual precipitation is 19 to 23 inches.

This unit is about 40 percent Kaseberg soil, 25 percent Fiddyment soil, and 20 percent Urban land. The Kaseberg soil is dominantly in areas on the summits of hills where slopes are convex. The Fiddyment soil is dominantly in areas on the side slopes of hills where slopes are complex.

Included in this unit are small areas of Orangevale soils and Xerarents. Orangevale soils are on dissected terraces in scattered areas. Xerarents are in filled areas. Also included are soils that are less than 10 inches or more than 40 inches deep to a hardpan. Included areas make up about 15 percent of the total acreage.

The Kaseberg soil is shallow and well drained. It formed in material weathered from consolidated sediments derived from mixed rock sources. Typically, the surface layer and subsoil are brown and yellowish brown loam, which extends to a depth of about 18 inches. The next 1 inch is a hardpan that is strongly cemented with silica. Siltstone is at a depth of about 19 inches. In some areas the surface layer is fine sandy loam. In other areas the subsoil directly overlies the bedrock.

Permeability is moderate in the Kaseberg soil. Available water capacity is low. The effective rooting depth and the depth to a hardpan are 14 to 20 inches. The depth to consolidated sediments is 15 to 21 inches. Runoff is slow or medium. The hazard of water erosion is slight or moderate.

The Fiddyment soil is moderately deep and well drained. It formed in material weathered from consolidated sandstone or siltstone. Typically, the surface layer is brown fine sandy loam about 8 inches thick. Below this is yellowish brown loam about 7 inches thick. The subsoil is a claypan of brown clay loam about 13 inches thick. The next 12 inches is a light yellowish brown and very pale brown hardpan that is cemented with silica. Siltstone is at a depth of about 40 inches. In some areas the surface layer is loam or sandy loam. In other areas the subsoil is clay.

Permeability is very slow in the Fiddyment soil. Water is perched above the claypan for short periods after heavy rainfall in winter and early spring and when the soil is overirrigated. Available water capacity is low. The effective rooting depth is 20 to 40 inches, but roots are restricted to the cracks and faces of peds in the claypan, which is at a depth of 15 to 25 inches. The depth to a hardpan is 20 to 40 inches. The depth to consolidated sediments is 21 to 40 inches. The shrink-swell potential is moderate. Runoff is slow or medium. The hazard of water erosion is slight or moderate.

Urban land consists of areas covered by impervious surfaces or structures, such as roads, driveways, sidewalks, buildings, and parking lots. The soil material under the impervious surfaces is similar to that of the Kaseberg or Fiddyment soil, although it may have been truncated or otherwise altered.

This unit is used mainly for urban development. A few areas smaller than 10 acres are used for irrigated pasture.

Where this unit is used for urban development, the main limitations in areas of the Kaseberg soil are the depth to a hardpan or consolidated sediments, the hazard of water erosion, and the slope. The Fiddyment soil is limited by low strength, the depth to a hardpan or consolidated sediments, the very slow permeability, the hazard of water erosion, and the slope. Shallow excavations, such as trenches and holes, are limited by the shallow or moderate depth to a hardpan or consolidated sediments. Properly designing roads helps to compensate for the instability of the subsoil and helps to control surface runoff and stabilize cut slopes. Excavating for roads and buildings increases the hazard of erosion. Only the part of the site that is used for construction should be disturbed. Revegetating disturbed areas around construction sites helps to control erosion. Steep slopes that have been cut and filled are susceptible to erosion and should be permanently protected. Some protective measures that can be used alone or in combination are a cover of turf, ground cover plants, jute netting, soil stabilizer substances, and retaining walls.

During summer irrigation is needed in areas used for lawns, shrubs, vines, or shade and ornamental trees. Establishing plants is difficult in areas where the surface layer has been removed. Mulching and applying fertilizer in cut areas help to establish the plants.

The Kaseberg and Fiddyment soils are suited to irrigated pasture. The small areas that are used for irrigated pasture consist of both soils or only one of the two soils. The main limitations in areas of the Kaseberg soil are the shallowness to a hardpan, the low available water capacity, the hazard of water erosion, and the slope. The Fiddyment soil is limited by the shallowness to a claypan, the moderate depth to a hardpan, the very slow permeability, the low available water capacity, the moderate hazard of water erosion, and the slope. Subsoiling improves the downward movement of water and the penetration of roots in the very slowly permeable subsoil of the Fiddyment soil.

Because of the slope, the depth to a claypan, and the very slow permeability, sprinkler irrigation is the best method of applying water. Graded border irrigation can be used in areas that have slopes of less than 5 percent. An efficient water application system is needed to prevent the development of a perched water table. Applications of water should be light and frequent because of the runoff rate.

The grasses and legumes selected for planting should be those that are suited to a shallow root zone. Grazing when the soils are wet results in compaction of the surface layer, poor tilth, and excessive runoff. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and control erosion.

No land capability classification is assigned. The MLRA is 17.

163—Keyes sandy loam, 2 to 15 percent slopes. This shallow, moderately well drained soil is commonly on hills that have weak hummocky microrelief. It formed in material weathered from sediments of andesitic gravel, cobbles, and tuff. Slopes are convex. The native vegetation is mainly annual grasses and forbs. Elevation is 130 to 290 feet. The average annual precipitation is 19 to 20 inches.

Typically, the surface layer is grayish brown and yellowish brown sandy loam about 9 inches thick. The upper 6 inches of the subsoil is brown gravelly sandy clay loam. The next 4 inches is a claypan of brown gravelly clay. The lower 6 inches is a hardpan that is weakly cemented with silica. Weathered bedrock is at a depth of about 25 inches. In some areas the surface layer is gravelly sandy loam or loam. In other areas the subsoil has very gravelly strata.

Included in this unit are small areas of Pardee, Pentz, and Ranchoseco soils. Also included are soils that have a hardpan at a depth of 20 to 40 inches. Included areas make up about 15 percent of the total acreage.

Permeability is very slow in the Keyes soil. Available water capacity is very low. The effective rooting depth is

13 to 20 inches, but roots are restricted to the cracks and faces of peds in the claypan. The depth to a hardpan ranges from 13 to 20 inches. The depth to bedrock is 14 to 40 inches. Runoff is slow or medium. The hazard of water erosion is slight or moderate.

This unit is used mainly as rangeland. Some areas are used for homesite development.

Few limitations affect the use of this unit for livestock grazing. The general management concerns include the shallow rooting depth and the very low available water capacity. The characteristic plant community is mainly soft chess, wild oats, and filaree. Proper grazing management helps to maintain the organic matter content, increases the rate of water infiltration, and improves plant growth early in the season.

Where this soil is used for homesite development, the main limitations are the depth to a hardpan, the very slow permeability, the slope, and the hazard of erosion. Shallow excavations, such as trenches and holes, are limited by the shallowness to a hardpan. Excavations for roads and buildings increase the hazard of erosion. Preserving the existing plant cover and revegetating disturbed areas around construction sites help to control erosion. Steep slopes that have been cut and filled are susceptible to erosion and should be permanently protected. Some protective measures that can be used alone or in combination are a cover of turf, ground cover plants, jute netting, soil stabilizer substances, and retaining walls.

If this soil is used as a site for septic tank absorption fields, the very slow permeability and the shallowness to a claypan and hardpan increase the possibility that the absorption fields will fail. If the absorption lines are installed below the hardpan, the absorption field may not adequately filter the effluent. The slope is a management concern when the absorption fields are installed. The absorption lines should be installed on the contour. During the rainy season, the effluent from onsite sewage disposal systems may seep at points downslope.

During summer irrigation is needed in areas used for lawns, shrubs, vines, or shade and ornamental trees. Establishing plants is difficult in areas where the subsoil or hardpan has been exposed. Mulching and applying fertilizer in cut areas help to establish the plants.

This unit is in capability subclass VIe, nonirrigated. The MLRA is 18.

164—Kimball silt loam, 0 to 2 percent slopes. This very deep, well drained soil is in low, beveled areas on low terraces. It formed in alluvium derived from mixed granitic rocks. Slopes are plane. The vegetation in uncultivated areas is mainly annual grasses and forbs. Elevation is 15 to 105 feet. The average annual precipitation is 15 to 18 inches.

Typically, the surface layer is brown and light brown silt loam about 24 inches thick. The upper part of the subsoil is a claypan of brown and strong brown clay about 12 inches thick. The lower part to a depth of 60 inches is brown sandy clay loam and sandy loam. In some areas the surface layer is loam. In other areas it is lighter colored.

Included in this unit are small areas of Bruella and San Joaquin soils and Durixeralfs and Xerarents. Bruella soils are on intermediate terraces. Durixeralfs are in cut areas. San Joaquin soils are in the higher areas on the low terraces. Also included are soils that have a weak hardpan at a depth of 40 to 60 inches. Included areas make up about 15 percent of the total acreage.

Permeability is very slow in the Kimball soil. Water is perched above the claypan for short periods after heavy rainfall in winter and early spring and when the soil is overirrigated. Available water capacity is moderate. The effective rooting depth is 60 inches or more, but roots are restricted to the cracks and faces of peds in the claypan. The shrink-swell potential is high. Runoff is slow. The hazard of water erosion is slight.

Most areas of this unit are used for irrigated hay and pasture or for irrigated crops, mainly wheat, corn, and rice. A few areas are used for urban development.

This unit is suited to irrigated hay and pasture. It is limited mainly by the depth to a claypan, the very slow permeability, and the moderate available water capacity. Subsoiling improves the downward movement of water and the penetration of roots in the very slowly permeable claypan.

Sprinkler and border irrigation systems are suitable. Leveling helps to ensure a uniform distribution of irrigation water. An efficient water application system is needed to prevent the development of a perched water table on the claypan. Applications of irrigation water should be adjusted to the available water capacity and water intake rate of the soil and to the needs of the crop. The grasses and legumes selected for planting should be those that are suited to a moderately deep soil. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and a lower water intake rate. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition.

This unit is suited to irrigated crops. If the unit is used for crops other than rice, the main limitations are the depth to a claypan, the very slow permeability, and the moderate available water capacity. Because of the moderate depth to a claypan, the soil is poorly suited to deep-rooted crops. A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling can break up the tillage pan. Returning all crop residue, except for rice straw, to the soil and including grasses, legumes, or a grass-legume mixture in the cropping sequence help to maintain fertility and tilth. Furrow, border, and sprinkler irrigation systems are suitable where crops other than rice are grown.

If this unit is used for urban development, the main limitations are the very slow permeability, the shrink-swell potential, and low strength. Properly grading building sites helps to divert water away from the foundations and helps to prevent ponding in the adjacent areas. Excess runoff can be removed by a system of suitably designed drainage ditches or drainage pipe. If buildings are constructed on the claypan, properly designing foundations and footings and diverting runoff away from the buildings help to prevent the structural damage caused by shrinking and swelling. Properly designing roads and streets helps to compensate for the instability of the subsoil. Revegetating disturbed areas around construction sites helps to control erosion.

If this soil is used as a site for septic tank absorption fields, the very slow permeability can be overcome by increasing the size of the absorption field or by installing the absorption lines below the claypan. After periods of heavy rainfall, the water table, which is perched above the claypan, can cause the failure of onsite sewage disposal systems.

An adequate drainage system is needed in areas where deep-rooted trees and shrubs are planted. During summer irrigation is needed in areas used for lawns, shrubs, vines, or shade and ornamental trees.

This unit is in capability unit IIIs-3, irrigated and nonirrigated. The MLRA is 17.

165—Kimball silt loam, 2 to 8 percent slopes. This very deep, well drained soil is on descending side slopes on low terraces. It formed in alluvium derived from mixed granitic rocks. Slopes are complex. The vegetation in uncultivated areas is mainly annual grasses and forbs. Elevation is 50 to 140 feet. The average annual precipitation is 16 to 18 inches.

Typically, the surface layer is brown and light brown silt loam about 24 inches thick. The upper part of the subsoil is a claypan of brown and strong brown clay about 12 inches thick. The lower part to a depth of 60 inches is brown sandy clay loam and sandy loam. In some areas the surface layer is loam.

Included in this unit are small areas of San Joaquin soils and Durixeralfs and Xerarents. Durixeralfs are in cut areas. San Joaquin soils are on the summits of the low terraces. Xerarents are in filled areas. Also included are soils that have a hardpan at a depth of 40 to 60 inches and soils that have a moderately slowly permeable subsoil. Included areas make up about 15 percent of the total acreage.

Permeability is very slow in the Kimball soil. Water is perched above the claypan for short periods after heavy rainfall in winter and early spring and when the soil is overirrigated. Available water capacity is moderate. The effective rooting depth is 60 inches or more, but roots are restricted to the cracks and faces of peds in the claypan. The shrink-swell potential is high. Runoff is medium. The hazard of water erosion is moderate.

This unit is used for irrigated hay and pasture. The main limitations are the depth to a claypan, the very slow permeability, the moderate available water capacity, the slope, and the hazard of water erosion. Subsoiling improves the downward movement of water and the penetration of roots in the very slowly permeable claypan. Seedbeds should be prepared on the contour or across the slope where practical.

Because of the slope, the depth to a claypan, and the very slow permeability, sprinkler irrigation is the best method of applying water. Applications of irrigation water should be adjusted to the available water capacity and water intake rate of the soil and to the needs of the crop. The grasses and legumes selected for planting should be those that are suited to a moderately deep soil. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and control erosion.

This unit is in capability unit IIIe-3, irrigated and nonirrigated. The MLRA is 17.

166—Kimball-Urban land complex, 0 to 2 percent slopes. This map unit is in low, beveled areas on low terraces. Slopes have been shaped for urban uses. The vegetation is mainly ornamental plants or annual grasses and forbs. Elevation is 20 to 75 feet. The average annual precipitation is 16 to 18 inches. The unit is about 50 percent Kimball soil and 35 percent Urban land.

Included in this unit are small areas of Bruella and San Joaquin soils and Durixeralfs and Xerarents. Bruella soils are on intermediate terraces. Durixeralfs are in cut areas. San Joaquin soils are in the slightly higher areas. Xerarents are in filled areas. Included areas make up about 15 percent of the total acreage.

The Kimball soil is very deep and well drained. It formed in alluvium derived from mixed granitic rocks. Typically, the surface layer is brown and light brown silt loam about 24 inches thick. The upper part of the subsoil is a claypan of brown and strong brown clay about 12 inches thick. The lower part to a depth of 60 inches is brown sandy clay loam and sandy loam. In some areas the surface layer is loam.

Permeability is very slow in the Kimball soil. Water is perched above the claypan for short periods after heavy rainfall in winter and early spring and when the soil is overirrigated. Available water capacity is moderate. The effective rooting depth is 60 inches or more, but roots are restricted to the cracks and faces of peds in the claypan. The shrink-swell potential is high. Runoff is slow. The hazard of water erosion is slight.

Urban land consists of areas covered by impervious surfaces or structures, such as roads, driveways, sidewalks, buildings, and parking lots. The soil material under the impervious surfaces is similar to that of the Kimball soil, although it may have been truncated or otherwise altered.

This unit is used for urban development. The main limitations affecting urban uses are the very slow permeability, the shrink-swell potential, and low strength. Excess runoff can be removed by a system of suitably designed drainage ditches or drainage pipe. Properly designing buildings and roads helps to offset the effects of shrinking and swelling and low strength. If buildings are constructed on the claypan, properly designing foundations and footings and diverting runoff away from the buildings help to prevent the structural damage caused by shrinking and swelling. Revegetating disturbed areas around construction sites helps to control erosion. After periods of heavy rainfall, the water table, which is perched above the claypan, can cause the failure of onsite sewage disposal systems.

An adequate drainage system is needed in areas where deep-rooted trees and shrubs are planted. During summer irrigation is needed in areas used for gardens or landscape plants. Carefully applying irrigation water helps to prevent the development of a perched water table.

No land capability classification is assigned. The MLRA is 17.

167—Lang fine sandy loam, drained, 0 to 2 percent slopes. This very deep, artificially drained soil is on low flood-plain splays in areas of recent levee breaks. It is protected against flooding by a system of levees and large upstream dams. Levees, open and closed drains, and pumps have lowered the water table and altered the drainage of the soil. The soil formed in moderately well drained alluvium derived from mixed rock sources. The vegetation in uncultivated areas is mainly annual grasses and forbs. Elevation is sea level to 30 feet above sea level. The average annual precipitation is 15 to 17 inches.

Typically, the surface layer is light yellowish brown fine sandy loam about 12 inches thick. The underlying material to a depth of 60 inches is light yellowish brown and white sand. In some areas the surface layer is sand.

Included in this unit are small areas of Columbia, Laugenour, and Sailboat soils. Columbia and Sailboat soils are on natural levees. Included areas make up about 15 percent of the total acreage.

Permeability is rapid in the Lang soil. Available water capacity is low. The effective rooting depth is limited by a seasonal high water table in winter and early spring. The water table is high because of seepage and is maintained at a depth of 60 to 72 inches by pumping. Runoff is very slow. The hazard of water erosion is slight. The hazard of soil blowing is moderate. The soil is subject to rare flooding.

Most areas of this unit are used for irrigated crops, mainly wheat and corn. Alfalfa and tomatoes are grown in a few areas. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is suited to irrigated crops. It is limited mainly by the low available water capacity, a rapid water intake rate, and the hazard of soil blowing. The organic matter content can be maintained by returning all crop residue to the soil, plowing under cover crops, and using a suitable crop rotation. Soil blowing can be controlled by returning crop residue to the soil and minimizing tillage.

Sprinkler and furrow irrigation systems are suitable. 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 because of the rapid water intake rate. To avoid overirrigating and the leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity and water intake rate of the soil and to the needs of the crop. Pipe, ditch lining, or drop structures in irrigation ditches facilitate irrigation and reduce the hazard of ditch erosion.

This unit is in capability units IIw-4, irrigated, and IIIw-4, nonirrigated. The MLRA is 16 or 17.

168—Lang-Urban land complex, drained, 0 to 2 percent slopes. This map unit is on low flood-plain splays in areas of recent levee breaks. It is protected against flooding by a system of levees and large upstream dams. Levees, open and closed drains, and pumps have lowered the water table and altered the drainage of the Lang soil. Slopes have been shaped for urban uses. The vegetation is mainly ornamental plants or annual grasses and forbs. Elevation is 10 to 30 feet.

The average annual precipitation is 17 to 18 inches. The unit is about 55 percent Lang soil and 30 percent Urban land.

Included in this unit are small areas of Columbia and Egbert soils. Columbia soils are on natural levees. Egbert soils are in backswamps. Included areas make up about 15 percent of the total acreage.

The Lang soil is very deep and is artificially drained. It formed in moderately well drained alluvium derived from mixed rock sources. Typically, the surface layer is light yellowish brown fine sandy loam about 12 inches thick. The underlying material to a depth of 60 inches is light yellowish brown and white sand. In some areas the surface layer is sand. In other areas the soil is not stratified.

Permeability is rapid in the Lang soil. Available water capacity is low. The effective rooting depth is limited by a seasonal high water table in winter and early spring. The water table is high because of seepage and is maintained at a depth of 60 to 72 inches by pumping. Runoff is very slow. The hazard of water erosion is slight. The soil is not susceptible to soil blowing. It is subject to rare flooding.

Urban land consists of areas covered by impervious surfaces or structures, such as roads, driveways, sidewalks, buildings, and parking lots. The soil material under the impervious surfaces is similar to that of the Lang soil, although it may have been truncated or otherwise altered.

This unit is used for urban development. The Lang soil is limited mainly by flooding. Also, cutbanks are not stable and are subject to sloughing. Revegetating disturbed areas around construction sites as soon as possible with drought-tolerant plants helps to control erosion. During summer irrigation is needed in areas used for lawns, shrubs, vines, or shade and ornamental trees.

No land capability classification is assigned. The MLRA is 17.

169—Laugenour loam, partially drained, 0 to 2 percent slopes. This very deep, artificially drained soil is on low flood-plain splays and natural levees. It is protected against flooding by a system of levees and large upstream dams. Levees, open and closed drains, and pumps have lowered the water table and altered the drainage of the soil. The soil formed in poorly drained alluvium derived from mixed rock sources. Slopes are plane and descend from the levees or channels. The vegetation in uncultivated areas is mainly annual grasses, forbs, and hydrophytic plants. Elevation is 10 feet below to 20 feet above sea level. The average annual precipitation is 14 to 18 inches.

Typically, the surface layer is light brownish gray and grayish brown, mottled loam about 16 inches thick. The upper part of the underlying material is pale brown, mottled sandy loam about 23 inches thick. The lower part to a depth of 60 inches is stratified, pale brown sandy loam and loam. In some areas the surface layer is sandy loam. In other areas it is not mottled.

Included in this unit are small areas of Lang and Sailboat soils. Sailboat soils are on natural levees. Also included, near the mouth of the American River, are areas of soils that are more frequently flooded than the Laugenour soil. Included areas make up about 15 percent of the total acreage.

Permeability is moderate in the Laugenour soil. Available water capacity is high. The effective rooting depth is limited by a seasonal high water table in winter and early spring. The water table is high because of seepage and generally is maintained below a depth of 36 inches by pumping. It can be at a depth of 20 to 36 inches for short periods. Most areas south of Locke have subsided. Runoff is slow. The hazard of water erosion is slight. The soil is subject to rare flooding.

This unit is used mainly for irrigated crops, such as corn, wheat, tomatoes, and pears. Some areas are used for irrigated hay and pasture. Alfalfa can be grown in areas where the water table is carefully managed. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is suited to irrigated crops. It is limited mainly by the depth to a seasonal high water table and subsidence in some areas. The water table during the rainy period in winter generally limits the suitability of this unit for deep-rooted crops. Pears, however, can tolerate some wetness. Tile drainage can lower the water table if a suitable outlet is available, but onsite investigation is needed because of the potential for subsidence. Differential subsidence of underlying organic material in some areas may cause an increase in the slope and require modifications of irrigation and drainage systems. Returning all crop residue to the soil and including grasses, legumes, or a grass-legume mixture in the cropping sequence help to maintain fertility and tilth.

Furrow and sprinkler irrigation systems are suitable. To avoid overirrigating and the leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity and water intake rate of the soil and to the needs of the crop. Pipe, ditch lining, or drop structures in irrigation ditches facilitate irrigation and reduce the hazard of ditch erosion. The potential for subsidence should considered when one of these measures is selected.

This unit is suited to irrigated hay and pasture. It is limited mainly by the depth to a seasonal high water table and subsidence in some areas. Irrigation water can be applied by sprinkler or border methods. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and a lower water intake rate. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition.

This unit is in capability units IIw-2, irrigated, and IIIw-2, nonirrigated. The MLRA is 16 or 17.

170—Laugenour-Urban land complex, partially drained, 0 to 2 percent slopes. This map unit is on low flood-plain splays and natural levees. It is protected against flooding by a system of levees and large upstream dams. Levees, open and closed drains, and pumps have lowered the water table and altered the drainage of the Laugenour soil. Slopes have been shaped for urban uses and descend from the levees or channels. The vegetation is mainly ornamental plants. Elevation is 10 to 20 feet. The average annual precipitation is 17 to 18 inches. The unit is about 55 percent Laugenour soil and 30 percent Urban land.

Included in this unit are small areas of Columbia, Sailboat, and Valpac soils. Valpac soils are on high flood plains. Included areas make up about 15 percent of the total acreage.

The Laugenour soil is very deep and is artificially drained. It formed in poorly drained alluvium derived from mixed rock sources. Typically, the surface layer is light brownish gray and grayish brown, mottled loam about 16 inches thick. The upper part of the underlying material is pale brown, mottled sandy loam about 23 inches thick. The lower part to a depth of 60 inches is stratified, pale brown sandy loam and loam. In some areas the surface layer is sandy loam. In other areas the upper layers do not have mottles.

Permeability is moderate in the Laugenour soil. Available water capacity is high. The effective rooting depth is limited by a seasonal high water table in winter and early spring. The water table is high because of seepage and generally is maintained below a depth of 36 inches by pumping. It can be at a depth of 20 to 36 inches for short periods. Runoff is slow. The hazard of water erosion is slight. The soil is not susceptible to soil blowing. It is subject to rare flooding.

Urban land consists of areas covered by impervious surfaces or structures, such as roads, driveways, sidewalks, buildings, and parking lots. The soil material under these impervious surfaces is similar to that of the Laugenour soil, although it may have been truncated or otherwise altered.

This unit is used for urban development. The main limitations affecting urban uses are the depth to a seasonal high water table and the flooding. Shallow excavations, such as trenches and holes, are limited by the seasonal high water table. Septic tank absorption fields do not function properly because of the seasonal high water table.

An adequate drainage system is needed in areas where deep-rooted trees and shrubs are planted. During summer irrigation is needed in areas used for lawns, shrubs, vines, or shade and ornamental trees.

No land capability classification is assigned. The MLRA is 17.

171—Lithic Xerorthents, 2 to 8 percent slopes. These very shallow, excessively drained soils are on hills. They formed in alluvium derived from mixed rock sources and underlain by unrelated andesitic tuffaceous breccia. Slopes are complex. The native vegetation is mainly annual grasses and forbs. Elevation is 100 to 240 feet. The average annual precipitation is 18 to 20 inches.

The texture and color of the layers of these soils vary from one area to another. In a reference pedon, the surface layer is brown loam about 4 inches thick. It is underlain by unrelated, light gray tuffaceous breccia (fig. 7).

Included in this unit are small areas of Pardee, Pentz, Ranchoseco, and Redding soils. Redding soils are on high terraces. Also included are areas that have slopes of 8 to 15 percent and small areas of exposed bedrock. Included areas make up about 20 percent of the total acreage.

Permeability is moderate in the Lithic Xerorthents. Available water capacity is very low. The effective rooting depth and the depth to bedrock are 1 to 4 inches. Runoff is medium. The hazard of water erosion is moderate.

This unit is used as rangeland. The production of vegetation suitable for livestock grazing is limited by the very shallow depth to bedrock and the very low available water capacity. The Lithic Xerorthents support only sparse stands of plants that are suitable for grazing, mainly soft chess, toad rush, and hairgrass. Measures that control erosion are needed.

This unit is in capability subclass VIIs, nonirrigated. The MLRA is 17.

172—Liveoak sandy clay loam, 0 to 2 percent slopes, occasionally flooded. This very deep, well drained soil is on narrow, high flood plains. It formed in alluvium derived from granitic rocks. Slopes are plane. The vegetation in uncultivated areas is mainly annual grasses, forbs, and scattered oaks. Elevation is 25 to 110 feet. The average annual precipitation is 17 to 20 inches.

Figure 7.—Fractures in tuffaceous breccia indicated by lines of tall grass in an area of Lithic Xerorthents, 2 to 8 percent slopes.

Typically, the surface layer is dark grayish brown and brown sandy clay loam about 18 inches thick. The subsoil is about 30 inches of brown sandy clay loam and yellowish brown sandy loam. The substratum to a depth of 60 inches is light yellowish brown and yellowish brown sandy loam. In some areas the surface layer is loam or sandy loam.

Included in this unit are small areas of Columbia and Sailboat soils on low flood plains near drainageways. Also included are soils that have a subsoil of clay loam or clay and soils that are frequently flooded. Included areas make up about 15 percent of the total acreage.

Permeability is moderate in the Liveoak soil. Available water capacity is high. The effective rooting depth is 60 inches or more. Runoff is slow. The hazard of water erosion is slight. The soil is occasionally flooded for very brief or brief periods during prolonged, high-intensity storms. Channeling and deposition are common along streambanks.

This unit is used for irrigated hay and pasture, irrigated crops, or dryland crops. The commonly grown crops include irrigated wheat, alfalfa, and corn. Dryland wheat also is grown. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is suited to irrigated hay and pasture. It is limited mainly by the hazard of flooding during winter and early spring. Irrigation water can be applied by border and sprinkler methods. To avoid overirrigating and the leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity and water intake rate of the soil and to the needs of the crop. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and a lower water intake rate. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition.

This unit is suited to irrigated crops. It is limited mainly by the hazard of flooding during winter and early spring. A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling breaks up the tillage pan. Returning all crop residue to the soil and including grasses, legumes, or a grass-legume mixture in the cropping sequence help to maintain fertility and tilth.

Furrow, border, and sprinkler irrigation systems are suitable. Pipe, ditch lining, or drop structures in irrigation ditches facilitate irrigation and reduce the hazard of ditch erosion.

This unit is suited to dryland crops. The main management concern is the hazard of flooding. Leaving crop residue on or near the surface helps to conserve moisture and maintain tilth.

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

173—Liveoak-Urban land complex, 0 to 2 percent slopes. This unit is on narrow, high flood plains. Channeling and the construction of diversions have reduced the hazard of flooding. Slopes have been shaped for urban uses. The vegetation is mainly ornamentals or annual grasses, forbs, and oaks. Elevation is 70 to 100 feet. The average annual precipitation is 20 to 22 inches. The unit is about 55 percent Liveoak soil and 30 percent Urban land.

Included in this unit are small areas of Columbia soils and Xerarents. Columbia soils are on low flood plains. Xerarents are in filled areas. Also included are soils that have a subsoil of clay loam or clay and soils that are frequently flooded. Included areas make up about 15 percent of the total acreage.

The Liveoak soil is very deep and well drained. It formed in alluvium derived from granitic rocks. Typically, the surface layer is dark grayish brown and brown sandy clay loam about 18 inches thick. The subsoil is about 30 inches of brown sandy clay loam and yellowish brown sandy loam. The substratum to a depth of 60 inches is yellowish brown sandy loam. In some areas the surface layer is loam or sandy loam.

Permeability is moderate in the Liveoak soil. Available water capacity is high. The effective rooting depth is 60 inches or more. Runoff is slow. The hazard of water erosion is slight. The soil is subject to rare flooding.

Urban land consists of areas covered by impervious surfaces or structures, such as roads, driveways, sidewalks, buildings, and parking lots. The soil material under the impervious surfaces is similar to that of the Liveoak soil, although it may have been truncated or otherwise altered.

This unit is used for urban development. It is limited mainly by the hazards of sloughing and flooding. Cutbanks are not stable and are subject to sloughing. Dikes and channels that have outlets for floodwater can protect buildings from flooding. Revegetating disturbed areas around construction sites helps to control erosion. During summer irrigation is needed in areas used for lawns, shrubs, vines, or shade and ornamental plants.

No land capability classification is assigned. The MLRA is 17.

174—Madera loam, 0 to 2 percent slopes. This moderately deep, moderately well drained soil is in low areas on low terraces commonly adjacent to flood plains. It formed in alluvium derived from granitic rocks. Slopes are convex. The native vegetation is mainly annual grasses and forbs and a few scattered oaks. Elevation is 10 to 160 feet. The average annual precipitation is 15 to 18 inches.

Typically, the surface layer is light brownish gray and brown loam about 15 inches thick. The subsoil is a claypan of brown clay about 14 inches thick. A light yellowish brown, indurated, silica-cemented hardpan is at a depth of about 29 inches. In some areas the surface layer is silt loam.

Included in this unit are small areas of Clear Lake, Galt, and Kimball soils. Clear Lake soils are along drainageways. Galt soils are in basins. Also included are small areas of soils that are subject to rare flooding. Included areas make up about 15 percent of the total acreage.

Permeability is very slow in the Madera soil. Water is perched above the claypan for short periods after heavy rainfall in winter and early spring and when the soil is overirrigated. Available water capacity is low. The effective rooting depth is 20 to 40 inches, but roots are restricted to the cracks and faces of peds in the claypan. The depth to a hardpan is 20 to 40 inches. The shrink-swell potential is high. Runoff is slow. The hazard of water erosion is slight.

This unit is used mainly as rangeland. Some areas are used for irrigated crops or for irrigated hay and pasture. The commonly grown crops include corn and wheat. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

Where this unit is used as rangeland, the production of vegetation suitable for livestock grazing is limited by the low available water capacity. The characteristic plant community is mainly soft chess, filaree, foxtail fescue, and annual ryegrass. Proper grazing management helps to maintain the organic matter content, increases the rate of water infiltration, and improves plant growth early in the season.

This unit is suited to irrigated crops. If the unit is used for crops other than rice, the main limitations are the depth to a claypan, the depth to a hardpan, the very slow permeability, and the low available water capacity. A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling breaks up the tillage pan. It also improves the downward movement of water and the penetration of roots in the very slowly permeable claypan. Returning all crop residue, except for rice straw, to the soil and including grasses, legumes, or a grass-legume mixture in the cropping sequence help to maintain fertility and tilth.

Furrow, border, and sprinkler irrigation systems are suitable where crops other than rice are grown. Leveling helps to ensure a uniform distribution of irrigation water. An efficient water application system is needed to prevent the development of a perched water table. Because of the low available water capacity, applications of water should be light and frequent.

This unit is suited to rice crops. It has few limitations. Level basin irrigation is suitable where rice is grown.

This unit is suited to irrigated hay and pasture. It is limited mainly by the depth to a claypan, the depth to a hardpan, and the low available water capacity. Irrigation water can be applied by sprinkler or border methods. The grasses and legumes selected for planting should be those that are suited to a shallow root zone. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and a lower water intake rate. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition.

This unit is in capability unit IVs-3, irrigated and nonirrigated. The MLRA is 17.

175—Madera loam, 2 to 8 percent slopes. This moderately deep, moderately well drained soil is on the side slopes of low terraces commonly adjacent to flood plains. It formed in alluvium derived from granitic rocks. Slopes are complex. The native vegetation is mainly annual grasses and forbs. Elevation is 10 to 140 feet. The average annual precipitation is 16 to 18 inches.

Typically, the surface layer is light brownish gray and brown loam about 15 inches thick. The subsoil is a claypan of brown clay about 14 inches thick. A light yellowish brown, indurated, silica-cemented hardpan is at a depth of about 29 inches. In some areas the surface layer is silt loam.

Included in this unit are areas of Clear Lake clay, hardpan substratum, and areas of Kimball soils. Also included are soils that have slopes of 8 to 15 percent and soils that are subject to rare flooding. Included areas make up about 15 percent of the total acreage.

Permeability is very slow in the Madera soil. Water is perched above the claypan for short periods after heavy rainfall in winter and early spring and when the soil is overirrigated. Available water capacity is low. The effective rooting depth is 20 to 40 inches, but roots are restricted to the cracks and faces of peds in the claypan. The depth to a hardpan is 20 to 40 inches. The shrink-swell potential is high. Runoff is medium. The hazard of water erosion is moderate.

This unit is used mainly as rangeland. Some areas are used for irrigated hay and pasture. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

Where this unit is used as rangeland, the production of vegetation suitable for livestock grazing is limited by the low available water capacity. The characteristic plant community is mainly soft chess, filaree, foxtail fescue, and annual ryegrass. Proper grazing management helps to maintain the organic matter content, increases the rate of water infiltration, and improves plant growth early in the season.

This unit is suited to irrigated hay and pasture. The main limitations are the depth to a claypan, the depth to a hardpan, the very slow permeability, the low available water capacity, the slope, and the hazard of water erosion. Subsoiling improves the downward movement of water and the penetration of roots in the very slowly permeable claypan. Seedbeds should be prepared on the contour or across the slope where practical.

Because of the slope, the depth to a claypan, and the very slow permeability, sprinkler irrigation is the best method of applying water. Graded border irrigation can be used in areas that have slopes of less than 5 percent. Because of the low available water capacity, applications of water should be light and frequent.

The grasses and legumes selected for planting should be those that are suited to a shallow root zone. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and control erosion.

This unit is in capability unit IVe-3, irrigated and nonirrigated. The MLRA is 17.

176—Madera-Galt complex, 0 to 2 percent slopes. This map unit is in low areas on low terraces. The native vegetation is mainly annual grasses and forbs. Elevation is 15 to 135 feet. The average annual precipitation is 16 to 18 inches.

This unit is about 50 percent Madera soil and 35 percent Galt soil. The Madera soil is in high areas where slopes are convex. The Galt soil is in small local basins. Slopes in areas of this soil are concave. Some areas of the unit are plane because of land leveling.

Included in this unit are small areas of Clear Lake clay, hardpan substratum, and small areas of soils in basins. Also included are soils along drainageways that have slopes of 2 to 9 percent and soils that are subject to rare flooding. Included areas make up about 15 percent of the total acreage.

The Madera soil is moderately deep and moderately well drained. It formed in alluvium derived from granitic rocks. Typically, the surface layer is light brownish gray and brown loam about 15 inches thick. The subsoil is a claypan of brown clay about 14 inches thick. A light yellowish brown, indurated, silica-cemented hardpan is at a depth of about 29 inches. In some areas the surface layer is silt loam.

Permeability is very slow in the Madera soil. Water is perched above the claypan for short periods after heavy rainfall in winter and early spring. Available water capacity is low. The effective rooting depth is 20 to 40 inches, but roots are restricted to the cracks and faces of peds in the claypan. The depth to a hardpan is 20 to 40 inches. The shrink-swell potential is high. Runoff is slow. The hazard of water erosion is slight.

The Galt soil is moderately deep and moderately well drained. It formed in fine textured alluvium derived dominantly from granitic rocks. Typically, the surface layer is grayish brown clay about 13 inches thick. Below this is mixed grayish brown and brown clay about 19 inches thick. A variegated yellowish red, light yellowish brown, and white, calcareous hardpan that is weakly cemented with silica is at a depth of about 32 inches. In some areas the surface layer is silty clay loam, clay loam, or silty clay.

Permeability is slow in the Galt soil. Available water capacity is low. The effective rooting depth and the depth to a hardpan are 20 to 40 inches. The shrink-swell potential is high. Runoff is ponded. As much as 12 inches of standing water is on the surface in winter and spring. The soil is not susceptible to water erosion.

This unit is used mainly as rangeland. Some areas are used for dryland crops, such as wheat. The unit can be used for irrigated hay and pasture or for irrigated crops if it is leveled. It may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

Where this unit is used as rangeland, the production of vegetation on the Madera soil, which is in higher, convex areas, is limited by the low available water capacity. The Galt soil, which is in the depressional areas, is limited by the fine texture of the surface layer, the high shrink-swell potential, and the ponding. The characteristic plant community is mainly soft chess, filaree, foxtail fescue, and annual ryegrass on the Madera soil and annual ryegrass, soft chess, foxtail fescue, and toad rush on the Galt soil. Early in the green feed period, livestock grazing is concentrated in the higher, convex areas because water accumulates in the depressional areas. Late in the green feed period, grazing is concentrated in the depressional areas. If the unit is grazed by livestock when the soil in the depressional areas is too moist, trampling of the surface causes compaction and the uprooting of plants. Proper grazing management helps to maintain the organic matter content, increases the rate of water infiltration, and increases plant growth early in the season. Fencing is difficult. Excessive shrinking and swelling of these soils forces fenceposts out of the ground.

This unit is poorly suited to dryland crops. The Madera soil is limited by the low available water capacity and the shallow depth to a claypan. The Galt soil is limited by the fine texture of the surface layer and the ponding. A surface drainage system and leveling are needed to remove excess water and prevent ponding in concave areas.

The soils should be cultivated only within a narrow range in moisture content. The Galt soil is too sticky for cultivation when wet and is too hard when dry. A tillage pan forms easily if the Madera soil is tilled when wet. Chiseling or subsoiling can break up the tillage pan. Tilth and fertility can be improved by returning crop residue to the soil.

This unit is in capability unit IVs-5, nonirrigated. The MLRA is 17.

177—Medisaprists, 0 to 2 percent slopes, frequently flooded. These very deep, very poorly drained soils are in tidal marshes. They formed in hydrophytic plant remains stratified with alluvium derived from mixed rock sources. Slopes are plane or concave. The native vegetation is mainly hydrophytic plants, including cattails and tules. Elevation is 2 feet below to 2 feet above sea level. The average annual precipitation is about 13 inches.

The texture, color, and thickness of the layers of these soils vary from one area to another. In a reference pedon, the surface layer is about 8 inches of light brownish gray mucky clay and gray mucky clay loam. The next 20 inches is gray mucky peat. The upper part of the underlying material is light brownish gray and light olive gray sandy loam about 22 inches thick. The lower part to a depth of 60 inches is very dark gray and dark gray muck.

Included in this unit are small areas of Fluvaquents and Xeropsamments. Fluvaquents are in the higher areas. Xeropsamments are in areas of dredge piles derived from nearby channels. Included areas make up about 10 percent of the total acreage.

Permeability is rapid to moderately slow in the Medisaprists. The effective rooting depth is 60 inches or more for water-tolerant plants. At high tide these soils are regularly inundated by tidal water as much as 24 inches deep. A seasonal high water table is within a depth of 12 inches throughout the year. The soils are subject to saltwater intrusion into the water table from the adjacent river channels in years of low riverflow. Runoff is ponded or very slow. The soils are subject to frequent freshwater flooding for variable periods during winter and spring. They are not susceptible to water erosion.

This unit is used for wildlife habitat. The most common wildlife are waterfowl, shore birds, marsh wrens, beavers, and muskrats. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is suited to wetland wildlife habitat. It has few limitations. Because of tidal inundation, the dominant vegetation consists of plants that can tolerate continual wetness. Management for wildlife consists mainly of measures that maintain the existing habitat.

This unit is in capability subclass VIIw, nonirrigated. The MLRA is 16.

178—Mokelumne gravelly loam, 2 to 15 percent slopes. This moderately deep, well drained soil is on hills. It formed in alluvium underlain by material derived from weakly consolidated, clayey or sandy marine sediments. Slopes are dominantly convex but are concave in a few areas. Some areas have been disturbed by placer gold mining, most of which was done with picks and shovels in an earlier period. Shallow excavations were made, and the soil material was left in irregular mounds. The native vegetation is mainly sparse to dense stands of oaks, digger pine, shrubs, annual grasses, and forbs (fig. 8). Various amounts of oaks, pine, and shrubs have been cleared in many areas. Elevation is 160 to 300 feet. The average annual precipitation is 19 to 22 inches.

Typically, the surface layer is pinkish gray and light brown gravelly loam about 10 inches thick. The subsoil is a claypan of variegated light reddish brown, red, pink, reddish yellow, and white clay about 29 inches thick. White, weakly consolidated, clayey sediments are at a depth of about 39 inches. In some areas the surface layer is gravelly sandy loam, sandy clay loam, or loam. In other areas the subsoil is gravelly.

Included in this unit are small areas of Auburn and Mokelumne Variant soils and soils that have a surface layer of grayish brown sandy loam and are underlain by red, hard sandstone at a depth of 7 to 15 inches. Auburn soils are on foothills. Mokelumne Variant soils are on terrace remnants. Also included are areas of truncated Mokelumne soils from which 30 to 60 percent of the surface layer has been removed by placer mining and then deposited in mounds. Also included are areas that have slopes of 15 to 30 percent. Included areas make up about 15 percent of the total acreage.

Permeability is very slow in the Mokelumne soil. Available water capacity is low. The effective rooting depth is 20 to 40 inches, but roots are restricted to the cracks and faces of peds in the claypan. Runoff is medium. The hazard of water erosion is moderate.

This unit is used mainly as rangeland. It can be used for firewood production. Clay is mined in some areas.

Where this unit is used as rangeland, the general management concerns include a limited supply of soil moisture, the hazard of erosion, and in many areas a moderate or dense canopy of trees or brush. The characteristic plant community is mainly ripgut brome and wild oats and an overstory of interior live oak. It also includes blue oak, digger pine, and manzanita. In areas where the oaks and brush have been thinned or cleared, the vegetation is mainly soft chess, clover, wild oats, and filaree. The production potential in such areas is 3,500, 2,600, and 1,000 pounds per acre, respectively, in favorable, normal, and unfavorable years. If trees and shrubs are managed so that open areas are established, this unit can produce a good stand of forage plants. Some trees, however, should be maintained to control erosion and preserve the wildlife habitat and esthetic value. Proper grazing management helps to maintain the organic matter content, increases the rate of water infiltration, and improves plant growth early in the season.

Where firewood is harvested on this unit, the main management concern is the hazard of erosion. The proper design, location, and maintenance of access roads help to control erosion. Vehicular traffic can damage the soil during wet periods. The formation of ruts created by wheeled equipment can cause severe gullying. Interior live oak is the major tree species on this unit. There are lesser amounts of blue oak and digger pine. Digger pine is subject to windthrow during periods when winds are strong and the soil is wet. Some stump sprouting of the blue oak can occur. Volumes of 116 cords per acre have been measured on this soil.

This unit is in capability unit IVe-3, nonirrigated. The MLRA is 18.

179—Mokelumne-Pits, mine complex, 15 to 50 percent slopes. This map unit is on the side slopes of intermingled terrace remnants and hills. Slopes are complex. The vegetation is mainly annual grasses, forbs, and scattered oaks. Dense stands of oaks, digger pine, and shrubs are in a few areas. Elevation is 220 to 350 feet. The average annual precipitation is 20 to 22 inches.

This unit is about 75 percent Mokelumne soil and 15 percent Pits, mine. The Mokelumne soil is on the side slopes of terrace remnants and on hills. Slopes in areas of this soil are 15 to 30 percent. They are complex. The Pits are in areas on the side slopes of terrace remnants where slopes are 15 to 50 percent and are concave. The Pits do not occur in some areas.

Figure 8.—Typical vegetation in an area of Mokelumne gravelly loam, 2 to 15 percent slopes.

Included in this unit are Corning, Mokelumne Variant, and Redding soils on terrace remnants that have slopes of 0 to 5 percent and Xerorthents in areas of mine tailings at the base of the slopes or on mounds on the side slopes of hills. Also included are soils that are underlain by iron-cemented sediments. Included areas make up about 10 percent of the total acreage.

The Mokelumne soil is moderately deep and well drained. It formed in alluvium underlain by material weathered from weakly consolidated, clayey or sandy marine sediments. The surface layer is pinkish gray and light brown gravelly loam about 10 inches thick. The subsoil is a claypan of variegated light reddish brown, red, pink, reddish yellow, and white clay about 29 inches thick. White, weakly consolidated, clayey sediments are at a depth of about 39 inches. In some areas the surface layer is coarse sandy loam or gravelly sandy loam.

Permeability is very slow in the Mokelumne soil. Available water capacity is low. The effective rooting depth is 20 to 40 inches, but roots are restricted to the cracks and faces of peds in the claypan. The depth to consolidated sediments is 20 to 40 inches. Runoff is rapid. The hazard of water erosion is severe.

The Pits consist of areas that have been placer mined for gold and scraped areas where clayey sediments or sandstone is exposed. The placer mining excavations are shallow and were made during early mining activities in areas where water carried by ditches was used to wash gravelly soil material downslope. The vegetation is very sparse in these areas.

Areas of the Pits are highly disturbed and vary in natural drainage, permeability, and available water capacity. Runoff is very rapid. The hazard of water erosion is severe. Fertility is extremely low.

This unit is used mainly as rangeland. Clay is mined in some areas.

Where this unit is used as rangeland, the primary management concern is the hazard of erosion. Also, the Mokelumne soil is limited by the low available water capacity, and the Pits are limited by low fertility. The characteristic plant community is mainly soft chess, clover, wild oats, and filaree on the Mokelumne soil. The vegetation on the Pits is very sparse. Measures that control erosion are needed. Proper grazing management helps to maintain the organic matter content, increases the rate of water infiltration, and improves plant growth early in the season.

This unit is in capability subclass VIIe, nonirrigated. The MLRA is 18.

180—Mokelumne Variant sandy clay loam, 2 to 8 percent slopes. This deep, well drained soil is on high terrace remnants. It formed in alluvium derived from mixed rock sources and underlain by sandy or clayey marine sediments. Slopes are convex. Some areas have been disturbed by placer gold mining, most of which was done with picks and shovels in an earlier period. The native vegetation is mainly oaks, annual grasses, and forbs. Some areas have been cleared of oaks. Elevation is 160 to 300 feet. The average annual precipitation is 19 to 22 inches.

Typically, the surface layer is brown, reddish brown, and yellowish red sandy clay loam about 15 inches thick. The upper 13 inches of the subsoil is yellowish red and reddish brown sandy clay loam and gravelly sandy clay loam. The next 7 inches is red gravelly clay. The lower 14 inches is a claypan of variegated red, reddish yellow, and very pale brown clay. The underlying material is reddish yellow and white sandy clay loam about 8 inches thick. Pink, weakly consolidated sandstone is at a depth of about 57 inches. In some areas the surface layer is loam, gravelly sandy loam, or gravelly sandy clay loam. In other areas the subsoil is very gravelly sandy clay loam.

Included in this unit are Mokelumne soils on foot slopes below the Mokelumne Variant soil. Also included are soils that are more than 60 inches or 30 to 40 inches deep over bedrock, soils that do not have a very slowly permeable claypan, and soils that have slopes of 8 to 15 percent. Included areas make up about 25 percent of the total acreage.

Permeability is very slow in the Mokelumne Variant soil. Water is perched above the claypan for short periods after heavy rainfall in winter and early spring. Available water capacity is moderate. The effective rooting depth is 40 to 60 inches, but roots are restricted to the cracks and faces of peds in the claypan, which is at a depth of 30 to 50 inches. The depth to consolidated sediments ranges from 40 to 60 inches. Runoff is slow or medium. The hazard of water erosion is slight or moderate.

This unit is used mainly as rangeland. It can be used for firewood production. Clay is mined in some areas.

Where this unit is used as rangeland, the production of vegetation suitable for livestock grazing is limited by the moderate or dense canopy of oaks. The characteristic understory plant community is mainly soft chess, ripgut brome, clover, and filaree. The overstory vegetation consists of blue oak and interior live oak. In areas that have been cleared of blue oak, the amount of ripgut brome has been decreased. If trees are managed so that open areas are established, this unit can produce a good stand of forage plants. Some trees, however, should be maintained to preserve the wildlife habitat and esthetic value. Proper grazing management helps to maintain the organic matter content, increases the rate of water infiltration, and improves plant growth early in the season.

Where firewood is harvested on this unit, the main management concern is the moderate hazard of erosion. The proper design, location, and maintenance of access roads help to control erosion. Vehicular traffic can damage the soil during wet periods. Blue oak is the major tree species on this unit. There are lesser amounts of interior live oak. Some stump sprouting of the blue oak can occur. Volumes of 53 cords per acre have been measured on this soil.

This unit is in capability unit IIIe-3, nonirrigated. The MLRA is 17.

181—Natomas loam, 0 to 2 percent slopes. This very deep, well drained soil is in high areas on low terraces. It formed in alluvium derived from mixed rock sources. Slopes are convex. The native vegetation is mainly annual grasses, forbs, and scattered oaks. Elevation is 45 to 180 feet. The average annual precipitation is 17 to 23 inches.

Typically, the surface layer is brown loam about 17 inches thick. The upper part of the subsoil is yellowish red and reddish brown loam about 16 inches thick. The lower part is red clay loam about 45 inches thick. The substratum to a depth of 84 inches is yellowish red and strong brown sandy loam. In some areas the surface layer is sandy loam.

Included in this unit are small areas of Americanos, Kimball, and San Joaquin soils. Americanos soils are on low stream terraces. Also included are soils that have a brown subsoil in which the base saturation is more than 75 percent. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the Natomas soil. Available water capacity is very high. The effective rooting depth is 60 inches or more. Runoff is slow. The hazard of water erosion is slight.

This unit is used for urban or recreational development. The main limitation affecting urban uses is low strength. Properly designed roads and streets help to compensate for this limitation. Revegetating disturbed areas around construction sites helps to control erosion. During summer irrigation is needed in areas used for lawns, shrubs, vines, or shade and ornamental trees.

This unit is suited to recreational development. It has few limitations. Erosion and sedimentation can be controlled and the esthetic value enhanced by maintaining an adequate plant cover.

This unit is in capability class I, irrigated, and in capability unit IIIc-1, nonirrigated. The MLRA is 17.

182—Natomas-Xerorthents, dredge tailings complex, 0 to 50 percent slopes. This map unit is in high areas on low terraces that have been disturbed during mining activities. Slopes are complex. The vegetation is mainly annual grasses, forbs, and scattered oaks. The vegetation on the Xerorthents also includes other hardwoods. Elevation is 120 to 150 feet. The average annual precipitation is 20 to 23 inches.

This unit is about 45 percent Natomas soil and 40 percent Xerorthents. The Natomas soil is in undisturbed areas on low terraces where slopes are convex and are 0 to 2 percent. The Xerorthents are in areas of dredge tailings where slopes are short, complex, and disturbed and are 2 to 50 percent.

Included in this unit are Slickens in low areas at the base of the steeper slopes. Included areas make up about 15 percent of the total acreage.

The Natomas soil is very deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is brown loam about 17 inches thick. The upper part of the subsoil is yellowish red and reddish brown loam about 16 inches thick. The lower part is red clay loam about 45 inches thick. The substratum to a depth of 84 inches is yellowish red sandy loam. In places the surface layer is sandy loam.

Permeability is moderately slow in the Natomas soil. Available water capacity is very high. The effective rooting depth is 60 inches or more. Runoff is slow. The hazard of water erosion is slight.

The Xerorthents are very deep and are somewhat excessively drained and excessively drained. They formed in material that has a high content of gravel and cobbles derived from mixed rock sources. The material was deposited as tailings after most of the fine-earth material was washed from it and removed during gold dredging activities. The texture, color, and thickness of the layers of these soils vary from one area to another. In a reference pedon, the surface layer is light yellowish brown extremely cobbly fine sandy loam about 12 inches thick. The next 9 inches is a poorly sorted zone of well rounded stones, cobbles, and pebbles. The underlying material to a depth of 63 inches is pale brown extremely cobbly and very cobbly fine sandy loam.

Permeability is rapid or very rapid in the Xerorthents. Available water capacity is very low or low. The effective rooting depth is 60 inches or more. Runoff is slow or very slow. Water erosion is a slight hazard or is not a hazard at all.

This unit is used for urban development. It may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

The main limitation affecting urban uses is low strength in the Natomas soil. The Xerorthents are limited by the very low or low available water capacity, the rapid or very rapid permeability, the large amount of gravel and cobbles on the surface and in the substratum, and the slope. Properly designed roads and streets help to compensate for low strength in the Natomas soil. Extensive grading is needed to prepare and smooth the Xerorthents for development. Additions of loamy material that has no coarse fragments may be required to establish lawns, shrubs, and trees. Drought-tolerant species should be selected for planting. During summer irrigation is needed in areas used for lawns, shrubs, vines, or shade and ornamental trees.

This unit is in capability subclass VIIs, nonirrigated. The MLRA is 17.

183—Orangevale coarse sandy loam, 2 to 5 percent slopes. This very deep, well drained soil is on high terrace remnants. It formed in coarse textured alluvium derived from granitic rocks. Slopes are complex. The vegetation in uncultivated areas is mainly oaks, annual grasses, and forbs. Elevation is 200 to

275 feet. The average annual precipitation is 21 to 24 inches.

Typically, the surface layer is yellowish brown coarse sandy loam about 15 inches thick. The next 5 inches is mixed yellowish brown coarse sandy loam and strong brown sandy clay loam. The upper part of the subsoil is strong brown, yellowish red, and dark yellowish brown sandy clay loam about 52 inches thick. The lower part to a depth of 80 inches is yellowish red coarse sandy loam. In some areas the surface layer is loamy coarse sand.

Included in this unit are small areas of Fiddyment soils, Xerarents, and Urban land. Fiddyment soils are on hills. Xerarents are in filled areas. Also included are soils that are moderately slowly permeable and soils that have slopes of 5 to 8 percent. Included areas make up about 15 percent of the total acreage.

Permeability is moderate in the Orangevale soil. Available water capacity also is moderate. The effective rooting depth is 60 inches or more. Runoff is slow. The hazard of water erosion is moderate.

This unit is used mainly for urban development or for irrigated crops. The commonly grown crops include peaches, apples, and cherries. A few areas are used for irrigated pasture.

Where this soil is used for urban development, the main management concern is the hazard of water erosion. Revegetating disturbed areas around construction sites helps to control erosion. During summer irrigation is needed in areas used for lawns, shrubs, vines, or shade and ornamental trees.

This soil is suited to irrigated crops. It is limited mainly by the slope, the moderate available water capacity, and the hazard of water erosion. Growing cover crops in winter helps to maintain tilth and fertility and control erosion in orchards and vineyards. The soil should be tilled on the contour or across the slope.

Sprinkler and drip irrigation systems are suitable because of the slope and the hazard of erosion. Irrigation water should be applied at a rate that ensures optimum production without increasing the hazard of deep percolation, the runoff rate, or the hazard of erosion.

This unit is in capability units IIe-1, irrigated, and IIIe-1, nonirrigated. The MLRA is 17.

184—Orangevale-Kaseberg-Urban land complex, 2 to 8 percent slopes. This map unit is on intermingled dissected high terraces and hills. Slopes are complex and have been shaped for urban uses. Intermittent shallow drainageways are at the base of the slopes. The vegetation is mainly ornamental plants or annual grasses, forbs, and oaks. Elevation is 120 to 260 feet. The average annual precipitation is 19 to 24 inches.

This unit is about 40 percent Orangevale soil, 25 percent Kaseberg soil, and 20 percent Urban land. The Orangevale soil is dominantly on the summits of dissected terraces but also is on side slopes and along drainageways. The Kaseberg soil is on hills. The Urban land is throughout the unit.

Included in this unit are small areas of Fiddyment soils and Xerarents. Fiddyment soils are on hills. Xerarents are in filled areas. Also included are areas that have slopes of 8 to 15 percent. Included areas make up about 15 percent of the total acreage.

The Orangevale soil is very deep and well drained. It formed in coarse textured alluvium derived from granitic rocks. Typically, the surface layer is yellowish brown coarse sandy loam about 15 inches thick. The next 5 inches is mixed yellowish brown coarse sandy loam and strong brown sandy clay loam. The upper part of the subsoil is strong brown, yellowish red, and dark yellowish brown sandy clay loam about 52 inches thick. The lower part to a depth of 80 inches is yellowish red coarse sandy loam. In some areas the surface layer is loamy coarse sand.

Permeability is moderate in the Orangevale soil. Available water capacity also is moderate. The effective rooting depth is 60 inches or more. Runoff is slow. The hazard of water erosion is moderate.

The Kaseberg soil is shallow and well drained. It formed in material weathered from consolidated sediments derived from mixed rock sources. Typically, the surface layer and subsoil are brown and yellowish brown loam, which extends to a depth of about 18 inches. The next 1 inch is a hardpan that is strongly cemented with silica. Siltstone is at a depth of about 19 inches. In some areas the surface layer is fine sandy loam. In other areas the subsoil directly overlies the bedrock.

Permeability is moderate in the Kaseberg soil. Available water capacity is low. The effective rooting depth and the depth to a hardpan are 14 to 20 inches. The depth to consolidated sediments is 15 to 21 inches. Runoff is slow or medium. The hazard of water erosion is slight or moderate.

Urban land consists of areas covered by impervious surfaces or structures, such as roads, driveways, sidewalks, buildings, and parking lots. The soil material under the impervious surfaces is similar to that of the Orangevale and Kaseberg soils, although it may have been truncated or otherwise altered.

This unit is used mainly for urban development. A few areas smaller than 10 acres are used for irrigated pasture.

Where this unit is used for urban development, the main management concern is the hazard of water erosion. Also, the depth to a hardpan and the depth to consolidated sediments are limitations in areas of the Kaseberg soil. They limit shallow excavations, such as trenches and holes. Excavating for roads and buildings increases the hazard of erosion. Preserving the existing plant cover and revegetating disturbed areas around construction sites help to control erosion. Steep slopes that have been cut and filled are susceptible to erosion and should be permanently protected. Some protective measures that can be used alone or in combination are a cover of turf, ground cover plants, jute netting, soil stabilizer substances, and retaining walls. Septic tank absorption fields do not function properly on the Kaseberg soil because of the shallowness to a hardpan and consolidated sediments.

During summer irrigation is needed in areas used for lawns, shrubs, vines, or shade and ornamental trees. The soil depth varies. Plant selection, the amount of irrigation water to be applied, and the frequency of irrigation are determined by the depth of the soil. Establishing plants is difficult in areas where the subsoil or consolidated sediments have been exposed. Mulching and applying fertilizer in cut areas help to establish the plants.

The Orangevale and Kaseberg soils are suited to irrigated pasture. The pastured areas in the unit consist of both soils or only one of the two soils. The main management concerns are the limited available water capacity, the slope, and the hazard of water erosion. Also, the Kaseberg soil is limited by the shallowness to a hardpan. Seedbeds should be prepared on the contour or across the slope where practical.

Because of the limited available water capacity and the slope, sprinkler irrigation is the best method of applying water. Graded border irrigation can be used in areas that have slopes of less than 5 percent. Because the Kaseberg soil is droughty, applications of irrigation water should be light and frequent. Careful applications are needed to prevent the development of a perched water table.

The Orangevale soil has no depth limitations, but the grasses and legumes selected for planting on the Kaseberg soil should be those that are suited to a shallow root zone. Grazing when the soils are wet results in compaction of the surface layer, poor tilth, and excessive runoff. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and control erosion.

No land capability classification is assigned. The MLRA is 17.

185—Orangevale-Kaseberg-Urban land complex, 8 to 25 percent slopes. This map unit is on hills. Slopes are complex and have been shaped for urban uses. Intermittent shallow drainageways are at the base of the slopes. The vegetation is mainly ornamental plants or annual grasses, forbs, and oaks. Elevation is 120 to 260 feet. The average annual precipitation is 19 to 24 inches.

This unit is about 45 percent Orangevale soil, 25 percent Kaseberg soil, and 15 percent Urban land. The Orangevale soil is dominantly in areas on the side slopes of hills where slopes are 8 to 25 percent. The Kaseberg soil is in areas on hills where slopes are 8 to 20 percent. The Urban land is throughout the unit.

Included in this unit are small areas of Fiddyment soils and Xerarents. Xerarents are in filled areas. Also included are areas that have slopes of less than 8 percent or 25 to 70 percent. Included areas make up about 15 percent of the total acreage.

The Orangevale soil is very deep and well drained. It formed in coarse textured alluvium derived from granitic rocks. Typically, the surface layer is yellowish brown coarse sandy loam about 15 inches thick. The next 5 inches is mixed yellowish brown coarse sandy loam and strong brown sandy clay loam. The upper part of the subsoil is strong brown, yellowish red, and dark yellowish brown sandy clay loam about 52 inches thick. The lower part to a depth of 80 inches is yellowish red coarse sandy loam. In some areas the surface layer is loamy coarse sand.

Permeability is moderate in the Orangevale soil. Available water capacity also is moderate. The effective rooting depth is 60 inches or more. Runoff is medium or rapid. The hazard of water erosion is moderate or severe.

The Kaseberg soil is shallow and well drained. It formed in material weathered from consolidated sediments derived from mixed rock sources. Typically, the surface layer and subsoil are brown and yellowish brown loam, which extends to a depth of about 18 inches. The next 1 inch is a hardpan that is strongly cemented with silica. Siltstone is at a depth of about 19 inches. In some areas the surface layer is fine sandy loam.

Permeability is moderate in the Kaseberg soil. Available water capacity is low. The effective rooting depth and the depth to a hardpan are 14 to 20 inches. The depth to consolidated sediments is 15 to 21 inches. Runoff is medium or rapid. The hazard of water erosion is moderate or severe.

Urban land consists of areas covered by impervious surfaces or structures, such as roads, driveways, sidewalks, buildings, and parking lots. The soil material under the impervious surfaces is similar to that of the Orangevale and Kaseberg soils, although it may have been truncated or otherwise altered.

This unit is used mainly for urban development. A few areas smaller than 10 acres are used for irrigated pasture.

Where this unit is used for urban development, the main management concerns are the hazard of water erosion and the slope. Also, the depth to a hardpan and the depth to consolidated sediments are limitations in areas of the Kaseberg soil. They limit shallow excavations, such as trenches and holes. Properly designing roads helps to control surface runoff and stabilize cut slopes. Excess runoff can be removed by a system of suitably designed drainage ditches or drainage pipe. Excavating for roads and buildings increases the hazard of erosion. Preserving the existing plant cover and revegetating disturbed areas around construction sites help to control erosion. Steep slopes that have been cut and filled are susceptible to erosion and should be permanently protected. Some protective measures that can be used alone or in combination are a cover of turf, ground cover plants, jute netting, soil stabilizer substances, and retaining walls. Because of the depth to a hardpan and the slope, the Kaseberg soil is not suited to septic tank absorption fields. Because of the slope, the effluent in the absorption fields can surface in downslope areas.

During summer irrigation is needed in areas used for lawns, shrubs, vines, or shade and ornamental trees. The depth to a hardpan varies. Plant selection, the amount of irrigation water to be applied, and the frequency of irrigation are determined by the depth of the soil. Establishing plants is difficult in areas where the subsoil or consolidated sediments have been exposed. Mulching and applying fertilizer in cut areas help to establish the plants.

The Orangevale and Kaseberg soils are poorly suited to irrigated pasture. The pastured areas in the unit consist of both soils or only one of the two soils. The main management concerns are the limited available water capacity, the slope, and the hazard of water erosion. Also, the Kaseberg soil is limited by the shallowness to a hardpan. Seedbeds should be prepared on the contour or across the slope where practical. Because of the low available water capacity in the Kaseberg soil and the slope and the hazard of erosion in areas of both soils, sprinkler irrigation is the best method of applying water. Because the Kaseberg soil is droughty, applications of irrigation water should be light and frequent. Heavier applications can be made on the Orangevale soil.

The Orangevale soil has no depth limitations, but the grasses and legumes selected for planting on the Kaseberg soil should be those that are suited to a shallow root zone. Grazing when the soils are wet results in compaction of the surface layer, poor tilth, and excessive runoff. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and control erosion.

No land capability classification is assigned. The MLRA is 17.

186—Orthents-Urban land complex, 0 to 2 percent slopes. This map unit is in filled areas on low flood plains. Filling has elevated the land surface and reduced the hazard of flooding. A system of levees and large upstream dams has also reduced the hazard of flooding. Slopes have been shaped for urban uses. The vegetation is mainly ornamental plants or annual grasses and forbs. Elevation is 20 to 25 feet. The average annual precipitation is about 18 inches. The unit is about 50 percent Orthents and 35 percent Urban land.

Included in this unit are small areas of Columbia, Laugenour, and Sailboat soils. These soils are in areas that have not been filled. They make up about 15 percent of the total acreage.

The Orthents are very deep, somewhat poorly drained to well drained, and altered. They formed in fill material derived from nearby soils and sediments of mixed origin. The texture, color, and thickness of the layers of fill in these soils vary from one area to another. In a reference pedon, the surface layer is light yellowish brown loam about 9 inches thick. The underlying material to a depth of 62 inches is stratified light yellowish brown, pale brown, brown, and yellowish brown silt loam, loam, loamy sand, and sandy loam.

Permeability is moderately slow to moderately rapid in the Orthents. Available water capacity is low to high. Runoff is slow. The hazard of water erosion is slight. The effective rooting depth is limited by a seasonal high water table in winter and early spring. The water table is high because of seepage and is maintained below a depth of 36 inches. The soils are subject to rare flooding.

Urban land consists of areas covered by impervious surfaces or structures, such as roads, driveways, sidewalks, buildings, and parking lots. The soil material under the impervious surfaces is similar to that of the Orthents.

This unit is used for urban development. The main limitations affecting urban uses are the depth to a seasonal high water table and the flooding. Shallow excavations, such as trenches and holes, are limited by the depth to a seasonal high water table in some areas.

An adequate drainage system is needed in areas where deep-rooted trees and shrubs are planted. During summer irrigation is needed in areas used for lawns, shrubs, vines, or shade and ornamental trees.

No land capability classification is assigned. The MLRA is 17.

187—Pardee-Ranchoseco complex, 3 to 15 percent slopes. This map unit is on hills characterized by mound-intermound microrelief. Slopes are complex. The native vegetation is mainly annual grasses and forbs and a few scattered oaks. Elevation is 140 to 510 feet. The average annual precipitation is 17 to 20 inches.

This unit is about 45 percent Pardee soil and 40 percent Ranchoseco soil. The Pardee soil is on the mounds. The Ranchoseco soil is in the concave areas between the mounds.

Included in this unit are small areas of Amador, Gillender, Hadselville, and Pentz soils and Lithic Xerorthents. Also included are soils that are 20 to 30 inches deep over bedrock and have a very slowly permeable claypan. 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 rock sources and underlain by basic andesitic tuffaceous conglomerate. Typically, the surface layer is brown gravelly loam about 11 inches thick. The subsoil is about 5 inches of reddish brown very gravelly loam and yellowish red very gravelly clay loam. Andesitic conglomerate is at a depth of about 16 inches. In some areas the surface layer is cobbly loam.

Permeability is moderately slow in the Pardee soil. Available water capacity is very low. The effective rooting depth and the depth to bedrock are 10 to 20 inches. Runoff is medium. The hazard of water erosion is slight or moderate.

The Ranchoseco soil is very shallow and moderately well drained. It formed in gravelly and cobbly alluvium derived from mixed rock sources and underlain by basic andesitic tuffaceous conglomerate. Typically, the surface layer is brown gravelly loam about 3 inches thick. The subsoil is light brown very gravelly loam about 4 inches thick. The surface layer and subsoil have strong brown root stains. Andesitic conglomerate is at a depth of about 7 inches. In some areas the surface layer is cobbly loam.

Permeability is moderate in the Ranchoseco soil. Available water capacity is very low. The effective rooting depth and the depth to bedrock are 4 to 10 inches. Runoff is very slow or slow. The hazard of water erosion is slight or moderate.

This unit is used as rangeland. It may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

The production of vegetation suitable for livestock grazing is limited by the very low available water capacity and a moderate level of fertility. The Ranchoseco soil, which is in the intermound areas, also is limited by ponding and by the very shallow depth to bedrock. The characteristic plant community is mainly soft chess, wild oats, and filaree on the Pardee soil and soft chess, mouse barley, and clover on the Ranchoseco soil. Early in the green feed period, grazing is concentrated on the mounds because water accumulates in the intermound areas. Late in the green feed period, grazing is concentrated in the intermound areas. Grazing can continue on the mounds for 2 to 3 weeks after the vegetation in the intermound areas is dry or has been removed, but it should be discontinued when the vegetation on the mounds has a patchy appearance. Proper grazing management helps to maintain fertility and the organic matter content, increases the rate of water infiltration, and improves plant growth early in the season.

This unit is in capability subclass VIs, nonirrigated. The MLRA is 17.

188—Pentz-Lithic Xerorthents complex, 30 to 50 percent slopes. This map unit is on the side slopes of hills. Slopes are convex or plane. The native vegetation is mainly annual grasses and forbs. Elevation is 125 to 400 feet. The average annual precipitation is 16 to 22 inches.

This unit is about 80 percent Pentz soil and 15 percent Lithic Xerorthents. Lithic Xerorthents are in scattered areas where the underlying sediments are strongly consolidated and hard.

Included in this unit are small areas of Keyes and Redding soils and Rock outcrop. Keyes soils are in concave areas at the base of the slopes. Redding soils are on high terrace remnants. The Rock outcrop occurs as horizontal bands and ledges. Also included are soils that have slopes of less than 30 percent or more than 50 percent and soils that have a subsoil of sandy clay loam and are underlain by consolidated sediments at a depth of 20 to 30 inches. Included areas make up about 5 percent of the total acreage.

The Pentz soil is shallow and well drained. It formed in material weathered from weakly consolidated basic andesitic tuffaceous sediments. Typically, the surface layer is brown fine sandy loam about 9 inches thick. The subsoil also is brown fine sandy loam. It is about 7 inches thick. Weakly consolidated tuffaceous sandstone is at a depth of about 16 inches. In some areas the surface layer is gravelly sandy loam, sandy loam, or loam.

Permeability is moderately rapid in the Pentz soil. Available water capacity is very low or low. The effective rooting depth and the depth to weakly consolidated bedrock are 10 to 20 inches. Runoff is rapid. The hazard of water erosion is severe.

The Lithic Xerorthents are very shallow and somewhat excessively drained. They formed in material weathered from hard andesitic sediments, conglomerate, or tuff-breccia. The texture and color of the layers of these soils vary from one area to another. In a reference pedon, the surface layer is pale brown sandy loam about 8 inches thick. It is underlain by light gray, strongly consolidated andesitic tuffaceous sediments.

Permeability is moderately rapid or moderate in the Lithic Xerorthents. Available water capacity is very low. The effective rooting depth and the depth to hard bedrock are 1 to 10 inches. Runoff is rapid. The hazard of water erosion is severe.

This unit is used as rangeland. The main management concerns are the limited available water capacity, the hazard of erosion, and the shallow rooting depth. The characteristic plant community is soft chess, ripgut brome, and filaree on the Pentz soil. The vegetation on the Lithic Xerorthents is similar to that on the Pentz soil but is more sparse. Measures that control erosion are needed. The slope limits access by livestock and results in overgrazing of the less sloping areas. Proper grazing management helps to maintain the organic matter content, increases the rate of water infiltration, and improves plant growth early in the season. Springs and seeps are common in areas of this unit. They can be developed as watering facilities for wildlife and as a way to better distribute livestock.

This unit is in capability subclass VIIe, nonirrigated. The MLRA is 18.

189—Peters clay, 1 to 8 percent slopes. This shallow, well drained soil is in slight depressions and swales on the side slopes of hills. It formed in material weathered from weakly consolidated basic andesitic tuffaceous sediments. Slopes are concave. The native vegetation is mainly annual grasses and forbs. Elevation is 120 to 180 feet. The average annual precipitation is 19 to 22 inches.

Typically, the upper 18 inches is grayish brown clay. It is underlain by light gray, consolidated andesitic tuffaceous sediments.

Included in this unit are small areas of Amador, Pentz, and Vleck soils. Amador and Pentz soils are on hills. Also included are soils that have a surface layer that is lighter colored than that of the Peters soil and are underlain by rhyolitic tuffaceous sediments at a depth of 20 to 35 inches. Included areas make up about 15 percent of the total acreage.

Permeability is slow in the Peters soil. Available water capacity is low. The effective rooting depth and the depth to soft bedrock are 10 to 20 inches. The shrink-swell potential is high. Runoff is very slow or medium. Water is ponded in low areas for brief periods after high-intensity winter storms. The hazard of water erosion is slight.

This unit is used as rangeland. The production of vegetation and livestock grazing are limited by the low available water capacity, the fine texture of the surface layer, the high shrink-swell potential, and the accumulation of water in low areas. The characteristic plant community is mainly soft chess, annual ryegrass, wild oats, and filaree. If the soil is grazed when it is too moist, trampling of the surface causes compaction and the uprooting of plants. Proper grazing management helps to maintain the organic matter content, increases the rate of water infiltration, and improves plant growth early in the season. Fencing is difficult. Excessive shrinking and swelling of the soil forces fenceposts out of the ground.

This unit is in capability unit IVe-5, nonirrigated. The MLRA is 18.

190—Pits. This map unit consists of sand, gravel, and clay pits and rock quarries. Some areas are shallow pits on ridgetops. The shallow pits were exposed during early placer mining operations in which water carried by ditches was used to wash gravelly soil material downslope. Most areas of this unit have been extensively excavated. Slopes are complex. Areas are highly disturbed and vary in natural drainage, permeability, erosion hazard, runoff, and available water capacity. Elevation is 10 to 330 feet. The average annual precipitation is 16 to 21 inches.

No land capability classification is assigned. The MLRA is 17 or 18.

191—Red Bluff loam, 0 to 2 percent slopes. This very deep, well drained soil is on intermediate terraces. It formed in alluvium derived from mixed rock sources. Slopes are convex. The native vegetation is mainly annual grasses and forbs. Elevation is 60 to 160 feet. The average annual precipitation is 17 to 22 inches.

Typically, the surface layer is brown loam about 8 inches thick. The upper part of the subsoil is reddish brown and yellowish red clay loam about 17 inches thick. The lower part to a depth of 68 inches is yellowish red and red clay and clay loam. In some areas the surface layer is sandy loam. In other areas the soil is gravelly throughout.

Included in this unit are Redding soils in concave areas; Xerorthents in areas of mine tailings; and, on the side slopes of terraces, areas that have slopes of 5 to 15 percent. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the Red Bluff soil. Available water capacity is high. The effective rooting depth is 60 inches or more. Runoff is slow. The hazard of water erosion is slight.

This unit is used mainly as rangeland. Some areas are used for dryland crops, such as wheat, for irrigated pasture, and for urban development. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

Where this unit is used as rangeland, the production of vegetation suitable for livestock grazing is limited by a moderate level of fertility. The characteristic plant community is mainly soft chess, wild oats, foxtail fescue, and filaree. In areas where grazing is limited, ripgut brome is dominant. Proper grazing management helps to maintain fertility and the organic matter content, increases the rate of water infiltration, and improves plant growth early in the season. The unit responds well to range improvement practices, such as range seeding and applications of fertilizer. The plants selected for seeding should be those that meet the seasonal requirements of livestock or wildlife, or both. After the seeds are planted, grazing should be deferred until the plants have set seed.

This unit is suited to dryland crops. It is limited by the moderate level of fertility. A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling breaks up the tillage pan. Leaving crop residue on or near the surface helps to conserve moisture and maintain tilth and fertility.

This unit is in capability units IIs-9, irrigated, and IIIs-9, nonirrigated. The MLRA is 17.

192—Red Bluff loam, 2 to 5 percent slopes. This very deep, well drained soil is on high terraces. It formed in alluvium derived from mixed rock sources. Slopes are convex. The native vegetation is mainly annual grasses and forbs. Elevation is 75 to 310 feet. The average annual precipitation is 17 to 24 inches.

Typically, the surface layer is brown loam about 8 inches thick. The upper part of the subsoil is reddish brown and yellowish red clay loam about 17 inches thick. The next part is yellowish red and red gravelly clay about 18 inches thick. The lower part to a depth of 68 inches is yellowish red, red, and light brown very gravelly clay loam. In some areas the surface layer is sandy loam. In other areas the soil is gravelly throughout.

Included in this unit are Redding soils in the lower areas that are incised by many shallow drainageways and Xerorthents in areas of dredge tailings. Also included are areas along the side slopes of terraces or drainageways that have slopes of 5 to 15 percent and soils that have a hardpan at a depth of 40 to 60 inches. Included areas make up about 20 percent of the total acreage.

Permeability is moderately slow in the Red Bluff soil. Available water capacity is high. The effective rooting depth is 60 inches or more. Runoff is slow or medium. The hazard of water erosion is slight or moderate.

This unit is used mainly as rangeland. Some areas are used for dryland crops, such as wheat. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

Where this unit is used as rangeland, the production of vegetation suitable for livestock grazing is limited by a moderate level of fertility. The characteristic plant community is mainly soft chess, wild oat, foxtail fescue, and filaree. In areas where grazing is limited, ripgut brome is dominant. Proper grazing management helps to maintain fertility and the organic matter content, increases the rate of water infiltration, and improves plant growth early in the season. The unit responds well to range improvement practices, such as range seeding and applications of fertilizer. The plants selected for seeding should be those that meet the seasonal requirements of livestock or wildlife, or both. After the seeds are planted, grazing should be deferred until the plants have set seed.

This unit is suited to dryland crops. It is limited mainly by the hazard of erosion and the moderate level of fertility. A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling can break up the tillage pan. Leaving crop residue on or near the surface helps to conserve moisture, maintain tilth and fertility, and control erosion. The soil should be tilled on the contour or across the slope.

This unit is in capability unit IIIe-9, nonirrigated. The MLRA is 17.

193—Red Bluff-Redding complex, 0 to 5 percent slopes. This map unit is on high terraces. Slopes are complex. The native vegetation is mainly annual grasses and forbs. Elevation is 90 to 310 feet. The average annual precipitation is 18 to 24 inches.

This unit is about 45 percent Red Bluff soil and 40 percent Redding soil. Slopes in areas of the Red Bluff soil are convex and are 2 to 5 percent. Those in areas of the Redding soil are convex or complex; are incised by many shallow, intermittent drainageways and depressions; and are 0 to 3 percent. The Redding soil is commonly a few feet lower in elevation than the Red Bluff soil.

Included in this unit are small areas of Corning and Hicksville soils and Xerorthents. Hicksville soils are on low stream terraces. Xerorthents are in areas of mine tailings. Also included are soils that have a hardpan at a depth of 40 to 60 inches, ponded areas in convoluted drainageways and depressions, and soils on the side slopes of terraces that have slopes of 5 to 20 percent. Included areas make up about 20 percent of the total acreage.

The Red Bluff soil is very deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is brown loam about 8 inches thick. The upper part of the subsoil is reddish brown and yellowish red clay loam about 17 inches thick. The next part is yellowish red and red gravelly clay about 18 inches thick. The lower part to a depth of 68 inches is yellowish red, red, and light brown very gravelly clay loam. In some areas the surface layer is sandy loam.

Permeability is moderately slow in the Red Bluff soil. Available water capacity is high. The effective rooting depth is 60 inches or more. Runoff is slow or medium. The hazard of water erosion is slight or moderate.

The Redding soil is moderately deep and moderately well drained. It formed in gravelly and cobbly alluvium derived from mixed rock sources. Typically, the surface layer is strong brown gravelly loam about 7 inches thick. The upper part of the subsoil is yellowish red loam and gravelly loam. The lower part is a claypan of reddish brown and yellowish red gravelly clay about 8 inches thick. Below this to a depth of 66 inches is a very gravelly hardpan that is strongly cemented with silica. In some areas the surface layer is gravelly sandy loam, loam, or sandy loam.

Permeability is very slow in the Redding soil. Water is perched above the claypan for short periods after heavy rainfall in winter and early spring. Available water capacity is low. The effective rooting depth is 20 to 40 inches, but roots are restricted to the cracks and faces of peds in the claypan, which is at a depth of 17 to 30 inches. The depth to a hardpan is 20 to 40 inches. The shrink-swell potential is high. Runoff is very slow or slow. The hazard of water erosion is slight.

This unit is used as rangeland or for dryland crops, such as wheat. It may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

Where this unit is used as rangeland, the production of vegetation suitable for livestock grazing is limited by a moderate level of fertility. The Redding soil also is limited by the low available water capacity. The characteristic plant community is mainly soft chess, wild oat, foxtail fescue, and filaree on the Red Bluff soil and soft chess, foxtail fescue, and filaree on the Redding soil. In areas where grazing is limited, ripgut brome is dominant on the Red Bluff soil. Proper grazing management helps to maintain fertility and the organic matter content, increases the rate of water infiltration, and improves plant growth early in the season.

This unit is poorly suited to dryland crops. The Red Bluff soil is limited mainly by the hazard of erosion and the moderate level of fertility. The Redding soil is limited by the low available water capacity, the moderate level of fertility, the content of coarse fragments in the surface layer, and many incised drainageways. Because of the runoff that accumulates along drainageways during winter and early spring, yields of the crops grown during this period can be reduced. Land smoothing is needed to minimize the accumulation of runoff in concave areas.

A tillage pan forms easily if this unit is tilled when wet. Chiseling or subsoiling can break up the tillage pan. Coarse fragments in the surface layer cause rapid wear of tillage equipment. Leaving crop residue on or near the surface helps to conserve moisture, maintain tilth and fertility, and control erosion. The soils should be tilled on the contour or across the slope.

This unit is in capability unit IVe-3, nonirrigated. The MLRA is 17.

194—Red Bluff-Urban land complex, 0 to 5 percent slopes. This map unit is on high terraces. Slopes have been shaped for urban uses. The vegetation is mainly ornamental plants of annual grasses and forbs. Elevation is 100 to 290 feet. The average annual precipitation is 18 to 24 inches. The unit is about 50 percent Red Bluff soil and 35 percent Urban land.

Included in this unit are small areas of Hicksville and Redding soils and Xerorthents. Hicksville soils are on low stream terraces. Xerorthents are in areas of mine tailings. Also included are soils that have a hardpan at a depth of 40 to 60 inches and areas on the side slopes of terraces that have slopes of 5 to 12 percent. Included areas make up about 15 percent of the total acreage.

The Red Bluff soil is very deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is brown loam about 8 inches thick. The upper part of the subsoil is reddish brown and yellowish red clay loam about 17 inches thick. The next part is yellowish red and red gravelly clay about 18 inches thick. The lower part to a depth of 68 inches is yellowish red, red, and light brown very gravelly clay loam. In some areas the surface layer is sandy loam.

Permeability is moderately slow in the Red Bluff soil. Available water capacity is moderate or high. The effective rooting depth is 60 inches or more. Runoff is slow or medium. The hazard of water erosion is slight or moderate.

Urban land consists of areas covered by impervious surfaces or structures, such as roads, driveways, sidewalks, buildings, and parking lots. The soil material under these impervious surfaces is similar to that of the Red Bluff soil, although it may have been truncated or otherwise altered.

This unit is used for urban development. The main limitations affecting urban uses are the hazard of erosion and low strength. Properly designed roads and streets help to compensate for the instability of the subsoil. Revegetating disturbed areas around construction sites helps to control erosion. Removal of pebbles and cobbles in disturbed areas is needed for the best results when the site is landscaped, particularly in areas used for lawns. Establishing plants is difficult in areas where the subsoil has been exposed. Mulching and applying fertilizer in cut areas help to establish the plants. During summer irrigation is needed in areas used for lawns, shrubs, vines, or shade and ornamental trees.

No land capability classification is assigned. The MLRA is 17.

195—Red Bluff-Xerarents complex, 0 to 2 percent slopes. This map unit is on high terraces. Slopes are plane because of land shaping or leveling. The vegetation in uncultivated areas is mainly annual grasses and forbs. Elevation is 120 to 320 feet. The average annual precipitation is 18 to 24 inches.

This unit is about 50 percent Red Bluff soil and 35 percent Xerarents. The Red Bluff soil is in the relatively undisturbed areas, and the Xerarents are in filled areas that have 20 or more inches of overburden.

Included in this unit are small areas of Redding soils and Xerorthents. Xerorthents are in areas of mine tailings. Also included are soils in deeply cut areas that are gravelly or very gravelly clay at the surface and areas that have slopes of 2 to 15 percent. Included areas make up about 15 percent of the total acreage.

The Red Bluff soil is very deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is brown loam about 8 inches thick. The upper part of the subsoil is reddish brown and yellowish red clay loam about 17 inches thick. The next part is yellowish red and red gravelly clay about 8 inches thick. The lower part to a depth of 68 inches is yellowish red, red, and light brown very gravelly clay loam. In some areas the surface layer is sandy loam.

Permeability is moderately slow in the Red Bluff soil. Available water capacity is high. The effective rooting depth is 60 inches or more. Runoff is slow. The hazard of water erosion is slight.

The Xerarents are very deep, well drained, and altered. They formed in fill material mixed by leveling activities. The fill material is derived from nearby soils of mixed origin. The texture, color, and thickness of the layers of these soils vary from one area to another. In a reference pedon, the surface layer is fill about 30 inches thick. It is brown loam mixed with fragments of reddish brown, yellowish red, and red clay loam, gravelly clay, and very gravelly clay. The next 8 inches is a buried surface layer of brown loam. The upper part of the buried subsoil is reddish brown and yellowish red clay loam about 17 inches thick. The lower part to a depth of 60 inches or more is yellowish red and red gravelly clay and very gravelly clay.

Permeability is moderate to slow in the Xerarents. Available water capacity is moderate or high. The effective rooting depth is 60 inches or more. Runoff is slow. The hazard of water erosion is slight.

Most areas of this unit are used for irrigated pasture and hay. A few areas are used for irrigated crops, such as corn and wheat. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is suited to irrigated hay and pasture. It is limited mainly by the restricted permeability and the fertility of the Xerarents. Subsoiling improves the downward movement of water and the penetration of roots in the compacted layers of fill material. Pasture plants respond well to nitrogen and phosphorus fertilizer. Sprinkler and graded border irrigation systems are suitable. Applications of irrigation water should be adjusted to the available water capacity and water intake rate of the soils and to the needs of the crop.

Grazing when the soils are wet results in compaction of the surface layer, poor tilth, and a lower water intake rate. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition.

This unit is in capability units IIs-9, irrigated, and IIIs-9, nonirrigated. The MLRA is 17.

196—Red Bluff-Xerorthents, dredge tailings complex, 2 to 50 percent slopes. This map unit is on high terraces that have been disturbed during mining activities. Slopes are complex. The vegetation is mainly annual grasses and forbs and scattered blue oaks. Some hardwoods are on the Xerorthents. Elevation is 110 to 310 feet. The average annual precipitation is 20 to 24 inches.

This unit is about 45 percent Red Bluff soil and 40 percent Xerorthents. The Red Bluff soil is in the relatively undisturbed areas on terraces where slopes are 2 to 5 percent and are convex. The Xerorthents are in areas of dredge tailings where slopes are 2 to 50 percent and are short, complex, and disturbed.

Included in this unit are small areas of Corning, Hicksville, and Redding soils and Slickens. Hicksville soils are on low stream terraces. Slickens are at the base of the slopes in the areas of tailings. Also included are soils that have a hardpan at a depth of 40 to 60 inches and soils that have slopes of 5 to 30 percent. Included areas make up about 15 percent of the total acreage.

The Red Bluff soil is very deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is brown loam about 8 inches thick. The upper part of the subsoil is reddish brown and yellowish red clay loam about 17 inches thick. The next part is yellowish red and red gravelly clay about 18 inches thick. The lower part to a depth of 68 inches is yellowish red, red, and light brown very gravelly clay loam. In some areas the surface layer is sandy loam.

Permeability is moderately slow in the Red Bluff soil. Available water capacity is high. The effective rooting depth is 60 inches or more. Runoff is slow or medium. The hazard of water erosion is slight or moderate.

The Xerorthents are very deep and are somewhat excessively drained and excessively drained. They formed in material that has a high content of gravel and cobbles derived from mixed rock sources. The material was deposited as tailings after most of the fine-earth material was washed from it and removed during gold dredging activities. The texture, color, and thickness of the layers of these soils vary from one area to another. In a reference pedon, the surface layer is light yellowish brown extremely cobbly fine sandy loam about 12 inches thick. The next 9 inches is a poorly sorted zone of well rounded stones, cobbles, and pebbles. The underlying material to a depth of 63 inches is pale brown extremely cobbly and very cobbly fine sandy loam.

Permeability is moderately rapid or very rapid in the Xerorthents. Available water capacity is very low or low. The effective rooting depth is 60 inches or more. Runoff is very slow or slow. Water erosion is a slight hazard or is not a hazard at all.

This unit is used as rangeland. It may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

The production of vegetation and livestock grazing on the Xerorthents are limited by the very low or low available water capacity and the high amount of gravel and cobbles on the surface. The Red Bluff soil is limited by a moderate level of fertility. The vegetation on the Xerorthents is mainly a sparse cover of annual grasses and clovers. The characteristic plant community on the Red Bluff soil is mainly soft chess, wild oats, foxtail fescue, and filaree. In areas where grazing is limited, ripgut brome is dominant on the Red Bluff soil. The use of the Xerorthents by livestock is minimal. Proper grazing management helps to maintain fertility and the organic matter content, increases the rate of water infiltration, and improves plant growth early in the season.

This unit is in capability subclass VIIs, nonirrigated. The MLRA is 17.

197—Redding loam, 2 to 8 percent slopes. This moderately deep, moderately well drained soil is on high terraces and terrace remnants. It formed in gravelly and cobbly alluvium derived from mixed rock sources. Slopes are dominantly convex but are incised by many shallow, intermittent drainageways and depressions. The native vegetation is mainly annual grasses and forbs. Elevation is 40 to 170 feet. The average annual precipitation is 16 to 19 inches.

Typically, the surface layer is strong brown loam about 7 inches thick. The upper 13 inches of the subsoil is yellowish red loam and clay loam. The lower 8 inches is a claypan of reddish brown and yellowish red clay. A hardpan is at a depth of about 28 inches. It is strongly cemented with silica in the upper part and weakly cemented in the lower part. In some areas the surface layer is sandy loam or gravelly loam.

Included in this unit are small areas of Corning, Hicksville, and San Joaquin soils. Hicksville soils are on low stream terraces. San Joaquin soils are on low terraces. Also included are areas that have slopes of 0 to 2 percent or 8 to 15 percent and soils that have a hardpan at a depth of 40 to 60 inches. Included areas make up about 20 percent of the total acreage.

Permeability is very slow in the Redding soil. Water is perched above the claypan for short periods after heavy rainfall in winter and early spring. Available water capacity is low. The effective rooting depth is 23 to 40 inches, but roots are restricted to the cracks and faces of peds in the claypan, which is at a depth of 20 to 35 inches. The depth to a hardpan is 23 to 40 inches. The shrink-swell potential is high in the subsoil. Runoff is slow or medium. The hazard of water erosion is slight or moderate.

This unit is used mainly as rangeland. Some areas are used for dryland crops, such as wheat. A few areas are used for irrigated hay and pasture. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

Where this unit is used as rangeland, the production of vegetation suitable for livestock grazing is limited by the low available water capacity and a moderate level of fertility. The characteristic plant community is mainly soft chess, foxtail fescue, and filaree. Proper grazing management helps to maintain fertility and the organic matter content, increases the rate of water infiltration, and improves plant growth early in the season.

This unit is suited to dryland crops. It is limited mainly by the hazard of erosion, the low available water capacity, the moderate level of fertility, and the many incised drainageways. Because of the runoff that accumulates along drainageways during winter and early spring, yields of the crops grown during this period can be reduced. Land smoothing is needed to minimize the accumulation of runoff in concave areas. A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling breaks up the tillage pan. Leaving crop residue on or near the surface helps to conserve moisture, maintain tilth and fertility, and control erosion. The soil should be tilled on the contour or across the slope.

This unit is in capability unit IIIe-3, irrigated and nonirrigated. The MLRA is 17.

198—Redding gravelly loam, 0 to 8 percent slopes. This moderately deep, moderately well drained soil is on high terraces and terrace remnants. It formed in gravelly and cobbly alluvium derived from mixed rock sources. Slopes are dominantly convex but are incised by many shallow, intermittent drainageways and depressions. The native vegetation is mainly annual grasses and forbs. Elevation is 40 to 390 feet. The average annual precipitation is 16 to 24 inches.

Typically, the surface layer is strong brown gravelly loam about 7 inches thick. The upper 13 inches of the subsoil is yellowish red loam and gravelly loam. The lower 8 inches is a claypan of reddish brown and yellowish red gravelly clay. A very gravelly hardpan that is strongly cemented with silica is at a depth of about 28 inches. In some areas the surface layer is gravelly sandy loam. In other areas the subsoil has very gravelly strata.

Included in this unit are small areas of Corning, Hicksville, Keyes, and Pardee soils and Xerorthents. Hicksville soils are on low stream terraces. Keyes and Pardee soils are on hills. Red Bluff soils are on the slightly higher, convex slopes north of the Cosumnes River. Also included are Durixeralfs and Xerarents in areas that have been cut and filled during land leveling or grading activities, soils that have a hardpan at a depth of 40 to 60 inches, and soils on the side slopes of terraces that have slopes of 8 to 15 percent. Included areas make up about 25 percent of the total acreage.

Permeability is very slow in the Redding soil. Water is perched above the claypan for short periods after heavy rainfall in winter and early spring and when the soil is overirrigated. Available water capacity is low. The effective rooting depth is 20 to 40 inches, but roots are restricted to the cracks and faces of peds in the claypan, which is at a depth of 17 to 30 inches. The depth to a hardpan is 20 to 40 inches. The shrink-swell potential is high. Runoff is very slow or medium. The hazard of water erosion is slight or moderate.

This unit is used mainly as rangeland. Some areas are used for irrigated hay and pasture or for dryland crops, such as wheat. A few areas are used for urban development. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

Where this unit is used as rangeland, the production of vegetation suitable for livestock grazing is limited by the low available water capacity and a moderate level of fertility. The characteristic plant community is mainly soft chess, foxtail fescue, and filaree. Proper grazing management helps to maintain fertility and the organic matter content, increases the rate of water infiltration, and improves plant growth early in the season.

This unit is suited to irrigated hay and pasture. The main management concerns are the hazard of water erosion, the depth to a claypan, the depth to a hardpan, the very slow permeability, the low available water capacity, the moderate level of fertility, and the slope. Seedbeds should be prepared on the contour or across the slope where practical. Subsoiling improves the downward movement of water and the penetration of roots in the very slowly permeable claypan. Pasture plants respond well to nitrogen and phosphorus fertilizer.

Because of the slope, the depth to a hardpan, and the very slow permeability, sprinkler irrigation is the best method of applying water. Because of the low available water capacity, applications of water should be light and frequent. An efficient water application system is needed to prevent the development of a perched water table.

The grasses and legumes selected for planting should be those that are suited to a moderately deep soil. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and control erosion.

This unit is poorly suited to dryland crops. It is limited mainly by the low available water capacity, the hazard of erosion, the moderate level of fertility, the content of coarse fragments in the surface layer, and many incised drainageways. Because of the runoff that accumulates along drainageways during winter and early spring, yields of the crops grown during this period can be reduced. Also, the crops are subject to root rot. Land smoothing is needed to minimize the accumulation of runoff in concave areas. A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling breaks up the tillage pan. Coarse fragments in the surface layer cause rapid wear of tillage equipment. Leaving crop residue on or near the surface helps to conserve moisture, maintain tilth and fertility, and control erosion. The soil should be tilled on the contour or across the slope.

If this unit is used for urban development, the main limitations are the shrink-swell potential, low strength, the depth to a hardpan, the very slow permeability, and the hazard of water erosion. Shallow excavations, such as trenches and holes, are limited by the depth to a hardpan. Properly grading building sites helps to divert water away from the foundations and helps to prevent ponding in the adjacent areas. Excess runoff can be removed by a system of suitably designed drainage ditches or drainage pipe. If buildings are constructed on the claypan, properly designing foundations and footings and diverting runoff away from the buildings help to prevent the structural damage caused by shrinking and swelling. Properly designing roads and streets helps to compensate for the instability of the subsoil. Excavating for roads and buildings increases the hazard of erosion. Preserving the existing plant cover and revegetating disturbed areas around construction sites help to control erosion.

If this soil is used as a site for septic tank absorption fields, the very slow permeability and the depth to a hardpan can be overcome in some areas by increasing the size of the absorption field or by installing the absorption lines below the hardpan. After periods of heavy rainfall, the water table, which is perched above the claypan, can cause the failure of onsite sewage disposal systems.

An adequate drainage system is needed in areas where deep-rooted trees and shrubs are planted. During summer irrigation is needed in areas used for lawns, shrubs, vines, or shade and ornamental trees.

This unit is in capability unit IVe-3, irrigated and nonirrigated. The MLRA is 17.

199—Reiff fine sandy loam, 0 to 2 percent slopes, occasionally flooded. This very deep, well drained soil is on narrow, low flood plains. It formed in alluvium derived from mixed rock sources. Slopes are plane or slightly convex. The vegetation in uncultivated areas is mainly annual grasses and forbs. Scattered oaks and other hardwoods are near drainageways. Elevation is 40 to 130 feet. The average annual precipitation is 16 to 20 inches.

Typically, the surface layer is brown fine sandy loam about 7 inches thick. The underlying material is about 51 inches of stratified yellowish brown fine sandy loam, light yellowish brown very fine sandy loam and sandy loam, yellowish brown very fine sandy loam, and brown loamy sand. Below this to a depth of 64 inches is a buried surface layer of dark brown loam. In some areas the surface layer is sandy loam, very fine sandy loam, or loam.

Included in this unit are small areas of Coyotecreek, Hicksville, Sailboat, San Joaquin, and Vina soils. Coyotecreek and Vina soils are on high flood plains. Hicksville soils are on low stream terraces. Sailboat soils are on low flood plains. San Joaquin soils are on low terraces. Also included, in areas protected by levees, are soils that are subject to rare flooding. Included areas make up about 15 percent of the total acreage.

Permeability is moderate in the Reiff soil. Available water capacity is high. The effective rooting depth is 60 inches or more. Runoff is slow. The hazard of water erosion is slight. The soil is occasionally flooded for very brief or brief periods during prolonged, high-intensity storms. Channeling and deposition are common along streambanks.

Most areas of this unit are used for irrigated crops, mainly wheat, corn, tomatoes, and grapes. Other crops include hops, asparagus, and beans. A few areas are used for irrigated hay and pasture.

This unit is suited to irrigated crops. It is limited mainly by the hazard of flooding during winter and the moderate available water capacity. Crops can be damaged by floodwater. The hazard of flooding can be reduced in some areas by levees, dikes, and diversions. Returning all crop residue to the soil and including grasses, legumes, or a grass-legume mixture in the cropping sequence help to maintain fertility and tilth. Growing winter cover crops in vineyards helps to maintain tilth and fertility.

Furrow, border, and sprinkler irrigation systems are suitable. To avoid overirrigating and the leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity and water intake rate of the soil and to the needs of the crop. Pipe, ditch lining, or drop structures in irrigation ditches facilitate irrigation and reduce the hazard of ditch erosion.

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

200—Rindge muck, partially drained, 0 to 2 percent slopes. This very deep, artificially drained, organic soil is in reclaimed freshwater marshes. It is protected against flooding by a system of levees and large upstream dams. Levees, drainage ditches, and pumps have lowered the water table and altered the drainage of the soil. The soil formed in very poorly drained hydrophytic plant remains derived from reeds and tules. The vegetation in uncultivated areas is mainly hydrophytic plants, annual grasses, and forbs. Slopes are plane. Elevation is 5 to 15 feet below sea level. The average annual precipitation is 13 to 16 inches.

Typically, the surface layer is black muck about 16 inches thick. The underlying material to a depth of 60 inches is black peat. In some areas the surface layer is overwash of mucky silt loam.

Included in this unit are small areas of Gazwell and Sailboat soils. Gazwell soils are in backswamps. Sailboat soils are on natural levees. Included areas make up about 5 percent of the total acreage.

Permeability is rapid in the Rindge soil. Available water capacity is very high. The effective rooting depth is limited by a fluctuating high water table. The water table is high because of seepage and is controlled by pumping. Depth to the water table ranges from 18 to 36 inches in winter and early spring and from 36 to 60 inches during the rest of the year. The soil is subject to subsidence, peat fires, and rare flooding. When allowed to dry, it shrinks irreversibly. Runoff is very slow. Water erosion is a slight hazard or is not a hazard at all. The hazard of soil blowing is severe.

This unit is used for irrigated crops. The commonly grown crops include corn, asparagus, and wheat. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is suited to irrigated crops. It is limited mainly by the depth to a fluctuating water table, the rapid permeability, subsidence, and the hazard of soil blowing. Because this organic soil is subject to differential subsidence, planing of the fields may be necessary to improve the efficiency of irrigation. Soil blowing can be controlled by keeping the soil rough and cloddy when it is not protected by vegetation. Tillage should be kept to a minimum.

Subirrigation and sprinkler irrigation systems are suitable because of the rapid permeability. Subirrigation is more common than other irrigation systems. Large ditches that have small spud ditches between them are used to subirrigate and drain the soil. The water table is raised to a depth of 1 foot at planting time. Then, it is slowly lowered during the growing season until it is at a depth of about 5 feet at harvest time. Salts that accumulate in the upper part of the soil because of subirrigation should be leached every few years in areas where salt-sensitive crops are grown. To minimize the subsidence caused by oxidation, the water table should not be lowered below the rooting depth of the crops.

This unit is in capability unit IIIw-10, irrigated and nonirrigated. The MLRA is 16.

201—Rindge mucky silt loam, partially drained, 0 to 2 percent slopes. This very deep, artificially drained, organic soil is in reclaimed freshwater marshes. It is protected against flooding by a system of levees and large upstream dams. Levees, drainage ditches, and pumps have lowered the water table and altered the drainage of the soil. The soil formed in very poorly drained hydrophytic plant remains derived from reeds and tules. The vegetation in uncultivated areas is mainly hydrophytic plants, annual grasses, and forbs. Slopes are plane. Elevation is 5 to 20 feet below sea level. The average annual precipitation is 13 to 16 inches.

Typically, the surface layer is dark gray mucky silt loam about 13 inches thick. The underlying material to a depth of 60 inches is black peat. In some areas the surface layer is muck.

Included in this unit are small areas of Gazwell and Sailboat soils. Gazwell soils are in backswamps. Sailboat soils are on natural levees. Included areas make up about 5 percent of the total acreage.

Permeability is rapid in the Rindge soil. Available water capacity is very high. The effective rooting depth is limited by a seasonal high water table that fluctuates throughout the year. The water table is high because of seepage and is controlled by pumping. Depth to the water table ranges from 18 to 36 inches in winter and early spring and from 36 to 60 inches during the rest of the year. The soil is subject to subsidence, peat fires, and rare flooding. When allowed to dry, it shrinks irreversibly. Runoff is very slow. Water erosion is a slight hazard or is not a hazard at all. The hazard of soil blowing is moderate.

This unit is used for irrigated crops. The commonly grown crops include corn, asparagus, and wheat. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is suited to irrigated crops. It is limited mainly by the depth to a fluctuating water table, the rapid permeability, subsidence, and the hazard of soil blowing. Because this organic soil is subject to differential subsidence, planing of the fields may be necessary to improve the efficiency of irrigation. Soil blowing can be controlled by keeping the soil rough and cloddy when it is not protected by vegetation. Tillage should be kept to a minimum.

Subirrigation and sprinkler irrigation systems are suitable because of the rapid permeability. Subirrigation is more common than other irrigation systems. Large ditches that have small spud ditches between them are used to subirrigate and drain the soil. The water table is raised to a depth of 1 foot at planting time. Then, it is slowly lowered during the growing season until it is at a depth of about 5 feet at harvest time. Salts that accumulate in the upper part of the soil because of subirrigation should be leached every few years in areas where salt-sensitive crops are grown. To minimize the subsidence caused by oxidation, the water table should not be lowered below the rooting depth of the crops.

This unit is in capability unit IIIw-10, irrigated and nonirrigated. The MLRA is 16.

202—Rindge mucky clay loam, 0 to 2 percent slopes. This very deep, artificially drained, organic soil is in reclaimed freshwater marshes. It is protected against flooding by a system of levees and large upstream dams. Levees, drainage ditches, and pumps have lowered the water table and altered the drainage of the soil. The soil formed in very poorly drained hydrophytic plant remains derived from reeds and tules. Slopes are plane. Elevation is 10 to 15 feet below sea level. The average annual precipitation is about 13 inches.

Typically, the surface layer is very dark gray mucky clay loam about 15 inches thick. The underlying material to a depth of 60 inches is very dark gray peat. In some areas the surface layer is muck or mucky clay.

Included in this unit are small areas of Gazwell soils. These soils are in backswamps. They make up about 5 percent of the total acreage.

Permeability is rapid in the Rindge soil. Available water capacity is moderate. The effective rooting depth is limited by a seasonal high water table that fluctuates throughout the year. The water table is high because of seepage and is maintained between depths of 18 and 36 inches by pumping. The soil is subject to subsidence, peat fires, and rare flooding. When allowed to dry, it shrinks irreversibly. In years of low riverflow, the soil is subject to saltwater intrusion into the water table from the adjacent river channels. Runoff is very slow. The hazard of water erosion is slight. The hazard of soil blowing is moderate, but the soil usually is not dry enough for soil blowing.

This unit is used for irrigated crops. The commonly grown crops include corn, wheat, and asparagus. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is suited to irrigated crops. It is limited mainly by the depth to a fluctuating water table, the rapid permeability, subsidence, and saltwater intrusion from river channels. Because this organic soil is subject to differential subsidence, planing of the fields may be necessary to improve the efficiency of irrigation. In years when salt water intrudes into the ground water, crop yields are reduced.

Subirrigation and sprinkler irrigation systems are suitable because of the rapid permeability. Subirrigation is more common than other irrigation systems. Large ditches that have small spud ditches between them are used to subirrigate and drain the soil. The water table is raised to a depth of 1 foot at planting time. Then, it is slowly lowered during the growing season until it is at a depth of about 3 feet at harvest time. Salts that accumulate in the upper part of the soil because of subirrigation and saltwater intrusion should be leached almost yearly. To minimize the subsidence caused by oxidation, the water table should not be lowered below the rooting depth of the crops.

This unit is in capability unit IVw-10, irrigated and nonirrigated. The MLRA is 16.

203—Riverwash. This map unit is commonly along channels of the American River. In a few areas it is along the Cosumnes River. It consists of unstabilized, stratified, sandy, silty, cobbly, and gravelly sediments that are reworked by water almost every year. It supports little or no vegetation. Elevation is 15 to 130 feet. The average annual precipitation is 18 to 20 inches.

Included in this unit are small areas of Xerofluvents on unstable slopes descending from the higher flood plains. These areas make up about 15 percent of the total acreage.

This unit is excessively drained. It is frequently flooded for brief to very long periods in winter and spring.

A few areas are mined for sand and gravel. This unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is in capability subclass VIIIw, nonirrigated. The MLRA is 17.

204—Rossmoor fine sandy loam, 0 to 2 percent slopes. This very deep, well drained soil is on narrow, high flood plains. It formed in alluvium derived from mixed rock sources. The construction of large upstream dams has reduced the hazard of flooding. Slopes are smooth in most areas. They are complex, however, in areas that have broad stabilized channels. The vegetation in uncultivated areas is mainly annual grasses, forbs, and oaks. Elevation is 30 to 110 feet. The average annual precipitation is 17 to 22 inches.

Typically, the surface layer is brown fine sandy loam about 6 inches thick. The underlying material to a depth of 62 inches is yellowish brown and brown fine sandy loam. In some areas the surface layer is loamy fine sand or sandy loam.

Included in this unit are small areas of Columbia soils and Xerofluvents. Columbia soils are on low flood plains. Xerofluvents are in channeled areas and on unstable side slopes descending to the American River. Also included are soils that are loamy sand throughout and soils that have a gravelly or very gravelly substratum. Included areas make up about 15 percent of the total acreage.

Permeability is moderately rapid in the Rossmoor soil. Available water capacity is high. The effective rooting depth is 60 inches or more. Runoff is slow. The hazard of water erosion is slight. The soil is subject to rare flooding.

This unit is used for recreational development or for irrigated crops. It may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is suited to recreational development. It is limited mainly by the hazard of flooding. Recreational facilities should be designed so that they can withstand flooding. Erosion can be controlled and the esthetic value enhanced by maintaining an adequate plant cover. Areas that have been cut and filled should be seeded or mulched.

This unit is suited to irrigated crops. It has few limitations. Returning all crop residue to the soil and including grasses, legumes, or a grass-legume mixture in the cropping sequence help to maintain fertility and tilth.

Furrow, border, and sprinkler irrigation systems are suitable. To avoid overirrigating and the leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity and water intake rate of the soil and to the needs of the crop. Pipe, ditch lining, or drop structures in irrigation ditches facilitate irrigation and reduce the hazard of ditch erosion.

This unit is in capability class I, irrigated, and in capability unit IIIc-1, nonirrigated. The MLRA is 17.

205—Rossmoor-Urban land complex, 0 to 2 percent slopes. This map unit is on narrow, high flood plains. It is protected against flooding by a system of levees and large upstream dams. Slopes have been shaped for urban uses. The vegetation is mainly ornamental plants, annual grasses and forbs, and scattered oaks. Elevation is 30 to 80 feet. The average annual precipitation is 18 to 22 inches. The unit is about 55 percent Rossmoor soil and 30 percent Urban land.

Included in this unit are small areas of Americanos and Columbia soils. Americanos soils are on low stream terraces. Columbia soils are on low flood plains. Also included are soils that are loamy sand throughout and soils that have a gravelly or very gravelly substratum. Included areas make up about 15 percent of the total acreage.

The Rossmoor soil is very deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is brown fine sandy loam about 6 inches thick. The underlying material to a depth of 62 inches is yellowish brown and brown fine sandy loam. In some areas the surface layer is sandy loam or loamy fine sand. In other areas it is lighter colored.

Permeability is moderately rapid in the Rossmoor soil. Available water capacity is high. The effective rooting depth is 60 inches or more. Runoff is slow. The hazard of water erosion is slight. The soil is subject to rare flooding.

Urban land consists of areas covered by impervious surfaces or structures, such as roads, driveways, sidewalks, buildings, and parking lots. The soil material under the impervious surfaces is similar to that of the Rossmoor soil, although it may have been truncated or otherwise altered.

This unit is used for urban development. The main management concern is the hazard of flooding. Revegetating disturbed areas around construction sites helps to control erosion. During summer irrigation is needed in areas used for lawns, shrubs, vines, or shade and ornamental trees.

No land capability classification is assigned. The MLRA is 17.

206—Sailboat silt loam, partially drained, 0 to 2 percent slopes. This very deep, artificially drained soil is on natural levees on low flood plains. It is protected against flooding by a system of levees and large upstream dams. Levees, open and closed drains, and pumps have lowered the water table and altered the drainage of the soil. The soil formed in somewhat poorly drained alluvium derived from mixed rock sources. Slopes are plane and descend from the levees or channels. The vegetation in uncultivated areas is mainly annual grasses, forbs, and hydrophytic plants. Elevation is 10 feet below to 25 feet above sea level. The average annual precipitation is 14 to 18 inches.

Typically, the surface layer is light yellowish brown silt loam about 16 inches thick. The next layer is very pale brown silt loam about 12 inches thick. Below this is a buried surface layer of grayish brown clay loam about

6 inches thick. The underlying material to a depth of 62 inches is light brownish gray loam. In some areas the surface layer is sandy loam or loam. In other areas it is darker. In places the soil does not have a buried layer.

Included in this unit are small areas of Columbia, Cosumnes, Egbert, Gazwell, and Scribner soils. Egbert soils are on high flood plains. Gazwell and Scribner soils are in backswamps. Also included are small areas of soils that are silty throughout. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the Sailboat soil. Available water capacity is very high. The effective rooting depth is limited by a seasonal high water table in winter and early spring. The water table is high because of seepage and is maintained at a depth of 36 to 60 inches by pumping. It can be as high as 24 to 36 inches for short periods. Most areas of this soil south of Locke have subsided. Runoff is slow. The hazards of water erosion and soil blowing are slight. The soil is subject to rare flooding.

Most areas of this unit are used for irrigated crops. The commonly grown crops include pears, corn, wheat, sugar beets, asparagus, tomatoes, and alfalfa. Irrigated pasture and nonirrigated safflower are grown in a few areas. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is suited to irrigated crops. It is limited mainly by the depth to a seasonal high water table and by subsidence in some areas. The water table during the rainy period in winter and early spring generally limits the suitability for deep-rooted crops. Pear trees, however, can tolerate some wetness. Tile drainage can lower the water table if a suitable outlet is available. Differential subsidence of the underlying organic material in some areas causes an increase in the slope and may require modifications of irrigation and drainage systems. Returning crop residue to the soil and including grasses, legumes, or a grass-legume mixture in the cropping sequence help to maintain fertility and tilth.

Furrow, border, and sprinkler irrigation systems are suitable. Applications of irrigation water should be adjusted to the available water capacity and water intake rate of the soil and to the needs of the crop.

This unit is in capability units IIw-2, irrigated, and IIIw-2, nonirrigated. The MLRA is 16 or 17.

207—Sailboat silt loam, drained, 0 to 2 percent slopes. This very deep, artificially drained soil is on narrow, low flood plains. It is protected against flooding by levees. The levees and ground-water overdraft have altered the drainage of the soil. The soil formed in somewhat poorly drained alluvium derived from mixed rock sources. Slopes are plane. The vegetation in uncultivated areas is mainly annual grasses, forbs, and scattered oaks. Elevation is 15 to 85 feet. The average annual precipitation is 16 to 19 inches.

Typically, the surface layer is light yellowish brown silt loam about 16 inches thick. The next layer is very pale brown silt loam about 12 inches thick. Below this is a buried surface layer of grayish brown clay loam about 6 inches thick. The underlying material to a depth of 62 inches is light brownish gray loam. In some areas the surface layer is sandy loam or loam. In other areas it is darker. In places the soil does not have a buried surface layer.

Included in this unit are small areas of Columbia, Cosumnes, and Coyotecreek soils. Coyotecreek soils are on high flood plains. Also included are soils that are occasionally flooded. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the Sailboat soil. Available water capacity is very high. The effective rooting depth is 60 inches or more. Depth to the water table is more than 72 inches. Runoff is slow. The hazard of water erosion is slight. The soil is not susceptible to soil blowing. It is subject to rare flooding.

This unit is used for irrigated crops or for irrigated hay and pasture. The commonly grown crops include corn, wheat, alfalfa, tomatoes, and grapes. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is suited to irrigated crops. It has few limitations. Returning all crop residue to the soil and including grasses, legumes, or a grass-legume mixture in the cropping sequence help to maintain fertility and tilth. Growing cover crops during winter helps to maintain tilth and fertility in orchards and vineyards.

Furrow, border, sprinkler, and trickle irrigation systems are suitable. Applications of irrigation water should be adjusted to the available water capacity and water intake rate of the soil and to the needs of the crop.

This unit is suited to irrigated hay and pasture. It has few limitations. Border and sprinkler irrigation systems are suitable. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition.

This unit is in capability class I, irrigated, and in capability unit IIIc-1, nonirrigated. The MLRA is 17.

208—Sailboat silt loam, drained, 0 to 2 percent slopes, occasionally flooded. This very deep, artificially drained soil is on narrow, low flood plains. Ground-water overdraft has altered the drainage of the soil. The soil formed in somewhat poorly drained alluvium derived from mixed rock sources. Slopes are plane. The vegetation in uncultivated areas is mainly annual grasses, forbs, and scattered oaks. Elevation is 20 to 140 feet. The average annual precipitation is 15 to 20 inches.

Typically, the surface layer is light yellowish brown silt loam about 16 inches thick. The next layer is very pale brown silt loam about 12 inches thick. Below this is a buried surface layer of grayish brown clay loam about 6 inches thick. The underlying material to a depth of 62 inches is light brownish gray loam. In some areas the surface layer is sandy loam or loam. In other areas it is darker. In places the soil does not have a buried surface layer.

Included in this unit are small areas of Columbia, Coyotecreek, Reiff, and Vina soils. Coyotecreek and Vina soils are on high flood plains. Also included are soils that are silty throughout; soils that are protected by levees and are subject to rare flooding; frequently flooded soils in unprotected areas along creeks; and, near the mouth of the American River, small areas of soils that have a seasonal high water table at a depth of 36 to 72 inches and are frequently flooded. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the Sailboat soil. Available water capacity is very high. The effective rooting depth is 60 inches or more. Depth to the water table is more than 72 inches. Runoff is slow. The hazard of water erosion is slight. The soil is not susceptible to soil blowing. It is occasionally flooded for very brief or brief periods during prolonged, high-intensity storms. Channeling and deposition are common along streambanks.

This unit is used for irrigated crops or for irrigated hay and pasture. The commonly grown crops include alfalfa, corn, tomatoes, and wheat. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is suited to irrigated crops. It is limited mainly by the hazard of flooding. Crops can be damaged by floodwater during winter and early spring. The hazard of flooding can be reduced in some areas by diversions and dikes. Returning all crop residue to the soil and including grasses, legumes, or a grass-legume mixture in the cropping sequence help to maintain fertility and tilth.

Furrow, border, and sprinkler irrigation systems are suitable. The application rate should be adjusted to the available water capacity and water intake rate of the soil and to the needs of the crop.

This unit is suited to irrigated hay and pasture. It is limited mainly by the hazard of flooding. Border and sprinkler irrigation systems are suitable. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition.

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

209—Sailboat-Urban land complex, partially drained, 0 to 2 percent slopes. This map unit is on natural levees on low flood plains. It is protected against flooding by a system of levees and large upstream dams. Levees, open and closed drains, and pumps have lowered the water table and altered the drainage of the Sailboat soil. Slopes descend from the levees or channels and have been shaped for urban uses. The vegetation is mainly ornamental plants or annual grasses, forbs, and hydrophytic plants. Elevation is sea level to 25 feet above sea level. The average annual precipitation is 15 to 18 inches. The unit is about 50 percent Sailboat soil and 35 percent Urban land.

Included in this unit are small areas of Columbia, Egbert, and Cosumnes soils. Egbert soils are on high flood plains. Included areas make up about 15 percent of the total acreage.

The Sailboat soil is very deep and is artificially drained. It formed in somewhat poorly drained alluvium derived from mixed rock sources. Typically, the surface layer is light yellowish brown silt loam about 16 inches thick. The next layer is very pale brown silt loam about 12 inches thick. Below this is a buried surface layer of grayish brown clay loam about 6 inches thick. The underlying material to a depth of 62 inches is light brownish gray loam. In some areas the surface layer is sandy loam or loam.

Permeability is moderately slow in the Sailboat soil. Available water capacity is very high. The effective rooting depth is limited by a seasonal high water table in winter and early spring. The water table is high because of seepage and generally is maintained between depths of 36 and 60 inches by pumping. It is at a depth of 24 to 36 inches for short periods. Runoff is slow. The hazard of water erosion is slight. The soil is not susceptible to soil blowing. It is subject to rare flooding.

Urban land consists of areas covered by impervious surfaces or structures, such as roads, driveways, sidewalks, buildings, and parking lots. The soil material under the impervious surfaces is similar to that of the Sailboat soil, although it may have been truncated or otherwise altered.

This unit is used for urban development. The main limitations are the moderately slow permeability, the depth to a seasonal high water table, low strength, and the flooding. Shallow excavations, such as trenches and holes, are limited by the seasonal high water table. Properly designing roads and streets helps to compensate for the instability of the soil. The moderately slow permeability and the high water table increase the possibility that improperly designed septic tank absorption fields will fail. Offsite sewage disposal systems should be considered.

An adequate drainage system is needed in areas where deep-rooted trees and shrubs are planted. During summer irrigation is needed in areas used for lawns, shrubs, vines, or shade and ornamental trees.

No land capability classification is assigned. The MLRA is 17.

210—Sailboat Variant silty clay loam, partially drained, 0 to 2 percent slopes. This very deep, artificially drained soil is on low flood-plain splays. It is protected against flooding by a system of levees and large upstream dams. Levees, drainage ditches, and pumps have lowered the water table and altered the drainage of the soil. The soil formed in poorly drained alluvium derived from mixed rock sources and underlain by hydrophytic plant remains. Slopes are plane or convex. The vegetation in uncultivated areas is mainly annual grasses and forbs and hydrophytic plants. Elevation is 15 to 5 feet below sea level. The average annual precipitation is about 13 inches.

Typically, the surface layer is stratified pale brown, very pale brown, yellow, and grayish brown silty clay loam about 23 inches thick. Below this is a buried surface layer of dark gray mucky silty clay loam about 10 inches thick. The next layer is black mucky silt loam about 24 inches thick. The underlying material to a depth of 64 inches is black mucky peat. In some areas the surface layer is silt loam.

Included in this unit are small areas of Gazwell and Scribner soils in backswamps and soils that are 40 to 60 or more inches deep to the buried surface layer. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the upper part of the Sailboat Variant soil and rapid below a depth of about 57 inches. Available water capacity is high. The effective rooting depth is limited by a seasonal high water table that fluctuates throughout the year. The water table is high because of seepage and is controlled by pumping. Depth to the water table ranges from 18 to 36 inches in winter and early spring and from 36 to 60 inches during the rest of the year. The soil is subject to subsidence. When allowed to dry, the underlying organic material shrinks irreversibly. Runoff is slow. The hazards of water erosion and soil blowing are slight. The soil is subject to rare flooding.

This unit is used for irrigated crops. The commonly grown crops include alfalfa, asparagus, corn, and wheat. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is suited to irrigated crops. It is limited mainly by the moderately slow permeability, a fluctuating water table, and subsidence. A surface drainage system and open drainage ditches are needed to remove excess surface water and lower the water table. The water table during the rainy period in winter and early spring generally limits the suitability for deep-rooted crops. Salts that accumulate in the upper part of the soil because of the high water table should be leached every few years. To minimize the subsidence caused by oxidation, the water table should not be lowered below the rooting depth of the crops. Because the soil is subject to differential subsidence, planing of the fields may be necessary to improve the efficiency of irrigation. Subsoiling improves the downward movement of water and the penetration of roots in the upper part of the soil. Returning all crop residue to the soil and using a cropping system that includes grasses, legumes, or a grass-legume mixture help to maintain fertility and tilth.

Furrow, border, and sprinkler irrigation systems are suitable. Applications of irrigation water should be adjusted to the available water capacity and water intake rate of the soil and to the needs of the crop.

This unit is in capability unit IIIw-10, irrigated and nonirrigated. The MLRA is 16.

211—San Joaquin fine sandy loam, 0 to 3 percent slopes. This moderately deep, moderately well drained soil is on low terraces. It formed in alluvium derived dominantly from granitic rocks. Slopes are complex. The vegetation in uncultivated areas is mainly annual grasses, forbs, and a few widely scattered oaks. Elevation is 20 to 90 feet. The average annual precipitation is 17 to 19 inches.

Typically, the surface layer is yellowish brown and brown fine sandy loam about 13 inches thick. The upper part of the subsoil is brown and strong brown sandy loam about 17 inches thick. The lower part is a claypan of yellowish brown and brown clay about 5 inches thick. The upper part of the substratum is a brown, pinkish gray, and yellowish brown, indurated hardpan about 25 inches thick. The lower part to a depth of 67 inches is light yellowish brown loamy coarse sand. In some areas the surface layer is sandy loam.

Included in this unit are small areas of Bruella, Dierssen, Fiddyment, and Hedge soils. Bruella soils are in the slightly higher areas. Dierssen and Hedge soils are in the slightly lower areas. Fiddyment soils are on hills. Also included are leveled fields that have Durixeralfs in cut areas and Xerarents in filled areas. Included areas make up about 15 percent of the total acreage.

Permeability is very slow in the San Joaquin soil. Water is perched above the claypan for short periods after heavy rainfall in winter and early spring and when the soil is overirrigated. Available water capacity is low. The effective rooting depth is 23 to 40 inches, but roots are restricted to the cracks and faces of peds in the claypan, which is at a depth of 20 to 36 inches. The depth to a hardpan is 23 to 40 inches. The shrink-swell potential is high. Runoff is very slow or slow. The hazard of water erosion is slight.

This unit is used mainly for irrigated hay and pasture or for dryland crops, such as wheat. Some areas are used for urban development. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is suited to irrigated hay and pasture. It is limited mainly by the depth to a claypan, the depth to a hardpan, the very slow permeability, the low available water capacity, and the complex slopes. Sprinkler irrigation is the best method of applying water because of the complex slopes. An efficient water application system is needed to prevent the development of a perched water table on the claypan. Because the soil is droughty, applications of water should be light and frequent. Leveling helps to ensure a uniform distribution of irrigation water.

The grasses and legumes selected for planting should be those that are suited to a moderately deep soil. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and a lower water intake rate. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition.

This unit is suited to dryland crops. It is limited mainly by the low available water capacity and the complex slopes. A surface drainage system is needed to remove excess water from depressional areas. A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling can break up the tillage pan. Leaving crop residue on or near the surface helps to conserve moisture and maintain tilth. The soil should be tilled on the contour or across the slope.

Where this soil is used for urban development, the main limitations are the shrink-swell potential, low strength, the depth to a hardpan, and the very slow permeability. Shallow excavations, such as trenches and holes, are limited by the depth to a hardpan. Properly grading building sites helps to divert water away from the foundations and helps to prevent ponding in the adjacent areas. Excess runoff can be removed by a system of suitably designed drainage ditches or drainage pipe. If buildings are constructed on the claypan, properly designing foundations and footings and diverting runoff away from the buildings help to prevent the structural damage caused by shrinking and swelling. Properly designing roads and streets helps to compensate for the instability of the subsoil. Revegetating disturbed areas around construction sites helps to control erosion.

If this soil is used as a site for septic tank absorption fields, the very slow permeability and the depth to a hardpan can be overcome by increasing the size of the absorption field or by installing the absorption lines below the hardpan. After periods of heavy rainfall, the perched water table can cause the failure of onsite sewage disposal systems.

An adequate drainage system is needed in areas where deep-rooted trees and shrubs are planted. During summer irrigation is needed in areas used for lawns, shrubs, vines, and shade and ornamental trees.

This unit is in capability unit IIIs-3, irrigated and nonirrigated. The MLRA is 17.

212—San Joaquin fine sandy loam, 3 to 8 percent slopes. This moderately deep, moderately well drained soil is on the side slopes of low terraces. It formed in alluvium derived from granitic rocks. Slopes are complex. The vegetation in uncultivated areas is mainly annual grasses, forbs, and a few widely scattered oaks. Elevation is 20 to 75 feet. The average annual precipitation is 17 to 19 inches.

Typically, the surface layer is yellowish brown and brown fine sandy loam about 13 inches thick. The upper part of the subsoil is brown and strong brown sandy loam about 17 inches thick. The lower part is a claypan of yellowish brown and brown clay about 5 inches thick. The upper part of the substratum is a brown, pinkish gray, and yellowish brown, indurated hardpan about 25 inches thick. The lower part to a depth of 67 inches is light yellowish brown loamy coarse sand. In some areas the surface layer is sandy loam.

Included in this unit are small areas of Bruella, Fiddyment, and Hedge soils. Bruella soils are in the slightly higher areas. Fiddyment soils are on hills. Hedge soils are in the slightly lower areas. Also included are areas of soils that are subject to rare flooding. Included areas make up about 15 percent of the total acreage.

Permeability is very slow in the San Joaquin soil. Water is perched above the claypan for short periods after heavy rainfall. Available water capacity is low. The effective rooting depth is 23 to 40 inches, but roots are restricted to the cracks and faces of peds in the claypan, which is at a depth of 20 to 36 inches. The depth to a hardpan is 23 to 40 inches. The shrink-swell potential is high. Runoff is slow or medium. The hazard of water erosion is slight or moderate.

This unit is used mainly for dryland crops, such as wheat. Some areas are used for urban development.

This unit is suited to dryland crops. It is limited mainly by the low available water capacity, the moderate hazard of water erosion, and the complex slopes. A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling can break up the tillage pan. Leaving crop residue on or near the surface helps to conserve moisture and maintain tilth. Tilling on the contour or across the slope helps to control erosion.

This unit is suited to urban development. The main limitations are the high shrink-swell potential, low strength, the depth to a hardpan, the very slow permeability, and the hazard of erosion. Shallow excavations, such as trenches and holes, are limited by the depth to a hardpan. Properly grading building sites helps to divert water away from the foundations and helps to prevent ponding in the adjacent areas. Excess runoff can be removed by a system of suitably designed drainage ditches or drainage pipe. If buildings are constructed on the claypan, properly designing foundations and footings and diverting runoff away from the buildings help to prevent the structural damage caused by shrinking and swelling. Properly designing roads and streets helps to compensate for the instability of the subsoil. Excavating for roads and streets increases the hazard of erosion. Preserving the existing plant cover and revegetating disturbed areas around construction sites help to control erosion.

If this soil is used as a site for septic tank absorption fields, the very slow permeability and the depth to a hardpan can be overcome by increasing the size of the absorption field or by installing the absorption lines below the hardpan. After periods of heavy rainfall, the perched water table above the hardpan can cause the failure of onsite sewage disposal systems.

An adequate drainage system is needed in areas where deep-rooted trees and shrubs are planted. During summer irrigation is needed in areas used for lawns, shrubs, vines, and shade and ornamental trees.

This unit is in capability unit IIIe-3, irrigated and nonirrigated. The MLRA is 17.

213—San Joaquin silt loam, leveled, 0 to 1 percent slopes. This moderately deep, moderately well drained soil is on low terraces. It formed in alluvium derived from mixed granitic rocks. Slopes are plane because of land leveling. The vegetation in uncultivated areas is mainly annual grasses and forbs. Elevation is 20 to 125 feet. The average annual precipitation is 15 to 19 inches.

Typically, the surface layer is strong brown silt loam about 23 inches thick. The subsoil is a claypan of yellowish red clay loam about 5 inches thick. The next layer is an indurated hardpan about 26 inches thick. The substratum to a depth of 60 inches is light yellowish brown loam. In some areas the surface layer is sandy loam, fine sandy loam, or loam.

Included in this unit are small areas of Bruella soils; Durixeralfs; Galt, Hedge, and Kimball soils; and Xerarents. Bruella soils are in the slightly higher areas. Durixeralfs are in cut areas. Galt soils are in depressions. Hedge and Kimball soils are in the slightly lower areas. Xerarents are in filled areas. Also included are areas of soils that are subject to rare flooding. Included areas make up about 15 percent of the total acreage.

Permeability is very slow in the San Joaquin soil. Water is perched above the claypan for short periods after heavy rainfall in winter and early spring and when the soil is overirrigated. Available water capacity is low. The effective rooting depth is 23 to 40 inches, but roots are restricted to the cracks and faces of peds in the claypan, which is at a depth of 20 to 36 inches. The depth to a hardpan ranges from 23 to 40 inches. The shrink-swell potential is high. Runoff is very slow. Water erosion is a slight hazard or is not a hazard at all.

This unit is used for irrigated crops or for irrigated hay and pasture. The commonly grown crops include corn, wheat, rice, barley, milo, and ladino clover for seed. Alfalfa also is grown.

This unit is suited to irrigated crops. If the unit is used for crops other than rice, the main limitations are the depth to a claypan, the depth to a hardpan, the very slow permeability, and the low available water capacity. Because of the depth to a hardpan, the soil is poorly suited to deep-rooted crops. Where feasible, deep ripping of the cemented pan helps to overcome this limitation. A tillage pan forms easily if the soil is tilled when wet. Chiseling and subsoiling can break up the tillage pan. Returning all crop residue, except for rice straw, to the soil and including grasses, legumes, or a grass-legume mixture in the cropping sequence help to maintain fertility and tilth.

Furrow, border, and sprinkler irrigation systems are suitable where crops other than rice are grown. An efficient water application system is needed to prevent the development of a perched water table. Applications of irrigation water should be adjusted to the available water capacity and water intake rate of the soil and to the needs of the crop.

This unit is suited to rice crops. It has few limitations. Level basin irrigation is suitable where rice is grown.

This unit is suited to irrigated hay and pasture. It is limited mainly by the depth to a claypan, the depth to a hardpan, the very slow permeability, and the low available water capacity. Irrigation water can be applied by sprinkler or border methods. The grasses and legumes selected for planting should be those that are suited to a moderately deep soil. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and a lower water intake rate. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition.

This unit is in capability unit IIIs-3, irrigated and nonirrigated. The MLRA is 17.

214—San Joaquin silt loam, 0 to 3 percent slopes. This moderately deep, moderately well drained soil is on low terraces. It formed in alluvium derived from dominantly granitic rocks. Slopes are complex. Some areas have not been smoothed and are incised by a few shallow drainageways and numerous small depressions. The native vegetation is mainly annual grasses, forbs, and a few widely scattered oaks. Elevation is 20 to 170 feet. The average annual precipitation is 15 to 19 inches.

Typically, the surface layer is strong brown silt loam about 23 inches thick. The subsoil is a claypan of yellowish red clay loam about 5 inches thick. Below this is an indurated hardpan about 11 inches thick. The next 15 inches is a hardpan that is strongly cemented with silica. The substratum to a depth of 60 inches is yellowish brown loam. In some areas the surface layer is sandy loam, fine sandy loam, or loam.

Included in this unit are small areas of Bruella, Galt, Hedge, and Kimball soils. Bruella soils are in the slightly higher areas. Galt soils are in depressions. Hedge and Kimball soils are in the slightly lower areas. Also included are areas of soils that are subject to rare flooding. Included areas make up about 15 percent of the total acreage.

Permeability is very slow in the San Joaquin soil. Water is perched above the claypan for short periods after heavy rainfall in winter and early spring and when the soil is overirrigated. Available water capacity is low. The effective rooting depth is 23 to 40 inches, but roots are restricted to the cracks and faces of peds in the claypan, which is at a depth of 20 to 36 inches. The depth to a hardpan ranges from 23 to 40 inches. The shrink-swell potential is high. Runoff is slow. The hazard of water erosion is slight.

Most areas of this unit are used as rangeland or for dryland crops, mainly wheat. A few areas are used for irrigated hay and pasture or for irrigated vineyards. If leveled, this unit can be used for field and row crops or for rice. It may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

Where this unit is used as rangeland, the production of vegetation suitable for livestock grazing is limited by the low available water capacity. The characteristic plant community is mainly soft chess, annual ryegrass, and filaree. Proper grazing management helps to maintain the organic matter content, increases the rate of water infiltration, and improves plant growth early in the season. The unit responds well to range improvement practices, such as range seeding and applications of fertilizer. The plants selected for seeding should be those that meet the seasonal requirements of livestock or wildlife, or both. After the seeds are planted, grazing should be deferred until the plants have set seed.

This unit is suited to dryland crops. It is limited mainly by the low available water capacity and the complex slopes in some areas. A surface drainage system is needed to remove excess water from low areas. In areas that have drainageways and depressions, leveling is needed to prevent the accumulation of runoff in concave areas. A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling breaks up the tillage pan. Leaving crop residue on or near the surface helps to conserve moisture and maintain tilth.

This unit is suited to irrigated hay and pasture. It is limited mainly by the depth to a claypan or a hardpan, the very slow permeability, the low available water capacity, and the complex slopes. Sprinkler irrigation is the best method of applying water in areas that have complex slopes. Border irrigation is suitable where the border checks are designed for a uniform application and the hay and pasture plants have been established. An efficient water application system is needed to prevent the development of a perched water table. Applications of irrigation water should be adjusted to the available water capacity and water intake rate of the soil and to the needs of the crop.

The grasses and legumes selected for planting should be those that are suited to a moderately deep soil. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and a lower water intake rate. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition.

This unit is suited to irrigated crops that do not require leveled fields. It is limited mainly by the depth to a claypan or a hardpan, the very slow permeability, the low available water capacity, and the complex slopes. Because of the depth to a cemented hardpan, the soil is poorly suited to deep-rooted crops. Where feasible, deep ripping of the cemented hardpan helps to overcome this limitation. A surface drainage system is needed to remove excess water from low areas. Growing cover crops in vineyards helps to maintain tilth and fertility. Sprinkler irrigation is the best method of applying water.

If leveled, this unit is suited to rice. Leveling may expose the claypan or the hardpan. Level basin irrigation is suitable where rice is grown.

This unit is in capability unit IIIs-3, irrigated and nonirrigated. The MLRA is 17.

215—San Joaquin silt loam, 3 to 8 percent slopes. This moderately deep, moderately well drained soil is on the side slopes of low terraces. It formed in alluvium derived from mixed granitic rocks. Slopes are complex. Many areas are dissected by shallow drainageways. The native vegetation is mainly annual grasses and forbs and a few widely scattered oaks. Elevation is 20 to 150 feet. The average annual precipitation is 15 to 19 inches.

Typically, the surface layer is strong brown silt loam about 23 inches thick. The subsoil is a claypan of yellowish red clay loam about 5 inches thick. The next layer is an indurated hardpan about 26 inches thick. The substratum to a depth of 60 inches is light yellowish brown loam. In some areas the surface layer is sandy loam, loam, or fine sandy loam.

Included in this unit are small areas of Columbia, Hedge, and Kimball soils. These soils are in the lower areas. Also included are small areas of Galt soils in depressions, soils that have slopes of 9 to 15 percent, and soils that are subject to rare flooding. Included areas make up about 15 percent of the total acreage.

Permeability is very slow in the San Joaquin soil. Water is perched above the claypan for short periods after heavy rainfall in winter and early spring and when the soil is overirrigated. Available water capacity is low. The effective rooting depth is 23 to 40 inches, but roots are restricted to the cracks and faces of peds in the claypan, which is at a depth of 20 to 36 inches. The depth to a hardpan ranges from 23 to 40 inches. The shrink-swell potential is high. Runoff is medium. The hazard of water erosion is moderate.

Most areas of this unit are used as rangeland or for dryland crops, such as wheat. A few areas are used for irrigated hay and pasture. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

Where this unit is used as rangeland, the production of vegetation suitable for livestock grazing is limited by the low available water capacity. The characteristic plant community is mainly soft chess, annual ryegrass, and filaree. Proper grazing management helps to maintain the organic matter content, increases the rate of water infiltration, and improves plant growth early in the season. The unit responds well to range improvement practices, such as range seeding and applications of fertilizer. The plants selected for seeding should be those that meet the seasonal requirements of livestock or wildlife, or both. After the seeds are planted, grazing should be deferred until the plants have set seed.

This unit is suited to dryland crops. It is limited mainly by the hazard of water erosion, the complex slopes, and the low available water capacity. A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling breaks up the tillage pan. The hazard of erosion can be reduced if crop residue is left on or near the surface and tillage is on the contour or across the slope.

This unit is suited to irrigated hay and pasture. The main limitations are the depth to a claypan, the depth to a hardpan, the very slow permeability, the low available water capacity, the slope, and the hazard of water erosion. Seedbeds should be prepared on the contour or across the slope where practical. Because of the slope, the depth to a claypan, and the very slow permeability, sprinkler irrigation is the best method of applying water. The application rate should be adjusted to the available water capacity and water intake rate of the soil and to the needs of the crop.

The grasses and legumes selected for planting should be those that are suited to a moderately deep soil. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and control erosion.

This unit is in capability unit IIIe-3, irrigated and nonirrigated. The MLRA is 17.

216—San Joaquin-Durixeralfs complex, 0 to 1 percent slopes. This map unit is on low terraces. Slopes are plane because of land leveling. The vegetation in uncultivated areas is mainly annual grasses and forbs. Elevation is 20 to 100 feet. The average annual precipitation is 15 to 18 inches.

This unit is about 55 percent San Joaquin soil and 35 percent Durixeralfs. The San Joaquin soil is in areas that have been left relatively undisturbed when leveled. The Durixeralfs are in cut areas from which most or all of the original surface layer has been removed.

Included in this unit are small areas of Galt and Kimball soils. Galt soils are in depressions. Kimball soils are in the slightly lower areas. Also included are small areas of Xerarents. Included areas make up about 10 percent of the total acreage.

The San Joaquin soil is moderately deep and moderately well drained. It formed in alluvium derived from granitic rocks. Typically, the surface layer is strong brown silt loam about 23 inches thick. The subsoil is a claypan of yellowish red clay loam about 5 inches thick. The next layer is an indurated hardpan about 26 inches thick. The substratum to a depth of 60 inches is light yellowish brown loam. In some areas the surface layer is sandy loam, fine sandy loam, or loam.

Permeability is very slow in the San Joaquin soil. Water is perched above the claypan for short periods after heavy rainfall in winter and early spring and when the soil is overirrigated. Available water capacity is low. The effective rooting depth is 23 to 40 inches, but roots are restricted to the cracks and faces of peds in the claypan, which is at a depth of 20 to 36 inches. The depth to a hardpan ranges from 23 to 40 inches. The shrink-swell potential is high. Runoff is very slow. Water erosion is a slight hazard or is not a hazard at all.

The Durixeralfs are shallow or moderately deep, well drained, and altered. They formed in alluvium derived from mixed granitic rocks. The texture, color, and thickness of the layers of these soils vary from one area to another. In a reference pedon, the surface layer is brown clay about 6 inches thick. The subsoil also is brown clay. It is about 14 inches thick. Below this to a depth of 60 inches is a continuous hardpan that is strongly cemented with silica. In some areas the surface layer is clay loam or sandy clay loam.

Permeability is slow or very slow in the Durixeralfs. Available water capacity is very low or low. The effective rooting depth is 10 to 30 inches. It is 10 to 20 inches in most areas. The depth to a hardpan ranges from 10 to 30 inches. Runoff is very slow. Water erosion is a slight hazard or is not a hazard at all.

This unit is used for irrigated pasture and hay or for irrigated crops. The commonly grown crops include ladino clover for seed, corn, milo, rice, wheat, and sudangrass. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is suited to irrigated hay and pasture. The main limitations are the depth to a hardpan, the very slow permeability, and the limited available water capacity. Also, the San Joaquin soil is limited by the depth to a claypan and the Durixeralfs by the fine texture of the surface layer. Chiseling or subsoiling improves the downward movement of water and the penetration of roots.

Border and sprinkler irrigation systems are suitable. Because of the limited available water capacity, applications of irrigation water should be light and frequent. An efficient water application system is needed to prevent the development of a perched water table.

The grasses and legumes selected for planting should be those that are suited to a shallow or moderately deep soil. Grazing when the soils are wet results in compaction of the surface layer, poor tilth, and a lower water intake rate. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition.

This unit is suited to irrigated crops. If the unit is used for crops other than rice, the main limitations are the depth to a hardpan, the very slow permeability, and the limited available water capacity. Also, the San Joaquin soil is limited by the depth to a claypan and the Durixeralfs by the fine texture of the surface layer. A tillage pan forms easily if the soils are tilled when wet. Chiseling or subsoiling breaks up the tillage pan and thus improves the downward movement of water and the penetration of roots. Returning all crop residue, except for rice straw, to the soil and including grasses, legumes, or a grass-legume mixture in the cropping sequence help to maintain fertility and tilth. Furrow, border, and sprinkler irrigation systems are suitable where crops other than rice are grown.

This unit is suited to rice crops. The San Joaquin soil has few limitations. The Durixeralfs are limited mainly by the fine texture of the surface layer and the very slow runoff. Because of these limitations, the use of equipment is restricted to periods when the soils are dry enough to support heavy loads. Level basin irrigation systems are suitable where rice is grown.

This unit is in capability unit IVs-5, irrigated and nonirrigated. The MLRA is 17.

217—San Joaquin-Galt complex, leveled, 0 to 1 percent slopes. This map unit is on low terraces. Slopes are plane. The vegetation in uncultivated areas is mainly annual grasses and forbs. Elevation is 20 to 85 feet. The average annual precipitation is 15 to 18 inches.

This unit is about 45 percent San Joaquin soil and 40 percent Galt soil. The San Joaquin soil is in areas that were slightly cut when leveled. The Galt soil is in areas that were slightly filled when leveled.

Included in this unit are small areas of Clear Lake, Durixeralfs, and Kimball soils and Xerarents. Clear Lake soils are in basins. Durixeralfs are in deeply cut areas. Xerarents are in deeply filled areas. Also included are areas of soils that are subject to rare flooding. Included areas make up about 15 percent of the total acreage.

The San Joaquin soil is moderately deep and moderately well drained. It formed in alluvium derived from mixed granitic rocks. Typically, the surface layer is strong brown silt loam about 15 inches thick. The subsoil is a claypan of yellowish red clay loam about 5 inches thick. The next layer is an indurated hardpan about 26 inches thick. The substratum to a depth of 60 inches is light yellowish brown loam. In some areas the surface layer is sandy loam, fine sandy loam, loam, or sandy clay loam.

Permeability is very slow in the San Joaquin soil. Water is perched above the claypan for short periods after heavy rainfall in winter and early spring and when the soil is overirrigated. Available water capacity is low. The effective rooting depth is 20 to 36 inches, but roots are restricted to the cracks and faces of peds in the claypan, which is at a depth of 12 to 30 inches. The depth to a hardpan ranges from 20 to 36 inches. The shrink-swell potential is high. Runoff is very slow. Water erosion is a slight hazard or is not a hazard at all.

The Galt soil is moderately deep and moderately well drained. It formed in fine textured alluvium derived from granitic rocks. Typically, the soil is covered with fill material of pale brown silt loam about 6 inches thick. Below this is a surface layer of grayish brown clay about 13 inches thick. The next layer is grayish brown and brown clay about 19 inches thick. A yellowish red and light yellowish brown, calcareous hardpan that is weakly cemented with silica is at a depth of about 38 inches. In some areas the surface layer is clay, silty clay, or silty clay loam.

Permeability is slow in the Galt soil. Available water capacity is low. The effective rooting depth and the depth to a hardpan are 24 to 40 inches. The shrink-swell potential is high. Runoff is very slow. The hazard of water erosion is slight.

This unit is used for irrigated crops or for irrigated hay and pasture. The commonly grown crops include corn, wheat, ladino clover for seed, rice, and milo. Alfalfa also is grown. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is suited to irrigated crops. If the unit is used for crops other than rice, the main limitations are the depth to a hardpan and the low available water capacity. Also, the San Joaquin soil is limited by the depth to a claypan and the very slow permeability and the Galt soil by the slow permeability. Because of the depth to a cemented hardpan, the soils are poorly suited to deep-rooted crops. Where feasible, deep ripping of the cemented hardpan helps to overcome this limitation. A tillage pan forms easily if the San Joaquin soil is tilled when wet. Chiseling or subsoiling can break up the tillage pan. Returning all crop residue, except for rice straw, to the soil and including grasses, legumes, or a grass-legume mixture in the cropping sequence help to maintain fertility and tilth.

Furrow, border, and sprinkler irrigation systems are suitable where crops other than rice are grown. An efficient water application system is needed to prevent the development of a perched water table. Applications of irrigation water should be adjusted to the available water capacity and water intake rate of the soils and to the needs of the crop.

This unit is suited to rice crops. It has few limitations. Level basin irrigation is suitable where rice is grown. Leveling for irrigation may expose the hardpan.

This unit is suited to irrigated hay and pasture. It is limited mainly by the depth to a hardpan and the low available water capacity. Also, the San Joaquin soil is limited by the depth to a claypan and the very slow permeability and the Galt soil by the slow permeability. Irrigation water can be applied by sprinkler or border methods. The grasses and legumes selected for planting should be those that are suited to a moderately deep soil. Grazing when the soils are wet results in compaction of the surface layer, poor tilth, and a lower water intake rate. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition.

This unit is in capability unit IIIs-3, irrigated and nonirrigated. The MLRA is 17.

218—San Joaquin-Galt complex, 0 to 3 percent slopes. This map unit is on low terraces. Slopes are complex. The native vegetation is mainly annual grasses and forbs. Elevation is 20 to 95 feet. The average annual precipitation is 15 to 18 inches.

This unit is about 45 percent San Joaquin soil and 40 percent Galt soil. The San Joaquin soil is in high areas where slopes are 0 to 3 percent and are convex. The Galt soil is in areas in small basins where slopes are 0 to 2 percent and are concave.

Included in this unit are small areas of Clear Lake soils in basins. Also included are areas of soils that are subject to rare flooding. Included areas make up about 15 percent of the total acreage.

The San Joaquin soil is moderately deep and moderately well drained. It formed in alluvium derived from mixed granitic rocks. Typically, the surface layer is strong brown silt loam about 23 inches thick. The subsoil is a claypan of yellowish red clay loam about 5 inches thick. The next layer is an indurated hardpan about 26 inches thick. The substratum to a depth of 60 inches is light yellowish brown loam. In some areas the surface layer is sandy loam, fine sandy loam, or loam.

Permeability is very slow in the San Joaquin soil. Water is perched above the claypan for short periods after heavy rainfall in winter and early spring. Available water capacity is low. The effective rooting depth is 23 to 40 inches, but roots are restricted to the cracks and faces of peds in the claypan, which is at a depth of 20 to 36 inches. The depth to a hardpan ranges from 23 to 40 inches. The shrink-swell potential is high. Runoff is slow. The hazard of water erosion is slight.

The Galt soil is moderately deep and moderately well drained. It formed in fine textured alluvium derived from granitic rocks. Typically, the surface layer is grayish brown clay about 13 inches thick. The next 19 inches is mixed grayish brown and brown clay. A variegated yellowish red, light yellowish brown, and white, calcareous hardpan that is weakly cemented with silica is at a depth of about 32 inches. In some areas the surface layer is silty clay or silty clay loam.

Permeability is slow in the Galt soil. Available water capacity is low. The effective rooting depth and the depth to a hardpan are 20 to 40 inches. The shrink-swell potential is high. Runoff is ponded. As much as 12 inches of standing water is on the surface in winter and early spring. The soil is not susceptible to water erosion.

Most areas of this unit are used as rangeland. A few areas are used for dryland crops, such as wheat. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

Where this unit is used as rangeland, the production of vegetation and livestock grazing are limited by the low available water capacity in the San Joaquin soil, which is in the higher convex areas. The Galt soil, which is in depressional areas, is limited by ponding, the fine texture of the surface layer, and the high shrink-swell potential. The characteristic plant community is mainly soft chess, annual ryegrass, and filaree on the San Joaquin soil and annual ryegrass, soft chess, foxtail fescue, and toad rush on the Galt soil. Early in the green feed period, livestock grazing is concentrated in the higher, convex areas because water accumulates in the depressional areas. Late in the green feed period, grazing is concentrated in the depressional areas. If this unit is grazed by livestock when the soil in the depressional areas is too moist, trampling of the surface causes compaction and the uprooting of plants. Proper grazing management helps to maintain the organic matter content, increases the rate of water infiltration, and improves plant growth early in the season. Fencing is difficult. Excessive shrinking and swelling of the Galt soil can cause fenceposts to be forced out of the ground.

This unit is poorly suited to dryland crops. The soils are limited by the low available water capacity. The Galt soil also is limited by the fine texture of the surface layer and by ponding. A surface drainage system and leveling are needed to remove excess water and prevent ponding in concave areas. The soils should be cultivated only within a narrow range in moisture content. The Galt soil is too sticky for cultivation when wet and is too hard when dry. A tillage pan forms easily if the San Joaquin soil is tilled when wet. Chiseling or subsoiling can break up the tillage pan. Tilth and fertility can be improved by returning crop residue to the soil.

This unit is in capability unit IIIs-5, nonirrigated. The MLRA is 17.

219—San Joaquin-Urban land complex, 0 to 2 percent slopes. This map unit is on low terraces. Slopes have been shaped for urban uses. The vegetation is mainly ornamental plants or annual grasses and forbs. Elevation is 20 to 90 feet. The average annual precipitation is 16 to 18 inches. The unit is about 50 percent San Joaquin soil and 35 percent Urban land.

Included in this unit are small areas of Bruella, Clear Lake, Galt, and Kimball soils. Bruella soils are on intermediate terraces. Clear Lake and Galt soils are in basins. Also included are Durixeralfs in cut areas and Xerarents in filled areas. Included areas make up about 15 percent of the total acreage.

The San Joaquin soil is moderately deep and well drained. It formed in alluvium derived from mixed granitic rocks. Typically, the surface layer is strong brown silt loam about 23 inches thick. The subsoil is a claypan of yellowish red clay loam about 5 inches thick. The next layer is an indurated hardpan about 26 inches thick. The substratum to a depth of 60 inches is light yellowish brown loam. In some areas the surface layer is sandy loam, fine sandy loam, loam, or sandy clay loam.

Permeability is very slow in the San Joaquin soil. Water is perched above the claypan for short periods after heavy rainfall in winter and early spring or when the soil is overirrigated. Available water capacity is low. The effective rooting depth is 23 to 40 inches, but roots are restricted to the cracks and faces of peds in the claypan, which is at a depth of 20 to 36 inches. The depth to a hardpan ranges from 23 to 40 inches. The shrink-swell potential is high. Runoff is slow. The hazard of water erosion is slight.

Urban land consists of areas covered by impervious surfaces or structures, such as roads, driveways, sidewalks, buildings, and parking lots. The soil material under the impervious surfaces is similar to that of the San Joaquin soil, although it may have been truncated or otherwise altered.

This unit is used for urban development. The main limitations affecting urban uses are the shrink-swell potential, low strength, the depth to a hardpan, and the very slow permeability. Shallow excavations, such as trenches and holes, are limited by the moderate depth to a hardpan. Properly grading building sites helps to divert water away from the foundations and helps to prevent ponding in the adjacent areas. Excess runoff can be removed by a system of suitably designed drainage ditches or drainage pipe. If buildings are constructed on the claypan, properly designing foundations and footings and diverting runoff away from the buildings help to prevent the structural damage caused by shrinking and swelling. Properly designing roads and streets helps to compensate for the instability of the subsoil. Revegetating disturbed areas around construction sites helps to control erosion.

If the San Joaquin soil is used as a site for septic tank absorption fields, the very slow permeability and the moderate depth to a hardpan can be overcome by increasing the size of the absorption field or by installing the absorption lines below the hardpan. After periods of heavy rainfall, the water table, which is perched above the claypan, can cause the failure of onsite sewage disposal systems.

An adequate drainage system is needed in areas where deep-rooted trees and shrubs are planted. During summer irrigation is needed in areas used for lawns, shrubs, vines, or shade and ornamental trees.

No land capability classification is assigned. The MLRA is 17.

220—San Joaquin-Urban land complex, 0 to 3 percent slopes. This map unit is on low terraces. Slopes have been shaped for urban uses. The vegetation is mainly ornamental plants or annual grasses and forbs and a few scattered oaks. Elevation is 20 to 95 feet. The average annual precipitation is 18 to 20 inches. The unit is about 65 percent San Joaquin soil and 25 percent Urban land.

Included in this unit are small areas of Bruella and Dierssen soils. Bruella soils are on the slightly higher intermediate terraces. Dierssen soils are on the slightly lower rims of basins. Also included are Durixeralfs in cut areas, Xerarents in filled areas, and soils that have a subsoil of sandy clay loam or clay loam. Included areas make up about 10 percent of the total acreage.

The San Joaquin soil is moderately deep and moderately well drained. It formed in alluvium derived from granitic rocks. Typically, the surface layer is yellowish brown and brown fine sandy loam about 13 inches thick. The upper part of the subsoil is brown and strong brown sandy loam about 17 inches thick. The lower part is a claypan of yellowish brown and brown clay about 5 inches thick. The upper part of the substratum is a brown, pinkish gray, and yellowish brown, indurated hardpan about 25 inches thick. The lower part to a depth of 67 inches is light yellowish brown loamy coarse sand. In some areas the surface layer is sandy loam. In other areas the hardpan is directly underlain by siltstone.

Permeability is very slow in the San Joaquin soil. Water is perched above the claypan for short periods after heavy rainfall in winter and early spring and when the soil is overirrigated. Available water capacity is low. The effective rooting depth is 23 to 40 inches, but roots are restricted to the cracks and faces of peds in the claypan, which is at a depth of 20 to 36 inches. The depth to a hardpan is 23 to 40 inches. The shrink-swell potential is high. Runoff is very slow or slow. The hazard of water erosion is slight.

Urban land consists of areas covered by impervious surfaces or structures, such as roads, driveways, sidewalks, buildings, and parking lots. The soil material under the impervious surfaces is similar to that of the San Joaquin soil, although it may have been truncated or otherwise altered.

This unit is used for urban development. The main limitations are the shrink-swell potential, low strength, the depth to a hardpan, and the very slow permeability. Shallow excavations, such as trenches and holes, are limited by the depth to a hardpan. Properly grading building sites helps to divert water away from the foundations and helps to prevent ponding in the adjacent areas. Excess runoff can be removed by a system of suitably designed drainage ditches or drainage pipe. If buildings are constructed on the claypan, properly designing foundations and footings and diverting runoff away from the buildings help to prevent the structural damage caused by shrinking and swelling. Properly designing roads and streets helps to compensate for the instability of the subsoil. Revegetating disturbed areas around construction sites helps to control erosion.

If the San Joaquin soil is used as a site for septic tank absorption fields, the very slow permeability and the moderate depth to a hardpan can be overcome by increasing the size of the absorption field or by installing the absorption lines below the hardpan. After periods of heavy rainfall, the water table, which is perched above the claypan, can cause the failure of onsite sewage disposal systems.

An adequate drainage system is needed in areas where deep-rooted trees and shrubs are planted. During summer irrigation is needed in areas used for lawns, shrubs, vines, or shade and ornamental trees.

No land capability classification is assigned. The MLRA is 17.

221—San Joaquin-Xerarents complex, leveled, 0 to 1 percent slopes. This map unit is on low terraces. Slopes are plane because of land leveling. The vegetation in uncultivated areas is mainly annual grasses and forbs. Elevation is 20 to 125 feet. The average annual precipitation is 15 to 18 inches.

This unit is about 45 percent San Joaquin soil and 40 percent Xerarents. The San Joaquin soil is in areas that have been left relatively undisturbed when leveled. The Xerarents are in filled areas.

Included in this unit are small areas of Clear Lake and Columbia soils; Durixeralfs; and Galt, Kimball, and Sailboat soils. Columbia and Sailboat soils are on low flood plains along drainageways. Clear Lake and Galt soils are overlain by a thin overburden of fill material. Durixeralfs are in heavily cut areas. Also included are areas of soils that are subject to rare flooding. Included areas make up about 15 percent of the total acreage.

The San Joaquin soil is moderately deep and moderately well drained. It formed in alluvium derived from granitic rocks. Typically, the surface layer is strong brown silt loam about 23 inches thick. The subsoil is a claypan of yellowish red clay loam about 5 inches thick. The upper part of the substratum is an indurated hardpan about 26 inches thick. The lower part to a depth of 60 inches is light yellowish brown loam. In some areas the surface layer is fine sandy loam, sandy loam, or loam.

Permeability is very slow in the San Joaquin soil. Water is perched above the claypan for short periods after heavy rainfall in winter and early spring or when the soil is overirrigated. Available water capacity is low. The effective rooting depth is 23 to 40 inches, but roots are restricted to the cracks and faces of peds in the claypan, which is at a depth of 20 to 36 inches. The depth to a hardpan ranges from 23 to 40 inches. The shrink-swell potential is high. Runoff is very slow. Water erosion is a slight hazard or is not a hazard at all.

The Xerarents are moderately deep to very deep, well drained, and altered. They formed in fill material mixed by leveling activities. The fill material is derived from nearby soils of mixed but dominantly granitic origin. Prior to leveling, areas of these soils consisted of depressions and narrow channels along drainageways. The texture, color, and thickness of the layers of these soils vary from one area to another. In a reference pedon, the surface layer is about 16 inches of pale brown, yellowish brown, light gray, white, and brown sandy loam and sandy clay loam fill that has remnant subsoil fragments of clay loam or clay. The subsurface layer is about 14 inches of pale brown and brown loamy sand and sandy loam fill that has remnant subsoil fragments of clay loam or clay. Below this is a buried surface layer of grayish brown loam about 5 inches thick. The underlying material to a depth of 60 inches is brown loam and a light yellowish brown, weakly cemented hardpan.

Permeability is moderate to very slow in the Xerarents. Available water capacity is moderate or high. The effective rooting depth and the depth to a hardpan are 32 to more than 60 inches. The shrink-swell potential is low to high. Runoff is very slow. Water erosion is a slight hazard or is not a hazard at all.

This unit is used for irrigated crops or for irrigated hay and pasture. The commonly grown crops include corn, wheat, rice, milo, sudangrass, and ladino clover. Alfalfa also is grown. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is suited to irrigated crops. If the unit is used for crops other than rice, the main limitations are the depth to a claypan, very slow permeability, and low available water capacity in the San Joaquin soil. A tillage pan forms easily if the soils are tilled when wet. Chiseling or subsoiling breaks up the tillage pan. Subsoiling improves the downward movement of water and the penetration of roots in the very slowly permeable claypan. Returning all crop residue, except for rice straw, to the soil and including grasses, legumes, or a grass-legume mixture in the cropping sequence help to maintain fertility and tilth.

Furrow, border, and sprinkler irrigation systems are suitable where crops other than rice are grown. An efficient water application system is needed to prevent the development of a perched water table. Because the San Joaquin soil is droughty, applications of irrigation water should be light and frequent.

This unit is suited to rice crops. It has few limitations. Level basin irrigation systems are suitable in areas used for rice.

This unit is suited to hay and pasture. The main limitations are the depth to a claypan and a hardpan, very slow permeability, and low available water capacity in the San Joaquin soil. Irrigation water can be applied by sprinkler or graded border methods. The grasses and legumes selected for planting should be those that are suited to a moderately deep soil. Grazing when the soils are wet results in compaction of the surface layer, poor tilth, and a lower water intake rate. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition.

This unit is in capability unit IIIs-3, irrigated and nonirrigated. The MLRA is 17.

222—Scribner clay loam, partially drained, 0 to 2 percent slopes. This very deep, artificially drained soil is on the reclaimed edges of backswamps. It is protected against flooding by a system of levees and large upstream dams. Levees, open and closed drains, and pumps have lowered the water table and altered the drainage of the soil. The soil formed in poorly drained alluvium derived from mixed rock sources. Slopes are plane or convex and in some areas descend from the levees or channels. The vegetation in uncultivated areas is mainly hydrophytic plants or annual grasses and forbs. Elevation is 10 feet below to 10 feet above sea level. The average annual precipitation is 13 to 16 inches.

Typically, the surface layer is gray, grayish brown, and strong brown clay loam about 12 inches thick. The next layer is gray clay loam about 27 inches thick. The underlying material to a depth of 60 inches is stratified gray clay loam and light brownish gray sandy clay loam. In some areas the surface layer is silt loam.

Included in this unit are small areas of Dierssen, Egbert, Gazwell, Sailboat, and Tinnin soils. Dierssen soils are on the rims of basins. Egbert and Gazwell soils are in backswamps. Sailboat soils are on natural levees. Tinnin soils are on ridges and mounds. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the Scribner soil. Available water capacity is very high. The effective rooting depth is limited by a seasonal high water table in winter and early spring. The water table is high because of seepage and generally is maintained between depths of 36 and 60 inches by pumping. It can be at a depth of 20 to 36 inches for short periods. The soil has subsided in areas south of Locke. Runoff is very slow. The hazards of water erosion and soil blowing are slight. The soil is subject to rare flooding.

Most areas of this unit are used for irrigated crops. The commonly grown crops include wheat, corn, tomatoes, and alfalfa. Pears are grown in a few areas. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is suited to irrigated crops. It is limited mainly by the depth to a seasonal high water table and subsidence in some areas. The water table during the rainy period in winter generally limits the suitability for deep-rooted crops. Pears, however, can tolerate some wetness. Tile drainage can lower the water table if a suitable outlet is available. Differential subsidence of the underlying organic material in some areas may cause an increase in the slope and require modifications of irrigation and drainage systems. Tilth and fertility can be improved by returning crop residue to the soil and by growing winter cover crops in orchards.

Furrow, border, and sprinkler irrigation systems are suitable. Applications of irrigation water should be adjusted to the available water capacity and water intake rate of the soil and to the needs of the crop.

This unit is in capability units IIw-2, irrigated, and IIIw-2, nonirrigated. The MLRA is 16.

223—Slickens. This map unit consists of accumulations of moderately fine textured and fine textured material separated from Red Bluff, Redding, and other soils during placer mining and gold dredging activities. The Slickens generally are in specially constructed settling basins but also are on low flood plains adjacent to streams. Slopes are 0 to 3 percent. The vegetation is mainly scattered, sparse stands of annual grasses, forbs, and chaparral. Elevation is 140 to 240 feet. The average annual precipitation is 18 to 21 inches.

Included in this unit are small areas of Red Bluff and Redding soils and Xerorthents. Red Bluff and Redding soils are on high terraces. Xerorthents are in areas of dredge tailings. Included areas make up about 5 percent of the unit.

Permeability is moderately slow or slow in the Slickens. Water is commonly perched above the moderately fine textured and fine textured material during periods of high-intensity storms in winter and early spring. Available water capacity is high or very high. Runoff is ponded to slow. The hazard of water erosion is slight. The Slickens are frequently flooded for brief or long periods in winter and early spring.

This unit is used as rangeland. It may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

Few limitations affect the use of this unit for livestock grazing. The unit is limited mainly by a perched water table and by ponding. In ponded areas trampling by livestock can damage the plants. Onsite investigation is needed to address management requirements.

No land capability classification is assigned because the soil properties vary considerably. The MLRA is 17.

224—Tehama loam, 0 to 2 percent slopes. This very deep, well drained soil is on low terraces. It formed in alluvium derived from sedimentary rocks. Slopes are plane or convex and have been incised by many shallow drainageways and small depressions. The native vegetation is mainly annual grasses and forbs. Elevation is 160 to 250 feet. The average annual precipitation is 18 to 20 inches.

Typically, the surface layer is yellowish brown, light yellowish brown, and reddish yellow loam about 24 inches thick. The subsoil to a depth of 67 inches is light yellowish brown silty clay loam and pale brown and light gray clay loam. In places the surface layer is silt loam.

Included in this unit are small areas of Creviscreek, Hicksville, Kimball, and San Joaquin soils. Creviscreek soils are on stream terraces. Hicksville soils are on low stream terraces. Included areas make up about 15 percent of the total acreage.

Permeability is slow in the Tehama soil. Water is perched above the subsoil for short periods after heavy rainfall in winter and early spring. Available water capacity is very high. The effective rooting depth is 60 inches or more. Runoff is slow. The hazard of water erosion is slight.

This unit is used as rangeland. It can be used for irrigated crops or for irrigated hay and pasture if irrigation water becomes available.

Few limitations affect the production of vegetation suitable for livestock grazing. The characteristic plant community is mainly soft chess, wild oats, and filaree. In areas of abandoned cropland, the vegetation consists mainly of low-value remnant weedy species. Proper grazing management helps to maintain the organic matter content, increases the rate of water infiltration, and helps to achieve the desired balance of species in the plant community. The unit responds well to range improvement practices, such as range seeding and applications of fertilizer. The plants selected for seeding should be those that meet the seasonal requirements of livestock or wildlife, or both. After the seeds are planted, grazing should be deferred until the plants have set seed.

This unit is in capability units IIs-3, irrigated, and IIIs-3, nonirrigated. The MLRA is 17.

225—Tinnin loamy sand, 0 to 2 percent slopes. This very deep, well drained soil is on narrow ridges and mounds on the rims of basins. It formed in eolian material derived from granitic rocks. Slopes are convex. The native vegetation is mainly annual grasses and forbs and scattered oaks. Elevation is 5 to 20 feet. The average annual precipitation is 15 to 16 inches.

Typically, the surface layer is dark brown loamy sand about 12 inches thick. The substratum to a depth of 64 inches is dark brown sand and dark yellowish brown and yellowish brown loamy sand. In some areas the surface layer is sand or sandy loam.

Included in this unit are small areas of Dierssen and Egbert soils. Dierssen soils are on the rims of basins. Egbert soils are on high flood plains. Included areas make up about 15 percent of the total acreage.

Permeability is rapid in the Tinnin soil. Available water capacity is low. The effective rooting depth is 60 inches or more. Runoff is slow. The hazard of water erosion is slight. The hazard of soil blowing is severe. The soil is subject to rare flooding.

This unit is used for irrigated crops. The commonly grown crops include alfalfa, corn, grapes, wheat, and pears. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is suited to irrigated crops. The main limitations are the coarse texture of the surface layer, a rapid water intake rate, the low available water capacity, the rapid permeability, and the hazard of soil blowing. The organic matter content can be maintained by returning all crop residue to the soil, plowing under cover crops, and using a suitable crop rotation. Soil blowing can be controlled by returning crop residue to the soil and minimizing tillage.

Because the water intake rate is rapid, sprinkler irrigation is the best method of applying water. Because the 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 avoid overirrigating and the leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity and water intake rate of the soil and to the needs of the crop. Pipe, ditch lining, or drop structures in irrigation ditches facilitate irrigation and reduce the hazard of ditch erosion. Growing cover crops in winter helps to maintain tilth and fertility and control erosion in orchards and vineyards.

This unit is in capability units IIIs-4, irrigated, and IVe-4, nonirrigated. The MLRA is 17.

226—Tinnin-Urban land complex, 2 to 8 percent slopes. This map unit is on narrow ridges and mounds on low terraces. Slopes have been shaped for urban uses. The vegetation is mainly ornamental plants or annual grasses and forbs. Elevation is 15 to 35 feet. The average annual precipitation is 17 to 19 inches. The unit is about 55 percent Tinnin soil and 30 percent Urban land.

Included in this unit are small areas of Kimball and San Joaquin soils on low terraces. Also included are areas that have slopes of 0 to 2 percent. Included areas make up about 15 percent of the total acreage.

The Tinnin soil is very deep and well drained. It formed in eolian material derived from granitic rocks. Typically, the surface layer is dark brown loamy sand about 12 inches thick. The substratum to a depth of 64 inches is dark brown sand and dark yellowish brown and yellowish brown loamy sand. In some areas the surface layer is sand.

Permeability is rapid in the Tinnin soil. Available water capacity is low. The effective rooting depth is 60 inches or more. Runoff is slow. The hazard of water erosion is moderate. The hazard of soil blowing is severe.

Urban land consists of areas covered by impervious surfaces or structures, such as roads, driveways, sidewalks, buildings, and parking lots. The soil material under the impervious surfaces is similar to that of the Tinnin soil, although it may have been truncated or otherwise altered.

This unit is used for urban development. The main limitations affecting urban uses are the hazard of water erosion, the hazard of soil blowing, a rapid water intake rate, and the hazard of sloughing. Cutbanks are not stable and are subject to sloughing. Revegetating disturbed areas around construction sites as soon as possible helps to control erosion. The plants selected for landscaping should be those that are suited to droughty soils. During summer irrigation is needed in areas used for lawns, shrubs, vines, or shade and ornamental trees.

No land capability classification is assigned. The MLRA is 17.

227—Urban land. This map unit consists of large areas covered by impervious surfaces or structures, such as roads, driveways, sidewalks, buildings, and parking lots. In most places 90 percent or more of the area is covered by impervious surfaces.

The soil material under the impervious surfaces may have been altered during construction. It is similar to that of the nearby soils, including Americanos, Andregg, Argonaut, Auburn, Columbia, Cosumnes, Egbert, Fiddyment, Galt, Hedge, Kaseberg, Kimball, Lang, Laugenour, Liveoak, Natomas, and Orangevale soils; Orthents; Red Bluff, Rossmoor, Sailboat, San Joaquin, Tinnin, and Valpac soils; and Xerarents and Xerorthents.

No land capability classification is assigned. The MLRA is 17.

228—Urban land-Natomas complex, 0 to 2 percent slopes. This map unit is in high areas on low terraces. Slopes have been shaped for urban uses. The vegetation is mainly ornamental plants or annual grasses, forbs, and scattered oaks. Elevation is 45 to 140 feet. The average annual precipitation is 17 to 23 inches. The unit is about 45 percent Urban land and 40 percent Natomas soil.

Included in this unit are small areas of Americanos, Kimball, and San Joaquin soils and Xerarents. Americanos soils are on low stream terraces. Kimball and San Joaquin soils are in the slightly lower areas on the low terraces. Xerarents are in filled areas. Also included, in low areas, are soils that have a subsoil of brown sandy clay loam and a base saturation of more than 75 percent. Included areas make up about 15 percent of the total acreage.

Urban land consists of areas covered by impervious surfaces or structures, such as roads, driveways, sidewalks, buildings, and parking lots. The soil material under the impervious surfaces is similar to that of the Natomas soil, although it may have been truncated or otherwise altered.

The Natomas soil is very deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is brown loam about 17 inches thick. The upper part of the subsoil is yellowish red and reddish brown loam about 16 inches thick. The lower part is red clay loam about 45 inches thick. The substratum to a depth of 84 inches is yellowish red sandy loam. In some areas the surface layer is sandy loam.

Permeability is moderately slow in the Natomas soil. Available water capacity is very high. The effective rooting depth is 60 inches or more. Runoff is slow. The hazard of water erosion is slight.

This unit is used for urban development. The main limitation affecting urban uses is low strength in the subsoil. Properly designing roads and streets helps to compensate for this limitation. Revegetating disturbed areas around construction sites helps to control erosion. During summer irrigation is needed in areas used for lawns, shrubs, vines, or shade and ornamental trees.

No land capability classification is assigned. The MLRA is 17.

229—Urban land-Xerarents-Fiddyment complex, 0 to 8 percent slopes. This map unit is in filled areas on hills. Slopes have been shaped for urban uses. The vegetation is mainly ornamental plants and scattered oaks or annual grasses and forbs. Elevation is 30 to 270 feet. The average annual precipitation is 16 to 23 inches. The unit is about 40 percent Urban land, 30 percent Xerarents, and 15 percent Fiddyment soil.

Included in this unit are small areas of Kaseberg and Orangevale soils. These soils are in unaltered areas. Also included are altered areas of soils that are less than 10 inches deep to consolidated sediments. Included areas make up about 15 percent of the total acreage.

Urban land consists of areas covered by impervious surfaces or structures, such as roads, driveways, sidewalks, buildings, and parking lots. The soil material under the impervious surfaces is similar to that of the Xerarents or of Fiddyment or Orangevale soils, although it may have been truncated or otherwise altered.

The Xerarents are moderately deep to very deep, well drained, and altered. They formed in fill material mixed by grading and excavation activities. The fill material is derived from nearby soils of mixed or granitic origin. The texture, color, and thickness of the layers of these soils vary from one area to another. In a reference pedon, the surface layer is light yellowish brown and pale brown loam about 4 inches thick. The next 25 inches is mixed very pale brown, light yellowish brown, pale brown, yellowish brown, and strong brown loam. The next 11 inches is a buried subsoil of brown loam and clay loam. Below this is an indurated and weakly cemented hardpan about 5 inches thick. Siltstone is at a depth of about 45 inches.

Permeability is moderate to very slow in the Xerarents. Available water capacity is low to high. The effective rooting depth and the depth to consolidated sediments are 20 to 80 inches. The shrink-swell potential is low to high. Runoff is slow or medium. The hazard of water erosion is slight or moderate.

The Fiddyment soil is moderately deep and well drained. It formed in material weathered from consolidated sandstone or siltstone. Typically, the surface layer is brown fine sandy loam about 8 inches thick. The next layer is yellowish brown loam about 7 inches thick. The subsoil is a claypan of brown clay loam about 13 inches thick. The next 12 inches is a light yellowish brown and very pale brown hardpan that is cemented with silica. Siltstone is at a depth of about 40 inches. In some areas the surface layer is loam or sandy loam.

Permeability is very slow in the Fiddyment soil. Water is perched above the claypan for short periods after heavy rainfall in winter and early spring and when the soil is overirrigated. Available water capacity is low. The effective rooting depth is 20 to 40 inches, but roots are restricted to the cracks and faces of peds in the claypan. The depth to a hardpan is 20 to 40 inches. The depth to consolidated sediments is 21 to 40 inches. The shrink-swell potential is moderate in the subsoil. Runoff is slow or medium. The hazard of water erosion is slight or moderate.

This unit is used for urban development. The main limitations are the variety of soil depths and the complex slopes. Shallow excavations, such as trenches and holes, are limited by the depth to consolidated sediments in some areas. Properly grading building sites helps to divert water away from the foundations and helps to prevent ponding in the adjacent areas. Revegetating disturbed areas around construction sites helps to control erosion. Steep slopes that have been cut and filled are susceptible to erosion and should be permanently protected. Some protective measures that can be used alone or in combination are a cover of turf, ground cover plants, jute netting, soil stabilizer substances, and retaining walls.

An adequate drainage system is needed in areas where deep-rooted trees and shrubs are planted. During summer irrigation is needed in areas used for lawns, shrubs, vines, or shade and ornamental trees. Soil depth varies. It should be checked before plants are selected and the amount of irrigation water to be applied and the frequency of irrigation are determined. Establishing plants is difficult in areas where subsoil or substratum material is at the surface. Mulching and applying fertilizer in cut areas help to establish the plants.

No land capability classification is assigned. The MLRA is 17.

230—Valpac loam, partially drained, 0 to 2 percent slopes. This very deep, artificially drained soil is on natural levees on high flood plains. It is protected against flooding by a system of levees and large upstream dams. Levees, open and closed drains, and pumps have lowered the water table and altered the drainage of the soil. The soil formed in somewhat poorly drained alluvium derived from mixed rock sources. Slopes are plane and descend from the levees or channels. The vegetation in uncultivated areas is mainly annual grasses and forbs and hydrophytic plants. Elevation is 5 to 25 feet. The average annual precipitation is 16 to 18 inches.

Typically, the surface layer is grayish brown loam about 10 inches thick. The underlying material to a depth of 61 inches is stratified gray and light yellowish brown silt loam; light gray loam; light brownish gray sandy loam, clay loam, loam, and silt loam; and grayish brown clay loam. In some areas the surface layer is clay loam.

Included in this unit are small areas of Egbert, Laugenour, and Scribner soils. Egbert soils are on high flood plains and in backswamps at the slightly lower elevations. Laugenour soils are on natural levees. Scribner soils are on the edges of backswamps. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the Valpac soil. Available water capacity is very high. The effective rooting depth is limited by a seasonal high water table in winter and early spring. The water table is high because of seepage and generally is maintained between depths of 36 and 60 inches by pumping. It can be at a depth of 20 to 36 inches for short periods.

Runoff is slow. The hazards of water erosion and soil blowing are slight. The soil is subject to rare flooding.

This unit is used for irrigated crops or for irrigated hay and pasture. The commonly grown crops include grapes, pears, corn, tomatoes, and small grain, such as wheat. Alfalfa can be grown in areas where the water table is carefully managed. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is suited to irrigated crops. It is limited mainly by the depth to a seasonal high water table. The water table during the rainy period in winter generally limits the suitability for deep-rooted crops. Pears, however, can tolerate some wetness. Tile drainage can lower the water table if a suitable outlet is available. Tilth and fertility can be improved by returning crop residue to the soil and by growing winter cover crops in orchards and vineyards.

Furrow, border, and sprinkler irrigation systems are suitable. Applications of irrigation water should be adjusted to the available water capacity and water intake rate of the soil and to the needs of the crop.

This unit is suited to irrigated hay and pasture. It is limited mainly by the depth to a seasonal high water table. Irrigation water can be applied by sprinkler or border methods. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and a lower water intake rate. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition.

This unit is in capability units IIw-2, irrigated, and IIIw-2, nonirrigated. The MLRA is 16 or 17.

231—Valpac-Urban land complex, partially drained, 0 to 2 percent slopes. This map unit is on natural levees on high flood plains. It is protected against flooding by a system of levees and large upstream dams. Levees, open and closed drains, and pumps have lowered the water table and altered the drainage of the Valpac soil. Slopes are plane and descend from the levees or channels, or they have been shaped for urban uses. The vegetation is mainly ornamental plants or annual grasses and forbs and hydrophytic plants. Elevation is 10 to 25 feet. The average annual precipitation is 16 to 17 inches. The unit is about 60 percent Valpac soil and 30 percent Urban land.

Included in this unit are small areas of Egbert and Laugenour soils. Egbert soils are on backswamps. Included areas make up about 10 percent of the total acreage.

The Valpac soil is very deep and is artificially drained. It formed in somewhat poorly drained alluvium derived from mixed rock sources. Typically, the surface layer is grayish brown loam about 10 inches thick. The underlying material to a depth of 61 inches is stratified gray silt loam, light gray loam, and light brownish gray sandy loam and clay loam. In some areas the surface layer is clay loam. In other areas it is lighter colored.

Permeability is moderately slow in the Valpac soil. Available water capacity is very high. The effective rooting depth is limited by a seasonal high water table in winter and early spring. The water table is high because of seepage and generally is maintained between depths of 36 and 60 inches by pumping. It can be at a depth of 20 to 36 inches for short periods. Runoff is slow. The hazard of water erosion is slight. The soil is not susceptible to soil blowing. It is subject to rare flooding.

Urban land consists of areas covered by impervious surfaces or structures, such as roads, driveways, sidewalks, buildings, and parking lots. The soil material under the impervious surfaces is similar to that of the Valpac soil, although it may have been truncated or otherwise altered.

This unit is used for urban development. The main limitations affecting urban uses are the moderately slow permeability, the depth to a seasonal high water table, and the flooding. Shallow excavations, such as trenches and holes, are limited by the seasonal high water table. The moderately slow permeability and the high water table increase the possibility that improperly designed septic tank absorption fields will fail. Offsite sewage disposal systems should be considered.

An adequate drainage system is needed in areas where deep-rooted trees and shrubs are planted. During summer irrigation is needed in areas used for lawns, shrubs, vines, or shade and ornamental trees.

No land capability classification is assigned. The MLRA is 17.

232—Valpac Variant sandy loam, partially drained, 0 to 2 percent slopes. This very deep, artificially drained soil is on low flood-plain splays. It is protected against flooding by a system of levees and large upstream dams. Levees, drainage ditches, and pumps have lowered the water table and altered the drainage of the soil. The soil formed in poorly drained alluvium derived from mixed rock sources and underlain by alluvium that has a high content of hydrophytic plant remains. Slopes are complex because of subsidence. The vegetation in uncultivated areas is mainly hydrophytic plants, annual grasses, and forbs. Elevation ranges from 15 feet below sea level to sea level. The average annual precipitation is 13 to 16 inches.

Typically, the surface layer is grayish brown and dark grayish brown sandy loam about 16 inches thick. The next 9 inches is stratified light gray and light brownish gray sand and grayish brown silt loam. Below this to a depth of 60 inches is a buried soil that consists of stratified very dark gray mucky silty clay, black mucky silty clay loam, and black mucky clay. In some areas the surface layer is loam or silt loam.

Included in this unit are small areas of Gazwell, Rindge, Sailboat, and Scribner soils. Gazwell soils are in backswamps. Rindge soils are in undrained marshes. Sailboat soils are on natural levees. Scribner soils are on the edges of backswamps. Included areas make up about 15 percent of the total acreage.

Permeability is moderate in the Valpac Variant soil. Available water capacity is very high. The effective rooting depth is limited by a seasonal high water table that fluctuates throughout the year. The water table is high because of seepage and is controlled by pumping. Depth to the water table ranges from 18 to 36 inches in winter and early spring and from 36 to 60 inches during the rest of the year. The soil is subject to subsidence. When allowed to dry, the buried soil, which is high in organic matter content, shrinks irreversibly. Runoff is slow. The hazard of water erosion is slight. The hazard of soil blowing is moderate. The soil is subject to rare flooding.

Most areas of this unit are used for irrigated crops. The commonly grown crops include corn, wheat, and tomatoes. Nonirrigated safflower is grown in a few areas. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is suited to irrigated crops. It is limited mainly by the depth to a fluctuating water table, the moderate available water capacity, the hazard of soil blowing, and subsidence. Because the soil is subject to differential subsidence, planing of the fields may be necessary to improve the efficiency of irrigation. Soil blowing can be controlled by returning crop residue to the soil and minimizing tillage.

Subirrigation and furrow, border, and sprinkler irrigation systems are suitable. Subirrigation is more common than other irrigation systems. Large ditches that have small spud ditches between them are used to subirrigate and drain the soil. The water table is raised to a depth of 1 foot at planting time. Then, it is slowly lowered during the growing season until it is at a depth of about 5 feet at harvest time. To minimize the subsidence caused by oxidation, the water table should not be lowered below the rooting depth of the crops. To avoid overirrigating and the leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity and water intake rate of the soil and to the needs of the crop.

This unit is in capability unit IIIw-10, irrigated and nonirrigated. The MLRA is 16.

233—Vina fine sandy loam, 0 to 2 percent slopes. This very deep, well drained soil is on narrow, high flood plains. It is protected against flooding by levees. It formed in alluvium derived from mixed rocks containing some granitic material. The native vegetation is mainly annual grasses, forbs, and scattered oaks. Elevation is 90 to 140 feet. The average annual precipitation is 19 to 20 inches.

Typically, the surface layer is brown fine sandy loam about 5 inches thick. The underlying material to a depth of 61 inches is weakly stratified, brown loam and sandy loam. In some areas the surface layer is sandy loam, loam, or silt loam.

Included in this unit are small areas of Columbia and Reiff soils. These soils are on low flood plains. Also included are soils that have a substratum of silt loam and small areas of soils that are occasionally flooded. Included areas make up about 15 percent of the total acreage.

Permeability is moderate in the Vina soil. Available water capacity is high. The effective rooting depth is 60 inches or more. Runoff is slow. The hazard of water erosion is slight. The soil is subject to rare flooding.

Most areas of this unit are used for irrigated crops. A few areas are used for irrigated hay and pasture. The commonly grown crops include hops, walnuts, corn, wheat, and alfalfa. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is suited to irrigated crops. It has few limitations. The existing levees, dikes, and diversions should be periodically checked and a proper maintenance program developed. Excessive cultivation can result in the formation of a tillage pan. This pan can be broken up by subsoiling when the soil is dry. Fertility and tilth can be maintained by returning all crop residue to the soil, including grasses, legumes, or a grass-legume mixture in the cropping sequence, and growing winter cover crops in orchards.

Furrow, border, and sprinkler irrigation systems are suitable. To avoid overirrigating and the leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity and water intake rate of the soil and to the needs of the crop. Pipe, ditch lining, or drop structures in irrigation ditches facilitate irrigation and reduce the hazard of ditch erosion.

This unit is suited to irrigated hay and pasture. It has few limitations. Sprinkler and border irrigation systems are suitable. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition.

This unit is in capability class I, irrigated, and capability unit IIIc-1, nonirrigated. The MLRA is 17.

234—Vina fine sandy loam, 0 to 2 percent slopes, occasionally flooded. This very deep, well drained soil is on narrow, high flood plains. It formed in alluvium derived from mixed rocks containing some granitic material. The native vegetation is mainly annual grasses, forbs, and scattered oaks. Elevation is 85 to 140 feet. The average annual precipitation is 19 to 20 inches.

Typically, the surface layer is brown fine sandy loam about 5 inches thick. The underlying material to a depth of 61 inches is weakly stratified, brown loam and sandy loam. In some areas the surface layer is sandy loam, loam, or silt loam.

Included in this unit are small areas of Coyotecreek, Reiff, and Sailboat soils. Reiff and Sailboat soils are on low flood plains. Also included are areas of soils that are frequently flooded. Included areas make up about 15 percent of the total acreage.

Permeability is moderate in the Vina soil. Available water capacity is high. The effective rooting depth is 60 inches or more. Runoff is slow. The hazard of water erosion is slight. The soil is occasionally flooded for very brief or brief periods during prolonged, high-intensity storms. Channeling and deposition are common along streambanks.

Most areas of this unit are used for irrigated crops, such as corn, wheat, and alfalfa. A few areas are used for irrigated hay and pasture. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is suited to irrigated crops. It is limited mainly by the hazard of flooding during winter and early spring. Crops can be damaged by floodwater. The hazard of flooding can be reduced in some areas by diversions and dikes. Excessive cultivation can result in the formation of a tillage pan. This pan can be broken up by subsoiling when the soil is dry. Returning all crop residue to the soil and including grasses, legumes, or a grass-legume mixture in the cropping sequence help to maintain fertility and tilth.

Furrow, border, and sprinkler irrigation systems are suitable. To avoid overirrigating and the leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity and water intake rate of the soil and to the needs of the crop. Pipe, ditch lining, or drop structures in irrigation ditches facilitate irrigation and reduce the hazard of ditch erosion.

This unit is suited to irrigated hay and pasture. It is limited mainly by the hazard of flooding during winter. Sprinkler and border irrigation systems are suitable. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition.

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

235—Vleck gravelly loam, 2 to 15 percent slopes. This moderately deep, moderately well drained soil is on the foot slopes of hills. It formed in alluvium underlain by material weathered from weakly consolidated rhyolitic tuffaceous sediments. Slopes are concave. Scattered mined areas where a subsoil of clay is at the surface are throughout the unit. They are ½ acre to 3 acres in size. They are areas where the surface layer was removed during gold mining activities. The native vegetation is mainly annual grasses and forbs. Elevation is 120 to 370 feet. The average annual precipitation is 19 to 23 inches.

Typically, the surface layer is gray and light gray gravelly loam about 13 inches thick. The upper 12 inches of the subsoil is a claypan of light brownish gray clay that has light gray bleached coatings. The lower 7 inches is mixed pale yellow and light yellowish brown sandy clay loam. The substratum is a pale yellow hardpan that is strongly cemented with silica. It is about 18 inches thick. Pale yellow, weakly consolidated sediments are at a depth of about 50 inches. In some areas the surface layer is gravelly sandy loam, sandy loam, or loam. In other areas the subsoil is gravelly clay.

Included in this unit are small areas of Amador and Gillender soils on hills. Also included are soils that are 10 to 20 inches deep to a hardpan. Included areas make up about 15 percent of the total acreage.

Permeability is very slow in the Vleck soil. Water is perched above the claypan for short periods after heavy rainfall in winter and early spring. Available water capacity is low. The effective rooting depth is 20 to 40 inches, but roots are restricted to the cracks and faces of peds in the claypan, which is at a depth of 10 to 20 inches. The depth to a hardpan is 20 to 40 inches. The depth to bedrock is 30 to 60 inches. The shrink-swell potential is high. Runoff is slow or medium. The hazard of water erosion is slight or moderate.

This unit is used as rangeland. The production of vegetation suitable for livestock grazing is limited by the low available water capacity and the shallowness to a claypan. The characteristic plant community is mainly soft chess, annual ryegrass, and filaree. Proper grazing management helps to maintain the organic matter content, increases the rate of water infiltration, and improves plant growth early in the season.

This unit is in capability unit IVe-3, nonirrigated. The MLRA is 18.

236—Vleck-Amador-Pits, mine complex, 15 to 50 percent slopes. This map unit is on hills and terrace escarpments. Gullies that are now vegetated and open ditches that are abandoned are common. They are associated with former gold mining activities. The native vegetation is mainly annual grasses and forbs. Elevation is 150 to 380 feet. The average annual precipitation is 19 to 20 inches.

This unit is about 40 percent Vleck soil, 25 percent Amador soil, and 20 percent Pits, mine. The Vleck soil is on the concave upper foot slopes of hills. Slopes in areas of this soil are 15 to 30 percent. The Pits are in scattered areas on the side slopes of hills and on terrace escarpments where slopes are 15 to 50 percent.

Included in this unit are small areas of Corning and Redding soils on high terrace remnants and Xerorthents near mined areas. Also included are soils that have slopes of 8 to 15 percent and are on the lower foot slopes and very deep soils that are on high terrace remnants and have a subsoil of strong brown or reddish yellow very gravelly sandy clay loam or gravelly loam. Included areas make up about 15 percent of the total acreage.

The Vleck soil is moderately deep and moderately well drained. It formed in alluvium underlain by material weathered from weakly consolidated rhyolitic tuffaceous sediments. Typically, the surface layer is gray and light gray loam about 13 inches thick. The upper part of the subsoil is a claypan of light brownish gray clay about 12 inches thick. The lower part is mixed pale yellow and light yellowish brown sandy clay loam about 7 inches thick. The substratum is a pale yellow hardpan that is strongly cemented with silica. It is about 18 inches thick. Pale yellow, weakly consolidated sediments are at a depth of about 50 inches. In some areas the surface layer is gravelly loam or sandy loam.

Permeability is very slow in the Vleck soil. Water is perched above the claypan for short periods after heavy rainfall in winter and early spring. Available water capacity is low. The effective rooting depth is 20 to 40 inches, but roots are restricted to the cracks and faces of peds in the claypan, which is at a depth of 10 to 20 inches. The depth to a hardpan is 20 to 40 inches. The depth to bedrock is 30 to 60 inches. The shrink-swell potential is high. Runoff is rapid. The hazard of water erosion is moderate or severe.

The Amador soil is shallow and well drained. It formed in material weathered dominantly from weakly consolidated rhyolitic tuffaceous sediments. Typically, the surface layer is light gray sandy loam about 6 inches thick. The subsoil is light gray sandy loam about 13 inches thick. White, weakly consolidated tuffaceous sediments are at a depth of about 19 inches. In some areas the surface layer is loam or gravelly loam. On east-facing slopes it is darker.

Permeability is moderate in the Amador soil. Available water capacity is low. The effective rooting depth and the depth to weakly consolidated sediments are 10 to 20 inches. Runoff is rapid. The hazard of water erosion is severe.

The Pits consist of areas where placer mining for gold has exposed the underlying consolidated sediments. Shallow excavations were made during early mining activities in areas where water carried by ditches was used to wash gravelly soil material downslope. The vegetation is very sparse in these areas.

The Pits are highly disturbed and vary in natural drainage, permeability, and available water capacity. Runoff is rapid. The hazard of water erosion is severe. Fertility is very low.

This unit is used as rangeland. The main management concerns are the hazard of erosion, the limited available water capacity, and the depth to a restrictive layer. Also, the Amador soil is limited by the slope. The characteristic plant community is mainly soft chess, annual ryegrass, and filaree on the Vleck soil and soft chess, ripgut brome, and foxtail fescue on the Amador soil. The vegetation on the Pits is very sparse and is of little value to livestock. The slope limits access by livestock and results in overgrazing of the less sloping areas. Proper grazing management helps to maintain the organic matter content, increases the rate of water infiltration, improves plant growth early in the season, and helps to control erosion. Springs and seeps are common in areas of this unit. They can be developed as watering facilities for wildlife and as a way to achieve better distribution of livestock.

This unit is in capability subclass VIIe, nonirrigated. The MLRA is 18.

237—Whiterock loam, 3 to 30 percent slopes. This very shallow and shallow, somewhat excessively drained soil is on foothills. It formed in material weathered from vertically tilted metasedimentary rocks. Slopes are complex. The native vegetation is mainly oaks, annual grasses, and forbs. Many areas have been cleared. Elevation is 160 to 530 feet. The average annual precipitation is 20 to 24 inches.

Typically, the surface layer is pale brown and very pale brown loam about 8 inches thick. It is underlain by highly fractured and nearly vertically tilted metasedimentary rocks. In some areas the surface layer is silt loam, gravelly silt loam, or gravelly loam.

Included in this unit are small areas of Argonaut and Auburn soils and Rock outcrop. Also included, on concave foot slopes or along drainageways, are soils that are 14 to 24 inches deep over bedrock and have a subsoil of silty clay loam. Included areas make up about 15 percent of the total acreage.

Permeability is moderate in the Whiterock soil. Available water capacity is very low. The effective rooting depth and the depth to bedrock are 4 to 14 inches. Runoff is medium or rapid. The hazard of water erosion is slight or moderate.

This unit is used mainly as rangeland. It can be used for firewood production.

Where this unit is used as rangeland, the main management concerns are the limited available water capacity, the depth to bedrock, the hazard of erosion, and a moderate or dense canopy of oak in many areas. The characteristic understory plant community is mainly soft chess, foxtail fescue, and ripgut brome. The overstory vegetation consists of blue oak. In areas that have been cleared of blue oak, the vegetation is mainly soft chess, foxtail fescue, and filaree. Production may be 2,500, 1,500, and 800 pounds per acre in favorable, normal, and unfavorable years, respectively. If trees are managed so that open areas are established, this unit can produce a good stand of forage plants. Some trees, however, should be maintained to preserve the wildlife habitat and the esthetic value. Proper grazing management helps to maintain the organic matter content, increases the rate of water infiltration, improves plant growth early in the season, and helps to control erosion.

Where firewood is harvested on this unit, the main management concern is the moderate hazard of erosion. The proper design, location, and maintenance of access roads help to control erosion. Vehicular traffic can damage the soil during wet periods. Blue oak is the major tree species on this unit. Volumes of 32 cords of blue oak per acre have been measured on this soil. Some stump sprouting can occur.

This unit is in capability subclass VIIs, nonirrigated. The MLRA is 18.

238—Xerarents-San Joaquin complex, 0 to 1 percent slopes. This map unit is on low terraces. Slopes are plane because of leveling. The vegetation in uncultivated areas is mainly annual grasses and forbs. Elevation is 10 to 110 feet. The average annual precipitation is 15 to 18 inches.

This unit is about 65 percent Xerarents and 20 percent San Joaquin soil. The Xerarents are in areas that were filled when the land was leveled. The San Joaquin soil is in relatively undisturbed areas.

Included in this unit are small areas of Clear Lake and Columbia soils; Durixeralfs; Red Bluff, Redding, and Sailboat soils; and Urban land. Clear Lake soils are in basins. Columbia and Sailboat soils are on low flood plains. Durixeralfs and Red Bluff and Redding soils are on dissected high terraces. Also included are small areas of soils that are subject to rare flooding. Included areas make up about 15 percent of the total acreage.

The Xerarents are moderately deep to very deep, well drained, and altered. They are in filled areas on low terraces. Prior to leveling, areas of these soils consisted of depressions and narrow channels along drainageways. The soils formed in fill material mixed by leveling activities. The fill material is derived from nearby soils of mixed but dominantly granitic origin. The texture, color, and thickness of the layers of these soils vary from one area to another. In a reference pedon, the surface layer is about 16 inches of pale brown, yellowish brown, light gray, white, and brown sandy loam and sandy clay loam fill that has remnant subsoil fragments of clay loam or clay. The subsurface layer is about 14 inches of pale brown and brown loamy sand and sandy loam fill that has remnant subsoil fragments of clay loam or clay. Below this is a buried surface layer of grayish brown loam about 5 inches thick. The underlying material to a depth of 60 inches is brown loam and a light yellowish brown, weakly cemented hardpan.

Permeability is moderate to very slow in the Xerarents. Available water capacity is moderate or high. The effective rooting depth is 32 to more than 60 inches. The shrink-swell potential is low to high. Runoff is very slow. Water erosion is a slight hazard or is not a hazard at all.

The San Joaquin soil is moderately deep and moderately well drained. Typically, the surface layer is yellowish brown and brown fine sandy loam about 13 inches thick. The upper part of the subsoil is brown and strong brown sandy loam about 17 inches thick. The lower part is a claypan of yellowish brown and brown clay about 5 inches thick. The upper part of the substratum is a brown, pinkish gray, and yellowish brown, indurated hardpan about 25 inches thick. The lower part to a depth of 67 inches is light yellowish brown loamy coarse sand. In some areas the surface layer is sandy loam.

Permeability is very slow in the San Joaquin soil.

Water is perched above the claypan for short periods after heavy rainfall in winter and early spring and when the soil is overirrigated. Available water capacity is low. The effective rooting depth is 23 to 40 inches, but roots are restricted to the cracks and faces of peds in the claypan, which is at a depth of 20 to 36 inches. The depth to a hardpan is 23 to 40 inches. The shrink-swell potential is high. Runoff is very slow or slow. The hazard of water erosion is slight.

This unit is used mainly for irrigated hay and pasture. Some areas are used for irrigated crops. The commonly grown crops include corn, wheat, grapes, rice, and milo. Alfalfa is grown in a few areas. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is suited to irrigated hay and pasture. In some areas the available water capacity, the depth to a hardpan, and the restricted permeability are limitations. Subsoiling improves the downward movement of water and the penetration of roots in the slowly permeable and very slowly permeable layers. Sprinkler and border irrigation systems are suitable. An efficient water application system is needed to prevent the development of a perched water table in areas where permeability is restricted.

Grazing when the soils are wet results in compaction of the surface layer, poor tilth, and a lower water intake rate. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition.

This unit is suited to irrigated crops. In some areas the available water capacity, the depth to a hardpan, and the restricted permeability are limitations. Returning all crop residue to the soil and including grasses, legumes, or a grass-legume mixture in the cropping sequence help to maintain fertility and tilth. Furrow, border, and sprinkler irrigation systems are suitable.

This unit is in capability unit IIIs-3, irrigated and nonirrigated. The MLRA is 17.

239—Xerarents-Redding complex, 0 to 2 percent slopes. This map unit is on high terraces. Slopes are plane because of land leveling. The vegetation in uncultivated areas is mainly annual grasses and forbs. Elevation is 80 to 280 feet. The average annual precipitation is 16 to 20 inches.

This unit is about 45 percent Xerarents and 40 percent Redding soil. The Xerarents are in areas that were filled when the land was leveled. The Redding soil is in areas that have been left relatively undisturbed.

Included in this unit are small areas of Corning soils. Also included, in areas that were cut during leveling, are soils that are less than 20 inches deep to a hardpan. Included areas make up about 15 percent of the total acreage.

The Xerarents are moderately deep to very deep, well drained, and altered. They formed in fill material mixed by leveling activities. The fill material is derived from nearby soils of mixed origin. Prior to leveling, areas of these soils consisted of depressions. The texture, color, and thickness of the layers of these soils vary from one area to another. In a reference pedon, the surface layer is strong brown, yellowish red, and brown gravelly loam fill about 12 inches thick. The next 10 inches is strong brown and reddish brown loam and sandy clay loam fill. The next 7 inches is a buried surface layer of strong brown loam. The upper 10 inches of the subsoil is yellowish red loam and clay loam. The lower 6 inches is a claypan of reddish brown and yellowish red clay. Below this to a depth of 60 inches is a hardpan that is strongly cemented or weakly cemented with silica.

Permeability is moderate to very slow in the Xerarents. Available water capacity is moderate or high. The effective rooting depth and the depth to a hardpan are 32 to more than 60 inches. Runoff is very slow. The hazard of water erosion is slight.

The Redding soil is moderately deep and moderately well drained. It formed in gravelly and cobbly alluvium derived from mixed rock sources. Typically, the surface layer is strong brown loam about 7 inches thick. The upper 13 inches of the subsoil is yellowish red loam and clay loam. The lower 8 inches is a claypan of reddish brown and yellowish red clay. Below this to a depth of 66 inches is a hardpan that is strongly cemented with silica. In some areas the surface layer is gravelly loam. In other areas the subsoil is very gravelly clay.

Permeability is very slow in the Redding soil. Water is perched above the claypan for short periods after heavy rainfall in winter and early spring. Available water capacity is low. The effective rooting depth is 23 to 40 inches, but roots are restricted to the cracks and faces of peds in the claypan, which is at a depth of 20 to 35 inches. The depth to a hardpan ranges from 23 to 40 inches. The shrink-swell potential is high. Runoff is slow. The hazard of water erosion is slight.

This unit is used mainly for irrigated hay and pasture. It may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is suited to irrigated hay and pasture. The main limitations in areas of the Redding soil are the depth to a claypan, the depth to a hardpan, the very slow permeability, and the low available water capacity. The Xerarents are limited by the very slow or slow permeability and by low fertility in the fill material.

Subsoiling improves the downward movement of water and the penetration of roots in the slowly permeable and very slowly permeable subsoil. Sprinkler and border irrigation systems are suitable. An efficient water application system is needed to prevent the development of a perched water table.

The grasses and legumes selected for planting should be those that are suited to a moderately deep soil. Grazing when the soils are wet results in compaction of the surface layer, poor tilth, and a lower water intake rate. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition.

This unit is in capability unit IIIs-3, irrigated and nonirrigated. The MLRA is 17.

240—Xerarents-Urban land-San Joaquin complex, 0 to 5 percent slopes. This map unit is in filled areas on low terraces. Slopes have been shaped for urban uses. The vegetation is mainly ornamental plants or annual grasses and forbs. Elevation is 10 to 370 feet. The average annual precipitation is 15 to 23 inches. The unit is about 45 percent Xerarents, 25 percent Urban land, and 15 percent San Joaquin soil.

Included in this unit are small areas of Clear Lake soils, Durixeralfs, and Galt, Red Bluff, and Redding soils. Clear Lake soils are in basins. Durixeralfs and Galt soils are on low terraces. Red Bluff and Redding soils are on dissected high terraces. Included areas make up about 15 percent of the total acreage.

The Xerarents are moderately deep to very deep, well drained, and altered. They formed in fill material mixed during grading and excavation activities. The fill material is derived from nearby soils of mixed but dominantly granitic origin. The texture, color, and thickness of the layers of these soils vary from one area to another. In a reference pedon, the surface layer is about 16 inches of pale brown, yellowish brown, light gray, white, and brown sandy loam and sandy clay loam fill that has remnant subsoil fragments of clay loam or clay. The subsurface layer is about 14 inches of pale brown and brown loamy sand and sandy loam fill that has remnant subsoil fragments of clay loam or clay. Below this is a buried surface layer of grayish brown loam about 5 inches thick. The underlying material to a depth of 60 inches is brown loam and a light yellowish brown, weakly cemented hardpan.

Permeability is moderate to very slow in the Xerarents. Available water capacity is moderate or high. The effective rooting depth is 32 to more than 60 inches. The shrink-swell potential is low to high. Runoff is very slow or slow. The hazard of water erosion is slight.

Urban land consists of areas covered by impervious surfaces or structures, such as roads, driveways, sidewalks, buildings, and parking lots. The soil material under the impervious surfaces is similar to that of many soils, including San Joaquin, Madera, Hedge, Galt, Clear Lake, Red Bluff, and Redding soils, although it may have been truncated or otherwise altered.

The San Joaquin soil is moderately deep and moderately well drained. Typically, the surface layer is yellowish brown and brown fine sandy loam about 13 inches thick. The upper part of the subsoil is brown and strong brown sandy loam about 17 inches thick. The lower part is a claypan of yellowish brown and brown clay about 5 inches thick. The upper part of the substratum is a brown, pinkish gray, and yellowish brown, indurated hardpan about 25 inches thick. The lower part to a depth of 67 inches is light yellowish brown loamy coarse sand. In some areas the surface layer is sandy loam.

Permeability is very slow in the San Joaquin soil. Water is perched above the claypan for short periods after heavy rainfall in winter and early spring and when the soil is overirrigated. Available water capacity is low. The effective rooting depth is 23 to 40 inches, but roots are restricted to the cracks and faces of peds in the claypan, which is at a depth of 20 to 36 inches. The depth to a hardpan is 23 to 40 inches. The shrink-swell potential is high. Runoff is very slow or slow. The hazard of water erosion is slight.

This unit is used for urban development. The main limitation affecting urban uses is the variety of soil depths. Shallow excavations, such as trenches and holes, are limited by the moderate depth to a hardpan in some areas. A plant cover can be established and maintained by applying fertilizer and by seeding, mulching, and shaping the slopes. The soil depth should be checked before plants are selected and the amount of irrigation water to be applied and the frequency of irrigation are determined. Establishing plants is difficult in areas where subsoil or substratum material is at the surface. Mulching and applying fertilizer help to establish the plants.

No land capability classification is assigned. The MLRA is 17.

241—Xerarents-Urban land-Fiddyment complex, 8 to 15 percent slopes. This map unit is in filled areas on hills. Slopes have been shaped for urban uses. The vegetation is mainly ornamental plants and scattered oaks or annual grasses and forbs. Elevation is 100 to 260 feet. The average annual precipitation is 20 to 23 inches. The unit is about 50 percent Xerarents, 20 percent Urban land, and 15 percent Fiddyment soil.

Included in this unit are small areas of Kaseberg and Orangevale soils and areas that have slopes of 0 to 8 percent or 15 to 25 percent. Also included are altered soils that are less than 20 inches or more than 80 inches deep to consolidated sediments. Included areas make up about 15 percent of the total acreage.

The Xerarents are moderately deep to very deep, well drained, and altered. They formed in fill material mixed by grading and excavation activities. The fill material is derived from nearby soils of mixed and granitic origin. The texture, color, and thickness of the layers of these soils vary from one area to another. In a reference pedon, the surface layer is light yellowish brown and pale brown loam about 4 inches thick. The next 25 inches of fill material is mixed very pale brown, light yellowish brown, pale brown, and strong brown loam. The next 11 inches is a buried subsoil of brown loam and clay loam. Below this is an indurated and weakly cemented hardpan about 4 inches thick. Siltstone is at a depth of about 44 inches.

Permeability is moderate to very slow in the Xerarents. Available water capacity is low to high. The effective rooting depth and the depth to consolidated sediments are 20 to 80 inches. The shrink-swell potential is low to high. Runoff is medium. The hazard of water erosion is moderate.

Urban land consists of areas covered by impervious surfaces or structures, such as roads, driveways, sidewalks, buildings, and parking lots. The soil material under the impervious surfaces is similar to that of the Xerarents or of Fiddyment or Orangevale soils, although it may have been truncated or otherwise altered.

The Fiddyment soil is moderately deep and well drained. It formed in material weathered from consolidated sandstone or siltstone. Typically, the surface layer is light yellowish brown and pinkish gray fine sandy loam about 14 inches thick. The subsoil is a claypan of pale brown and brown clay loam and clay. It is about 14 inches thick. The next layer is a light yellowish brown, indurated, silica-cemented hardpan about 6 inches thick. Siltstone is at a depth of about 34 inches. In some areas the surface layer is sandy loam or gravelly sandy loam.

Permeability is very slow in the Fiddyment soil. Water is perched above the claypan for short periods after heavy rainfall in winter and early spring. Available water capacity is very low or low. The effective rooting depth is 20 to 30 inches, but roots are restricted to the cracks and faces of peds in the claypan. The depth to a hardpan is 20 to 40 inches. The depth to consolidated sediments is 21 to 40 inches. The shrink-swell potential is high. Runoff is slow or medium. The hazard of water erosion is slight or moderate.

This unit is used for urban development. The main limitations affecting urban uses are the moderate hazard of erosion, the variety of soil depths, and the slope. Shallow excavations, such as trenches and holes, are limited by the moderate depth to consolidated sediments in some areas. Revegetating disturbed areas around construction sites helps to control erosion. Steep slopes that have been cut and filled are susceptible to erosion and should be permanently protected. Some protective measures that can be used alone or in combination are a cover of turf, ground cover plants, jute netting, soil stabilizer substances, and retaining walls.

During summer irrigation is needed in areas used for lawns, shrubs, vines, or shade and ornamental trees. Soil depth varies. It should be checked before plants are selected and the amount of irrigation water to be applied and the frequency of irrigation are determined. Establishing plants is difficult in areas where subsoil or substratum material is at the surface. Mulching and applying fertilizer in cut areas help to establish the plants.

No land capability classification is assigned. The MLRA is 17.

242—Xerofluvents, 0 to 2 percent slopes, flooded. These very deep, excessively drained to well drained soils are on low flood plains and the dissected remnants of high flood plains. They commonly are along the American River but in a few areas are along the Cosumnes River. They formed in alluvium derived from mixed rock sources. This unit is channeled by small drainageways that are flooded during periods of high waterflow in the adjacent rivers. Slopes are complex. Areas along the channels have concave side slopes of 2 to 25 percent. Slopes on the higher bars are smooth or hummocky. The native vegetation is mainly oaks, hardwoods, annual grasses, and forbs. Riparian vegetation grows along the drainageways. Elevation is 20 to 140 feet. The average annual precipitation is 18 to 23 inches.

The texture, color, and thickness of the layers of these soils vary from one area to another. In a reference pedon, the surface layer is pale brown sand about 4 inches thick. The underlying material to a depth of 60 inches is stratified pale brown, light gray, light brownish gray, and light yellowish brown sand to fine sandy loam.

Included in this unit are small areas of Riverwash, Rossmoor soils, and Xerorthents. Rossmoor soils are on high flood plains. Xerorthents are in areas of dredge tailings. Included areas make up about 10 percent of the total acreage.

Permeability is very rapid to moderately rapid in the Xerofluvents. Available water capacity is very low or low. The effective rooting depth is 60 inches or more. Runoff is very slow or slow. The hazard of water erosion is slight or moderate. The soils in the channeled areas are occasionally flooded or frequently flooded for brief or long periods in winter and spring. Those on the higher bars are rarely flooded or occasionally flooded for very brief or brief periods. Channeling and deposition are common.

This unit is used for recreational development or for wildlife habitat. The main types of wildlife are red hawks, gray fox, deer, and raccoon. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

If this unit is used for recreational development, the main hazards are flooding and erosion. Recreational facilities should be designed so that they can withstand flooding unless protection from flooding is provided. The higher bars in the unit are less frequently flooded than the channeled areas and thus are better suited to recreational development. Erosion is a hazard in the steeper areas. Revegetating disturbed areas around construction sites helps to control erosion.

This unit is suited to wetland wildlife habitat. It has few limitations. It has riparian woodland corridors and associated flood plains. Because of an already well established habitat diversity, the best management measures are those that maintain the existing habitat.

This unit is in capability subclass VIw, nonirrigated. The MLRA is 17.

243—Xerolls, 30 to 70 percent slopes. These shallow to very deep, somewhat excessively drained and well drained soils are on terrace escarpments and steep hillslopes along drainageways near the American River. They formed in colluvium derived from mixed granitic or metabasic rocks. Slopes are convex to concave. The native vegetation is mainly oaks, annual grasses, and forbs. Elevation is 60 to 350 feet. The average annual precipitation is 19 to 24 inches.

The texture, color, and thickness of the layers of these soils vary from one area to another. In a reference pedon, the surface layer is about 10 inches of brown loam and very gravelly loam. The upper part of the subsoil is dark yellowish brown gravelly clay loam about 9 inches thick. The lower part is brown and strong brown very gravelly clay loam and very gravelly sandy clay loam. It is about 25 inches thick. The underlying material to a depth of 60 inches is strong brown very gravelly sandy clay loam. The depth to sandstone, siltstone, or granitic or metabasic rocks ranges from 10 to more than 80 inches.

Included in this unit are small areas of Andregg, Auburn, Fiddyment, Kaseberg, and Red Bluff soils on the upper end of escarpments or hillslopes. Also included are areas that have slopes of 15 to 30 percent. Included areas make up about 10 percent of the total acreage.

Permeability is moderately rapid to moderately slow in the Xerolls. Available water capacity is very low to high. The effective rooting depth ranges from 10 to more than 80 inches. Runoff is rapid or very rapid. The hazard of water erosion is severe.

This unit is used for recreational development or for wildlife habitat. The main limitations affecting recreational development are the slope and the hazard of water erosion. The slope limits the use of these soils mainly to a few paths and trails, which should extend across the slope. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining an adequate plant cover.

This unit is suited to wildlife habitat. It is limited mainly by the very low or low available water capacity, which limits the growth and diversity of trees and shrubs. Areas of this unit are significant as wildlife habitat because they are adjacent to the riparian habitat along the American River. The best management measures are those that maintain the existing habitat.

This unit is in capability subclass VIIe, nonirrigated. The MLRA is 17.

244—Xeropsamments, 1 to 15 percent slopes. These very deep, moderately well drained to excessively drained soils are in areas of dredge piles that have been deposited on flood plains and natural levees. They formed in recently dredged material removed from the bottom of channels. The native vegetation is mainly a sparse cover of annual grasses and forbs and scattered shrubs and trees. Elevation is sea level to 40 feet above sea level. The average annual precipitation is 13 to 16 inches.

The texture, color, and thickness of the layers of these soils vary from one area to another. In a reference pedon, the surface layer is dark yellowish brown and yellowish brown sand about 10 inches thick. The upper part of the underlying material is light yellowish brown sand about 59 inches thick. The lower part to a depth of 64 inches is light yellowish brown silt loam. In some areas the surface layer is fine sandy loam or loamy sand.

Included in this unit are small areas of Fluvaquents and Gazwell and Sailboat soils. Fluvaquents are on low flood plains and in tidal marshes. Gazwell soils are in backswamps. Sailboat soils are on natural levees. Also included are soils that have a water table at a depth of 18 to 60 inches. Included areas make up about 15 percent of the total acreage.

Permeability is rapid in the Xeropsamments. Available water capacity is low. The effective rooting depth is 60 inches or more. Runoff is slow. The hazards of water erosion and soil blowing are severe. The soils are subject to rare flooding or are not flooded.

This unit is used for recreational development, wildlife habitat, or sand quarries. If leveled, some areas can be used for irrigated crops. The unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is suited to recreational development. The main limitations are the coarse texture of the surface layer, the low available water capacity, the hazard of erosion, the slope, and sloughing. Cutbanks are not stable and are subject to sloughing. A plant cover is needed to control erosion. Applying fertilizer and seeding, mulching, and shaping the slopes help to establish and maintain the plant cover. Drought-tolerant species should be selected for planting. Septic tank absorption fields can function well, but unfiltered effluent can seep into the water table because of the rapid permeability. Because the soils are droughty, irrigation is needed in areas used for lawns, shrubs, vines, or shade and ornamental trees.

This unit is poorly suited to wildlife habitat. It is limited mainly by the low available water capacity, which limits the growth and diversity of trees and shrubs. The best management measures are those that maintain the existing habitat.

This unit is in capability unit IVs-4, irrigated, and in capability subclass VIe, nonirrigated. The MLRA is 16.

245—Xerorthents, dredge tailings, 2 to 50 percent slopes. These very deep, somewhat excessively drained and excessively drained soils are in areas of dredge tailings (fig. 9). They formed in material that has a high content of gravel and cobbles derived from mixed rock sources. The material was deposited as tailings after most of the fine-earth material was washed from it and removed during gold dredging activities. Slopes are short, complex, and disturbed. The vegetation is mainly sparse stands of annual grasses and forbs and scattered hardwoods. Many of the youngest deposits are bare. Elevation is 80 to 400 feet. The average annual precipitation is 18 to 24 inches.

The texture, color, and thickness of the layers of these soils vary from one area to another. In a reference pedon, the surface layer is light yellowish brown extremely cobbly fine sandy loam about 12 inches thick. The next 9 inches is a poorly sorted zone of well rounded stones, cobbles, and gravel. The underlying material to a depth of 63 inches is pale brown extremely cobbly and very cobbly fine sandy loam.

Included in this unit are small areas of Natomas, Red Bluff, Redding, and Rossmoor soils and Riverwash, Slickens, and Xerofluvents. Included areas make up about 10 percent of the total acreage.

Permeability is moderately rapid to very rapid in the Xerorthents. Available water capacity is very low or low. The effective rooting depth is 60 inches or more. Runoff is very slow or slow. Water erosion is a slight hazard or is not a hazard at all.

This unit is used mainly for wildlife habitat. Some areas are used for recreational purposes. If leveled, the unit can be used for urban development. It may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion.

This unit is poorly suited to wildlife habitat. It is limited by the very low or low available water capacity and the high content of gravel and cobbles, which limit the growth of trees and shrubs. The best management measures are those that maintain the existing habitat.

This unit is in capability subclass VIIIs, nonirrigated. The MLRA is 17.

246—Xerorthents, dredge tailings-Urban land complex, 0 to 2 percent slopes. This map unit is in areas of leveled dredge tailings. Slopes have been shaped for urban uses. The vegetation is mainly ornamental plants or annual grasses and forbs. Elevation is 90 to 200 feet. The average annual precipitation is 18 to 24 inches. The unit is about 45 percent Xerorthents and 40 percent Urban land.

Included in this unit are small areas of Americanos and Natomas soils and Slickens. Americanos soils are on low stream terraces. Natomas soils are on low terraces. Included areas make up about 15 percent of the total acreage.

The Xerorthents are very deep and are somewhat excessively drained and excessively drained. They formed in material that has a high content of gravel and cobbles derived from mixed rock sources. The material was deposited as tailings after most of the fine-earth material was washed from it and removed during gold dredging activities. The texture, color, and thickness of the layers of these soils vary from one area to another. In a reference pedon, the surface layer is light yellowish brown extremely cobbly fine sandy loam about 12 inches thick. The next 9 inches is a poorly sorted zone of well rounded stones, cobbles, and gravel. The underlying material to a depth of 63 inches is pale brown extremely cobbly and very cobbly fine sandy loam.

Permeability is moderately rapid to very rapid in the Xerorthents. Available water capacity is very low or low. The effective rooting depth is 60 inches or more. Runoff is very slow. The hazard of water erosion is slight.

Urban land consists of areas covered by impervious

Figure 9.—An area of Xerorthents, dredge tailings, 2 to 50 percent slopes, where tailings were deposited in rows during gold dredging.

surfaces or structures, such as roads, driveways, sidewalks, buildings, and parking lots. The soil material under the impervious surfaces is similar to that of the Xerorthents.

This unit is used for urban development. The main limitations affecting urban uses are the moderately rapid to very rapid permeability, the very low or low available water capacity, and the high content of gravel and cobbles. Shallow excavations, such as trenches and holes, are limited by the content of gravel and cobbles. Cutbanks are not stable and are subject to sloughing. Removal of the gravel and cobbles is needed for the best results when the site is landscaped, particularly in areas used for lawns. Topsoil also may be needed. During summer irrigation is needed in areas used for lawns, shrubs, vines, or shade and ornamental trees.

No land capability classification is assigned. The MLRA is 17.

Prime Farmland

Prime farmland is of major importance in meeting the Nation's short- and long-range needs for food and fiber. The acreage of high-quality farmland is limited, and the U.S. Department of Agriculture recognizes that government at local, state, and federal levels, as well as individuals, must encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland soils, as defined by the U.S. Department of Agriculture, are soils that are best suited to food, seed, forage, fiber, and oilseed crops (fig. 10). Such soils have properties that favor the economic production of sustained high yields of crops. The soils need only to be treated and managed by acceptable farming methods. An adequate moisture supply and a sufficiently long growing season are required. Prime farmland soils produce the highest yields with minimal expenditure of energy and economic resources, and farming these soils results in the least damage to the environment.

Prime farmland soils either are used for food or fiber or are available for these uses. Urban or built-up land and water areas cannot be considered prime farmland.

Prime farmland soils commonly receive an adequate and dependable supply of moisture from precipitation or

Figure 10.—A cultivated area of Sailboat silt loam, partially drained, 0 to 2 percent slopes, along the Sacramento River in the American Basin. Where irrigated, this soil meets the requirements for prime farmland.

irrigation. The temperature and growing season are favorable, and the level of acidity or alkalinity is acceptable. The soils have few, if any, rocks and are permeable to water and air. They are not excessively erodible or saturated with water for long periods and are not frequently flooded during the growing season. The slope ranges from 0 to 5 percent.

Some soils that have a high water table, soils that are frequently flooded during the growing season, and soils that are droughty may qualify as prime farmland soils if the limitations are overcome by a drainage or irrigation system or by flood control. Onsite evaluation is necessary to determine the effectiveness of corrective measures. More information about the criteria for prime farmland can be obtained at the local office of the Soil Conservation Service.

A recent trend in land use has been the conversion of prime farmland to urban and industrial uses. The loss of prime farmland to other uses puts pressure on lands that are less productive than prime farmland.

About 162,000 acres in the county, or nearly 25 percent of the total acreage, would meet the requirements for prime farmland if an adequate and dependable supply of irrigation water were available and, in a few areas, if a drainage system or protection from flooding also were provided.

Table 6 lists those map units that meet the soil requirements for prime farmland where irrigation water is available. On some soils included in the list, additional measures are needed to overcome flooding or wetness. The need for these measures is indicated in parentheses after the map unit name. Onsite evaluation is needed to determine whether these limitations have been overcome by corrective measures. The location of each map unit is shown on the detailed soil maps at the back of this publication. Soil qualities that affect use and management are described in the section "Detailed Soil Map Units." This list does not constitute a recommendation for a particular land use.

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, a hardpan, or wetness can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and Pasture

This section was prepared by David Simpson, district conservationist, and John Weatherford, area agronomist, Soil Conservation Service.

General management needed for crops and for hay and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service and the Storie index used by the University of California Agricultural Experiment Station are explained; and the estimated yields of some of the main crops and hay and pasture plants are listed for the soils that are used as cropland or pasture.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed Soil Map Units." Specific information about soils and technical assistance in applying management practices to the soils on a particular farm can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

Concerns in Managing Cropland and Pasture

The major concerns in managing the soils in this survey area for irrigated and nonirrigated crops or pasture are maintaining or improving production and minimizing erosion. The management needed includes, but is not limited to, chiseling and subsoiling, a conservation cropping system, conservation tillage, cover crops, crop residue management, hayland management, land leveling in irrigated areas, irrigation water management, pasture management, removal of subsurface water, control of surface water, and reduction in the content of toxic salts.

Chiseling and subsoiling increase the effective rooting depth in soils that have a plowpan, claypan, or hardpan. Chiseling the plowpan and subsoiling the claypan or hardpan improve permeability and internal drainage, help to prevent the formation of a perched water table, and allow for deeper root penetration. Chiseling is temporarily beneficial on soils that have a surface layer of clay, such as Clear Lake, Galt, and Jacktone soils, but these soils may rapidly return to their original condition. Subsoiling is based on the depth to and thickness and hardness of the claypan or hardpan. It is not suitable on soils used for rice crops.

A conservation cropping system is a system in which the crop rotation and the cultural and management practices more than offset the effects of soil-depleting crops and the deterioration of cropland or pasture resulting from poor cultivating and harvesting practices. Conservation cropping systems are recommended on all tilled soils in the survey area. Practices in a conservation cropping system on irrigated cropland include rotating various row and field crops and returning crop residue to the soil. They may include cover crops of grasses and legumes, applications of fertilizer, and control of weeds and pests. Examples of suitable crop rotations are a rotation of corn and small grain and a rotation of small grain and tomatoes.

In areas where nonirrigated small grain is grown, a summer fallow system is used. Where this system is applied, weeds are controlled by tillage every other summer and moisture is stored in the soil when the field is fallowed. This system permits normal planting in tilled areas and controls the diseases resulting from continuous cropping. Because of advances in no-till grain drills, herbicides, and disease-resistant wheat varieties, it may be possible to produce a crop every year. In this survey area a typical cropping sequence is one in which small grain is planted in the fall and harvested in early summer. The stubble remains standing until the spring of the second year, when it can be incorporated into the soil. During the second summer, the field is left fallow and weeds are controlled by cultivation. Keeping as much crop residue as possible on the surface during the rainy season reduces the hazard of erosion on sloping soils. The use of subsurface tillage implements, such as chisels, blade-type sweeps, and rod weeders, is recommended on soils that do not have a high content of gravel near the surface.

Conservation tillage keeps to a minimum the number of operations necessary to prepare a seedbed, plant the crop, and control weeds and leaves crop residue on at least 30 percent of the surface. Excessive tillage tends to break down soil structure, causes compaction, reduces the content of organic matter, and could result in the formation of a plowpan below the tilled layer. These conditions increase the hazard of erosion, decrease the rate of water infiltration, and restrict root penetration. Varying the depth of tillage helps to prevent the formation of a plowpan. Combining tillage operations so that the number of trips over the field is reduced and delaying tillage when the soils are wet help to maintain tilth, prevent compaction, and conserve energy.

Cover crops are needed in orchards and vineyards and on soils that are left fallow during the rainy season. Cover crops help to maintain or increase the rate of water infiltration. Maintaining or increasing the infiltration rate permits winter access for cultural operations. During the spring, prior to end of the frost season, mowing the cover crop at a height of 2 to 4 inches reduces the likelihood that frost will damage the crop. The cover crop should then be allowed to produce seed.

Crop residue management returns crop residue to the soil. This measure helps to maintain soil tilth, the content of organic matter, and fertility and helps to control erosion. Crop residue should be left on or near the surface of sloping soils and windblown soils during critical erosion periods.

The content of organic matter influences the development and stabilization of soil structure and increases the rate of water infiltration and the available water capacity. The supply of organic matter should be periodically replenished. Returning crop residue to the soil is the easiest and most common way to replenish the supply. Corn, rice, wheat, and other crops that produce a large amount of crop residue should be included in the cropping system because they help to compensate for tomatoes, sugar beets, and other crops that produce a small amount of residue. Other excellent sources of organic matter are prunings from orchards and vineyards, animal manure, and grasses and legumes.

Hayland management is needed to protect irrigated and nonirrigated hayland, to provide for maximum production, to maintain a desirable plant community, and to extend the period of productivity. The management measures needed include managing irrigation water, applying fertilizer, and deferring mowing and baling when the soils are wet.

When irrigated hay crops are being established, seed should be planted into a firm seedbed early in fall or in spring. The first mowing should be delayed until the plants are well established. Planting on beds can improve production and drainage on wet or fine textured soils. The width of the beds should be based on the kind of soil and the wheel widths of the harvesting equipment. The spacing of borders in areas of hayland irrigated by controlled flooding should be in multiples of the cutting width of the mower to be used.

Land leveling in irrigation areas is needed to conserve irrigation water. It helps to ensure that the water is applied uniformly to the entire field and that the field has no wet swales or dry ridges. Land leveling also permits better field arrangements, which conserve labor, time, and energy. The first crop planted after the initial leveling of a field should be an annual crop. Planting an annual crop allows the filled areas to settle. The field can then be smoothed before a longer lived crop is planted.

Accurate land leveling is important. Laser-guided equipment is used to produce a uniform grade.

Significant benefits can be realized by releveling periodically and by releveling fields that were leveled without the aid of laser equipment.

Irrigation water management meets the needs of the crop for water in a planned and efficient manner by controlling the amount of water applied and the time of application. It results in the efficient use of the available irrigation water, minimizes water erosion, controls costly water losses, and preserves the quality of the water. Furrow, border, subirrigation, basin, sprinkler, and trickle methods are used in this survey area. Furrow and border systems are the most common methods. Their use is limited to nearly level areas. Subirrigation through spud ditches is limited to highly organic soils, such as Gazwell and Rindge soils. Sprinkler irrigation is common on sloping, unleveled soils used for pear orchards but may also be used to germinate tomatoes or corn on leveled land. Basin irrigation is common in areas where rice is grown. Trickle irrigation is used in orchards and vineyards.

Pasture management is needed to prevent deterioration of the pasture, provide for maximum forage production, maintain a desirable plant community, and extend the period of productivity. The practices used in irrigated areas include managing irrigation water, rotation grazing, applying fertilizer, harrowing or dragging to scatter animal droppings, periodic mowing to maintain uniform plant growth, and controlling weeds. Grazing should be deferred when the pasture is irrigated or when the soil is wet. The pasture should not be grazed until the plants are 8 to 10 inches high, and livestock should be removed from the pasture when the stubble is a minimum of 3 to 4 inches high.

Selecting a suitable plant mixture is important when a pasture is established. On most of the soils in the survey area, mixtures that include a perennial grass and trefoil or clover produce an abundance of high-quality forage.

When nonirrigated pasture is established, annual grasses and legumes should be seeded. During the year of establishment, grazing should not be permitted and annual weeds should be controlled. After the pasture is established, grazing should be deferred until the plants are 4 to 6 inches high and livestock should be removed when the stubble is 2 to 4 inches high. Annual pastures should be managed so that they have enough seed-producing plants to maintain plant density and a good stand.

Removal of subsurface water is needed on some soils to keep river seepage and low-quality water below the primary root zone of plants (fig. 11). Clear Lake, Columbia, Cosumnes, Egbert, Gazwell, Rindge, Sailboat, Scribner, and Valpac soils may require subsurface drainage. Because of the subsidence caused by oxidation, the water table in Rindge and Gazwell soils should not be lowered below the rooting depth of the crops.

Subsurface drainage can be improved by open drainage ditches, spud ditches, tile drains, or other perforated pipe systems. Proper disposal of poor-quality water collected by the drainage system is needed. High-quality ground water can be polluted by low-quality drainage water.

Control of surface water is needed where excess water from rainfall or irrigation is a problem in low areas adjacent to levees or in areas at the lower end of irrigated fields. Excess surface water reduces crop production and may increase the extent of unwanted weeds or provide a habitat for mosquitoes. It can be controlled by shaping and grading, constructing open drainage ditches, maintaining the existing natural drainageways, leveling irrigated areas, installing irrigation tailwater recovery systems, and managing irrigation water. Control of surface water is needed on Clear Lake, Dierssen, Egbert, Jacktone, Galt, and other soils.

Protection from flooding is needed on all soils in the Delta area and on the flood plains throughout the survey area. All low-lying soils in the Delta area and along the Sacramento River, such as Rindge, Gazwell, Scribner, Clear Lake, Egbert, Sailboat, and Valpac soils, require an extensive levee system that includes a pumped outlet to provide protection from flooding and to lower the water table (fig. 12). Low-lying soils along streams, such as Cosumnes and Columbia soils, require diversions, dikes, or levees to remove and control floodwater.

Reduction in the content of toxic salts is needed in areas where salts rise to the surface and accumulate in the root zone over a period of several years. This condition is the result of subirrigation. It can reduce crop yields. Gazwell and Rindge soils are commonly affected by this condition. Ridging the field with a tractor and flooding the field for most of the winter help to leach salts from the soils.

Best Suited Crops and Pasture Plants

Soils strongly influence the kind of crops and pasture plants that can be grown in a particular area. In areas where climate and topography do not change, the crops that can be grown are closely related to the kind of soil. The climate of Sacramento County favors a wide variety of crops. Occasional winter frosts, however, can damage semitropical fruit crops, such as citrus, and cotton and raisin grapes cannot be grown because of the somewhat cool temperatures and the rainfall early in the fall.

Irrigated field crops are grown on many soils in the

Figure 11.—A pump in the Delta area, where excess water is pumped from the main drainage ditches and returned to a river or slough across the levee.

county. Corn, silage corn, and wheat are grown on soils that are moderately deep to a hardpan, such as San Joaquin and Dierssen soils; on very deep soils, such as Cosumnes and Scribner soils; and on highly organic soils, such as Gazwell soils. The conservation practices necessary for sustained productivity vary greatly from one area to another on these soils. San Joaquin soils require heavy applications of fertilizer, careful water management, and chiseling. Cosumnes and Scribner soils may require measures that remove surface and subsurface water. Gazwell and Rindge soils require careful water management to reduce the rates of oxidation and subsidence in organic layers and to control the accumulation of salts resulting from subirrigation and a high water table. Salinity in these soils can be controlled by leaching every 3 to 5 years. Soil blowing is a hazard on all excessively cultivated soils used for corn in the Delta area. It can be controlled by crop residue management.

Rice is grown on soils in which permeability is restricted. San Joaquin soils have a very slowly permeable layer in the subsoil. Permeability is slow in Clear Lake, Galt, and Jacktone soils. Basin irrigation and an adequate water supply are essential for rice production (fig. 13).

Alfalfa grows best on very deep, well drained soils, such as Vina soils. It also grows well in areas of Scribner soils and in other areas where the water table is carefully managed and flood protection is provided. Alfalfa is grown on moderately deep soils, such as San Joaquin soils, but stands are short lived and yields are low. Alfalfa grown on soils that are commonly flooded, such as some areas of Cosumnes soils, can drown out at any time.

Vegetable crops are grown on very deep soils, such as Clear Lake, Scribner, Egbert, and Cosumnes soils. In some areas removal of subsurface water is required. Chiseling commonly breaks up compacted layers. Growing the vegetables in rotation with field crops helps to maintain tilth and control diseases. Portable sprinkler systems that are used to germinate processing tomatoes are replaced by furrow irrigation as the crop becomes established.

Clover and sudan are grown for seed in many areas of soils that are moderately deep to a hardpan, such as San Joaquin soils. These areas are irrigated by systems that include graded borders. Chiseling and careful water management are needed.

Dryland field crops are grown on Galt, San Joaquin, Redding, and Red Bluff soils. Slopes in areas of these soils are short and irregular and range from 2 to 8 percent. Crops can be damaged by the runoff that accumulates in low areas. Crop residue management can help to control erosion.

Fruit and nut crops grow best on the very deep, medium textured and coarse textured soils in the county. Pears and wine grapes are grown on some soils, such as Sailboat and Valpac soils, which are adjacent to levees. They also are grown on Columbia and other soils on protected flood plains. Pears and wine grapes are tolerant of the seasonal high water table caused by river seepage. In some areas where the soils do not have a seasonal high water table, other fruit and nut crops can be grown. In places, river seepage is severe and removal of subsurface water is needed. Wine grapes are grown on soils that are moderately deep to a hardpan, such as San Joaquin soils, but yields generally are low. Many methods of irrigation are used on these soils. Where pears and wine grapes are grown in the Delta area, perennial cover crops are commonly grown to improve trafficability and remove excess water.

Pasture plants grow well on many soils in the county. They are commonly grown on soils that are moderately deep to a hardpan, such as San Joaquin and Galt soils. The forage in many of the pastured areas is harvested as green chop for the dairy industry. Most of the pastures are irrigated by systems that include graded borders. Water management, applications of fertilizer, and rotation grazing are key management practices.

Yields Per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 7. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. Also, yields of one variety of a given crop may be higher or lower than those of another variety.

The yields are based mainly on the experience and

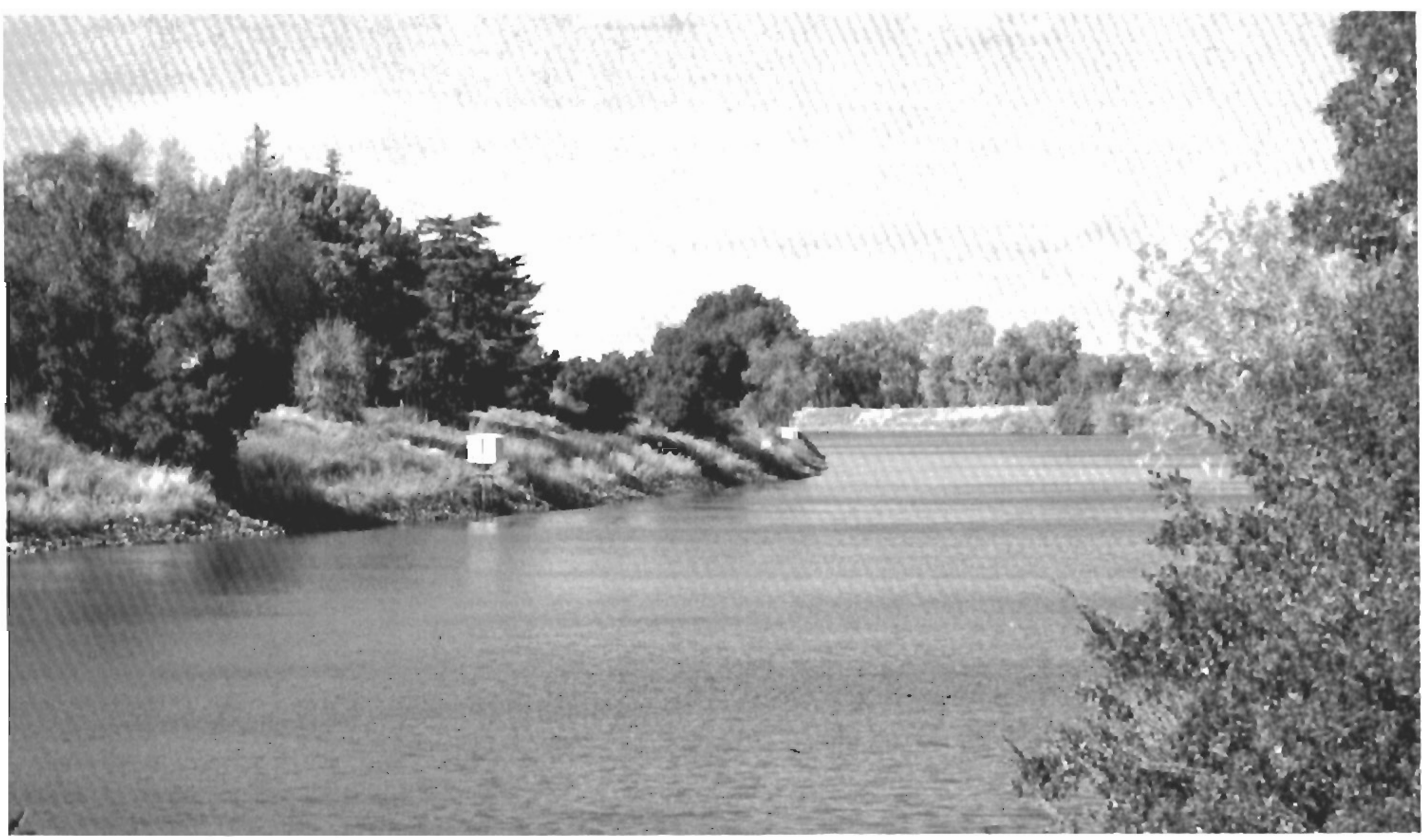

Figure 12.—Levees constructed along channels and sloughs in the Delta area.

Figure 13.—A rice field in an area of Clear Lake clay, hardpan substratum, drained, 0 to 1 percent slopes. The water level in the field is controlled by weir boxes.

records of farmers, conservationists, and extension agents *(36)*. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 7 are grown in the survey area. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops *(49)*. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system, soils generally are grouped at three levels: capability class, subclass, and unit. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIIe. The letter *e* shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation. There are no class V soils in this survey area.

Capability units are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Capability units generally are designated by adding an Arabic numeral to the subclass symbol, for example, IIs-5 and IIIs-3. The numbers used to designate units within the subclasses are as follows:

0. Indicates limitations caused by coarse sandy, very cobbly, or very gravelly material in the underlying material.
1. Indicates limitations caused by slope or by an actual or potential erosion hazard.
2. Indicates a limitation of wetness caused by poor drainage or flooding.
3. Indicates a limitation of slow or very slow permeability of the subsoil or the underlying material.
4. Indicates a low available water capacity in sandy or gravelly soils.
5. Indicates limitations caused by a fine textured or very fine textured surface layer.
6. Indicates limitations caused by salts or sodium.
7. Indicates limitations caused by rocks, stones, or cobbles that interfere with tillage.
8. Indicates that the soil has a very low or low available water capacity because the root zone generally is less than 40 inches deep over massive bedrock.
9. Indicates that a hazard or limitation is caused by low or very low fertility, acidity, or toxicity that cannot be corrected by adding normal amounts of fertilizer, lime, or other amendments.
10. Indicates a hazard of subsidence, susceptibility to burning, or a hazard of soil blowing caused by a high content of organic matter, peat, or muck.

No subclass or unit designations are assigned to class I soils because the soil characteristics are similar for all of the soils in this class. Unit designations are not assigned to the soils in classes V to VIII because these soils are normally not intensively managed as cropland.

The irrigated and nonirrigated capability classification is given in table 8 and at the end of each map unit description in the section "Detailed Soil Map Units." If a soil is not commonly irrigated, only the nonirrigated capability is listed.

Major Land Resource Areas

The capability classification is further refined by designating the major land resource area (MLRA) of the soils. A land resource area is a broad geographic area that has a distinct combination of climate, topography, vegetation, land use, and general type of farming. Parts of three of these nationally designated areas are in the county. These areas and their numbers are the California Delta, MLRA 16; the Sacramento and San Joaquin Valley, MLRA 17; and the Sierra Nevada Foothills, MLRA 18. The number of the resource area is shown after the capability classification in each map unit description in the section "Detailed Soil Map Units."

A soil in one resource area may have characteristics similar to those of a soil in another resource area and have the same capability symbol, but the climate, the vegetation, the suitable crops, and the management practices needed may differ. For example, capability unit IIw-2 includes very deep soils. The soils in capability unit IIw-2 and MLRA 16, the California Delta, are poorly suited to most deep-rooted crops because of a seasonal high water table. The soils in capability unit IIw-2 and MLRA 17, the Sacramento and San Joaquin Valley, are occasionally flooded but are suited to deep-rooted crops in most areas.

MLRA 16, the California Delta.—The Sacramento-San Joaquin Delta, which is at the junction of the Sacramento and San Joaquin Rivers in the southwestern part of the county, is in this major land resource area. The delta is divided by rivers and sloughs into a large number of manmade islands. These islands commonly have natural levees. The area is made up of flood plains and reclaimed freshwater marshes.

The natural vegetation is mainly tules, reeds, and other hydrophytic plants. Cottonwoods and willows grow in the higher areas along channels. Elevation ranges from 20 feet below to 10 feet above sea level. Most of the area is below sea level. The average annual precipitation is 13 to 16 inches. The average annual temperature is 59 to 60 degrees F, and the average frost-free period is 275 to 300 days.

The part of the county in this resource area generally is used for irrigated crops. The main crops are corn, wheat, and pears. The area provides valuable habitat for Pacific Flyway waterfowl.

The highly organic soils in this resource area are commonly subirrigated. Most of the mineral soils are irrigated by furrow, border, or sprinkler systems. Irrigation water is obtained from the adjacent sloughs and channels (fig. 14). Maintaining adequate drainage is a continuing management concern. An extensive system of open ditches is used to lower the water table and convey drainage water to areas where it is pumped from the main ditches back into the adjacent waterways. Subsidence of the highly organic soils, peat fires, soil blowing, and the possibility of a levee failure are continuing hazards. Saltwater intrusion and the concentration of salts in the soil are additional limitations.

MLRA 17, the Sacramento and San Joaquin Valley.—The lower Sacramento Valley, which extends from north to south through the western and central parts of the county, is in this major land resource area. The basins and basin rims in this resource area are in the western part of the county, and the terraces are in the central part. Most of the flood plains cross through the area from east to west, but the flood plain along the Sacramento River is along the western boundary of the county.

The natural vegetation is mainly annual grasses and forbs and scattered oaks. Elevation ranges from 0 to 390 feet. The average annual precipitation is 15 to 24 inches. The average annual temperature is 60 to 61 degrees F, and the average frost-free period is 230 to 300 days.

The part of the county in this resource area generally is used for irrigated crops, irrigated hay and pasture, rangeland, or urban development. A few areas are used for dryland crops, such as small grain. The main crops are corn, wheat, rice, clover for seed, sugar beets, and tomatoes. Riparian areas and irrigated pastures provide valuable habitat for wildlife.

Water for irrigation and for domestic and industrial uses is obtained from wells or nearby rivers and creeks. Furrow, border, sprinkler, and level basin irrigation systems are commonly used. Protection from flooding is needed during winter on the soils in basins, on basin rims, and on flood plains. The clayey soils in basins and on basin rims have a high shrink-swell potential, which can cause damage to improperly designed buildings and roads. A shallow or moderately deep claypan and a moderately deep hardpan in many of the soils on terraces restricts the movement of water and the penetration of roots.

MLRA 18, the Sierra Nevada Foothills.—The foothills of the Sierra Nevada, which are in the northeastern part of the county, are in this major land resource area. Most of the soils are very shallow or shallow over bedrock and are undulating to hilly.

The natural vegetation in this area is mainly annual grasses, forbs, and blue oak. The oak has been cleared in most areas. Elevation ranges from 140 to 830 feet. The average annual precipitation is 20 to 24 inches. The average annual temperature is 61 to 62 degrees F, and the average frost-free period is 250 to 275 days.

The part of the county in this resource area generally is used as rangeland. A few areas are used for urban development. In most areas, the supply of ground water is very limited and streamflow is intermittent. Water for livestock is provided by scattered stock ponds throughout the area. The supply of water for domestic and industrial uses is limited in all areas, except for those where it can be diverted from Folsom Lake or the

Figure 14.—Irrigation water for cropland in the Delta area is commonly siphoned from the adjacent sloughs and piped through levees to the fields.

Cosumnes River. This area provides valuable habitat for wildlife.

Storie Index Rating

This section was prepared by Gordon L. Huntington, lecturer and soil specialist, Department of Land, Air, and Water Resources, University of California, Davis.

The soils in this survey area are rated in table 9 according to the Storie index *(44, 45)*. This index expresses numerically the relative suitability of a soil for general intensive agricultural uses at the time of evaluation. The rating is based on soil characteristics only and is obtained by evaluating such factors as soil depth, texture of the surface soil, subsoil characteristics, drainage, and surface relief. Availability of water for irrigation, local climate, size and accessibility of mapped areas, distance to markets, and other factors that might determine the desirability of growing certain plants in a given locality are not considered. Therefore, the index should not be used as the only indicator of land value. Where the local economic, climatic, and geographic factors are known to the user, however, the Storie index provides additional objective information for land tract value comparisons.

Four general factors are used in determining the index rating—A, the permeability, water retention capability, and depth of the soil; B, the texture of the surface soil; C, the dominant slope of the soil body; and

X, other conditions more readily subject to management or modification by the land user. In this survey area these conditions include drainage, flooding, microrelief, and soil fertility. For some soils more than one of these conditions may be used in determining the rating. A rating of 100 percent expresses the most favorable, or ideal, condition for general crop production. Lower percentage ratings are assigned for less favorable conditions or characteristics. Factor ratings, in percentages, are selected from tables prepared from data and observations that have related soil properties to plant growth and crop yields *(44)*. In the tables currently used *(45)*, certain properties are assigned a range of values to allow for variations in the properties that affect the suitability of the soil for general agricultural purposes. Examples of these properties are soil depth and the content of gravel in a gravelly surface soil. When there is a range of values, the modal condition of a soil property, as it is described in a map unit, is used to select a value for a factor.

The index rating for a soil is obtained by multiplying the percentage rating values given to its four index factors, A, B, C, and X. If more than one condition is recognized for the X factor for a soil, the value for each condition acts as an additional multiplier. Thus, any of the general factors or X factor conditions may dominate or control the final rating. For example, consider a soil such as Sailboat silt loam, drained, 0 to 2 percent slopes, occasionally flooded. This is a very deep, moderately slowly permeable soil. The rating for factor A is 100 because no serious restriction affects root penetration or water movement. The rating for factor B is 100 because the soil has a surface layer of silt loam that can be easily worked during seedbed preparation, requires no unusual care or energy inputs, is readily penetrated by rain or irrigation water, and does not require frequent applications of water to maintain a favorable moisture status for plants. The rating for factor C is 100 because the soil is nearly level. The soil is moderately well drained and is occasionally flooded in winter and spring. These characteristics somewhat restrict the kinds of crops that can be grown and warrant a value of 64 for the X factor. Multiplying the percentage values for the A, B, C, and X factors gives a Storie index rating of 64 for this soil. If the flooding can be controlled in part or entirely, the Storie index can be increased by assigning appropriate higher values to the X factor to reflect the changed conditions. For example, the Storie index rating for Sailboat silt loam, drained, 0 to 2 percent slopes, is 76. This soil is rarely flooded.

The ratings of complexes in the survey area, such as Red Bluff-Redding complex, 0 to 5 percent slopes, and Auburn-Argonaut-Rock outcrop complex, 8 to 30 percent slopes, reflect the proportion of the dominant soils in the map units. Each of the dominant components in such complexes is rated separately in table 9. The Storie index rating for each unit is a weighted average of the separate ratings. Miscellaneous areas, such as Pits, Rock outcrop, and Urban land, are not evaluated in terms of factors A, B, C, or X. They have features that preclude common agricultural use; therefore, they have an index rating of zero.

Soils are assigned to grades according to their suitability for general intensive agriculture as shown by their Storie index ratings. The six grades and their ranges in index ratings are:

Grade 1	80 to 100
Grade 2	60 to 79
Grade 3	40 to 59
Grade 4	20 to 39
Grade 5	10 to 19
Grade 6	less than 10

In this survey area the soils in grade 1 are well suited to the intensively grown irrigated crops that are climatically adapted to the region. Grade 2 soils are good agricultural soils, although they are not so desirable as the soils in grade 1 because of a moderately coarse textured, coarse textured, or gravelly surface layer; a somewhat less permeable subsoil; a lower available water capacity; lower fertility; restricted drainage; a slight or moderate hazard of flooding; or a combination of these. Grade 3 soils are only fairly well suited because of moderate slopes; a moderate soil depth; a less permeable subsoil; a fine textured, moderately fine textured, or gravelly surface layer; poor drainage; a moderate hazard of flooding; low fertility; or a combination of these. Grade 4 soils are more poorly suited than the soils in grade 3 because of a shallower depth, a less permeable subsoil, steeper slopes, a more clayey or gravelly surface layer, poor drainage, a more severe hazard of flooding, hummocky microrelief, salinity, lower fertility, or a combination of these. Grade 5 soils are very poorly suited to agriculture and are seldom cultivated. They are more commonly used as rangeland, pasture, or woodland. Grade 6 soils and miscellaneous areas are not suited to agriculture because of very severe or extreme limitations or because of urban development. Table 9 lists the grade for each soil in the survey area.

Rangeland

This section was prepared by Sharon L. Larivee and John E. Hansen, range conservationists, Soil Conservation Service.

About 270,000 acres in Sacramento County, or more than 40 percent of the total acreage, is rangeland. About 100,000 acres is used for livestock grazing.

Livestock and livestock products make up one-third of the agricultural production in the county. Approximately two-thirds of this part of the production is derived from the dairy industry and the rest from beef enterprises. Most of the dairy enterprises are well established and family run. The beef industry is dominated by year-round cow-calf enterprises. In years of early heavy rainfall and good forage growth, seasonal stocker-feeder enterprises are important. The size of ranches varies throughout the county. The number of ranches is slowly decreasing because of low economic returns and urban development.

Before 1769, native deer, elk, and antelope grazed the California grasslands dominated by perennial species *(12)*. The grasslands were greatly altered when European livestock were introduced to California after the establishment of missions *(4)*. Many annual plants were introduced at this time, some by accident, some on purpose. The annual plants became well established in the mission areas and eventually spread inland as the grazing areas of domestic animals expanded. Many areas were continually overgrazed. Overgrazing stressed the native perennial vegetation and gave rise to aggressive, short-lived annuals. The annuals eventually became the dominant grasses throughout the state. Areas that escaped continual abuse retain sparse remnant populations of perennials.

The dominant vegetation on the rangeland in the county is annual grasses and scattered blue oak (fig. 15). A few wooded areas are in the foothills in the eastern part of the county. In these areas past management practices have influenced the present distribution of woodland. The survey area has a long history of cutting and clearing blue oak *(Quercus douglasii)* and interior live oak *(Quercus wislizenii)*. Natural reestablishment has been unsuccessful. As a result, different kinds of vegetation, such as that on oak-grass woodland and annual grass rangeland, are evident on the same kinds of soil.

The length of the green forage period is important on annual grassland. Green forage is higher in nutrition and palatability than forage that has dried. If the forage remains green for longer periods, cattle weight gains will increase. Annual grasses start to grow with the first heavy rains in the fall. At this time the young grasses make up only a small percentage of the feed. The older grasses have very little nutrient value. Until adequate green forage is available in late January or in February, cattle feed is supplemented throughout the fall with hay. The green forage of lush green grasses and forbs lasts until late April or early May. Once the grass dries, it loses many of its nutrients. These deficient nutrients can be supplemented in a mineral block or liquid form until the fall rains. Once the rains begin, the remaining nutrients are leached and supplemental feeding again becomes necessary. Some ranchers graze their cattle on irrigated pasture during the summer.

Soils strongly influence the natural vegetation. The soils in the foothills in the eastern part of the county are generally shallow. The production of annual grasses is moderate on these soils. Scattered blue oak grows throughout the foothills, and in some areas stands are moderate or dense. The green forage period is longer in areas that have a canopy of oak. The foothills receive slightly more rain than the rest of the county. The range dries up earliest in the foothills because of medium or rapid runoff and a shallow soil depth. Auburn soils are an example of soils in the foothills.

Soils on high terraces and hills are near the foothills. Most of these soils are characterized by mound-intermound topography. The mound areas consist of shallow soils, such as Amador soils, and the intermound areas consist of very shallow soils, such as Gillender soils. Water accumulates in the low intermound areas, but the soils in these areas dry out first because they are more shallow than the soils on the mounds. The green forage period lasts 2 to 3 weeks longer on the mounds. The vegetation on the mounds is typical of annual rangeland, and production is moderate. The major species are soft chess, wild oat, filaree, and annual fescue. The intermound areas support numerous species of flowering forbs, such as spike primrose, navarretia, blennosperma, and toad rush. Production in the intermound areas is low. These areas receive average amounts of rainfall. Blue oak grows only rarely in the mound-intermound areas. The maturity of the grass on the mounds determines whether or not the range is ready for grazing.

Some of the soils on the high terraces and hills are not characterized by mound-intermound topography. Redding soils are an example. Production is moderate on these soils. A few areas have thin to dense stands of blue oak or dense stands of interior live oak, blue oak, digger pine, and manzanita.

The soils on low terraces and flood plains in the survey area are moderately deep or deep. Fertility levels are high, and forage production is generally high. These soils receive average amounts of rain. Because of ponding or slow runoff, the grasses stay green longer than the grasses on other soils in the county. Scattered blue oak and white oak are throughout the low terraces and flood plains. They are generally larger than those on the high terraces. San Joaquin soils are an example of soils on low terraces.

In areas that have similar climate and topography, differences in the kind and amount of vegetation produced on rangeland and in the few wooded areas in the county are closely related to the kind of soil unless

Figure 15.—Annual grasses and forbs in an area of Hicksville sandy clay loam, 0 to 2 percent slopes, occasionally flooded. The scattered oak trees in the background are in an area of Whiterock loam, 3 to 30 percent slopes.

the soil has been altered by past management. Effective management is based on the relationship between the soils and vegetation and water.

Table 10 shows, for many of the soils in the county, the range site; the total annual production of vegetation in favorable, normal, and unfavorable years; the characteristic vegetation; and the average percentage of each species. Only those soils that are used as rangeland or are suited to use as rangeland are listed. Explanation of the column headings in table 10 follows.

A *range site* is a distinctive kind of rangeland that produces a characteristic plant community that differs from plant communities on other range sites in kind, amount, and proportion of range plants. For those areas where the relationship between soils and vegetation has been ascertained, range sites generally can be determined directly from the soil map. Soils that produce a similar kind, amount, and proportion of range plants are grouped into range sites. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, runoff, and the accumulation of water on the surface also are important.

Total production is the amount of vegetation that can be expected to grow annually on well managed rangeland that is supporting the characteristic plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruit of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. In a normal year, growing conditions are about average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Dry weight is the total annual yield per acre of air-dry vegetation. Yields are adjusted to a common percent of air-dry moisture content. The relationship of green weight to air-dry weight varies according to such factors as exposure, amount of shade, recent rains, and unseasonable dry periods.

Characteristic vegetation—the grasses, forbs, and shrubs that make up most of the characteristic plant community on each soil—is listed by common name. Under *composition*, the expected percentage of the total annual production is given for each species making up the characteristic vegetation. The amount that can be used as forage depends on the kinds of grazing animals and on the grazing season.

Range management requires a knowledge of the kinds of soil and of the plant community. It also requires an evaluation of the present composition of the vegetation in relation to the potential vegetation under favorable management. Past management and the amount and distribution of annual precipitation are important factors that influence plant composition and production.

The objective in range management is to control grazing in order to provide an adequate cover of residue, which protects the soil from erosion. Such management generally results in the maximum production of vegetation, conservation of water, and control of erosion. Sometimes, however, a plant species composition different from the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

The major management needs on the rangeland in the survey area are proper grazing use, a proper season of use, an even distribution of grazing, livestock water developments, cross fencing, range seeding, and applications of fertilizer.

Proper grazing use is grazing at an intensity that maintains a protective plant cover and maintains or improves the quality and quantity of desirable vegetation. On annual grassland natural seeding is the most common method of reproduction. A portion of the desirable species should be allowed to set seed if they are to be maintained in the plant community. Because wildlife and livestock graze selectively, controlled grazing is needed to maintain a desirable species composition. If grazing is not controlled, only the unpalatable species reproduce and thus the quality of the forage decreases. Leaving an adequate amount of dry vegetation on the range at the beginning of the fall-winter period improves the growth of new seedlings in winter and protects the new plants from drying winds and sunlight. The decomposing herbaceous material on the surface and partially intermixed with mineral soil conserves moisture and promotes the establishment and early growth of each year's seedlings.

The amount of residue left on the surface should be between 700 and 1,000 pounds air-dry weight per acre on sites having slopes of more than 30 percent. The amount of residue should be measured just prior to the onset of the rainy season, which is normally about November 1.

A proper season of use is based on the characteristics of the plant community. Rangeland should be grazed only during seasons when it is best suited to grazing. Three seasons are recognized in the survey area. These are the dry forage season, which lasts from about late May through October; the inadequate green forage season, which usually occurs between November and January; and the adequate green forage season, which lasts from about February through late April or early May. Most plant growth occurs during short rainy periods. Supplemental feeding is necessary during periods when plant growth is uncertain.

During the adequate green forage season, the amount of forage is sufficient to feed the livestock during the grazing season and to leave behind enough of the current year's growth for adequate seed production and seedling growth during the following year. Even if the range is grazed during the dry forage period, some of the current year's growth should be left to conserve moisture, control erosion, and provide residue for a seedbed.

Range readiness is closely related to the proper season of use. Spring grazing should be delayed until desirable forage species are ready for grazing and the compaction caused by trampling livestock can be kept to a minimum.

An even distribution of grazing is achieved through measures that cause livestock to graze the forage in a grazing unit as uniformly as possible. The objective is a minimum of overuse and wasted forage and a maximum of proper use consistent with a practical goal for the grazing unit. The efficiency of grazing differs from one grazing unit to another because of variations in the availability of water, in the distribution of shade, in topography, in the kinds of available forage, in the class of livestock, and in the season of grazing. Salting facilities can be used to achieve a more uniform distribution of grazing. They should be located in areas where grazing is desired. They should not be located next to watering facilities.

Livestock water developments, wherever they are economically and physically possible, can help to distribute grazing pressure. If livestock are required to travel long distances to and from sources of water, weight gain and the distribution of grazing are greatly minimized and the forage near the watering facilities is overgrazed. The interval between watering facilities depends on the kinds of livestock, the season of use, and the topography.

Cross fencing is a measure that concentrates animals in areas that they would ordinarily avoid. This measure achieves a more uniform distribution of grazing.

Range seeding can improve forage production and plant composition. The best results are obtained in areas that have a high potential for production but have been heavily used or disturbed by cultivation, such as some areas of Hicksville soils. Under normal conditions, areas affected by natural disasters, such as fire or drought, do not require range seeding. Range seeding is effective in converting cropland to rangeland. After the range is seeded, grazing should be deferred until the new plants have set seed.

Applications of fertilizer generally are not economically feasible on rangeland. They are suitable, however, when used in combination with range seeding.

Technical assistance in managing rangeland can be obtained from the local office of the Soil Conservation Service and from the resource conservation district.

Environmental Plantings

This section was prepared by Harold Hilburn, soil conservation technician, Soil Conservation Service.

Environmental plantings can be used as windbreaks around farmsteads and fields, for wildlife habitat, and for beautification. They protect yards, fruit trees, and gardens and abate noise. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

A few areas in the western part of the Delta area are subject to soil blowing during the growing season, especially if they are not protected by crop residue or growing crops. Field windbreaks can help to control soil blowing, reduce the drying effects of the wind on soils and plants, and help to protect tender plants from the abrasive action of rapidly moving soil particles.

Farmstead windbreaks protect both homes and livestock from the wind. As a result of these windbreaks, fuel consumption in the home can be reduced 20 to 30 percent and livestock in feedlots gain weight faster and require less feed.

Wide intervals between the tree rows (at least 16 to 20 inches) normally enhance wildlife habitat within a windbreak or environmental planting, whereas close intervals decrease the value of the habitat. Most animals prefer edge habitat rather than the interior of a dense windbreak.

Environmental plantings grown as windbreaks are most effective in protecting soils, crops, and farmsteads when established at right angles to the prevailing wind, along the perimeter of the field, and at intervals across the field. In nearly all areas of the county, environmental plantings cannot survive unless they are irrigated. Several different methods of irrigation are suitable, including drip, sprinkler, and furrow systems and open ditches. Applications of fertilizer are needed on most of the soils in the county. Applying a small amount of ammonium sulfate (21-0-0) during the first application of irrigation water helps to establish the plants. The environmental plantings should be adequately protected from fire, harmful rodents, poultry, and livestock. Fencing may be necessary.

The moderate depth to a hardpan in San Joaquin, Fiddyment, and Redding soils limits the number of trees that can be grown as environmental plantings. The species that have grown well on these soils are Arizona cypress; eucalyptus, such as manna gum, dwarf bluegum, and redgum; blackwood acacia, eldarica pine, and tamarisk. If a windbreak or enhancement of wildlife habitat is desired on soils that do not have a hardpan, some trees and shrubs in addition to those species can be planted. The species that can be planted to enhance wildlife habitat include multiflora rose, pampasgrass, and Russian olive.

Technical assistance in planning and establishing environmental plantings on a particular soil can be obtained from local offices of the Soil Conservation Service, the Cooperative Extension Service, and the California Department of Forestry.

Recreation

Sacramento County has numerous areas that provide opportunities for recreational activities, including boating, fishing, rafting, hiking, biking, picnicking, camping, and hunting. Some areas are of historical and scenic interest. The recreational areas include many county, city, and district parks, the American River Parkway, the Folsom Lake State Recreation Area, and the Brannon Island State Recreation Area. Hundreds of miles of rivers and sloughs in the Delta area and along the Sacramento River provide many opportunities for recreation.

Pheasant hunting is common on the farmland in the county. Waterfowl are hunted in a few fields in the Delta area that are managed for waterfowl and at the Sherman Island Waterfowl Management Area.

The use of recreational areas in the county has increased considerably in the past several years. Many areas are well suited to recreational development. Table 11 provides information that can be used in selecting sites that can be developed for recreational uses.

The soils of the survey area are rated in table 11 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 11, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties generally are favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 11 can be supplemented by other information in this survey, for example, interpretations for dwellings without basements and for local roads and streets in table 13 and interpretations for septic tank absorption fields in table 14.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils are gently sloping and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

This section was prepared by Larry H. Norris, biologist, Soil Conservation Service.

Fish and wildlife are valuable resources in Sacramento County (fig. 16). They improve the quality of the environment, act as early indicators of pollution, and provide numerous opportunities for recreation. Wildlife-related activities, such as nature study, bird-watching, hunting, and fishing, have a positive effect on the economy of the county. Many types of wildlife help in the control of weeds, insects, and animal pests.

Warm water fish, including largemouth bass, smallmouth bass, bluegill, black crappie, and other sunfish, catfish, and several other nongame species, inhabit the rivers, reservoirs, and ponds in the county. The rivers, creeks, and drainageways provide habitat for fish and important riparian habitat corridors for mammals, birds, reptiles, amphibians, insects, and other invertebrates. In the areas developed for intensive agriculture, these riparian corridors commonly are the only remaining areas of perennial wildlife habitat. Although the value of these wildlife corridors cannot be overemphasized, most have not been separated out as map units because of their limited size. The soils that

Figure 16.—Both cattle and great blue herons benefit from irrigated pastures in areas of San Joaquin silt loam, leveled, 0 to 1 percent slopes.

support significant amounts of underdeveloped native riparian vegetation include the occasionally flooded or frequently flooded Sailboat, Clear Lake, Columbia, Cosumnes, Liveoak, Reiff, Coyotecreek, and Vina soils.

The Sacramento-San Joaquin Delta, which has islands and waterways and is centrally located in the state, provides important habitat for wintering migratory waterfowl of the Pacific Flyway.

Human activities have various effects on wildlife populations. Many wildlife species, such as coyotes, blackbirds, and ground squirrels, can tolerate these activities and actually thrive in close association with humans. In contrast, the existence of some species has been threatened by human activities. A few species that have been listed as threatened, rare, or endangered inhabit county. The giant garter snake and the California black rail are listed by the state as rare. The giant garter snake is one of the most aquatic of the garter snakes and generally inhabits permanent areas of fresh water. Changing land uses, which have resulted in drainage and loss of permanent freshwater wetlands, have destroyed much of the giant garter snake's original habitat. The California black rail inhabits coastal salt marshes and inland freshwater marshes. Filling and draining coastal and inland marshes have significantly impacted the habitat for this species. Preserving the habitat for any of the threatened, rare, or endangered species can also benefit other wildlife species.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 12, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flooding. Soil temperature and soil moisture are also considerations. It is assumed that these crops will be irrigated where water is available. Examples of grain and seed crops are corn, wheat, oats, and milo.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flooding, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, orchardgrass, hardinggrass, alfalfa, and trefoil.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flooding. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are soft chess, wild oats, filaree, annual lupine, annual brome, and annual clover.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are oak, poplar, cherry, sweetgum, apple, hawthorn, dogwood, hickory, blackberry, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are Russian olive, black acacia, dwarf bluegum, and California black walnut.

Shrubs are bushy woody plants that produce fruit, buds, twigs, bark, and foliage. Soil properties and features that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and soil moisture. Examples of shrubs are manzanita, chamise, scrub oak, quailbush, and pyracantha.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. It is assumed that these plants will be irrigated where water is available. Submerged or floating aquatic plants are excluded. Soil properties affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, watergrass, swamp timothy, saltgrass, rushes, sedges, and cattails.

Shallow water areas have an average depth of less than 5 feet. Most are created by dams, levees, or other water-control structures. Some are naturally wet areas. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. Wildlife that are attracted to these areas include quail, pheasant, meadowlark, field sparrow, cottontail, coyote, red-tailed hawk, and owls.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. In some areas irrigation water is used to develop wetland wildlife habitat. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, and beaver.

Habitat for rangeland wildlife consists of areas of shrubs and wild herbaceous plants. Wildlife attracted to rangeland include coyote, deer, meadowlark, and red-tailed hawk.

The following paragraphs describe the suitability of the groups of map units in the section "General Soil Map Units" for various kinds of wildlife habitat.

Very Deep, Nearly Level to Steep Soils in Areas of Dredge Tailings

The soils in this group have poor potential for rangeland and openland wildlife habitat. The main factors affecting the potential are a very low available water capacity, a high content of gravel and cobbles, and rapid or very rapid permeability. These factors limit the growth of wild herbaceous plants, shrubs, and trees, which provide food and cover for wildlife. The main management needs are measures that maintain the existing habitat. Although water is available in low areas in winter and early spring, the habitat in areas of these soils is of limited value for resident wildlife.

Very Deep, Nearly Level Soils in Freshwater Marshes and Backswamps, on Natural Levees, and on Low and High Flood Plains

The soils in this group have good potential for openland wildlife habitat. Some soils, however, have minor limitations. The selection of trees and shrubs is limited to water-tolerant varieties on Gazwell and Rindge soils. The shrink-swell potential limits the selection of trees and shrubs on Cosumnes and Egbert soils. Maintaining and improving the existing stands of trees and shrubs along irrigation and drainage ditches and especially in areas adjacent to rivers and sloughs can improve the habitat for openland wildlife by providing year-round cover and resting and nesting sites.

The potential for the development of wetland wildlife habitat on these soils is good or fair. Generally, an adequate water supply is available and the soils are well suited to this kind of habitat.

Urban Land and Very Deep, Nearly Level Soils on High Flood Plains, Low Stream Terraces, and Low Terraces

All of the soils in this group, except for those in urban areas, have good potential for openland wildlife habitat. No significant limitations affect openland habitat. Crops and irrigation systems on most of the soils can provide food, water, and seasonal cover if the cropland is managed properly. Maintaining the vegetation along irrigation delivery and drainage ditches greatly improves the habitat for openland wildlife by providing year-round cover and resting and nesting sites.

If an adequate water supply is available, the potential for the development of wetland wildlife habitat on these soils is fair. The main limitations affecting this development are restricted permeability and the drainage class.

Nearly Level Soils in Basins and on Basin Rims

The soils in this group have fair potential for openland wildlife habitat. The main limitation is the shrink-swell potential, which restricts the growth and diversity of trees and shrubs in nonirrigated areas. Trees and shrubs provide important food and cover for openland wildlife. Crops and irrigation systems on most of the soils provide food, water, and seasonal cover if the cropland is managed properly. Maintaining the vegetation along irrigation delivery and drainage ditches can improve the habitat for openland wildlife by providing year-round cover and resting and nesting sites.

The potential for the development of wetland habitat on these soils is good. An adequate water supply is available, and the soils are well suited to this kind of habitat.

Nearly Level to Gently Rolling Soils on Low Terraces

The soils in this group generally have fair potential for openland wildlife habitat. The main factors affecting the potential are a high shrink-swell potential and a limited available water capacity, which restrict the growth and diversity of trees and shrubs in nonirrigated areas. Trees and shrubs provide important food and cover for openland wildlife. Maintaining and improving the existing stands of trees and shrubs along irrigation and drainage ditches and especially in areas adjacent to rivers can improve the habitat for openland wildlife by providing year-round cover and resting and nesting sites.

Except for a few soils that have slopes of more than 3 percent, the soils in this group have good potential for the development of wetland wildlife habitat. If an adequate water supply is available, wetland habitat can be easily created.

Generally, the potential for the development of rangeland wildlife habitat on these soils is fair. The high shrink-swell potential and the limited available water capacity are the main factors affecting the growth of trees and shrubs.

Urban Land and Nearly Level to Steep Soils on Hills and in Filled Areas

All of the soils in this group, except for those in urban areas, have fair or poor potential for rangeland wildlife habitat. The main factors affecting the potential are a limited available water capacity and the depth of the soils. These factors limit the growth of shrubs, which provide food and cover for rangeland wildlife. The main management needs are measures that maintain the existing habitat. Developing watering facilities, such as small ponds and guzzlers, can improve the habitat, especially if trees or shrubs are planted near the water.

Nearly Level to Hilly Soils on High Terraces and Hills

The soils in this group have good or fair potential for openland and rangeland wildlife habitat. The main factors affecting the potential for openland wildlife habitat are a limited available water capacity in all of the soils and a high shrink-swell potential in Redding and Corning soils. These factors restrict the growth and diversity of trees and shrubs in nonirrigated areas. Trees and shrubs provide important food and cover for openland wildlife. Developing watering facilities, such as small ponds and guzzlers, can improve the habitat, especially if shrubs are planted near the water. These measures can be particularly effective on Fiddyment and Red Bluff soils.

Undulating to Hilly Soils on Foothills

Except for Whiterock soils, the soils in this group have good or fair potential for rangeland wildlife habitat. The main factor affecting the potential is a limited available water capacity, which restricts the growth and diversity of trees and shrubs in nonirrigated areas. Trees and shrubs provide important food and cover for rangeland wildlife. Maintaining and improving the existing stands of trees and shrubs in areas near springs and reservoirs and along watercourses can improve the habitat for rangeland wildlife by providing year-round cover and resting and nesting sites. Developing watering facilities, such as small ponds and guzzlers, can improve the habitat, especially if shrubs are planted near the water.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building Site Development, Sanitary Facilities, Construction Materials, and Water Management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the "Glossary."

Building Site Development

Table 13 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features generally are favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and depth to the water table.

Dwellings and *small commercial buildings* are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or stabilized soil material; and a flexible or rigid surface. Cuts and fills generally are limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, subsidence of organic layers, and depth to a high water table affect the traffic-supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 14 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features generally are favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 14 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 60 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel, organic layers, or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 14 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage resulting from rapid permeability in the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground-water pollution. Ease of excavation and revegetation should be considered.

The ratings in table 14 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils and highly organic soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 15 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help to determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel, or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and depth to the water table is less than 1 foot. These soils may have layers of suitable material, but the material is less than 3 feet thick.

Sand and *gravel* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In table 15, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is as much as 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable, loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal high water table at or near the surface.

The surface layer of most soils generally is preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 16 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and for embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features generally are favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even more than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to control erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of soil blowing or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of soil blowing, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features listed in tables are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

Table 17 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the "Glossary."

Classification of the soils is determined according to the system adopted by the American Association of State Highway and Transportation Officials *(1)* and the Unified soil classification system *(2)*.

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SM-SC.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 18 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil Series and Their Morphology."

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of the soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for some soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, very fine sand, sand, and organic matter (as much as 4 percent) and on soil structure and permeability. The estimates are modified by the presence of rock fragments. Values of K range from 0.02 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion.

Erosion factor T is an estimate of the maximum average rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to soil blowing in cultivated areas. The groups indicate the susceptibility to soil blowing. Soils are grouped according to the following distinctions:

1. Coarse sands, sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.

2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, and sapric soil material. These soils are very highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

4L. Calcareous loams, silt loams, clay loams, and silty clay loams. These soils are erodible. Crops can be grown if intensive measures to control soil blowing are used.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control soil blowing are used.

5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material. These soils are slightly erodible. Crops can be grown if measures to control soil blowing are used.

6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay. These soils are very slightly erodible. Crops can be grown if ordinary measures to control soil blowing are used.

7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material. These soils are very slightly erodible. Crops can be grown if ordinary measures to control soil blowing are used.

8. Soils that are not subject to soil blowing because of coarse fragments on the surface or because of surface wetness.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 18, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Tables 19 and 20 give estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the infiltration of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep and very deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep to very deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water, soils of moderately fine texture or fine texture, or soils that have a water table at a depth of 36 to 60 inches. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary covering of the soil surface by flowing water, is caused by overflow from streams, by runoff from adjacent slopes, or by inflow from high tides. Shallow water standing or flowing for short periods after rainfall is not considered to be flooding. Standing water in swamps and marshes or in closed depressional areas is considered to be ponding.

Table 19 gives the frequency and duration of flooding and the time of year when flooding is most likely to occur.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but is possible under unusual weather conditions or after a levee failure; *occasional* that it occurs, on the average, no more than once in 2 years; and *frequent* that it occurs, on the average, more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months.

The information on flooding is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and level of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

In many areas in the county, the natural frequency of flooding has been reduced by the construction of levees or upstream dams. This reduction was considered in determining the hazard of flooding. No attempt was made, however, to rate the reliability of the protection provided by levees *(8)*. Most areas that are protected by levees are considered to be subject to rare flooding. Because of impeded outlets for surface water or increased runoff in urban areas, flooding sometimes occurs on some soils that are not flooded under natural conditions. Only the largest areas of these soils have been assigned a hazard of flooding. The small areas cannot be easily identified and are considered inclusions in the map units. The occurrence of flooding in such situations can increase in the future unless surface drainage systems are properly designed during land leveling, urban development, or other construction activities.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The estimates are based on field observations and the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 19 are the depth to the seasonal high water table; the kind of water table—that is, perched or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in the table.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. An *artesian* water table is under hydrostatic head, generally below an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower water table by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given in table 20 if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Cemented pans are cemented or indurated subsurface layers at a depth of 5 feet or less. Such pans cause difficulty in excavation. Pans are classified as thin or thick. A *thin* pan is one that is less than 3 inches thick if continuously indurated or less than 18 inches thick if discontinuous or fractured. Excavations can be made by trenching machines, backhoes, or small rippers. A *thick* pan is one that is more than 3 inches thick if continuously indurated or more than 18 inches thick if it is discontinuous or fractured. Such a pan is so thick or massive that blasting or special equipment is needed in excavation.

Subsidence is the settlement of organic soils or of saturated mineral soils of very low density. Subsidence results from either desiccation and shrinkage or oxidation of organic material, or both, following drainage. Some settlement may be attributed to soil blowing or burning of organic layers. Subsidence takes place gradually, usually over a period of several years. Table 20 shows the estimated initial subsidence, which usually is a result of drainage, and total subsidence, which usually is a result of oxidation.

Not shown in the table is subsidence caused by an imposed surface load or by the withdrawal of ground water throughout an extensive area as a result of lowering the ground-water level.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories *(50)*. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 21 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Eleven soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Vertisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Xerert (*Xer*, meaning dry, plus *ert*, from Vertisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Pelloxererts (*Pello*, meaning dusky, low chroma, plus *xerert*, the suborder of the Vertisols that has a xeric moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Pelloxererts.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the propertis and characteristics considered are particle-size class, mineral content, temperature regime, thickness of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine, montmorillonitic, thermic Typic Pelloxererts.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the underlying material can differ within a series.

Soil Series and Their Morphology

In this section, the soil series and higher taxonomic units recognized in the survey area are described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with nearby soils of other series. A pedon, a small three-dimensional natural body of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the "Soil Survey Manual" *(48)*. Many of the technical terms used in the description are defined in the "Glossary" or in "Soil Taxonomy" *(50)*. Unless otherwise stated, matrix colors in the descriptions are for dry soil and soil reaction was determined in the field by Hellige-Truog indicator solution. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Amador Series

The Amador series consists of shallow, well drained soils on hills. Areas that have a slope of less than 15 percent generally are characterized by mound-intermound microrelief. These soils are on the mounds. They formed in material weathered from weakly consolidated rhyolitic tuffaceous sediments. Slope ranges from 2 to 50 percent.

Amador soils are near Gillender and Hadselville soils, Lithic Xerorthents, and Pardee, Pentz, Ranchoseco, and Vleck soils. Gillender and Hadselville soils, Lithic Xerorthents, and Ranchoseco soils are very shallow and are in the intermound areas. Pentz and Pardee soils are on the mounds. Pentz soils have a mollic epipedon. Pardee soils have an argillic horizon. Vleck soils have a fine textured argillic horizon. They are on the foot slopes of hills.

Soils of the Amador series are loamy, mixed, thermic, shallow Typic Xerochrepts.

Typical pedon of Amador loam, in an area of Amador-Gillender complex, 2 to 15 percent slopes, about 4.1 miles southeast of Bridgehouse, 1.0 mile northwest along Meiss Road from the Ione Road intersection, and 285 feet north of Meiss Road; about 1,420 feet south and 1,870 feet east of the northwest corner of sec. 26, T. 7 N., R. 8 E., Carbondale Quadrangle:

A—0 to 6 inches; light gray (10YR 7/2) loam, dark grayish brown (10YR 4/2) moist; moderate coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine and few fine tubular and many very fine interstitial pores; about 10 percent gravel; strongly acid; clear wavy boundary.

Bw1—6 to 11 inches; light gray (10YR 7/2) loam, brown (10YR 5/3) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine and common fine tubular and many very fine interstitial pores; about 5 percent gravel; strongly acid; clear wavy boundary.

Bw2—11 to 19 inches; light gray (10YR 7/2) loam, brown (10YR 5/3) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and common fine tubular and many very fine interstitial pores; few thin colloidal stains on mineral grains; about 10 percent gravel, mostly at the base of the horizon; very strongly acid; abrupt wavy boundary.

Cr—19 inches; white (2.5Y 8/2), weakly consolidated rhyolitic tuffaceous sediments, pale yellow (2.5Y 7/4) moist; very strongly acid.

The depth to paralithic contact is 10 to 20 inches. The content of gravel ranges from 0 to 15 percent in the solum. Base saturation, by sum of cations, is 60 to 85 percent.

The A horizon has dry color of 10YR 6/3, 6/4, 7/2, or 7/3 and moist color of 10YR 4/2, 4/3, 4/4, 5/2, or 5/3 or 7.5YR 4/4. It is sandy loam or loam. Reaction is strongly acid to slightly acid.

The Bw horizon has dry color of 10YR 6/3, 7/2, or 7/3 or 7.5YR 7/4 and moist color of 10YR 4/3, 4/4, 5/3, or 5/4 or 7.5YR 4/4. It is sandy loam or loam. The content of clay is 12 to 25 percent. Reaction is very strongly acid to moderately acid.

The Cr horizon has dry color of 10YR 6/4 or 7/2, 2.5Y 7/2 or 8/2, or 5Y 7/2 or 8/2. It has moist color of 2.5Y 6/2 or 7/4 or 5Y 5/3, 6/2, or 8/4.

Americanos Series

The Americanos series consists of very deep, well drained soils on low stream terraces. These soils formed in alluvium derived from mixed rock sources. Slope ranges from 0 to 2 percent.

Americanos soils are near Natomas, Rossmoor, and San Joaquin soils and Xerorthents. Natomas soils are fine-loamy. They are on low terraces. Rossmoor soils are coarse-loamy. They are on high flood plains. San Joaquin soils are fine textured. They are on low terraces. Xerorthents have more than 60 percent coarse fragments. They are in areas of dredge tailings.

Soils of the Americanos series are fine-silty, mixed, thermic Mollic Haploxeralfs.

Typical pedon of Americanos silt loam, in an area of Americanos-Urban land complex, 0 to 2 percent slopes, about 1 mile northwest of Mather Field, 3,550 feet northeast along Folsom Boulevard from the intersection of Bradshaw Road and Folsom Boulevard, and 850 feet north of Folsom Boulevard; in an unsectionalized area, T. 8 N., R. 6 E., 38 degrees, 34 minutes, 49 seconds north latitude, 121 degrees, 19 minutes, 30 seconds west longitude, Carmichael Quadrangle:

Ap—0 to 8 inches; yellowish brown (10YR 5/4) silt loam, dark brown (10YR 3/3) moist; massive; hard, friable, slightly sticky and slightly plastic; common very fine roots; common very fine and few fine tubular pores; few thin clay films lining pores; slightly acid; clear smooth boundary.

Bt1—8 to 17 inches; dark yellowish brown (10YR 4/4) silt loam, dark yellowish brown (10YR 3/4) moist; massive; hard, firm, slightly sticky and slightly plastic; few coarse, medium, fine, and very fine roots; few very fine and fine tubular and common very fine interstitial pores; few moderately thick clay films lining pores and common thin clay films bridging mineral grains; neutral; clear smooth boundary.

Bt2—17 to 26 inches; dark yellowish brown (10YR 4/4) silt loam, dark yellowish brown (10YR 3/4) moist; massive; hard, friable, sticky and slightly plastic; few fine and very fine roots; common very fine and few fine tubular and few very fine interstitial pores; many moderately thick clay films bridging mineral grains and lining pores; neutral; clear smooth boundary.

Bt3—26 to 36 inches; dark yellowish brown (10YR 4/4) silt loam, dark yellowish brown (10YR 3/4) moist; massive; hard, friable, sticky and slightly plastic; few very fine and fine roots; few very fine interstitial and common very fine tubular pores; many thin clay films bridging mineral grains and few moderately thick clay films lining pores; neutral; clear smooth boundary.

Bt4—36 to 46 inches; light yellowish brown (10YR 6/4) silt loam, dark yellowish brown (10YR 4/4) moist; massive; hard, very friable, sticky and slightly plastic; few fine and common very fine roots; few very fine interstitial and common fine and few medium tubular pores; common thin clay films bridging mineral grains and few moderately thick clay films lining pores; neutral; clear smooth boundary.

C—46 to 54 inches; light yellowish brown (10YR 6/4) silt loam, dark yellowish brown (10YR 4/4) moist; massive; hard, very friable, sticky and slightly plastic; few very fine roots; common very fine tubular and interstitial pores; few thin clay films bridging mineral grains and lining pores; neutral; abrupt smooth boundary.

Cq—54 to 62 inches; light yellowish brown (10YR 6/4) sandy loam discontinuously and weakly cemented with silica; dark yellowish brown (10YR 4/4) moist; brittle when moist; about 60 percent of the horizon is cemented; neutral.

The depth to discontinuous cementation is 50 to 72 inches. Some pedons do not have a C horizon. Reaction is slightly acid or neutral throughout the profile.

The Ap horizon has dry color of 10YR 5/4 or 5/3 and moist color of 10YR 3/2, 3/3, or 3/4. The content of organic matter is 1 to 3 percent. The content of clay is 12 to 20 percent.

The Bt horizon has dry color of 10YR 4/4, 5/3, 5/4, or 6/4 or 7.5YR 5/4 and moist color of 10YR 3/3, 3/4, or 4/4 or 7.5YR 3/4 or 4/4. It is silt loam or loam. The content of clay is 18 to 27 percent.

The C horizon has dry color of 10YR 6/4 or 7.5YR 6/4 and moist color of 10YR 4/4 or 7.5YR 4/4. It is loam or silt loam. The content of clay is 8 to 18 percent.

The Cq horizon has dry color of 10YR 6/4 or 7.5YR 6/4 and moist color of 10YR 4/4 or 7.5YR 4/4. About 50 to 75 percent of the horizon is discontinuously and weakly cemented with silica.

Andregg Series

The Andregg series consists of moderately deep, well drained soils on foothills. These soils formed in material weathered from granitic rocks. Slope ranges from 2 to 15 percent.

Andregg soils are near Argonaut, Auburn, and Fiddyment soils and Xerolls. Argonaut soils have a fine textured argillic horizon. Auburn soils do not have a mollic epipedon. Argonaut and Auburn soils are on foothills. Fiddyment soils have a fine-loamy argillic horizon. They are on isolated hills. Xerolls vary greatly from one area to another. They are on terrace escarpments and steep hills.

Soils of the Andregg series are coarse-loamy, mixed, thermic Ultic Haploxerolls.

Typical pedon of Andregg coarse sandy loam, 2 to 8 percent slopes, 1.8 miles north of Folsom, 2,300 feet north and 300 feet west of the intersection of Inwood Road and Auburn-Folsom Road; 2,800 feet north and 800 feet west of the southeast corner of sec. 23, T. 10 N., R. 7 E., Folsom Quadrangle:

Oi—1 inch to 0; decomposed oak leaves; clear smooth boundary.

A—0 to 11 inches; brown (10YR 5/3) coarse sandy loam, dark brown (10YR 3/3) moist; massive; soft, very friable, slightly sticky and nonplastic; few very fine and fine roots; common very fine interstitial and few very fine tubular pores; moderately acid; gradual smooth boundary.

Bt—11 to 32 inches; light yellowish brown (10YR 6/4) coarse sandy loam, dark yellowish brown (10YR 4/4) moist; massive; slightly hard, friable, slightly sticky and nonplastic; few very fine and fine roots; common very fine interstitial and few very fine tubular pores; many thin colloid stains and few thin clay films bridging mineral grains; slightly acid; gradual irregular boundary.

Cr—32 to 35 inches; weathered granodiorite; slightly acid.

The depth to paralithic contact is 20 to 40 inches. The mollic epipedon is 7 to 20 inches thick, and the content of organic matter is 1 to 3 percent. Base saturation is 50 to 75 percent.

The A horizon has dry color of 10YR 5/3 or 4/3 and moist color of 10YR 3/3 or 3/2. Reaction is moderately acid to neutral.

The Bt horizon has dry color of 10YR 6/4 or 7.5YR 6/4 and moist color of 10YR 4/4 or 7.5YR 4/4. It is

Figure 17.—Profile of an Argonaut loam. A stone line is at a depth of about 12 inches, and a claypan is at a depth of 16 inches. Depth is marked in feet.

sandy loam or coarse sandy loam. The content of clay is 10 to 18 percent. The content of fine angular gravel is 0 to 10 percent. Reaction is moderately acid or slightly acid.

Argonaut Series

The Argonaut series consists of moderately deep, well drained soils on foothills. These soils formed in material weathered from metaandesite and metamorphic rocks (fig. 17). Slope ranges from 3 to 30 percent.

Argonaut soils are near Auburn, Mokelumne, and Whiterock soils. Auburn soils are loamy throughout. Mokelumne soils are kaolinitic. Whiterock soils are very shallow. Auburn and Whiterock soils are on foothills, and Mokelumne soils are on hills and the sides of terrace remnants.

Soils of the Argonaut series are fine, mixed, thermic Mollic Haploxeralfs.

Typical pedon of Argonaut loam, in an area of Auburn-Argonaut-Rock outcrop complex, 8 to 30 percent slopes, about 1.75 miles southwest of Malby Crossing, 8,900 feet south and 4,900 feet east of the intersection of Scott Road and Whiterock Road, and 30 feet north of a dirt road; about 100 feet south and 350 feet west of the northeast corner of sec. 33, T. 9 N., R. 8 E., Folsom SE Quadrangle:

A1—0 to 1 inch; light yellowish brown (10YR 6/4) loam, dark yellowish brown (10YR 3/4) moist; common fine prominent strong brown (7.5YR 5/6) mottles, strong brown (7.5YR 4/6) moist; massive; slightly hard, friable, nonsticky and nonplastic; many very fine roots; many very fine tubular and few very fine interstitial pores; about 5 percent subrounded gravel; moderately acid; abrupt smooth boundary.

A2—1 to 8 inches; reddish yellow (7.5YR 6/6) loam, yellowish red (5YR 4/6) moist; common medium distinct pale brown (10YR 6/3) mottles, brown (10YR 5/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine interstitial and common very fine tubular pores; very few thin clay films in patches; about 10 percent subrounded gravel; moderately acid; gradual smooth boundary.

Bt1—8 to 14 inches; yellowish red (5YR 5/6) gravelly loam, yellowish red (5YR 4/6) moist; common medium distinct light brown (7.5YR 6/4) mottles, brown (7.5YR 5/4) moist; weak fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine interstitial and common fine and few very fine tubular pores; common thin clay films on faces of peds and lining pores; about 20 percent gravel and 5 percent cobbles; moderately acid; abrupt wavy boundary.

Bt2—14 to 21 inches; variegated strong brown (7.5YR 5/6) and yellowish brown (10YR 5/6) clay, strong brown (7.5YR 4/6) and yellowish brown (10YR 5/6) moist; strong medium prismatic structure; extremely hard, very firm, sticky and plastic; few very fine roots; few very fine tubular and interstitial pores; many moderately thick clay films on faces of peds and lining pores; yellowish red (5YR 5/6), dry and moist, clay films on faces of peds in the upper part; about 10 percent subrounded gravel; slightly acid; clear wavy boundary.

BCt—21 to 29 inches; variegated yellowish brown (10YR 5/6) and yellowish red (5YR 5/8) clay loam, dark yellowish brown (10YR 4/6) and yellowish red (5YR 5/6) moist; strong coarse subangular blocky structure; extremely hard, very firm, sticky and plastic; no roots; few very fine tubular and interstitial pores; common moderately thick clay films on faces of peds and lining pores and few thin clay films on faces of peds; about 10 percent subrounded gravel; neutral; abrupt wavy boundary.

Cr—29 inches; pale yellow (2.5Y 7/4), strongly weathered, vertically tilted schist, light yellowish brown (2.5Y 6/4) moist; many moderately thick yellowish red (5YR 5/6) clay films along fracture planes; neutral.

The depth to paralithic contact ranges from 20 to 40 inches. By weighted average, the content of clay in the particle-size control section ranges from 35 to 45 percent.

The A horizon has dry color of 10YR 6/4; 7.5YR 7/4, 6/6, 5/6, or 5/4; or 5YR 6/4 or 5/4. It has moist color of 10YR 3/4; 7.5YR 4/6, 4/4, or 3/4; or 5YR 4/6 or 4/4. The upper 1 to 3 inches has moist value of 3 in some pedons. The content of clay is 12 to 20 percent. The content of gravel is 5 to 15 percent. Reaction is moderately acid or slightly acid.

The Bt1 horizon has dry color of 7.5YR 6/6, 6/4, 5/6, or 5/4 or 5YR 5/6 and moist color of 7.5YR 4/6 or 4/4 or 5YR 4/6 or 4/4. It is loam or clay loam. The content of clay is 20 to 30 percent. The content of coarse fragments is 5 to 25 percent. Reaction is moderately acid to neutral.

The Bt2 and BCt horizons have dry color of 10YR 5/6 or 5/4, 5YR 5/8, 2.5Y 6/4 or 5/4, or 7.5YR 5/6 and moist color of 10YR 6/6, 5/6, 5/4, or 4/6; 2.5Y 6/4 or 5/4; 7.5YR 4/6; or 5YR 4/6 or 5/6. They are clay loam or clay. The content of clay is 35 to 50 percent. The content of coarse fragments is 5 to 25 percent. Reaction is slightly acid or neutral.

The Cr horizon has dry color of 2.5Y 7/4 or 6/4 and moist color of 2.5Y 6/4 or 5/4.

The Argonaut soils in this county are taxadjuncts to the series because most pedons do not have moist value of less than 3.5 throughout the upper 4 inches of the A horizon. Some pedons have an A horizon with moist value of less than 3.5, but this horizon is less than 4 inches thick. This difference, however, does not significantly affect the use and management of the soils.

Auburn Series

The Auburn series consists of shallow and moderately deep, well drained soils on foothills. These soils formed in material weathered from metabasic and metasedimentary rocks. Slope ranges from 2 to 30 percent.

Auburn soils are near Argonaut, Creviscreek, Mokelumne, and Whiterock soils. Argonaut, Creviscreek, and Mokelumne soils have an argillic horizon. Argonaut soils are in concave areas on foothills. Creviscreek soils are on the toe slopes of hills along drainageways. Mokelumne soils are on rolling terrace remnants. Whiterock soils do not have a cambic horizon. They are on foothills.

Soils of the Auburn series are loamy, oxidic, thermic Ruptic-Lithic Xerochrepts.

Typical pedon of Auburn loam, in an area of Auburn-Argonaut-Rock outcrop complex, 8 to 30 percent slopes, about 1.2 miles northwest of White Rock, 4,500 feet north of the intersection of Highway 50 and the Southern Pacific Railroad tracks, 1,400 feet south-southwest of cattle guard on a ranch road; 100 feet south and 1,100 feet east of the northwest corner of sec. 9, T. 9 N., R. 8 E., Clarksville Quadrangle:

A1—0 to 3 inches; strong brown (7.5YR 5/8) loam, strong brown (7.5YR 4/6) moist; many fine prominent light yellowish brown (10YR 6/4) mottles, many fine distinct brown (7.5YR 4/4) moist; massive; hard, firm, nonsticky and nonplastic; common fine roots; common fine interstitial and common fine and few very fine tubular pores; moderately acid; clear smooth boundary.

A2—3 to 6 inches; reddish yellow (7.5YR 6/6) loam, strong brown (7.5YR 4/6) moist; massive; hard, firm, nonsticky and nonplastic; common fine roots; common very fine tubular and common fine interstitial pores; moderately acid; clear smooth boundary.

Bw1—6 to 10 inches; reddish yellow (7.5YR 6/6) loam, brown (7.5YR 4/4) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many fine and few medium tubular and common fine interstitial pores; about 5 percent gravel; moderately acid; clear wavy boundary.

Bw2—10 to 14 inches; yellowish red (5YR 5/6) loam, reddish brown (5YR 4/4) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; common fine tubular and few fine interstitial pores; few thin clay films bridging mineral grains; about 10 percent gravel and 5 percent cobbles; slightly acid; abrupt irregular boundary.

R—14 inches; highly fractured metabasic rock; fractures are 4 to 18 inches apart; moderately thick clay films lining fractures.

The depth to hard bedrock is 10 to 28 inches and varies within short distances. It is dominantly 10 to 20 inches. Reaction is moderately acid or slightly acid in the solum.

The A horizon has dry color of 7.5YR 6/6, 5/6, or 5/8 and moist color of 7.5YR 4/4, 4/6, or 5/4. The content of clay is 12 to 25 percent.

The Bw horizon has dry color of 7.5YR 6/6 or 5YR 5/6 or 6/6 and moist color of 7.5YR 4/4 or 4/6 or 5YR 4/4 or 4/6. In the lower part it has redder hue or brighter chroma than the A horizon. It is loam or silt loam. The content of clay is 12 to 25 percent. The content of coarse fragments is 5 to 15 percent.

Auburn silt loam, 2 to 30 percent slopes, is a taxadjunct to the series because it has paler colors than is defined as the range for the series and has a weakly developed argillic horizon. These differences, however, do not significantly affect the use and management of the soil.

Bruella Series

The Bruella series consists of very deep, well drained soils on intermediate terrace remnants. These soils formed in alluvium derived from granitic rock sources. Slope ranges from 0 to 5 percent.

Bruella soils are near San Joaquin soils. San Joaquin soils have a duripan at a depth of 23 to 40 inches. They are slightly lower on the landscape than the Bruella soils.

Soils of the Bruella series are fine-loamy, mixed, thermic Ultic Palexeralfs.

Typical pedon of Bruella sandy loam, 0 to 2 percent slopes, about 9.8 miles northwest of Twin Cities, 90 feet west of a north-south fence and 400 feet north of Eschinger Road; 2,300 feet east and 950 feet south of the northwest corner of sec. 19, T. 6 N., R. 6 E., Galt Quadrangle:

A—0 to 7 inches; yellowish brown (10YR 5/4) sandy loam, dark yellowish brown (10YR 3/4) moist; massive; granular structure in the upper ¼ inch; hard, friable, slightly sticky and slightly plastic; common fine roots; many very fine interstitial and common very fine, fine, and medium tubular pores; about 5 percent gravel; slightly acid; clear wavy boundary.

BA—7 to 18 inches; yellowish brown (10YR 5/4) sandy loam, brown (7.5YR 4/4) moist; massive; hard, friable, slightly sticky and slightly plastic; few fine roots; many very fine and fine interstitial and many very fine and fine and common coarse tubular pores; about 5 percent gravel; slightly acid; clear wavy boundary.

Bt1—18 to 27 inches; brown (7.5YR 5/4) sandy clay loam, dark reddish brown (5YR 3/4) moist; massive; hard, friable, slightly sticky and plastic; few fine roots; many very fine and fine interstitial and many very fine and fine and common coarse tubular pores; few thin clay films lining pores and bridging mineral grains; about 3 percent gravel; slightly acid; clear wavy boundary.

Bt2—27 to 42 inches; brown (7.5YR 5/4) sandy clay loam, yellowish red (5YR 4/6) moist; weak very coarse angular blocky structure; very hard, firm, sticky and plastic; very few very fine roots; common very fine and fine tubular pores; many thin clay films lining tubular pores and bridging mineral grains; few moderately thick clay films on faces of peds, dark reddish brown (5YR 3/4) moist; about 2 percent gravel; krotovina, 8 inches in diameter, filled with Bt1 material at the top of the horizon; slightly acid; gradual wavy boundary.

Bt3—42 to 61 inches; yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; weak medium prismatic structure; very hard, firm, sticky and plastic; few very fine and coarse tubular pores; few thin clay films bridging mineral grains; few moderately thick clay films on faces of peds, dark reddish brown (5YR 3/4) moist; common moderately thick clay films lining tubular pores; about 2 percent gravel; krotovina, 3 inches in diameter, filled with Bt2 material; neutral.

The combined thickness of the A and Bt horizons is 60 inches or more. By weighted average, the content of clay in the particle-size control section is 20 to 27 percent. The content of coarse sand and very coarse sand is 10 to 20 percent throughout the argillic horizon.

The A horizon has dry color of 10YR 5/4 or 5/3 or 7.5YR 5/4 and moist color of 10YR 4/4 or 3/4, 7.5YR 4/4 or 3/4, or 5YR 3/4. The content of clay is 12 to 20 percent.

The Bt horizon has dry color of 7.5YR 5/4 or 4/4 or 5YR 4/6 or 5/6 and moist color of 5YR 3/4, 4/4, or 4/6. It is sandy clay loam or clay loam. The content of clay is 20 to 35 percent.

Capay Series

The Capay series consists of very deep, moderately well drained soils on the rims of basins. These soils formed in alluvium derived from mixed rock sources. Slope ranges from 0 to 2 percent.

Capay soils are near Cosumnes, Hicksville, and San Joaquin soils. Cosumnes soils are stratified. They are on low flood plains. Hicksville and San Joaquin soils are on low stream terraces. Hicksville soils have a fine-loamy argillic horizon. San Joaquin soils have a duripan at a depth of 23 to 40 inches.

Soils of the Capay series are fine, montmorillonitic, thermic Typic Chromoxererts.

Typical pedon of Capay clay loam, 0 to 2 percent slopes, occasionally flooded, about 4.6 miles northeast of Herald, 4,600 feet north and 750 feet west of the intersection of Folsom South Canal and Highway 104; 2,150 feet north and 1,300 feet east of the southwest corner of sec. 26, T. 6 N., R. 7 E., Clay Quadrangle:

Ap—0 to 5 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; moderate coarse subangular blocky structure; very hard, firm, sticky and plastic; few very fine roots; few very fine tubular and interstitial pores; slightly acid; gradual smooth boundary.

A—5 to 28 inches; grayish brown (10YR 5/2) clay, very dark grayish brown (10YR 3/2) moist; moderate coarse and medium prismatic structure; very hard, firm, sticky and plastic; few very fine roots; few very fine tubular and interstitial pores; slightly acid; gradual smooth boundary.

AC—28 to 41 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate coarse angular blocky structure; very hard, firm, sticky and plastic; few very fine roots; few very fine tubular and interstitial pores; few intersecting slickensides; moderately alkaline; diffuse smooth boundary.

C1—41 to 55 inches; brown (10YR 5/3) clay loam, very dark grayish brown (10YR 3/2) moist; common medium distinct yellowish brown (10YR 5/6) mottles, dark yellowish brown (10YR 4/4) moist; moderate medium angular blocky structure; very hard, firm, sticky and plastic; few very fine roots; few very fine tubular and interstitial pores; moderately alkaline; gradual smooth boundary.

C2—55 to 67 inches; brown (10YR 5/3) clay loam, very dark grayish brown (10YR 3/2) moist; common medium distinct yellowish brown (10YR 5/6) mottles, dark yellowish brown (10YR 4/4) moist; massive; very hard, firm, sticky and plastic; few very fine tubular pores; few thin clay films lining pores; moderately alkaline.

Intersecting slickensides are at a depth of 12 to 40 inches. Cracks ¼ to 1 inch wide extend to a depth of 20 to 30 inches when the soils are dry. By weighted average, the content of clay is 35 to 55 percent in the particle-size control section. Some pedons are calcareous below a depth of 12 inches.

The A horizon has dry color of 10YR 5/2, 4/2, 5/3, or 4/3 or 2.5Y 5/2 or 4/2 and moist color of 10YR 3/3 or 3/2 or 2.5Y 3/2. The content of clay is 35 to 40 percent in the upper part of the horizon and 40 to 60 percent in the lower part. The lower part is clay or silty clay. Reaction is slightly acid to moderately alkaline, becoming more alkaline with increasing depth.

The C horizon has dry color of 10YR 5/3, 4/4, or 5/4 or 2.5Y 5/4 or 4/4 and moist color of 10YR 3/3 or 3/2 or 2.5Y 3/2. It is clay loam or silty clay loam. Reaction is mildly alkaline or moderately alkaline.

Clear Lake Series

The Clear Lake series consists of deep and very deep, poorly drained and somewhat poorly drained soils in basins and along drainageways. These artificially drained soils are deep over a duripan or very deep over stratified material. They formed in fine textured alluvium derived from mixed rock sources. Slope ranges from 0 to 2 percent.

Clear Lake soils are near Cosumnes, Dierssen, Galt, Jacktone, and San Joaquin soils. Cosumnes soils are stratified. They are on low flood plains. Dierssen, Galt, Jacktone, and San Joaquin soils are moderately deep over a duripan. Galt and San Joaquin soils are on low terraces. Dierssen and Jacktone soils are on the rims of basins.

Soils of the Clear Lake series are fine, montmorillonitic, thermic Typic Pelloxererts.

Typical pedon of Clear Lake clay, hardpan substratum, drained, 0 to 1 percent slopes, about 3.1 miles southeast of Point Pleasant; 800 feet north and 100 feet west of the southeast corner of sec. 9, T. 5 N., R. 5 E., Bruceville Quadrangle:

A—0 to 15 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; weak coarse prismatic structure; very hard, very firm, sticky and very plastic; many very fine and fine roots; many very fine and common fine tubular pores; few slickensides; mildly alkaline; gradual smooth boundary.

Ak—15 to 24 inches; mixed dark gray (10YR 4/1) and yellowish brown (10YR 5/4) clay, very dark gray (10YR 3/1) and dark grayish brown (10YR 4/2) moist; massive; very hard, very firm, sticky and plastic; common very fine roots; common very fine tubular pores; common intersecting slickensides; few manganese concretions; violently effervescent; lime segregated in few rounded fine concretions; moderately alkaline; gradual smooth boundary.

ACk—24 to 34 inches; mixed dark gray (10YR 4/1) and yellowish brown (10YR 5/4) clay, dark gray (10YR 4/1) and dark brown (10YR 4/3) moist; massive; very hard, very firm, sticky and very plastic; few very fine roots; common very fine tubular pores; common intersecting slickensides; few manganese concretions; violently effervescent; lime segregated in few rounded fine concretions; moderately alkaline; gradual wavy boundary.

Ck—34 to 48 inches; mixed yellowish brown (10YR 5/4) and gray (10YR 5/1) clay loam, dark brown (10YR 4/3) and dark gray (10YR 4/1) moist; massive; very hard, very firm, sticky and very plastic; few very fine roots; common very fine tubular pores; few intersecting slickensides; few manganese concretions; violently effervescent; lime segregated in few rounded fine concretions; moderately alkaline; gradual wavy boundary.

Ckqm—48 to 64 inches; variegated strong brown (7.5YR 5/6) and light yellowish brown (10YR 6/4), strongly cemented duripan, dark brown (7.5YR 4/4), dark yellowish brown (10YR 4/4), and dark grayish brown (2.5Y 4/2) moist; massive; very hard, very firm; common very fine tubular pores; common manganese stains; strongly effervescent; lime disseminated in common fine irregularly shaped filaments and soft masses; moderately alkaline.

The depth to a duripan is 40 to more than 60 inches. By weighted average, the content of clay is 35 to 60 percent in the 10- to 40-inch control section. Intersecting slickensides are at some depth between 15 and 40 inches. Cracks ½ inch to 1½ inches wide extend to a depth of 20 to 30 inches when the soils are dry. In pedons that have chroma of 1.5 or more, distinct or prominent mottles or iron and manganese concretions, or both, are below a depth of 12 inches. Some pedons do not have a duripan and are stratified in the lower part of the C horizon. The content of clay in these pedons is 20 to 35 percent.

The A horizon generally has dry color of 10YR 5/1, 4/1, or 3/1 or N 3/0 or 4/0 but is mixed with 10YR 5/4 in some pedons. It generally has moist color of 10YR 3/1 or 2/1 or N 3/0 or 2/0 but is mixed with 10YR 4/2 in some pedons. Reaction is slightly acid to moderately alkaline. The lower part of the horizon is calcareous in some pedons. The content of clay is 40 to 60 percent.

The C horizon has dry color of 10YR 6/1, 5/4, 5/3, 5/1, 4/4, 4/3, or 4/1 or 2.5Y 6/2 and moist color of 10YR 5/2, 5/1, 4/4, 4/3, or 4/1 or 2.5Y 4/2. It is clay loam, silty clay loam, silty clay, or clay. The content of clay is 40 to 60 percent in the upper part of the horizon and 27 to 40 percent in the lower part. Reaction is mildly alkaline or moderately alkaline.

The Ckqm horizon has dry color of 10YR 6/4; 7.5YR 7/6, 6/4, or 5/6; or 2.5Y 6/2. It has moist color of 10YR 5/2 or 4/4, 7.5YR 4/4, or 2.5Y 4/2. It is weakly cemented to strongly cemented. Reaction is mildly alkaline or moderately alkaline.

Columbia Series

The Columbia series consists of very deep, somewhat poorly drained soils on low flood plains, natural levees, and flood-plain splays. These soils are artificially drained. They formed in alluvium derived from mixed rock sources. Slope ranges from 0 to 5 percent.

Columbia soils are near Cosumnes, Madera, Sailboat, and San Joaquin soils. Cosumnes soils are fine textured. They are in downstream areas on low flood plains. Madera and San Joaquin soils have a fine textured argillic horizon over a duripan. They are on low terraces. Sailboat soils are fine-loamy. They are on natural levees.

Soils of the Columbia series are coarse-loamy, mixed, nonacid, thermic Aquic Xerofluvents.

Typical pedon of Columbia sandy loam, clayey substratum, drained, 0 to 2 percent slopes, about 6.1 miles northwest of Galt, 9,000 feet south and 3,400 feet west of the intersection of Eschinger Road and Highway 99; 4,500 feet south and 2,700 feet west of the southeast corner of sec. 19, in an unsectionalized area, T. 6 N., R. 6 E., 38 degrees, 20 minutes, 20 seconds north latitude, 121 degrees, 21 minutes, 40 seconds west longitude, Galt Quadrangle:

Ap—0 to 11 inches; light yellowish brown (10YR 6/4) sandy loam, dark brown (10YR 4/3) moist; massive; hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; common medium tubular and very fine interstitial pores; slightly acid; clear wavy boundary.

C—11 to 18 inches; light yellowish brown (10YR 6/4) sandy loam, dark brown (10YR 4/3) moist; few medium prominent strong brown (7.5YR 4/6) mottles, dark brown (7.5YR 3/4) moist; massive; hard, friable, slightly sticky and slightly plastic; common very fine and few fine roots; common very fine interstitial and few fine tubular pores; slightly acid; clear wavy boundary.

2C—18 to 24 inches; pale brown (10YR 6/3) sand, dark brown (10YR 4/3) moist; single grained; loose, nonsticky and nonplastic; few very fine and fine roots; many very fine and fine interstitial pores; slightly acid; abrupt wavy boundary.

3C1—24 to 33 inches; light yellowish brown (10YR 6/4) silt loam, dark yellowish brown (10YR 4/4) moist; common fine distinct strong brown (7.5YR 5/6) mottles, strong brown (7.5YR 4/6) moist; moderate thin platy structure; hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; common very fine and fine tubular pores; about 10 percent iron and manganese flakes and pellets 1 to 3 millimeters in diameter; slightly acid; abrupt wavy boundary.

3C2—33 to 36 inches; light yellowish brown (10YR 6/4) loam, dark yellowish brown (10YR 4/4) moist; many large prominent brown (7.5YR 5/8) mottles, strong brown (7.5YR 4/6) moist; massive; hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; common very fine and fine tubular pores; many small and medium iron and manganese flakes; slightly acid; abrupt wavy boundary.

4C—36 to 43 inches; pale brown (10YR 6/3) sand, dark brown (10YR 4/3) moist; single grained; loose, nonsticky and nonplastic; few very fine and fine roots; many very fine interstitial and common fine tubular pores; micaceous and highly stratified; slightly acid; abrupt wavy boundary.

5Ab—43 to 64 inches; dark gray (10YR 4/1) clay, black (10YR 2/1) moist; massive; hard, friable, sticky and plastic; few very fine and fine roots; many very fine and fine tubular pores; neutral.

Depth to the Ab horizon is 40 to 60 inches. By weighted average, the content of clay in the 10- to 40-inch control section is 10 to 18 percent and the content of sand coarser than very fine sand is more than 15 percent. Distinct or prominent mottles of high value and chroma are below the A horizon. Some pedons do not have a buried A horizon.

The A horizon has dry color of 10YR 6/4, 6/3, 5/4, 5/3, or 5/2 and moist color of 10YR 4/4 or 4/3. It is sandy loam, fine sandy loam, or silt loam. The content of clay is 5 to 20 percent. Reaction is slightly acid to mildly alkaline.

In most pedons the C horizon is stratified sand, loamy sand, sandy loam, fine sandy loam, silt loam, or loam and is slightly acid to mildly alkaline. In pedons that have a surface layer of fine sandy loam, however, the lower part of this horizon is stratified silt loam and silty clay loam, has a clay content of 20 to 35 percent, and is mildly alkaline or moderately alkaline.

The Ab horizon has dry color of 2.5Y 6/2 or 10YR 5/1, 4/2, or 4/1 and moist color of 2.5Y 3/2 or 10YR 3/1 or 2/1. In most pedons it is silty clay loam, clay loam, silty clay, or clay, has a clay content of 35 to 60 percent, and is neutral or mildly alkaline. In pedons that have a surface layer of fine sandy loam, however, the buried A horizon is mucky clay loam, has a clay content of 30 to 40 percent, and is mildly alkaline or moderately alkaline.

Corning Series

The Corning series consists of very deep, well drained or moderately well drained soils on high terraces and terrace remnants characterized by mound-intermound microrelief and on the side slopes of terraces. These soils formed in gravelly alluvium derived from mixed rock sources. Slope ranges from 0 to 30 percent.

Corning soils are near Hadselville, Pentz, and Redding soils. Hadselville soils have a mollic epipedon and are very shallow. They are in the intermound areas. Pentz soils have a mollic epipedon and are shallow. They are on the mounds. Hadselville and Pentz soils are on hills. Redding soils have a duripan at a depth of 20 to 40 inches. They are slightly higher on the landscape than the Corning soils.

Soils of the Corning series are fine, mixed, thermic Typic Palexeralfs.

Typical pedon of Corning gravelly sandy loam, moderately well drained, in an area of Corning complex, 0 to 8 percent slopes, about 2.4 miles south of a power plant; 1,000 feet west and 1,200 feet north of the southeast corner of sec. 5, T. 5 N., R. 8 E., Goose Creek Quadrangle:

A1—0 to 2 inches; brown (10YR 5/3) gravelly sandy loam, dark yellowish brown (10YR 3/4) moist; common medium distinct strong brown (7.5YR 4/6) mottles, dark brown (7.5YR 3/4) moist; moderate medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine and fine interstitial pores; about 15 percent subrounded gravel; moderately acid; clear wavy boundary.

A2—2 to 7 inches; brown (7.5YR 5/4) gravelly fine sandy loam, strong brown (7.5YR 4/6) moist; common medium distinct light yellowish brown (10YR 6/4) mottles, dark brown (7.5YR 3/4) moist; massive; hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; common very fine interstitial and common very fine and few fine tubular pores; about 15 percent subrounded gravel; strongly acid; clear wavy boundary.

BA1—7 to 12 inches; reddish brown (5YR 4/4) and yellowish red (5YR 5/6) loam, yellowish red (5YR 4/6) moist; massive; hard, friable, slightly sticky and plastic; common very fine and fine roots; many very fine interstitial and many very fine and common fine tubular pores; light brown (7.5YR 6/4) material along roots, brown (7.5YR 4/4) moist; about 10 percent subrounded gravel; strongly acid; gradual wavy boundary.

BA2—12 to 20 inches; yellowish red (5YR 5/6) and light brown (7.5YR 6/4) loam, yellowish red (5YR 4/6) moist; common large faint yellowish red (5YR 4/6) mottles, red (2.5YR 4/6) moist; massive; hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; many very fine and fine interstitial and tubular pores; many thin and moderately thick clay films bridging mineral grains and few thin clay films lining pores; about 10 percent subrounded gravel; strongly acid; bleaching in the lower ½ inch; abrupt wavy boundary.

Bt—20 to 32 inches; yellowish red (5YR 4/6) clay, red (2.5YR 4/6) moist; strong medium prismatic structure; very hard, very firm, very sticky and plastic; few very fine and fine roots between peds; few very fine and fine tubular pores; many moderately thick clay films on faces of peds, lining pores, and bridging mineral grains; about 10 percent subrounded gravel; moderately acid; gradual wavy boundary.

2BCt—32 to 39 inches; yellowish red (5YR 5/6 and 5/8) gravelly sandy clay loam, yellowish red (5YR 4/6) moist; massive; very hard, firm, sticky and plastic; common very fine and fine tubular pores; many moderately thick clay films bridging mineral grains and common thin and moderately thick clay films lining pores; about 20 percent subrounded gravel; mildly alkaline; gradual wavy boundary.

2C1—39 to 48 inches; yellowish red (5YR 5/8) gravelly coarse sandy loam, yellowish red (5YR 4/6) moist; massive; very hard, firm, sticky and plastic; common very fine and fine tubular pores; many moderately thick clay films bridging mineral grains and common thin and moderately thick clay films lining pores; about 30 percent subrounded gravel; moderately alkaline; gradual wavy boundary.

2C2—48 to 60 inches; yellowish red (5YR 5/8) gravelly sandy loam, yellowish red (5YR 4/6) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine interstitial and common fine tubular pores; common thin clay films bridging mineral grains; about 20 percent subrounded gravel; moderately alkaline.

Depth to the Bt horizon ranges from 20 to 40 inches and is generally greatest on the mounds. Depth to the 2C horizon ranges from 26 to 52 inches. The content of clay at the upper boundary of the Bt horizon increases by 25 to 40 percent within a distance of 1 inch. By weighted average, the content of clay in the upper 20 inches of the argillic horizon is 35 to 55 percent. In some pedons the 2C horizon is discontinuously and weakly cemented with silica.

The A horizon has dry color of 10YR 5/3, 5/4, 6/3, or 6/4 or 7.5YR 5/4 and moist color of 10YR 4/3, 3/4, or 4/4 or 7.5YR 3/4 or 4/4 in the concave intermound areas. In other areas it has dry color of 7.5YR 4/6, 5/4, 5/6, or 6/4 or 5YR 5/6 and moist color of 7.5YR 3/4 or 4/6 or 5YR 3/4 or 4/4. It is sandy loam, fine sandy loam, or loam. The content of coarse fragments is 15 to 30 percent. It includes 0 to 5 percent cobbles. The content of organic matter is more than 1 percent in the upper 1 to 3 inches but is less than 1 percent in the lower part of the horizon. Reaction is strongly acid to slightly acid. Base saturation is 35 to 75 percent.

The BA horizon has dry color of 7.5YR 5/4, 5/6, or 6/4 or 5YR 4/4, 5/6, or 6/6. It has moist color of 7.5YR 3/4 or 4/6; 5YR 3/4, 4/4, or 4/6; or 2.5YR 3/6. It is sandy loam or loam. The content of coarse fragments is 10 to 30 percent. It includes 0 to 5 percent cobbles. Reaction is strongly acid to slightly acid. Base saturation is 35 to 75 percent.

The Bt horizon has dry color of 5YR 4/4, 4/6, 5/6, 5/8, or 6/6 or 2.5YR 3/4, 3/6, or 4/6 and moist color of 5YR 4/4 or 4/6 or 2.5YR 3/4, 3/6, or 4/6. It is clay loam or clay. The content of clay is 35 to 55 percent. The content of coarse fragments is 10 to 25 percent. It includes 0 to 5 percent cobbles. Reaction is very strongly acid to slightly acid. Base saturation is 75 to 95 percent.

The 2BCt and 2C horizons have dry color of 7.5YR 5/4, 5/6, 6/4, or 6/6 or 5YR 5/4, 5/6, or 5/8 and moist color of 7.5YR 4/4, 4/6, or 5/6 or 5YR 4/4, 4/6, or 4/8. They are stratified loamy coarse sand to clay loam. The content of clay is 10 to 30 percent. By weighted average, the content of coarse fragments is 15 to 35 percent. It includes 0 to 5 percent cobbles. Reaction is moderately acid to moderately alkaline.

Cosumnes Series

The Cosumnes series consists of very deep, somewhat poorly drained soils that have a buried soil high in content of montmorillonitic clay. These soils are on low flood plains. They are artificially drained. They formed in alluvium derived from mixed sources. Slope ranges from 0 to 2 percent.

Cosumnes soils are near Clear Lake, Columbia, Egbert, Sailboat, and San Joaquin soils. Clear Lake soils have intersecting slickensides and have cracks that open to the surface. They are in basins. Columbia soils are coarse-loamy. They are in upstream areas on low flood plains. Egbert soils have a mollic epipedon. They are in downstream areas on high flood plains. Sailboat soils are fine-loamy. They are on natural levees. San Joaquin soils have a duripan at a depth of 23 to 40 inches. They are on low terraces adjacent to the Cosumnes soils.

Soils of the Cosumnes series are fine, mixed, nonacid, thermic Aquic Xerofluvents.

Typical pedon of Cosumnes silt loam, drained, 0 to 2 percent slopes, occasionally flooded, about 3.5 miles east of the intersection of Twin Cities Road and Franklin Boulevard, 500 feet north of the road, 500 feet east of a fence on a north-facing bank cut of Laguna (creek); 4,500 feet east and 500 feet north of the southeast corner of sec. 11, in an unsectionalized area, T. 5 N., R. 5 E., 38 degrees, 17 minutes, 31 seconds north latitude, 121 degrees, 22 minutes, 31 seconds west longitude, Bruceville Quadrangle:

A1—0 to 3 inches; pale brown (10YR 6/3) silt loam, dark brown (10YR 3/3) moist; strong fine and medium granular structure; hard, friable, sticky and slightly plastic; many medium, fine, and very fine roots; many fine interstitial and common fine and very fine tubular pores; slightly acid; clear wavy boundary.

A2—3 to 8 inches; pale brown (10YR 6/3) silt loam, dark brown (10YR 4/3) moist; massive; hard, friable, sticky and slightly plastic; many very fine and common fine and medium roots; many very fine and common medium and fine tubular pores; slightly acid; clear wavy boundary.

C1—8 to 17 inches; pale brown (10YR 6/3) silty clay loam, dark yellowish brown (10YR 3/4) moist; common medium distinct brown (7.5YR 5/4) mottles, dark brown (7.5YR 3/4) moist; massive; hard, friable, sticky and plastic; many very fine and common fine and medium roots; many very fine and fine and common medium tubular pores; slightly acid; gradual irregular boundary.

C2—17 to 21 inches; pale brown (10YR 6/3) clay, dark brown (10YR 4/3) moist; many medium distinct brown (7.5YR 5/4) mottles, dark brown (7.5YR 4/4) moist; massive; very hard, friable, sticky and plastic; common very fine, fine, and medium roots; common very fine, fine, and medium tubular pores; slightly acid; abrupt wavy boundary.

2Ab1—21 to 26 inches; gray (10YR 6/1) clay, very dark gray (10YR 3/1) moist; few medium prominent yellowish brown (10YR 5/6) mottles, dark yellowish brown (10YR 4/6) moist; strong coarse prismatic structure; very hard, firm, very sticky and plastic; few fine and medium and common very fine roots; many very fine and common fine and medium tubular pores; moderately alkaline; gradual wavy boundary.

2Ab2—26 to 43 inches; gray (N 5/0) clay, very dark gray (N 3/0) moist; moderate coarse prismatic structure parting to moderate coarse angular blocky; very hard, firm, very sticky and plastic; common very fine and medium and few fine roots; common very fine and few fine tubular pores; many intersecting slickensides; moderately alkaline; gradual wavy boundary.

2Bk1—43 to 52 inches; clay loam, gray (10YR 5/1) rubbed, very dark gray (10YR 3/1) rubbed and moist; moderate medium subangular blocky structure; very hard, firm, very sticky and plastic; few fine and medium and common very fine roots; common very fine and few fine tubular and interstitial pores; strongly effervescent; few fine irregularly shaped soft masses of carbonate; moderately alkaline; gradual wavy boundary.

2Bk2—52 to 60 inches; clay loam, pale brown (10YR 6/3) rubbed, dark grayish brown (10YR 4/2) rubbed and moist; massive; very hard, firm, sticky and plastic; few fine and medium roots; common very fine tubular and interstitial pores; strongly effervescent; few fine irregularly shaped soft masses of carbonate; moderately alkaline.

The depth to a buried soil ranges from 20 to 40 inches. By weighted average, the content of clay in the 10- to 40-inch control section is 35 to 55 percent. Some pedons do not have a 2Bk horizon.

The A horizon has dry color of 10YR 6/4 or 6/3 and moist color of 10YR 4/4, 4/3, 3/4, or 3/3. The content of clay ranges from 20 to 27 percent. Reaction is slightly acid to mildly alkaline.

The C horizon has dry color of 10YR 7/3, 6/3, 5/3, or 5/4 and moist color of 10YR 5/4, 4/4, 4/3, or 3/4. It is stratified silty clay loam, clay loam, silty clay, or clay. The content of clay is 27 to 55 percent. Reaction is slightly acid to mildly alkaline.

The 2Ab horizon has dry color of 10YR 6/1, 5/1, or 4/1 or N 5/0 or 4/0 and moist color of 10YR 4/1, 3/1, or 2/1 or N 3/0 or 2/0. It is clay loam, silty clay loam, silty clay, or clay. The content of clay is 35 to 55 percent. Reaction is neutral to moderately alkaline.

The 2Bk horizon has dry color of 10YR 7/1, 6/4, 5/1, 6/3, or 5/2 or 2.5Y 5/2 and moist color of 10YR 5/1, 4/4, 4/3, 3/1, or 4/2 or 2.5Y 3/2. It is stratified silty clay loam, clay loam, or clay. The content of clay is 30 to 45 percent. Reaction is neutral to moderately alkaline.

Coyotecreek Series

The Coyotecreek series consists of very deep, well drained soils on narrow, high flood plains. These soils formed in alluvium derived from mixed rock sources. Slope ranges from 0 to 2 percent.

Coyotecreek soils are near Hicksville, Reiff, Sailboat, and Vina soils. Hicksville soils have a fine-loamy argillic horizon. They are on low stream terraces. Reiff and Sailboat soils have an ochric epipedon. They are on low flood plains. Vina soils are coarse-loamy. They are in landscape positions similar to those of the Coyotecreek soils.

Soils of the Coyotecreek series are fine-silty, mixed, thermic Cumulic Haploxerolls.

Typical pedon of Coyotecreek silt loam, 0 to 2 percent slopes, occasionally flooded, about 5 miles southeast of Mather Air Force Base; 1,000 feet north and 550 feet west of the southeast corner of sec. 25, T. 8 N., R. 7 E., Buffalo Creek Quadrangle:

Ap—0 to 15 inches; dark brown (10YR 3/3) silt loam, very dark brown (10YR 2/2) moist; moderate coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine roots; common very fine interstitial pores; slightly acid; gradual wavy boundary.

A—15 to 35 inches; dark brown (10YR 3/3) loam, very dark grayish brown (10YR 3/2) moist; weak coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine interstitial and few very fine tubular pores; slightly acid; gradual wavy boundary.

AC—35 to 58 inches; brown (10YR 4/3) loam, very dark grayish brown (10YR 3/2) moist; massive; very hard, firm, slightly sticky and slightly plastic; common very fine interstitial pores; neutral; gradual wavy boundary.

C—58 to 65 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) and dark yellowish brown (10YR 4/4) moist; visible uncoated sand grains; massive; very hard, firm, sticky and slightly plastic; common very fine interstitial pores; neutral.

By weighted average, the content of clay in the 10- to 40-inch control section is 18 to 27 percent. The content of fine sand or coarser textured material is less than 15 percent. The soils are characterized by weak stratification. The mollic epipedon is more than 20 inches thick. Its content of organic matter is 2 to 3 percent. The content of organic carbon remains more than 0.3 percent to a depth of 50 inches.

The Ap and A horizons have dry color of 10YR 3/3, 4/2, 4/3, 5/2, or 5/3 and moist color of 10YR 2/2, 3/2, or 3/3. The content of clay is 18 to 27 percent. The texture is loam or silt loam in the lower part. Reaction is slightly acid or neutral.

The C horizon has dry color of 10YR 4/3 or 5/3. It is fine sandy loam, loam, silt loam, silty clay loam, or clay loam. The content of clay is 15 to 30 percent. Reaction is neutral or mildly alkaline.

Creviscreek Series

The Creviscreek series consists of deep and very deep, moderately well drained soils on stream terraces and the alluvial toe slopes of hills along drainageways. These soils formed in local alluvium underlain by weakly consolidated, clayey sediments. The alluvium is derived from mixed rock sources. Slope ranges from 0 to 3 percent.

Creviscreek soils are near Auburn, Hicksville, Mokelumne, Mokelumne Variant, Tehama, and Vleck soils. Auburn soils have lithic contact at a depth of 10 to 28 inches. They are on foothills. Hicksville soils have a dark surface layer and have 27 to 35 percent clay in the control section. They are on low stream terraces. Mokelumne soils have paralithic contact at a depth of 20 to 40 inches. They are on hills and the side slopes of terrace remnants. Mokelumne Variant soils have 27 to 35 percent clay in the control section. They are on high terrace remnants. Tehama soils are fine-silty. They are on low terraces above the Creviscreek soils. Vleck soils have a duripan at a depth of 20 to 40 inches. They are on hills.

Soils of the Creviscreek series are fine-loamy, mixed, thermic Typic Haploxeralfs.

Typical pedon of Creviscreek sandy loam, 0 to 3 percent slopes, about 1.5 miles southeast of Live Oak, about 4,000 feet south and 1,600 feet west of the intersection of Highway 16 and Ione Road; 1,600 feet north and 2,360 feet east of the southwest corner of sec. 12, T. 7 N., R. 8 E., Carbondale Quadrangle:

A1—0 to 1 inch; very pale brown (10YR 7/4) sandy loam, yellowish brown (10YR 5/4) moist; common fine prominent strong brown (7.5YR 5/8) mottles, strong brown (7.5YR 4/6) moist; massive; hard, friable, nonsticky and nonplastic; many very fine roots; many very fine interstitial and tubular pores; about 10 percent rounded fine gravel; moderately acid; clear smooth boundary.

A2—1 to 9 inches; light yellowish brown (10YR 6/4) sandy loam, brown (7.5YR 4/4) moist; massive; hard, friable, nonsticky and nonplastic; many very fine roots; many very fine and few fine interstitial and many very fine tubular pores; about 10 percent rounded fine gravel; moderately acid; clear wavy boundary.

A3—9 to 14 inches; reddish yellow (7.5YR 6/6) sandy loam, brown (7.5YR 4/4) moist; massive; slightly hard, friable, slightly sticky and nonplastic; common very fine roots; many very fine interstitial and many very fine and few fine and medium tubular pores; very few thin clay films lining pores; about 10 percent rounded fine gravel; slightly acid; gradual wavy boundary.

BA—14 to 21 inches; reddish yellow (7.5YR 6/6) and brown (7.5YR 5/4) sandy loam, strong brown (7.5YR 4/6) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine interstitial and tubular and few fine interstitial pores; few thin clay films lining pores and in seams; about 10 percent rounded fine gravel; moderately acid; clear wavy boundary.

Bt1—21 to 26 inches; reddish yellow (7.5YR 6/6) and brown (7.5YR 4/4) sandy clay loam, strong brown (7.5YR 4/6) and dark brown (7.5YR 3/4) moist; massive; hard, firm, slightly sticky and slightly plastic; few very fine roots; many fine tubular and many fine and few very fine interstitial pores; common thin clay films lining pores and few moderately thick clay films in seams; about 10 percent rounded fine gravel; slightly acid; clear wavy boundary.

2Bt2—26 to 29 inches; reddish yellow (7.5YR 6/6) and brown (7.5YR 4/4) gravelly sandy clay loam, strong brown (7.5YR 4/6) and dark brown (7.5YR 3/4) moist; massive; hard, firm, sticky and plastic; few very fine roots; many fine tubular and many fine and few very fine interstitial pores; many thin clay films lining pores and few moderately thick clay films in seams; about 25 percent gravel; slightly acid; clear wavy boundary.

3C1—29 to 37 inches; very pale brown (10YR 7/3) and reddish yellow (7.5YR 6/6) extremely gravelly sandy loam, light yellowish brown (10YR 6/4) and strong brown (7.5YR 5/6) moist; massive; hard, firm, sticky and plastic; no roots; common very fine interstitial pores; common thin clay films bridging mineral grains; about 65 percent gravel and 10 percent cobbles; neutral; clear wavy boundary.

3C2—37 to 45 inches; reddish yellow (7.5YR 6/6) very gravelly sandy clay loam, strong brown (7.5YR 5/6) moist; massive; very hard, firm, sticky and plastic; no roots; few very fine interstitial pores; many moderately thick light yellowish brown (10YR 6/4) clay films bridging mineral grains, yellowish brown (10YR 5/6) moist; about 50 percent gravel and 5 percent cobbles; neutral; clear wavy boundary.

3C3—45 to 57 inches; variegated yellow (10YR 7/6) and light gray (2.5Y 7/2), stratified very gravelly sandy loam and very gravelly sandy clay loam, brownish yellow (10YR 6/6) and light yellowish brown (2.5Y 6/4) moist; massive; very hard, firm, sticky and plastic; no roots; no pores; many thin clay films bridging mineral grains; about 55 percent fine gravel; mildly alkaline; abrupt wavy boundary.

4Cr—57 inches; light gray (5Y 7/2), weakly consolidated, clayey sediments, olive gray (5Y 5/2) moist; mildly alkaline.

The combined thickness of the A and Bt horizons is 25 to 39 inches. The depth to weakly consolidated sediments is 40 to 80 inches.

The A horizon has dry color of 10YR 6/4, 7/4, or 7/6 or 7.5YR 6/4, 7/4, 6/6, or 7/6 and moist color of 10YR 4/4 or 5/4 or 7.5YR 4/4, 5/4, 4/6, or 5/6. The content of clay is 8 to 15 percent. The content of gravel is 0 to 15 percent.

The Bt and 2Bt horizons have dry color of 10YR 6/4 or 7.5YR 4/4, 5/4, 6/4, 5/6, 6/6, or 7/6. They have moist color of 10YR 5/4 or 7.5YR 3/4, 4/4, 5/4, 4/6, or 5/6.

The Bt horizon is sandy loam or sandy clay loam. The content of clay is 18 to 27 percent. The content of gravel is 5 to 15 percent. Base saturation is 75 to 90 percent. Reaction is moderately acid to neutral.

The 2Bt horizon has 15 to 35 percent gravel. Reaction is slightly acid or neutral.

The 3C horizon has dry color of 7.5YR 7/4, 5/6, 6/6, or 7/6; 10YR 6/4, 7/3, 7/4, or 7/6; 2.5Y 7/2; or 5YR 6/8. It has moist color of 7.5YR 4/4, 5/4, 4/6, 5/6, or 7/6; 10YR 6/6 or 6/4; 2.5Y 7/2, 5/4, or 6/4; or 5YR 6/8. It is stratified sand to clay loam. The content of coarse fragments in individual strata ranges from 0 to 75 percent. It includes 0 to 5 percent cobbles. Reaction is slightly acid to moderately alkaline.

The 4Cr horizon has dry color of 2.5Y 7/2, 8/2, or 7/4 or 5Y 7/2 and moist color of 2.5Y 6/2 or 6/4 or 5Y 5/2, 6/2, or 6/3.

Dierssen Series

The Dierssen series consists of somewhat poorly drained soils that are moderately deep over a duripan. These soils are on the rims of basins. They are artificially drained. They formed in alluvium derived from mixed rock sources, dominantly granite. Slope ranges from 0 to 2 percent.

Dierssen soils are near Clear Lake, Egbert, Galt, San Joaquin, and Tinnin soils. Clear Lake and Galt soils have intersecting slickensides and have cracks that open to the surface. Clear Lake soils are in basins. Galt soils are on low terraces. Egbert soils are very deep. They are on high flood plains. San Joaquin soils have an ochric epipedon. They are on low terraces. Tinnin soils are very deep and sandy. They are on ridges and mounds.

Soils of the Dierssen series are fine, mixed, thermic Argic Durixerolls.

Typical pedon of Dierssen sandy clay loam, drained, 0 to 2 percent slopes, about 2.4 miles southwest of Point Pleasant, 2.2 miles west of the intersection of Dierssen Road and Franklin Boulevard and 30 feet north of Dierssen Road; in an unsectionalized area, T. 5 N., R. 5 E., 38 degrees, 17 minutes, 48 seconds north latitude, 121 degrees, 28 minutes, 06 seconds west longitude, Bruceville Quadrangle:

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) sandy clay loam, very dark brown (10YR 2/2) moist; weak coarse subangular blocky structure; hard, friable, sticky and plastic; common very fine, fine, medium, and coarse roots; common very fine interstitial and common very fine and fine tubular pores; mildly alkaline; clear wavy boundary.

AB—10 to 14 inches; brown (10YR 5/3) sandy clay loam, dark brown (10YR 4/3) moist; common medium prominent strong brown (7.5YR 5/6) mottles, dark brown (7.5YR 4/4) moist; weak coarse subangular blocky structure; hard, firm, sticky and plastic; few coarse and common fine and medium roots; few very fine and fine tubular and few very fine interstitial pores; common fine distinct black (N 2/0) manganese stains and concretions 2 to 10 millimeters in diameter; mildly alkaline; abrupt wavy boundary.

Btk—14 to 31 inches; yellowish brown (10YR 5/4) clay, dark yellowish brown (10YR 4/4) moist; strong very coarse prismatic structure; very hard, very firm, very sticky and very plastic; common fine roots; common very fine and fine tubular pores; many moderately thick clay films bridging mineral grains and lining pores; many black (N 2/0) manganese stains and concretions 2 to 10 millimeters in diameter; vertical cracks containing surface soil material; violently effervescent; lime segregated in common fine and medium irregularly shaped soft masses; moderately alkaline; clear smooth boundary.

Bqkm—31 to 36 inches; light yellowish brown (10YR 6/4), continuous, weakly cemented duripan, yellowish brown (10YR 5/4) moist; massive; brittle; common very fine and fine tubular pores; many discontinuous laminar bands strongly cemented with silica; violently effervescent; lime segregated in few fine irregularly shaped soft masses; moderately alkaline; clear smooth boundary.

Bqm—36 to 60 inches; very pale brown (10YR 7/4), continuous, weakly cemented duripan, dark brown (10YR 4/3) moist; massive; brittle; few very fine tubular pores; black (N 2/0) manganese stains and opal coatings along fractures; mildly alkaline.

The depth to a duripan is 20 to 40 inches. The thickness of the mollic epipedon ranges from 10 to 15 inches. The content of organic matter is 1 to 3 percent. Lime is in the lower part of the duripan in some pedons.

The Ap horizon has dry color of 10YR 4/2, 4/3, 5/3, or 5/2 and moist color of 10YR 2/2 or 3/2. It is sandy loam, sandy clay loam, or clay loam. Reaction is slightly acid to mildly alkaline.

The Btk horizon has dry color of 10YR 5/2, 5/4, 6/3, or 6/4 or 7.5YR 5/4 and moist color of 10YR 4/2, 4/3, 4/4, or 5/4 or 7/5YR 4/4. It is clay loam or clay. The content of clay is 35 to 50 percent. The calcium carbonate equivalent is 5 to 10 percent. Reaction is mildly alkaline or moderately alkaline.

The Bqkm and Bqm horizons have dry color of 10YR 6/2, 6/3, 6/4, 7/3, or 7/4 and moist color of 10YR 4/2, 4/3, 5/3, or 5/4 or 7.5YR 4/4. Less than half of the upper boundary is coated with opal or opal and sesquioxides or has durinodes. The matrix is weakly cemented to strongly cemented with silica.

Durixeralfs

In this survey area Durixeralfs consist of moderately well drained and well drained soils in cut areas on low terraces. These soils were truncated when the landscape was leveled. They are shallow or moderately deep over a duripan. They formed in alluvium derived from mixed rock sources, dominantly granite. Slope ranges from 0 to 2 percent.

Durixeralfs are near Galt and San Joaquin soils and Xerarents. Galt soils have intersecting slickensides and have cracks that open to the surface. They are in depressions on low terraces. San Joaquin soils have a surface layer of silt loam or fine sandy loam. Xerarents have fragments of an argillic horizon. They are in filled areas.

Reference pedon of Durixeralfs, 0 to 1 percent slopes, 1.2 miles northeast of Twin Cities, 300 feet east of McKenzie Road, and about 1.3 miles south of the intersection of Arno and McKenzie Roads; in an unsectionalized area, T. 5 N., R. 6 E., 38 degrees, 18 minutes, 22 seconds north latitude, 121 degrees, 17 minutes, 58 seconds west longitude, Galt Quadrangle:

Ap—0 to 6 inches; brown (7.5YR 5/4) clay, dark brown (7.5YR 4/4) moist; massive; hard, very firm, sticky and plastic; common very fine, many fine, and few medium roots; many very fine and common fine tubular and many very fine interstitial pores; fragments of the Bt and Bqm horizons; Bt fragments have many clay films bridging sand grains, but the films appear to be degrading because of cultivation; slightly acid; clear wavy boundary.

Bt—6 to 20 inches; brown (7.5YR 5/4) clay, dark brown (7.5YR 4/4) rubbed, reddish brown (5YR 4/4) moist; massive; very hard, extremely firm, sticky and plastic; common very fine and few fine roots; many very fine and few fine tubular pores; many moderately thick clay films lining pores and bridging mineral grains; clay films are dark reddish brown (5YR 3/4) moist and appear to be degrading; mildly alkaline; abrupt smooth boundary.

Bqm—20 to 36 inches; light yellowish brown

(10YR 6/4), strongly cemented duripan, dark brown (7.5YR 4/4) moist; massive; diffuse irregular boundary.

Bq—36 to 55 inches; reddish yellow (7.5YR 6/6) loam, variegated brown (7.5YR 5/4) and yellowish brown (10YR 5/4) moist; massive; hard, very firm, slightly sticky and slightly plastic; weakly cemented with silica; moderately alkaline; clear smooth boundary.

B′qm—55 to 69 inches; light yellowish brown (10YR 6/4), indurated duripan, dark yellowish brown (10YR 4/4) moist.

The reference pedon is an example of the soils within this category. It is not necessarily representative of these soils throughout the survey area.

The depth to a duripan is 10 to 30 inches. By weighted average, the content of clay in the family control section is 27 to 50 percent. Some pedons are truncated, having only part of the Bt and Bqm horizons. Some pedons have a calcareous duripan.

The Ap horizon has dry color of 5YR 4/6 or 5/6, 10YR 5/4, or 7.5YR 5/4 and moist color of 5YR 4/6 or 7.5YR 4/4 or 4/2. It is clay loam, sandy clay loam, or clay. The content of gravel is 2 to 10 percent. The pebbles are fragments of a ripped duripan. Reaction is slightly acid or neutral.

The Bt horizon has dry color of 5YR 4/4, 4/6, or 5/6; 10YR 5/4, 4/4, or 5/3; or 7.5YR 5/4. It has moist color of 5YR 3/4, 4/4, or 4/6 or 7.5YR 4/4. It is clay loam or clay. The content of gravel is 0 to 30 percent. Reaction is neutral or mildly alkaline.

The Bq and Bqm horizons have dry color of 10YR 6/3, 6/4, or 6/6 or 7.5YR 5/6 or 6/6 and moist color of 10YR 5/6, 5/4, or 4/4 or 7.5YR 5/4, 4/4, or 4/6. They are weakly cemented with silica to indurated.

Egbert Series

The Egbert series consists of very deep, poorly drained soils on high flood plains and in backswamps. These soils are artificially drained. They formed in alluvium derived from mixed rock sources and containing moderate amounts of organic matter. Slope ranges from 0 to 5 percent.

Egbert soils are near Cosumnes, Dierssen, Gazwell, Sailboat, Scribner, and Valpac soils. Cosumnes soils are highly stratified. They are on low flood plains. Dierssen soils have a duripan at a depth of 20 to 40 inches. They are on the rims of basins. Gazwell soils have a buried organic layer. They are in backswamps. Sailboat, Scribner, and Valpac soils are fine-loamy. Sailboat soils are on the natural levees of low flood plains. Scribner soils are on the edges of backswamps. Valpac soils are on the natural levees of high flood plains.

Soils of the Egbert series are fine, mixed, thermic Cumulic Haplaquolls.

Typical pedon of Egbert clay, partially drained, 0 to 2 percent slopes, about 4 miles northwest of Thornton, 0.7 mile northeast of the Delta Cross Channel, 5,150 feet north and 6,250 feet west of the intersection of Lauffer and Vail Roads; in an unsectionalized area, T. 5 N., R. 4 E., 38 degrees, 14 minutes, 58 seconds north latitude, 121 degrees, 29 minutes, 10 seconds west longitude, New Hope Quadrangle:

Ap—0 to 11 inches; grayish brown (10YR 5/2) clay, very dark grayish brown (10YR 3/2) moist; moderate fine, medium, and coarse clods; hard, firm, very sticky and plastic; common very fine roots; few very fine tubular pores; slightly acid; clear wavy boundary.

A—11 to 18 inches; grayish brown (10YR 5/2) clay, very dark grayish brown (10YR 3/2) moist; few fine prominent strong brown (7.5YR 5/6) mottles, dark reddish brown (5YR 3/3) moist; moderate medium and coarse subangular blocky structure; hard, firm, very sticky and plastic; common very fine roots; few very fine tubular pores; neutral; clear smooth boundary.

Ab—18 to 35 inches; gray (10YR 5/1) clay loam, black (N 2/0) moist; strong medium and coarse subangular blocky structure; hard, friable, very sticky and plastic; common very fine roots; common very fine and fine tubular pores; at a depth of 23 inches, a 1-inch-thick, continuous stratum of very pale brown (10YR 8/3) burnt soil material, yellowish brown (10YR 5/4) moist; mildly alkaline; gradual wavy boundary.

AC—35 to 46 inches; gray (10YR 5/1) clay loam, very dark gray (10YR 3/1) moist; common fine prominent strong brown (7.5YR 5/6) mottles, dark reddish brown (5YR 3/3) moist; weak medium and coarse subangular blocky structure; hard, friable, very sticky and plastic; common very fine, fine, and medium tubular and few very fine interstitial pores; mildly alkaline; clear wavy boundary.

Cg1—46 to 55 inches; grayish brown (2.5Y 5/2) clay loam, dark gray (10YR 4/1) moist; common fine prominent strong brown (7.5YR 5/6) mottles, reddish brown (5YR 4/4) moist; massive; hard, firm, sticky and plastic; common very fine, fine, and medium tubular and few very fine interstitial pores; mildly alkaline; gradual wavy boundary.

Cg2—55 to 60 inches; grayish brown (2.5Y 5/2) sandy clay loam, dark gray (10YR 4/1) moist; many fine

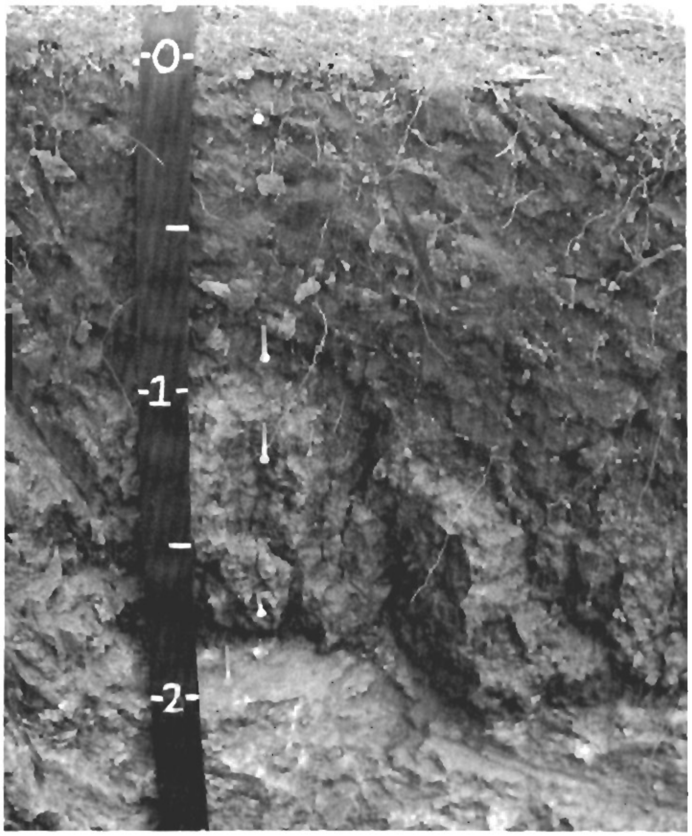

Figure 18.—Profile of Fiddyment soils, which have a claypan at a depth of 14 to 24 inches and a hardpan at a depth of 24 inches or more. Depth is marked in feet.

and medium prominent strong brown (7.5YR 5/6) mottles, reddish brown (5YR 4/4) moist; massive; hard, firm, sticky and plastic; few very fine tubular and common very fine and fine interstitial pores; mildly alkaline.

By weighted average, the content of clay in the 10- to 40-inch control section is 35 to 50 percent. The mollic epipedon is 24 to 50 inches thick. It has an organic matter content of 2 to 10 percent. Thin layers that are 10 to 50 percent organic matter are in some pedons.

The upper part of the A horizon has dry color of 10YR 4/2, 5/1, 5/2, or 5/3 and moist color of 10YR 3/1, 3/2, or 3/3. The content of clay is 40 to 55 percent. Reaction is slightly acid to mildly alkaline but may become more acid when the soils are dry. Some pedons have strata of burnt soil material.

The lower part of the A horizon has dry color of 10YR 4/1, 4/2, or 5/1. It is clay loam, silty clay loam, or clay. The content of clay is 35 to 50 percent. Reaction is slightly acid to mildly alkaline but may become more acid when the soils are dry.

The Cg horizon has dry color of 10YR 6/1; 2.5Y 6/2, 5/2, or 4/2; or 5Y 6/1. It has moist color of 10YR 4/1 or 5/1, 2.5Y 5/2, or 5Y 4/1. It is dominantly sandy clay loam or clay loam that has a clay content of 25 to 35 percent. In some pedons, however, it is silty clay loam, clay loam, or clay that has a clay content of 35 to 50 percent. Reaction is slightly acid to moderately alkaline.

Fiddyment Series

The Fiddyment series consists of well drained soils that are moderately deep over a duripan (fig. 18). These soils are on hills and low terraces. They formed in material weathered from weakly consolidated or moderately consolidated sandstone or siltstone that has thin, discontinuous strata of tuff in some areas. Slope ranges from 0 to 15 percent.

Fiddyment soils are near Kaseberg, Liveoak, Orangevale, and San Joaquin soils and Xerarents. Kaseberg soils are shallow. They are on hills. Liveoak and Orangevale soils are very deep. Liveoak soils are on high flood plains, and Orangevale soils are on high terrace remnants. San Joaquin soils are fine textured. They are on low terraces. Xerarents have fragments of an argillic horizon. They are in filled areas.

Soils of the Fiddyment series are fine-loamy, mixed, thermic Typic Durixeralfs.

Typical pedon of Fiddyment fine sandy loam, 1 to 8 percent slopes, 0.5 mile south of the southern boundary of Mather Air Force Base, 2,420 feet south and 350 feet east of the intersection of Kiefer and Sunrise Boulevards and of the northwest corner of sec. 29, T. 8 N., R. 7 E., Buffalo Creek Quadrangle:

A1—0 to 4 inches; brown (10YR 5/3) fine sandy loam, dark yellowish brown (10YR 3/4) moist; moderate medium platy and subangular blocky structure; platy structure at the top of the horizon; hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine and common fine tubular and many very fine interstitial pores; slightly acid; clear wavy boundary.

A2—4 to 8 inches; brown (10YR 5/3) fine sandy loam, dark yellowish brown (10YR 3/4) moist; massive; very hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine and common fine tubular and many very fine interstitial pores; slightly acid; abrupt wavy boundary.

A3—8 to 15 inches; yellowish brown (10YR 5/4) loam, dark brown (7.5YR 3/4) moist; massive; very hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine and common fine tubular and many very fine interstitial pores; few skeletans in the bottom part of the horizon; slightly acid; abrupt wavy boundary.

Bt1—15 to 24 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; strong medium prismatic structure; very hard, firm, sticky and plastic; common very fine roots; common very fine tubular pores; many thick clay films on faces of peds, common thin and moderately thick clay films lining pores, and many moderately thick clay films bridging mineral grains; about 2 percent 1/16- to 3/4-inch gravel; neutral; clear wavy boundary.

Bt2—24 to 28 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; strong medium prismatic structure; very hard, firm, sticky and plastic; common very fine roots; common very fine tubular pores; many thick clay films on faces of peds, common thin and moderately thick clay films lining pores, and many moderately thick clay films bridging mineral grains; mildly alkaline; abrupt smooth boundary.

Bqm—28 to 29 inches; light yellowish brown (10YR 6/4) and very pale brown (10YR 7/4), indurated duripan, yellowish brown (10YR 5/4) moist; common medium prominent very dark gray (10YR 3/1) mottles, black (10YR 2/1) moist; massive; extremely hard opal-coated laminar cap and strata indurated in more than half of the horizontal plane; brittle; moderately alkaline; abrupt wavy boundary.

Bq—29 to 40 inches; very pale brown (10YR 7/3), weakly cemented duripan, brown (10YR 5/3) moist; massive; very hard and extremely hard; common very fine tubular pores; common or many moderately thick pale brown (10YR 6/3) clay films and colloids, dark brown (7.5YR 4/4) moist; vertical fracture planes; common thin clay films and colloids lining pores; few opal coatings on fracture planes; brittle; moderately alkaline; clear wavy boundary.

Cr1—40 to 56 inches; light gray (10YR 7/2) siltstone, light brownish gray (10YR 6/2) moist; common medium prominent very dark gray (10YR 3/1) mottles, black (10YR 2/1) moist; extremely hard but can be cut with difficulty with a tile spade or auger; many very fine tubular and common very fine interstitial pores; many moderately thick clay films and colloids on vertical fracture planes, brown (7.5YR 4/4) moist; moderately alkaline; clear wavy boundary.

Cr2—56 to 64 inches; light gray (10YR 7/2) siltstone, light brownish gray (10YR 6/2) moist; common medium prominent very dark gray (10YR 3/1) mottles, black (10YR 2/1) moist; extremely hard but can be cut with difficulty with a tile spade or auger; many very fine tubular and interstitial pores; common medium distinct colloidal stains on cross sections, brown (7.5YR 4/4) moist; moderately alkaline.

The depth to a duripan is 20 to 40 inches. Paralithic contact directly underlies the duripan. The content of clay increases by 15 to 25 percent at an abrupt boundary within or at the upper boundary of the argillic horizon. Some pedons have bleached sand grains or sand grains coated with pale colored material within the matrix of a layer directly above the Bt horizon. This layer is 1 to 3 inches thick.

The A horizon has dry color of 7.5YR 5/4 or 10YR 6/4, 6/3, 5/4, or 5/3 and moist color of 7.5YR 4/4, 3/4, or 3/2 or 10YR 3/4 or 3/2. It is fine sandy loam or loam. The content of clay is 10 to 15 percent. The content of organic matter is 1 to 2 percent in the upper 4 to 6 inches but is less than 1 percent in the lower part of the horizon. Reaction generally is moderately acid to neutral; however, in some pedons it is strongly acid because of the addition of fertilizer.

Some pedons have a BA or BAt horizon. This horizon has dry color of 7.5YR 6/4 or 5/4 or 10YR 7/3, 6/4, or 5/3 and moist color of 7.5YR 4/4 or 10YR 4/3. It is loam or sandy loam. The content of clay is 10 to 18 percent. Reaction is moderately acid to neutral.

The Bt horizon has dry color of 7.5YR 6/4 or 5/4 or 10YR 7/3, 6/3, or 5/3 and moist color of 7.5YR 4/4 or 3/4, 10YR 4/3, or 5YR 3/4 or 4/4. It is sandy clay loam or clay loam. The content of clay is 27 to 35 percent. It increases with increasing depth. Reaction is slightly acid to mildly alkaline.

The Bqm and Bq horizons have dry color of 10YR 7/4, 7/3, 7/2, 6/4, 6/3, or 5/3 or 7.5YR 6/6, 6/3, or 5/4 and moist color of 10YR 6/2, 5/4, 5/3, or 4/3 or 7.5YR 4/4 or 4/6. The duripan is strongly cemented with silica to indurated. More than half of its upper boundary or some subhorizon is indurated. The duripan is 1/16 inch to 16 inches thick.

Fiddyment loam, 1 to 15 percent slopes, is a taxadjunct to the series because the content of clay in the argillic horizon is, by weighted average, 35 to 45 percent rather than 27 to 35 percent. This difference, however, does not significantly affect the use and management of the soil.

Fluvaquents

Fluvaquents in this survey area consist of stratified, very deep, very poorly drained soils on low flood plains, on interchannel bars, and in tidal marshes. These soils formed in alluvium derived from mixed rock sources and are stratified with hydrophytic plant remains. Slope ranges from 0 to 2 percent.

Fluvaquents are near Medisaprists and water areas.

Medisaprists are organic soils in tidal marshes.

Reference pedon of Fluvaquents, 0 to 2 percent slopes, frequently flooded, about 3.5 miles northwest of Antioch, in the Sherman Island Waterfowl Management Area, 4,200 feet southeast of Point Sacramento and 125 feet east of a small duck pond; sampled on September 10, 1984; in an unsectionalized area, 38 degrees, 03 minutes, 16 seconds north latitude, 121 degrees, 49 minutes, 35 seconds west longitude, Antioch Quadrangle:

Oi—6 to 0 inches; tall bulrush and cattail roots.

A1—0 to 8 inches; dark grayish brown (10YR 4/2) mucky clay loam, black (5Y 2.5/1) moist; massive; hard, friable, slightly sticky and slightly plastic; many very fine and fine and few medium roots; few very fine interstitial pores; electrical conductivity of 5.4 millimhos per centimeter; mildly alkaline; abrupt smooth boundary.

A2—8 to 11 inches; finely stratified gray (10YR 5/1) and dark gray (10YR 4/1) sandy loam, very dark gray (5Y 3/1) and black (N 2/0) moist; massive; slightly hard, friable, nonsticky and nonplastic; few very fine roots; few very fine interstitial pores; electrical conductivity of 3.2 millimhos per centimeter; mildly alkaline; abrupt wavy boundary.

Cg1—11 to 15 inches; light gray (2.5Y 7/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; few fine prominent yellowish brown (10YR 5/8) mottles, dark yellowish brown (10YR 3/6) moist; massive; hard, friable, slightly sticky and slightly plastic; few fine roots; few very fine interstitial and tubular pores; electrical conductivity of 5.0 millimhos per centimeter; moderately alkaline; abrupt wavy boundary.

Cg2—15 to 30 inches; stratified grayish brown (2.5Y 5/2) sandy loam, light gray (2.5Y 7/2) loam, very dark gray (N 3/0) muck, and light gray (5Y 6/1) mucky loam, very dark grayish brown (2.5Y 3/2), dark gray (10YR 4/1), black (N 2/0), and dark gray (5Y 4/1) moist; massive; slightly hard, friable, nonsticky and nonplastic; few fine roots; few very fine interstitial pores; electrical conductivity of 9.3 millimhos per centimeter; moderately alkaline; abrupt wavy boundary.

Cg3—30 to 55 inches; stratified dark gray (10YR 4/1) mucky loam and black (N 2/0) muck, very dark gray (10YR 3/1) and black (N 2/0) moist; massive; hard, friable, nonsticky and nonplastic; few very fine interstitial pores; electrical conductivity of 26.0 millimhos per centimeter; moderately alkaline; clear wavy boundary.

Oa—55 to 60 inches; dark gray (10YR 4/1) muck, black (10YR 2/1) moist; 5 percent fibers unrubbed; slightly hard, friable, nonsticky and nonplastic; electrical conductivity of 13.0 millimhos per centimeter; moderately alkaline.

The reference pedon is an example of the soils within this category. It is not necessarily representative of these soils throughout the survey area.

Texture and color vary considerably. The content of organic matter in individual strata ranges from 1 percent to more than 25 percent. By weighted average, the content of clay ranges from 5 to 45 percent. Some pedons do not have a buried organic layer.

Some pedons are not salt affected. Salt accumulation varies from year to year because of saltwater intrusion and rainfall variability.

Galt Series

The Galt series consists of moderately well drained soils in the basins of low terraces. These soils are moderately deep over a duripan. They formed in fine textured alluvium derived from mixed rock sources, dominantly granite. Slope ranges from 0 to 5 percent.

Galt soils are near Clear Lake and Dierssen soils, Durixeralfs, and Madera and San Joaquin soils. Clear Lake soils are very deep. They are in basins. Dierssen soils have an argillic horizon. They are on the rims of basins. Durixeralfs, Madera, and San Joaquin soils have an argillic horizon. They are on low terraces.

Soils of the Galt series are fine, montmorillonitic, thermic Typic Chromoxererts.

Typical pedon of Galt clay, 0 to 2 percent slopes, about 5 miles northwest of Galt, 2.6 miles west of the intersection of Twin Cities Road and Highway 99, and 1.6 miles due north of Twin Cities Road; in an unsectionalized area, T. 5 N., R. 6 E., 38 degrees, 18 minutes, 54 seconds north latitude, 121 degrees, 21 minutes, 25 seconds west longitude, Galt Quadrangle:

A1—0 to 5 inches; grayish brown (10YR 5/2) clay, very dark grayish brown (10YR 3/2) moist; common medium distinct yellowish brown (10YR 5/6) mottles, dark yellowish brown (10YR 4/4) moist; dominantly weak coarse prismatic structure parting to strong very coarse and coarse subangular blocky; clay loam that has thick platy and coarse granular structure in the upper 1 inch; very hard, firm, sticky and plastic; many very fine and fine roots; many very fine and common fine tubular pores; 1 to 2 percent iron and manganese concretions 1 to 3 millimeters in diameter; many vertical and horizontal cracks 2 to 3 millimeters wide when the soil material is slightly moist; slightly acid; gradual wavy boundary.

A2—5 to 13 inches; grayish brown (10YR 5/2) clay, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to strong very coarse and coarse subangular blocky; very hard, firm, sticky and plastic; many very fine and fine roots; many very fine and common fine tubular pores; few iron and manganese concretions 1 to 3 millimeters in size; many vertical cracks as much as 5 millimeters wide when the soil material is slightly moist; many intersecting slickensides; slightly acid; gradual wavy boundary.

AC—13 to 22 inches; mixed grayish brown (10YR 5/2) and brown (10YR 5/3) clay, dark brown (10YR 3/3) moist; moderate very coarse prismatic structure; extremely hard, very firm, very sticky and very plastic; common very fine and fine roots; common very fine and few fine tubular pores; 1 to 2 percent iron and manganese concretions 1 to 3 millimeters wide; many intersecting slickensides that form wedge-shaped aggregates; an accumulation of surface vegetation in vertical cracks; neutral; gradual wavy boundary.

C—22 to 32 inches; mixed grayish brown (10YR 5/2) and brown (10YR 5/3) clay, dark brown (10YR 3/3) moist; moderate very coarse prismatic structure; extremely hard, very firm, very sticky and very plastic; common very fine and few fine roots; common very fine and fine tubular and common very fine interstitial pores; 1 to 2 percent iron and manganese concretions 1 to 3 millimeters wide; many intersecting slickensides that form wedgelike aggregates; an accumulation of surface vegetation in vertical cracks; moderately alkaline; clear wavy boundary.

Cqkm—32 to 60 inches; variegated yellowish red (5YR 4/6), light yellowish brown (10YR 6/4), and white (10YR 8/1), continuous duripan; massive; weakly cemented; discontinuous, indurated, silica-cemented laminar bands, 1 to 5 millimeters thick, in the upper part; opal coatings lining pores and filling the interstices in the weakly cemented part; strongly effervescent; disseminated carbonates; moderately alkaline.

The depth to a duripan is 20 to 40 inches. Cracks ¼ inch to 1½ inches wide extend to a depth of 20 to 30 inches when the soils are dry. Slickensides intersect at some depth between 10 and 40 inches. The lower part of the C horizon is calcareous in some pedons.

The A horizon has dry color of 10YR 4/2, 5/2, or 5/3 and moist color of 10YR 3/2, 2/2, or 3/3. The content of clay is 40 to 60 percent. Some pedons have overburden of pale brown (10YR 4/3) silt loam in which the content of clay is 10 to 20 percent. Reaction is slightly acid or neutral.

The C horizon has dry color of 10YR 5/2, 5/3, 6/2, or 7/2 and moist color of 10YR 4/3, 4/2, or 3/3. It is silty clay or clay. The content of clay is 40 to 60 percent. Reaction is neutral to moderately alkaline.

The Cqkm horizon is massive or platy. It is weakly cemented to strongly cemented.

Gazwell Series

The Gazwell series consists of very deep, very poorly drained, mineral soils that have a buried organic soil. These soils are in backswamps along the edge of freshwater marshes. They are artificially drained. They formed in alluvium derived from mixed rock sources and directly underlain by decomposed hydrophytic plant remains. Slope ranges from 0 to 2 percent.

Gazwell soils are near Egbert, Rindge, Sailboat, and Scribner soils. Egbert soils have 2 to 10 percent organic matter in the 10- to 40-inch control section. They are on high flood plains. Rindge soils are organic. They are in freshwater marshes. Sailboat soils have an ochric epipedon. They are on the natural levees of low flood plains. Scribner soils are fine-loamy. They are on the edges of backswamps.

Soils of the Gazwell series are fine, mixed, thermic Cumulic Haplaquolls.

Typical pedon of Gazwell mucky clay, partially drained, 0 to 2 percent slopes, about 2.3 miles southeast of Rio Vista, about 9,600 feet due south and 5,000 feet due east of the intersection of Highways 12 and 160; 2,150 feet northeast of Tomato Slough along a dirt road on the north side of a major drain and 200 feet north into a field; in an unsectionalized area, 121 degrees, 39 minutes, 40 seconds west longitude, 38 degrees, 07 minutes, 50 seconds north latitude, Rio Vista Quadrangle:

Ap1—0 to 8 inches; dark grayish brown (10YR 4/2) mucky clay, very dark grayish brown (10YR 3/2) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots; many fine interstitial pores; about 15 percent organic matter; moderately acid; clear smooth boundary.

Ap2—8 to 17 inches; dark grayish brown (10YR 4/2) mucky clay, very dark brown (10YR 2/2) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine interstitial pores; about 14 percent organic matter; moderately acid; gradual smooth boundary.

Ap3—17 to 30 inches; dark grayish brown (10YR 4/2) mucky clay, very dark brown (10YR 2/2) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine interstitial pores; mixed throughout with common fine fragments of burnt material, reddish brown (5YR 4/4) moist; about 13 percent organic matter; moderately acid; abrupt wavy boundary.

Ab—30 to 36 inches; very dark gray (10YR 3/1) mucky clay, black (10YR 2/1) moist; few medium prominent yellowish red (5YR 4/6) mottles, dark reddish brown (5YR 3/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; common very fine roots; many very fine interstitial pores; discontinuous bands, ½ inch thick, of burnt material, dark yellowish brown (10YR 4/4) moist; about 25 percent organic matter; moderately acid; abrupt smooth boundary.

Oa1—36 to 48 inches; muck, very dark gray (10YR 3/1) broken face, black (10YR 2/1) moist; common fine prominent strong brown (7.5YR 4/6) mottles, red (2.5YR 4/8) moist; no visible fibers; massive; slightly hard, very friable, nonsticky and nonplastic; about 35 percent organic matter; very strongly acid; abrupt wavy boundary.

Oa2—48 to 61 inches; mucky peat, very dark gray (10YR 3/1) broken face, black (10YR 2/1) moist; about 40 percent fibers, less than 5 percent rubbed; strong very thin platy structure; slightly hard, firm, nonsticky and nonplastic; dark brown (10YR 3/3) fibers, dark yellowish brown (10YR 3/4) moist; about 33 percent organic matter; moderately acid.

Depth to the buried organic layer and the thickness of the mollic epipedon range from 28 to 39 inches. By weighted average, the control section, from a depth of 10 inches to the upper boundary of the organic soil, has a clay content of 40 to 60 percent and an organic matter content of 10 to 20 percent.

The Ap horizon has dry color of 10YR 5/1, 4/2, 4/1, or 3/1 and moist color of 10YR 3/2, 3/1, 2/2, or 2/1. The content of organic matter is 7 to 15 percent. Reaction is strongly acid to slightly acid.

The Ab horizon has dry color of 10YR 5/1, 4/1, or 3/1 and moist color of 10YR 3/1 or 2/1. It is mucky clay or mucky silty clay. The content of organic matter is 10 to 27 percent. Reaction is moderately acid or slightly acid. Some pedons have a burned layer, ½ inch to 2 inches thick, within the Ab or Oa1 horizon. This layer is at a depth of 20 to 45 inches. It has moist color of 10YR 5/6 or 4/4, 7.5YR 4/6 or 4/3, 5YR 5/6 or 5/4, or 2.5YR 4/8.

The Oa horizon has dry color of 10YR 5/1, 4/1, or 3/1 or N 2/0 and moist color of 10YR 2/1 or N 2/0. The content of fibers ranges from less than 5 percent in the upper part of the horizon to about 50 percent in the lower part. Most of the fibers are destroyed by rubbing when the material is moist. The content of organic matter is 27 to 40 percent. Reaction is very strongly acid or moderately acid.

Gillender Series

The Gillender series consists of very shallow, moderately well drained soils on hills characterized by mound-intermound microrelief. These soils are in the intermound areas. They formed in material weathered from weakly consolidated rhyolitic tuffaceous sediments. Slope ranges from 2 to 15 percent.

Gillender soils are near Amador and Hadselville soils, Lithic Xerorthents, and Pardee, Pentz, Ranchoseco, and Vleck soils. Amador, Pentz, and Pardee soils are shallow. They are on the mounds. Hadselville soils have a mollic epipedon. They are in the intermound areas. Lithic Xerorthents and Ranchoseco soils have lithic contact. They are in the intermound areas. Vleck soils have a fine textured argillic horizon. They are on the foot slopes of hills.

Soils of the Gillender series are loamy, mixed, nonacid, thermic, shallow Typic Xerorthents.

Typical pedon of Gillender loam, in an area of Amador-Gillender complex, 2 to 15 percent slopes, about 4.1 miles southeast of Bridge House, 1.0 mile west of the intersection of Ione and Meiss Roads, 15 feet north of a fence along Meiss Road; 1,510 feet south and 1,620 feet east of the northwest corner of sec. 26, T. 7 N., R. 8 E., Carbondale Quadrangle:

A1—0 to 2 inches; very pale brown (10YR 7/3) loam, brown (10YR 4/3) moist; common fine distinct dark yellowish brown (10YR 4/6) mottles, dark yellowish brown (10YR 3/6) moist; moderate fine granular and weak fine subangular blocky structure; soft, friable, slightly sticky and slightly plastic; many very fine and fine roots; common very fine and fine tubular and interstitial pores; about 15 percent gravel; moderately acid; clear wavy boundary.

A2—2 to 4 inches; very pale brown (10YR 7/3) loam, brown (10YR 5/3) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; common very fine and few fine interstitial and few very fine tubular pores; about 15 percent gravel; moderately acid; clear wavy boundary.

AC—4 to 7 inches; variegated light yellowish brown (2.5Y 6/4) and pale brown (10YR 6/3) sandy loam, light olive brown (2.5Y 5/4) and brown (10YR 5/3) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; common very fine and fine interstitial and few very fine tubular pores; about 15 percent gravel; moderately acid; abrupt wavy boundary.

Cr—7 to 20 inches; pale yellow (2.5Y 7/4), weakly consolidated rhyolitic tuffaceous sediments, light yellowish brown (2.5Y 6/4) moist; moderately acid.

The depth to paralithic contact is 4 to 10 inches. By weighted average, the content of clay in the control section is 12 to 25 percent. The content of gravel ranges from 0 to 15 percent throughout the profile. Some pedons do not have an AC horizon.

The A horizon has dry color of 10YR 6/2, 6/3, 6/4, 7/2, or 7/3 or 7.5YR 7/2 and moist color of 10YR 4/3, 4/4, 5/2, 5/3, or 5/4. The content of clay is 15 to 25 percent. Reaction is slightly acid or moderately acid.

The AC horizon has variegated dry color of 2.5Y 6/2 or 6/4 or 10YR 6/2, 6/3, or 6/4 and moist color of 2.5Y 5/4, 6/2, or 6/4 or 10YR 4/3, 5/3, 6/2, 6/3, or 6/4. It is sandy loam or loam. The content of clay is 12 to 25 percent. Reaction is slightly acid to strongly acid.

The Cr horizon has dry color of 10YR 6/4 or 7/2; 2.5Y 7/2, 7/4, or 8/2; or 5Y 7/2 or 8/2. It has moist color of 2.5Y 6/2, 6/4, or 7/4 or 5Y 5/3, 6/2, or 8/4. It crushes to sandy loam or loam.

Hadselville Series

The Hadselville series consists of very shallow, moderately well drained soils on hills characterized by mound-intermound microrelief. These soils are in the intermound areas. They formed in material weathered from weakly consolidated basic andesitic tuffaceous sediments. Slope ranges from 2 to 30 percent.

Hadselville soils are near Amador, Corning, Gillender, and Hicksville soils, Lithic Xerorthents, and Pardee, Pentz, Peters, Ranchoseco, and Redding soils. Gillender soils, Lithic Xerorthents, and Ranchoseco soils have an ochric epipedon. They are in the intermound areas. Corning soils have a fine textured argillic horizon. They are on high terraces. Hicksville soils have a fine-loamy argillic horizon. They are on low stream terraces. Amador, Pardee, and Pentz soils are shallow. They are on the mounds. Redding soils have a fine textured argillic horizon underlain by a duripan. They are on high terraces. Peters soils have a mollic epipedon. They are on the concave side slopes of hills.

Soils of the Hadselville series are loamy, mixed, thermic, shallow Entic Ultic Haploxerolls.

Typical pedon of Hadselville sandy loam, in an area of Hadselville-Pentz complex, 2 to 30 percent slopes, about 3 miles south of Bridge House, 2.3 miles west of the intersection of Ione Road and Meiss Road, about 170 feet east of a north-south fence, 75 feet north of Meiss Road; 1,750 feet south and 2,700 feet west of the northeast corner of sec. 22, T. 7 N., R. 8 E., Carbondale Quadrangle:

A—0 to 7 inches; grayish brown (10YR 5/2) sandy loam, very dark grayish brown (10YR 3/2) moist; common fine distinct yellowish brown (10YR 5/6) root stains, dark yellowish brown (10YR 3/6) moist; weak medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; many very fine roots; many very fine interstitial and tubular pores; about 10 percent, by volume, subrounded gravel ¼ to 1 inch in size; at the base of the horizon, a discontinuous layer of gravelly sandy loam that is ½ inch to 2 inches thick and has a few thin clay films on faces of peds; slightly acid; abrupt wavy boundary.

Cr—7 to 20 inches; variegated light gray (10YR 7/1) and very dark gray (10YR 3/1), weakly consolidated basic andesitic tuffaceous sandstone, dark grayish brown (10YR 4/2) and very dark gray (10YR 3/1) moist; neutral.

The depth to paralithic contact and the thickness of the mollic epipedon are 4 to 10 inches. Base saturation, by sum of cations, is 60 to 75 percent.

The A horizon has dry color of 10YR 5/3, 5/2, or 4/2 and moist color of 10YR 3/3, 3/2, or 2/2 or 7.5YR 3/2. The content of clay is 8 to 18 percent. The content of unrelated coarse fragments is 0 to 15 percent. It includes 0 to 5 percent cobbles. Reaction is strongly acid to slightly acid.

The color of the Cr horizon is commonly that of individual sand grains. The dominant hue is 10YR or 2.5Y. This horizon consists of weakly consolidated or moderately consolidated andesitic sediments that are stratified with conglomerate and andesitic rock fragments in some pedons.

Hedge Series

The Hedge series consists of moderately well drained soils in beveled areas on low terraces commonly adjacent to channels and in areas on flood plains or low stream terraces. These soils are moderately deep over a duripan. They formed in alluvium derived from granitic rock sources. Slope ranges from 0 to 2 percent.

Hedge soils are near Columbia, Hicksville, and San Joaquin soils. Columbia soils are coarse-loamy. They are on low flood plains. Hicksville soils do not have a duripan. They are on low stream terraces. San Joaquin soils have a fine textured argillic horizon and an indurated duripan. They are in the slightly higher positions on the low terraces.

Soils of the Hedge series are fine-loamy, mixed, thermic Haplic Durixeralfs.

Typical pedon of Hedge loam, 0 to 2 percent slopes, about 3.3 miles southwest of Mather Field, 3,050 feet south of Jackson Road and 610 feet east of Bradshaw Road, about 100 feet north of an east-west fence; 940 feet east and 1,750 feet south of the northeast corner of sec. 29, in an unsectionalized area, T. 8 N., R. 6 E., 38 degrees, 31 minutes, 15 seconds north latitude, 121 degrees, 19 minutes, 56 seconds west longitude, Carmichael Quadrangle:

Ap—0 to 7 inches; light yellowish brown (10YR 6/4) loam, dark brown (10YR 4/3) moist; massive; hard, friable, slightly sticky and slightly plastic; many very fine roots; common fine interstitial pores; about 2 percent very dark gray (10YR 3/1) soft masses 1/16 to 3/16 inch in diameter; slightly acid; abrupt wavy boundary.

A—7 to 14 inches; light yellowish brown (10YR 6/4) loam, dark brown (10YR 4/3) moist; few large distinct strong brown (7.5YR 5/6) mottles, brown (7.5YR 4/4) moist; massive; hard, friable, slightly sticky and slightly plastic; few very fine roots; many very fine and common fine interstitial pores; about 5 percent very dark gray (10YR 3/1) soft manganese masses and shot 1/16 to 3/16 inch in diameter; neutral; clear smooth boundary.

E1—14 to 19 inches; very pale brown (10YR 7/4) loam, brown (7.5YR 4/4) moist; few medium distinct strong brown (7.5YR 5/6) mottles, strong brown (7.5YR 4/6) moist; massive; hard, friable, slightly sticky and slightly plastic; few very fine roots; many very fine interstitial pores; about 10 percent very dark gray (10YR 3/1) soft manganese masses and shot 1/16 to 3/8 inch in diameter; mildly alkaline; clear wavy boundary.

E2—19 to 23 inches; very pale brown (10YR 7/4) loam, dark yellowish brown (10YR 4/4) moist; many fine distinct strong brown (7.5YR 5/6) mottles, strong brown (7.5YR 4/6) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine tubular pores; about 5 percent very dark gray (10YR 3/1) soft manganese masses and shot 1/16 to 3/8 inch in diameter; mildly alkaline; abrupt wavy boundary.

Bt1—23 to 31 inches; light yellowish brown (10YR 6/4) clay loam, brown (7.5YR 4/4) moist; common fine distinct yellowish brown (10YR 5/6) mottles, strong brown (7.5YR 5/6) moist; moderate coarse angular blocky structure; very hard, firm, sticky and plastic; many very fine interstitial and common very fine tubular pores; continuous, moderately thick, dark brown (7.5YR 4/2) clay films on faces of peds and lining pores; about 3 percent very dark gray (10YR 3/1) manganese shot 1/16 to 3/16 inch in diameter; mildly alkaline; clear wavy boundary.

Bt2—31 to 38 inches; strong brown (7.5YR 5/6) loam, brown (7.5YR 4/4) moist; common fine distinct very pale brown (10YR 7/4) mottles, yellowish brown (10YR 5/4) moist; weak coarse angular blocky structure; hard, very firm, slightly sticky and slightly plastic; many very fine tubular pores; many moderately thick clay films lining pores and many thin clay films on faces of peds; weak brittleness in the lower half of the horizon; about 3 percent very dark gray (10YR 3/1) manganese shot 1/16 to 3/16 inch in diameter; mildly alkaline; clear wavy boundary.

Bqm—38 to 44 inches; light yellowish brown (10YR 6/4) and strong brown (7.5YR 5/6) duripan, brown (7.5YR 4/4) and strong brown (7.5YR 4/6) moist; common fine distinct strong brown (7.5YR 4/6) mottles, dark brown (7.5YR 3/4) moist; massive; very hard and brittle, continuous, 1/2- to 1 1/2-inch layers that are weakly cemented with silica; hard, friable, slightly sticky and plastic in the matrix; many thin clay films lining pores and strong brown (7.5YR 5/6) opal coatings along vertical fractures and pores, brown (7.5YR 4/4) moist; common medium very dark gray (10YR 3/1) manganese stains; mildly alkaline; clear wavy boundary.

C—44 to 60 inches; light yellowish brown (10YR 6/4), compact sandy loam, brown (7.5YR 4/4) moist; massive; hard, friable, nonsticky and nonplastic; many very fine tubular pores; few thin yellowish red (5YR 5/6) clay films lining pores, yellowish red (5YR 4/6) moist; few fine very dark gray (10YR 3/1) manganese stains; discontinuous, very weak cementation; mildly alkaline.

The depth to a duripan is 20 to 40 inches. Some pedons have a discontinuous, strongly cemented manganese layer 1/16 to 1/4 inch thick.

The Ap and A horizons have dry color of 10YR 5/3, 6/3, or 6/4 or 7.5YR 5/4 and moist color of 10YR 3/4, 4/3, or 4/4 or 7.5YR 3/4 or 4/4. The content of clay is 12 to 20 percent. The content of soft to hard manganese accumulations is 1 to 5 percent. Reaction is moderately acid to neutral.

The E horizon has dry color of 10YR 5/4, 6/3, 6/4, 7/3, or 7/4 and moist color of 10YR 4/3, 4/4, or 5/4 or 7.5YR 4/4, 5/4, or 5/6. It is loam or fine sandy loam. The content of clay is 10 to 18 percent. The content of soft to hard manganese accumulations is 1 to 10 percent. Reaction is slightly acid to mildly alkaline.

The Bt horizon has dry color of 10YR 5/4 or 6/4 or 7.5YR 4/6, 5/4, or 5/6 and moist color of 10YR 4/4 or 7.5YR 4/4 or 4/6. The upper part of this horizon is clay loam or sandy clay loam and has a clay content of 27 to 35 percent. In most pedons the lower part has a clay content of 20 to 27 percent and is weakly cemented. The content of soft to hard manganese accumulations is 1 to 5 percent. Reaction is neutral or mildly alkaline.

The Bqm horizon has dry color of 10YR 6/3, 6/4, or 7/3 or 7.5YR 5/6 or 6/4 and moist color of 10YR 4/3 or 4/4 or 7.5YR 4/4 or 4/6. It is weakly cemented or moderately cemented with silica in continuous layers ½ inch to 4 inches thick. Reaction is mildly alkaline or moderately alkaline.

Hicksville Series

The Hicksville series consists of deep and very deep, moderately well drained soils on low stream terraces and alluvial flats along the drainageways of terraces and hills. These soils formed in alluvium derived from mixed rock sources. If it occurs, alluvium containing coarse fragments is from local sources. Slope ranges from 0 to 2 percent.

Hicksville soils are near Columbia, Corning, Coyotecreek, Hadselville, Pentz, Redding, and San Joaquin soils. Columbia soils are coarse-loamy and stratified. They are on low flood plains. Corning soils have a fine textured argillic horizon. They are on high terraces. Coyotecreek soils are fine-silty. They are on high flood plains. Hadselville and Pentz soils are on hills. They have a mollic epipedon. Hadselville soils are very shallow, and Pentz soils are shallow. Redding and San Joaquin soils have a duripan at a depth of 24 to 40 inches. Redding soils are on high terraces. San Joaquin soils are on low terraces.

Soils of the Hicksville series are fine-loamy, mixed, thermic Mollic Haploxeralfs.

Typical pedon of Hicksville loam, 0 to 2 percent slopes, occasionally flooded, about 1.3 miles northeast of Herald; 700 feet north and 800 feet west of the southeast corner of sec. 5, T. 5 N., R. 7 E., Clay Quadrangle:

A—0 to 5 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; massive; hard, friable, slightly sticky and slightly plastic; common very fine roots; common very fine interstitial and few very fine tubular pores; moderately acid; clear smooth boundary.

AB—5 to 13 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; common very fine interstitial and few very fine tubular pores; slightly acid; clear smooth boundary.

Bt1—13 to 18 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine interstitial and tubular pores; few thin clay films bridging mineral grains; slightly acid; clear smooth boundary.

Bt2—18 to 31 inches; brown (7.5YR 5/4) clay loam, dark brown (10YR 4/3) moist; few light gray (10YR 7/1) bleached sand grains on faces of peds; moderate medium and coarse subangular blocky structure; very hard, firm, sticky and plastic; few very fine roots; common very fine interstitial and few very fine tubular pores; common moderately thick clay films on faces of peds and lining pores; neutral; gradual smooth boundary.

Bt3—31 to 43 inches; brown (7.5YR 5/4) sandy clay loam, dark brown (10YR 4/3) moist; common light gray (10YR 7/1) bleached sand grains on faces of peds; moderate medium and coarse subangular blocky structure; very hard, firm, sticky and plastic; few very fine interstitial and tubular pores; many moderately thick clay films on faces of peds and lining pores; mildly alkaline; gradual wavy boundary.

BCt—43 to 65 inches; pale brown (10YR 6/3) sandy clay loam, dark yellowish brown (10YR 4/4) moist; moderate coarse subangular blocky structure; very hard, firm, sticky and plastic; few very fine interstitial and tubular pores; many moderately thick strong brown (7.5YR 4/6) clay films on faces of peds, lining pores, and bridging mineral grains, dark yellowish brown (10YR 4/4) moist; mildly alkaline.

Some pedons have paralithic contact at a depth of 40 to 60 inches and do not have a BCt horizon.

The A horizon has dry color of 10YR 4/3, 5/2, or 5/3 and moist color of 10YR 3/2 or 3/3 or 7.5YR 3/2. It is loam, gravelly loam, or sandy clay loam. The content of clay is 18 to 27 percent. The content of organic matter is 1 to 3 percent in the upper 4 inches. In some pedons, subhorizons are massive and hard or the content of organic matter is less than 1 percent at a depth of 9 inches.

The Bt horizon has dry color of 10YR 5/2, 5/3, 5/4, or 6/3 or 7.5YR 5/4 or 6/4 and moist color of 10YR 3/2, 3/3, 4/3, or 4/4 or 7.5YR 4/4. Bleached sand grains with color of 10YR 7/1, 7/2, or 6/5 are on faces of peds in the lower subhorizons. The content of clay is 27 to 35 percent. The content of gravel is 0 to 35 percent. Reaction is slightly acid to mildly alkaline.

The BCt horizon has dry color of 10YR 5/3, 6/3, or 6/4 and moist color of 10YR 4/3 or 4/4. Bleached sand grains with color of 10YR 6/3, 7/1, or 7/2 are on faces of peds. The texture is sandy loam or sandy clay loam.

The content of clay is 15 to 25 percent. The content of gravel is 0 to 15 percent. Reaction is slightly acid to mildly alkaline.

A 2C or 2BCt horizon is in most pedons that are gravelly throughout or that are 40 to 60 inches deep to a 3Cr horizon. It has dry color of 5Y 6/2 or 6/3, 2.5Y 6/2, or 10YR 6/3 and moist color of 2.5Y 5/4 or 6/3 or 10YR 5/2, 5/3, or 6/3. Coarse textured layers have bleached sand grains with color of 10YR 6/3, 7/1, or 7/2. The texture is stratified loamy sand to clay loam. By weighted average, the content of clay is 18 to 30 percent. The content of coarse fragments is 35 to 60 percent. Reaction is neutral or mildly alkaline.

The 3Cr horizon, if it occurs, has dry color of 5Y 6/3 or 2.5Y 7/2 and moist color of 5Y 6/2 or 2.5Y 5/4. It consists of weakly consolidated or moderately consolidated, clayey sediments.

Jacktone Series

The Jacktone series consists of somewhat poorly drained soils in high areas in basins. These soils are moderately deep over a duripan. They are artificially drained. They formed in fine textured alluvium derived from mixed rock sources. Slope ranges from 0 to 2 percent.

Jacktone soils are near Clear Lake and San Joaquin soils. Clear Lake soils are deep and very deep. They are in basins. San Joaquin soils have a surface layer of silt loam or fine sandy loam. They are on low terraces.

Soils of the Jacktone series are fine, montmorillonitic, thermic Typic Pelloxererts.

Typical pedon of Jacktone clay, drained, 0 to 2 percent slopes, about 4.5 miles northeast of the Sacramento Metropolitan Airport, 4,300 feet east of Highway 99 and 150 feet south of the Sacramento-Sutter County line, 150 feet south and 165 feet west of a valve headgate on the county line; 2,500 feet north and 1,050 feet west of the southeast corner of sec. 10, T. 10 N., R. 4 E., Taylor Monument Quadrangle:

Ap—0 to 6 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; moderate fine and medium subangular and moderate fine granular structure; very hard, firm, sticky and plastic; many very fine roots; many very fine, fine, medium, and coarse interstitial and few very fine tubular pores; neutral; abrupt smooth boundary.

A1—6 to 11 inches; very dark gray (10YR 3/1) clay, very dark gray (N 3/0) moist; moderate coarse angular blocky structure; extremely hard, very firm, sticky and plastic; common very fine roots; few very fine tubular pores; moderately alkaline; clear wavy boundary.

A2—11 to 21 inches; clay, very dark gray (10YR 3/1) dry and moist; massive; extremely hard, very firm, sticky and plastic; few very fine roots; few very fine tubular pores; intersecting slickensides assumed to be in the horizon when the soils are dry; few fine black (10YR 2/1) iron and manganese concretions; strongly effervescent; lime segregated in few fine rounded soft masses; moderately alkaline; clear wavy boundary.

A3—21 to 27 inches; clay, very dark gray (10YR 3/1) dry and moist; massive; extremely hard, very firm, sticky and plastic; few very fine roots; common very fine tubular and few very fine interstitial pores; intersecting slickensides assumed to be in the horizon when the soils are dry; few fine black (10YR 2/1) concretions; strongly effervescent; lime segregated in few fine rounded soft masses; moderately alkaline; gradual wavy boundary.

ACk—27 to 34 inches; gray (10YR 5/1) clay, dark gray (10YR 4/1) moist; massive; very hard, firm, sticky and plastic; few very fine roots; few very fine tubular and common very fine interstitial pores; few fine black (10YR 2/1) iron and manganese concretions; strongly effervescent; lime segregated in common fine irregularly shaped soft masses and disseminated lime; moderately alkaline; abrupt smooth boundary.

Cqkm—34 to 37 inches; indurated, silica-cemented laminar cap less than 2 millimeters thick over a light brownish gray (10YR 6/2), weakly cemented duripan, dark grayish brown (10YR 4/2) moist; massive; few very fine tubular and interstitial pores; few fine black (10YR 2/1) iron and manganese concretions; strongly effervescent; lime segregated in common fine or medium irregularly shaped filaments; continuous induration in 70 percent of the horizon; moderately alkaline; abrupt wavy boundary.

Cq—37 to 52 inches; light gray (10YR 7/2), weakly cemented duripan, grayish brown (2.5Y 5/2) moist; massive; common very fine tubular pores; matrix breaks to loam after prolonged rubbing; brittle; moderately alkaline; gradual wavy boundary.

C—52 to 60 inches; light yellowish brown (10YR 6/4) loam, dark yellowish brown (10YR 4/4) moist; massive; hard, firm, sticky and slightly plastic; few very fine tubular and many very fine interstitial pores; weakly cemented with silica and brittle in 30 percent of the horizon; moderately alkaline.

The depth to a duripan ranges from 20 to 40 inches. Intersecting slickensides are about 12 inches above the hardpan. When the soils are dry, cracks ½ inch to 1½ inches wide extend to a depth of 20 to 30 inches. In pedons that have chroma of 1.5 or more, distinct or prominent mottles or iron and manganese concretions, or both, are below a depth of 12 inches. The duripan is 3 to more than 30 inches thick.

The Ap and A horizons have dry color of 10YR 5/1, 4/1, or 3/1 or N 3/0 and moist color of 10YR 3/1 or 2/1 or N 3/0 or 2/0. The content of clay is 40 to 60 percent.

The ACk horizon has dry color of 10YR 4/3, 4/2, or 5/1 or 2.5Y 4/2 and moist color of 10YR 4/3, 3/3, 3/2, or 4/1 or 2.5Y 3/2. In many pedons the colors are mixed. The texture is clay loam or clay. The content of clay is 35 to 60 percent.

The Cqkm and Cq horizons have dry color of 10YR 6/2, 7/2, or 7/3 or 2.5Y 7/2 and moist color of 10YR 4/2 or 2.5Y 5/2, 5/4, or 4/4. Induration is in the form of a laminar cap or thin laminar layers below the upper boundary.

The C horizon underlying the duripan has colors similar to those of the Cqkm horizon. It is loam, sandy clay loam, or clay loam. The content of clay is 20 to 30 percent. This horizon is weakly cemented to strongly cemented.

Kaseberg Series

The Kaseberg series consists of well drained soils on hills. These soils are shallow over a duripan. They formed in material weathered from weakly consolidated or moderately consolidated sandstone or siltstone that has thin, discontinuous strata of tuff in some areas. Slope ranges from 2 to 15 percent.

Kaseberg soils are near Fiddyment and Orangevale soils and Xerarents and Xerolls. Fiddyment soils are moderately deep. They are slightly higher on terrace remnants than the Kaseberg soils. Orangevale soils are very deep. They are on high terrace remnants and hills. Xerarents have fragments of an argillic horizon. They are in filled areas. Xerolls have a mollic epipedon. They are on steep and very steep terrace escarpments and hills.

Soils of the Kaseberg series are loamy, mixed, thermic, shallow Typic Durochrepts.

Typical pedon of Kaseberg loam, in an area of Kaseberg-Fiddyment-Urban land complex, 2 to 15 percent slopes, about 1.9 miles southwest of Fair Oaks, 200 feet west of the intersection of Hollister Road and Grant Avenue, 400 feet south of Grant Avenue along a driveway and 100 feet east of the driveway; in an unsectionalized area, T. 9 N., R. 6 E., 38 degrees, 37 minutes, 41 seconds north latitude, 121 degrees, 17 minutes, 59 seconds west longitude, Citrus Heights Quadrangle:

Ap—0 to 4 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; strong medium granular structure; hard, friable, nonsticky and slightly plastic; many very fine roots; common very fine and fine tubular pores; neutral; abrupt smooth boundary.

ABt—4 to 8 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; massive; hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine and common fine tubular pores; few thin clay films lining pores and many thin clay bridges between mineral grains; slightly acid; clear smooth boundary.

Bt1—8 to 15 inches; yellowish brown (10YR 5/4) loam, dark yellowish brown (10YR 4/4) moist; weak medium prismatic structure; hard, friable, slightly sticky and slightly plastic; common very fine roots; few very fine and common fine and medium tubular pores; common thin dark yellowish brown (10YR 3/4) clay films on faces of peds and lining pores; neutral; clear wavy boundary.

Bt2—15 to 18 inches; yellowish brown (10YR 5/4) loam, dark yellowish brown (10YR 4/4 and 4/6) moist; massive; hard, friable, slightly sticky and slightly plastic; common very fine roots; common fine tubular pores; common thin clay bridges between mineral grains and few moderately thick clay films lining pores; neutral; abrupt wavy boundary.

Bqm—18 to 19 inches; variegated light yellowish brown (10YR 6/4) and light gray (2.5Y 7/2), continuous, strongly cemented duripan, yellowish brown (10YR 5/4) and light olive brown (2.5Y 5/4) moist; hard and brittle; white (10YR 8/2), continuously indurated, silica-cemented laminar cap less than 1 millimeter thick, very pale brown (10YR 8/3) moist; neutral; clear wavy boundary.

Cr—19 to 22 inches; variegated light yellowish brown (10YR 6/4) and light gray (2.5Y 7/2), weakly consolidated sandstone, yellowish brown (10YR 5/4) and light olive brown (2.5Y 5/4) moist.

The depth to a duripan ranges from 14 to 20 inches. Paralithic contact directly underlies the duripan. It is at a depth of 15 to 21 inches. Reaction is moderately acid to neutral in the solum.

The Ap and ABt horizons have dry color of 10YR 5/3, 5/4, or 6/3 or 7.5YR 5/4 and moist color of 10YR 3/2, 3/3, or 3/4. The content of clay is 10 to 15 percent.

The Bt horizon has dry color of 10YR 5/3, 5/4, 6/3, or 6/4 or 7.5YR 6/4 and moist color of 10YR 3/3, 3/4, 4/3, 4/4, or 4/6 or 7.5YR 4/4. The content of clay is 10 to 20 percent.

The Bqm horizon has dry color of 10YR 5/4 or 6/4 or 2.5Y 6/2 or 7/2 and moist color of 10YR 5/4 or 2.5Y 5/4 or 5/6. It is weakly cemented to strongly cemented and has a continuous cap of indurated silica.

The Cr horizon consists of weakly consolidated or moderately consolidated siltstone or sandstone.

The Kaseberg soils in this county are taxadjuncts to the series because they have a weak argillic horizon. This difference, however, does not significantly affect the use and management of the soils.

Keyes Series

The Keyes series consists of moderately well drained soils on hills characterized by weak hummocky microrelief. These soils are shallow over a duripan. They formed in material weathered from sediments consisting of andesitic gravel, cobbles, and tuff. Some of the gravel in the material overlying the claypan is metamorphic. Slope ranges from 2 to 15 percent.

Keyes soils are near Hadselville, Pardee, Pentz, and Ranchoseco soils. Hadselville and Ranchoseco soils are very shallow over bedrock. They are in concave areas between mounds on hills. Pardee and Pentz soils are shallow over bedrock. They are on mounds on hills.

Soils of the Keyes series are clayey, mixed, thermic, shallow Abruptic Durixeralfs.

Typical pedon of Keyes sandy loam, 2 to 15 percent slopes, about 8.0 miles southwest of Malby Crossing, 6,000 feet south and 4,850 feet west of the intersection of Latrobe Road and Stonehouse Road; 3,100 feet south and 1,600 feet west of the northeast corner of sec. 32, T. 8 N., R. 8 E., Folsom SE Quadrangle:

A1—0 to 2 inches; grayish brown (10YR 5/2) sandy loam, dark brown (7.5YR 3/2) moist; many fine distinct strong brown (7.5YR 5/8) root stains, strong brown (7.5YR 5/6) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine and few fine interstitial pores; about 5 percent fine gravel; moderately acid; abrupt smooth boundary.

A2—2 to 9 inches; yellowish brown (10YR 5/4) sandy loam, dark brown (7.5YR 3/4) moist; massive; slightly hard, friable, nonsticky and nonplastic; many very fine roots; many very fine interstitial and many very fine and few fine tubular pores; about 5 percent fine gravel; slightly acid; clear smooth boundary.

Bt—9 to 15 inches; brown (7.5YR 5/4) gravelly sandy clay loam, dark brown (7.5YR 3/4) moist; massive; slightly hard, friable, slightly sticky and nonplastic; common very fine roots; many very fine and common fine interstitial and tubular pores; common thin clay films lining pores and bridging mineral grains and few moderately thick clay films lining pores; about 15 percent well rounded gravel; slightly acid; abrupt wavy boundary.

2Bt—15 to 19 inches; dominantly brown (10YR 5/3) gravelly clay, dark yellowish brown (10YR 4/4) moist; brown (7.5YR 5/4) in the upper 1.5 inches, dark brown (7.5YR 4/4) moist; moderate fine prismatic structure; very hard, firm, sticky and plastic; few very fine roots; few very fine tubular pores; about 20 percent well rounded gravel and 5 percent well rounded cobbles; many moderately thick clay films on faces of peds; neutral; abrupt wavy boundary.

2Bqm—19 to 25 inches; strong brown (7.5YR 5/6) and very pale brown (10YR 7/4), continuous, weakly cemented duripan, strong brown (7.5YR 4/6) and yellow (10YR 7/6) moist; massive; brittle; few very fine interstitial pores; common silica coatings on the underside of coarse fragments; about 50 percent well rounded gravel and 5 percent well rounded cobbles; common thin clay films bridging mineral grains; mildly alkaline; clear wavy boundary.

3Cr—25 inches; variegated pale yellow (2.5Y 7/4), very dark grayish brown (2.5Y 3/2), and grayish brown (2.5Y 5/2), weakly consolidated andesitic sandstone, olive brown (2.5Y 4/4), very dark grayish brown (2.5Y 3/2), and light olive brown (2.5Y 5/4) moist; slightly acid.

The depth to a duripan is 13 to 20 inches. The depth to weathered bedrock is 14 to 40 inches. By weighted average, the content of clay in the particle-size control section is 35 to 50 percent and the content of coarse fragments in the control section is 15 to 35 percent.

The A horizon has dry color of 10YR 5/2, 5/3, 5/4, 6/2, 6/3, or 6/4 or 7.5YR 5/4 and moist color of 10YR 3/2, 3/3, 3/4, or 4/4 or 7.5YR 3/2, 3/4, or 4/4. The content of clay is 10 to 18 percent. Reaction is moderately acid to neutral.

The Bt horizon has dry color of 10YR 5/2, 5/3, or 5/4 or 7.5YR 4/4 or 5/4 and moist color of 10YR 3/2, 3/3, or 3/4 or 7.5YR 3/4. It is gravelly sandy clay loam or gravelly clay loam. The content of clay is 20 to 30 percent. The content of coarse fragments is 15 to 35 percent. It includes 0 to 10 percent cobbles. Reaction is slightly acid or neutral.

The 2Bt horizon has dry color of 10YR 4/3 or 5/3 or 7.5YR 4/4 and moist color of 10YR 3/3, 3/4, 4/3, or 4/4 or 7.5YR 3/4 or 4/4. It is gravelly clay or gravelly clay loam. The content of clay is 35 to 60 percent. The content of coarse fragments, which are mainly andesitic, is 15 to 35 percent. It includes 0 to 10 percent cobbles. Reaction is slightly acid or neutral.

The 2Bqm horizon has dry color of 10YR 5/4 or 7/4, 7.5YR 5/6, or 5YR 5/6 or 7/6 and moist color of 10YR 4/4 or 7/6, 7.5YR 4/6, or 5YR 4/6. The duripan is continuously cemented with silica. Cementation is strong to weak. This horizon is 4 to 12 inches thick. The content of coarse fragments, which are mainly andesitic, is 35 to 60 percent. It includes 0 to 20 percent cobbles.

Kimball Series

The Kimball series consists of very deep, moderately well drained soils in low, beveled areas and on the side slopes of low terraces. These soils formed in alluvium derived from mixed rock sources, dominantly granite. Slope ranges from 0 to 8 percent.

Kimball soils are near Bruella and San Joaquin soils. Bruella soils have a fine-loamy control section. They are on intermediate terrace remnants. San Joaquin soils have a duripan at a depth of 23 to 40 inches. San Joaquin soils are in the slightly higher areas on the low terraces.

Soils of the Kimball series are fine, mixed, thermic Mollic Palexeralfs.

Typical pedon of Kimball silt loam, 0 to 2 percent slopes, about 4,250 feet west of Highway 99, about 150 feet east of Southern Pacific Railroad tracks and 2,700 feet north of Kost Road; 900 feet west and 20 feet south of the northeast corner of sec. 34, T. 5 N., R. 6 E., Lodi North Quadrangle:

Ap—0 to 6 inches; brown (10YR 5/3) silt loam, dark brown (10YR 3/3) moist; massive; hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine and fine tubular and common very fine interstitial pores; slightly acid; clear wavy boundary.

A—6 to 15 inches; brown (10YR 5/3) silt loam, dark brown (10YR 3/3) moist; massive; hard, friable, slightly sticky and slightly plastic; many very fine and common fine roots; many very fine and fine tubular and common very fine interstitial pores; slightly acid; clear wavy boundary.

BA—15 to 24 inches; light brown (7.5YR 6/4) silt loam, brown (7.5YR 4/4) moist; massive; hard, friable, slightly sticky and slightly plastic; common very fine and few fine roots; many very fine and fine tubular and many very fine interstitial pores; few thin clay films bridging mineral grains; slightly acid; abrupt wavy boundary.

Bt—24 to 36 inches; brown (7.5YR 5/4) and strong brown (7.5YR 4/6) clay loam, brown (7.5YR 4/4) and strong brown (7.5YR 4/6) moist; moderate coarse prismatic structure parting to medium and coarse angular blocky; very hard, firm, very sticky and plastic; common very fine and few fine and coarse roots; many very fine and common fine tubular pores; many moderately thick clay films on faces of peds, lining pores, and bridging mineral grains; neutral; gradual wavy boundary.

2BCt1—36 to 45 inches; strong brown (7.5YR 5/6) sandy clay loam, brown (7.5YR 4/4) moist; massive; hard, firm, sticky and slightly plastic; very few very fine and fine roots; common very fine and few fine tubular and common very fine interstitial pores; few thin clay films lining pores and along vertically oriented fractures and common thin and moderately thick yellowish red (5YR 4/6) clay films, reddish brown (5YR 4/4) moist; neutral; gradual wavy boundary.

2BCt2—45 to 61 inches; strong brown (7.5YR 5/6) sandy loam, strong brown (7.5YR 4/6) moist; massive; hard, friable, slightly sticky and slightly plastic; very few very fine and fine roots; many very fine and common fine tubular and many very fine interstitial pores; common thin and moderately thick reddish brown (5YR 4/4) clay films along vertically oriented fractures, dark reddish brown (5YR 3/4) moist; neutral.

The content of clay increases by 15 to 25 percent at the abrupt boundary directly above the argillic horizon. Some pedons do not have a 2BCt horizon.

The Ap and A horizons have dry color of 10YR 5/2, 5/3, or 6/3 or 7.5YR 4/4 or 5/4. They have moist color of 10YR 3/2, 3/3, or 3/4; 7.5YR 3/2 or 3/3; or 5YR 3/3 or 3/4. The content of clay is 15 to 25 percent. Reaction is slightly acid to mildly alkaline.

The Bt horizon has dry color of 10YR 5/4 or 5/6; 7.5YR 4/4, 4/6, or 5/4; or 5YR 4/4, 4/6, 5/4, or 5/6. It has moist color of 10YR 4/4 or 4/6; 7.5YR 4/4 or 4/6; or 5YR 3/4, 4/3, or 4/4. It is clay loam or clay. The content of clay is 35 to 50 percent. The content of silt and very fine sand is 40 to 50 percent. Reaction is slightly acid to mildly alkaline.

The 2BCt has dry color of 7.5YR 5/4 or 5/6 or 5YR 5/4 or 5/6 and moist color of 7.5YR 4/4 or 4/6 or 5YR 4/4 or 4/6. It is sandy loam, loam, sandy clay loam, or clay loam. The content of clay is 18 to 30 percent. Reaction is neutral or mildly alkaline.

Lang Series

The Lang series consists of very deep, moderately well drained soils on low flood-plain splays. These soils are artificially drained. They formed in alluvium derived from mixed rock sources. Slope ranges from 0 to 2 percent.

Lang soils are near Columbia and Sailboat soils on the natural levees of low flood plains. Columbia soils are coarse-loamy. Sailboat soils are fine-loamy.

Soils of the Lang series are mixed, thermic Typic Psammaquents.

Typical pedon of Lang fine sandy loam, drained, 0 to 2 percent slopes, about 0.5 mile west of the Sacramento Metropolitan Airport, 0.7 mile east of Garden Highway 160 on Reservoir Road, 0.15 mile south on Schoolhouse Road, 10 feet east of the road and 100 feet north of an oak tree; 1,400 feet east and 1,400 feet south of the northwest corner of sec. 25, T. 10 N., R. 3 E., Taylor Monument Quadrangle:

Ap—0 to 12 inches; light yellowish brown (10YR 6/4) fine sandy loam, dark yellowish brown (10YR 4/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; many very fine interstitial pores; slightly acid; clear wavy boundary.

C1—12 to 21 inches; light yellowish brown (10YR 6/4) loamy sand, dark yellowish brown (10YR 4/4) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine roots; many very fine interstitial pores; discontinuous strata of sand less than 1 inch wide; neutral; abrupt wavy boundary.

C2—21 to 60 inches; white (10YR 8/1) sand, light gray (10YR 7/2) moist; single grained; loose, nonsticky and nonplastic; few very fine roots; many very fine interstitial pores; neutral.

The Ap horizon has dry color of 10YR 6/4 or 6/3 and moist color of 10YR 4/4 or 3/4. Reaction is slightly acid or neutral.

The C horizon has dry color of 10YR 8/1, 7/2, 6/4, or 6/3 and moist color of 10YR 7/2, 6/2, 4/4, or 4/3. It is loamy sand, fine sand, or sand. Reaction is slightly acid or neutral.

The Lang soils in this county are taxadjuncts to the series because they do not have mottles associated with wetness. This difference, however, does not significantly affect the use and management of the soils.

Laugenour Series

The Laugenour series consists of very deep, poorly drained soils on low flood-plain splays and natural levees. These soils are artificially drained. They formed in alluvium derived from mixed rock sources. Slope ranges from 0 to 2 percent.

Laugenour soils are near Egbert, Sailboat, Scribner, and Valpac soils. Egbert soils are fine textured. They are on high flood plains. Sailboat, Scribner, and Valpac soils are fine-loamy. Sailboat soils are on the natural levees of low flood plains. Scribner soils are on the edges of backswamps. Valpac soils are on the natural levees of high flood plains.

Soils of the Laugenour series are coarse-loamy, mixed, thermic Aeric Fluvaquents.

Typical pedon of Laugenour loam, partially drained, 0 to 2 percent slopes, about 2.0 miles northwest of Freeport, 3,300 feet northwest of Interstate 5 and Pocket Road on a dirt road, then 10 feet east of the road; in an unsectionalized area, T. 7 N., R. 4 E., 38 degrees, 29 minutes, 15 seconds north latitude, 121 degrees, 31 minutes, 10 seconds west longitude, Clarksburg Quadrangle:

Ap—0 to 7 inches; light brownish gray (10YR 6/2) loam, very dark grayish brown (10YR 3/2) and dark brown (10YR 3/3) moist; moderate medium angular blocky structure; hard, friable, sticky and slightly plastic; many very fine roots; many very fine interstitial and common very fine tubular pores; moderately alkaline; gradual smooth boundary.

A—7 to 16 inches; grayish brown (10YR 5/2) loam, dark grayish brown (2.5Y 4/2) moist; common fine prominent strong brown (7.5YR 5/8) mottles, dark yellowish brown (10YR 4/6) moist; moderate medium subangular blocky structure parting to moderate fine granular; hard, friable, sticky and slightly plastic; common very fine and medium roots; few fine and common very fine tubular and common very fine interstitial pores; moderately alkaline; abrupt wavy boundary.

C1—16 to 39 inches; pale brown (10YR 6/3) sandy loam, dark grayish brown (2.5Y 4/2) moist; many fine to coarse prominent strong brown (7.5YR 5/8) mottles, dark yellowish brown (10YR 4/6) moist; massive; soft, friable, slightly sticky and slightly plastic; common very fine and coarse roots; many very fine interstitial and many very fine, common fine, and few medium tubular pores; slightly effervescent; disseminated lime; moderately alkaline; clear wavy boundary.

C2—39 to 60 inches; pale brown (10YR 6/3), stratified loam and sandy loam, dark grayish brown (2.5Y 4/2) moist; many fine to coarse prominent strong brown (7.5YR 5/8) mottles, dark yellowish brown (10YR 4/6) moist; massive; soft, friable, slightly sticky and slightly plastic; common very fine and coarse roots; many fine tubular and interstitial pores; strongly effervescent; disseminated lime; moderately alkaline.

Reaction is mildly alkaline or moderately alkaline throughout the profile.

The A horizon has dry color of 10YR 6/3, 6/2, or 5/2. The content of clay ranges from 10 to 20 percent.

The C horizon has dry color of 10YR 6/3 or 7/3 and moist color of 2.5YR 4/2 or 10YR 4/6, 4/4, or 4/3. It is stratified loam to very fine sandy loam. The content of clay ranges from 10 to 25 percent.

The Laugenour soils in this county are taxadjuncts to the series because they are in a nonacid rather than a calcareous family. This difference, however, does not significantly affect the use and management of the soils.

Lithic Xerorthents

Lithic Xerorthents consist of very shallow, somewhat excessively drained or excessively drained soils on hills. These soils formed in alluvium derived from mixed rocks underlain by unrelated andesitic tuff-breccia or in material weathered from hard andesitic tuffaceous sediments. Slope ranges from 2 to 50 percent.

Lithic Xerorthents are near Amador, Gillender, Hadselville, Pentz, and Redding soils. Amador and Pentz soils are shallow. They are on mounds. Gillender soils have paralithic contact. Hadselville soils have a mollic epipedon and paralithic contact. Gillender and Hadselville soils are in intermound areas. Redding soils have a duripan at a depth of 20 to 40 inches. They are on high terraces.

Reference pedon of Lithic Xerorthents, 2 to 8 percent slopes, about 2.4 miles southwest of Bridgehouse, 4.5 miles along Meiss Road from the intersection of Meiss Road and lone Road, 700 feet north of Meiss Road; 900 feet west and 150 feet south of the northeast corner of sec. 17, T. 7 N., R. 8 E., Carbondale Quadrangle:

A—0 to 4 inches; brown (7.5YR 5/4) loam, dark brown (7.5YR 3/4) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and few fine roots; common very fine interstitial and few very fine tubular pores; about 3 percent gravel; moderately acid; abrupt smooth boundary.

2R—4 inches; tuff-breccia.

The reference pedon is an example of the soils within this category. It is not necessarily representative of these soils throughout the survey area.

The depth to lithic contact is 1 to 10 inches. The A horizon has dry color of 7.5YR 6/4, 5/4, or 5/6 or 10YR 6/2, 6/3, 6/4, 5/2, 5/3, or 5/4 and moist color of 7.5YR 4/3, 4/4, 3/4, or 3/3 or 10YR 3/2, 3/3, or 3/4. The content of coarse fragments is 0 to 25 percent. Reaction is moderately acid to neutral.

The R horizon is very hard tuff-breccia or very strongly consolidated andesitic tuffaceous sandstone. In some areas the tuff-breccia has stress cracks that are a few inches to about 1 foot wide and are filled with soil material.

Liveoak Series

The Liveoak series consists of very deep, well drained soils on narrow, high flood plains. These soils formed in alluvium derived from granitic rock sources. Slope ranges from 0 to 2 percent.

Liveoak soils are near Fiddyment and San Joaquin soils. Fiddyment soils have an argillic horizon over a duripan, which is at a depth of 20 to 40 inches. They are on hills. San Joaquin soils have a duripan at a depth of 20 to 40 inches. They are on low terraces.

Soils of the Liveoak series are fine-loamy, mixed, thermic Typic Haploxerolls.

Typical pedon of Liveoak sandy clay loam, 0 to 2 percent slopes, occasionally flooded, about 0.6 mile east of Rio Linda, 3,600 feet north and 1,350 feet east of the intersection of Elkhorn Boulevard and Creek Road; in an unsectionalized area, T. 10 N., R. 5 E., 38 degrees, 40 minutes, 35 seconds north latitude, 121 degrees, 25 minutes, 58 seconds west longitude, Rio Linda Quadrangle:

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) sandy clay loam, very dark grayish brown (10YR 3/2) moist; weak coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine roots; few very fine tubular pores; neutral; clear wavy boundary.

A—9 to 18 inches; brown (10YR 4/3) sandy clay loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; common very fine roots; few very fine tubular pores; neutral; clear smooth boundary.

Bw—18 to 33 inches; brown (10YR 5/3) sandy clay loam, dark brown (10YR 4/3) moist; moderate medium and coarse subangular blocky structure; hard, very friable, slightly sticky and slightly plastic; common very fine roots; few very fine tubular pores; common thin colloids in bridges between mineral grains; neutral; gradual wavy boundary.

BC—33 to 48 inches; yellowish brown (10YR 5/4) sandy loam, dark yellowish brown (10YR 4/4) moist; massive; hard, very friable, slightly sticky and slightly plastic; few very fine roots; few very fine tubular pores; neutral; gradual wavy boundary.

C1—48 to 55 inches; light yellowish brown (10YR 6/4) sandy loam, dark yellowish brown (10YR 4/4) moist; massive; hard, very friable, slightly sticky and slightly plastic; few very fine roots; few very fine interstitial pores; moderately alkaline; clear smooth boundary.

C2—55 to 60 inches; yellowish brown (10YR 5/4) sandy loam, dark yellowish brown (10YR 4/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; many very fine and fine interstitial pores; moderately alkaline.

The mollic epipedon ranges from 10 to 18 inches in thickness. Its organic matter content is 1 to 3 percent.

The Ap and A horizons have dry color of 10YR 5/3, 5/2, 4/4, 4/3, or 4/2 and moist color of 10YR 3/3 or 3/2 or 7.5YR 3/2. The content of clay is 20 to 25 percent. Reaction is slightly acid or neutral.

The Bw and BC horizons have dry color of 10YR 5/4, 5/3, 4/4, or 4/3 or 7.5YR 6/4 or 5/4 and moist color of 10YR 4/4, 4/3, or 3/3 or 7.5YR 4/4 or 3/4. They are sandy loam or sandy clay loam. The content of clay is 18 to 25 percent. Reaction is neutral or mildly alkaline.

The C horizon has moist color of 10YR 4/4, 4/3, or 4/2. It is stratified gravelly loamy coarse sand to sandy loam. The content of clay is 5 to 15 percent. The content of fine gravel generally is 0 to 5 percent but may be as high as 35 percent below a depth of 50 inches. Reaction is neutral to moderately alkaline.

Madera Series

The Madera series consists of moderately well drained soils in low areas on low terraces commonly adjacent to flood plains or basins. These soils are moderately deep over a duripan. They formed in alluvium weathered from granitic material. Slope ranges from 0 to 8 percent.

Madera soils are near Clear Lake, Galt, and San Joaquin soils. Clear Lake soils do not have a duripan. They are in basins. Galt soils have intersecting slickensides and have cracks that open to the surface. They are in basins on the low terraces. San Joaquin soils have mixed mineralogy. They are in the higher areas on the low terraces.

Soils of the Madera series are fine, montmorillonitic, thermic Abruptic Durixeralfs.

Typical pedon of Madera loam, in an area of Madera-Galt complex, 0 to 2 percent slopes, 2.2 miles west and 1.85 miles north of the intersection of Twin Cities Road and Highway 99; under power lines in an unsectionalized area, T. 5 N., R. 6 E., 38 degrees, 19 minutes, 05 seconds north latitude, 121 degrees, 21 minutes, 10 seconds west longitude, Galt Quadrangle:

A1—0 to 5 inches; light brownish gray (10YR 6/2) loam, dark brown (10YR 3/3) moist; common medium prominent yellowish brown (10YR 5/6) mottles, dark yellowish brown (10YR 4/6) moist; weak coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine and common fine tubular and very fine interstitial pores; few 1- to 3-millimeter, black (N 2/0) manganese concretions; moderately acid; clear wavy boundary.

A2—5 to 15 inches; brown (10YR 5/3) loam, dark yellowish brown (10YR 3/4) moist; weak very coarse and coarse subangular blocky structure; hard, friable, sticky and plastic; many very fine and common fine roots; many very fine, fine, and medium tubular and very fine interstitial pores; few 1- to 2-millimeter, black (N 2/0) manganese concretions; slightly acid; abrupt wavy boundary.

Bt1—15 to 21 inches; brown (7.5YR 5/4) clay, yellowish brown (10YR 5/4) moist; strong very coarse and coarse prismatic structure; extremely hard, very firm, sticky and plastic; many very fine and fine roots; common very fine interstitial and many very fine closed tubular pores; many thin and moderately thick clay films bridging sand grains, common thin clay films lining pores, and many thick and moderately thick clay films on faces of peds; brown (10YR 5/3) coatings on faces of peds, dark brown (10YR 3/3) moist; few 1- to 2-millimeter, black (N 2/0) manganese concretions; cracks 1 to 6 millimeters wide and averaging about 1 foot apart when the soil material is slightly moist; neutral; gradual wavy boundary.

Bt2—21 to 29 inches; brown (7.5YR 5/4 and 10YR 5/3) clay, variegated dark yellowish brown (10YR 4/4) and dark brown (10YR 3/3) moist; strong very coarse prismatic structure; extremely hard, very firm, sticky and plastic; common very fine and fine roots; many very fine closed tubular and common very fine interstitial pores; common moderately thick clay films bridging sand grains; cracks 1 to 6 millimeters wide and averaging about 1 foot apart when the soil material is slightly moist; many 1- to 3-millimeter, black (N 2/0) manganese concretions; at the lower boundary, 1 to 2 inches of clay loam that has a slight accumulation of lime; neutral; clear wavy boundary.

Bkqm1—29 to 37 inches; mixed light yellowish brown (10YR 6/4) and brownish yellow (10YR 6/6), indurated duripan; lime in seams and as filaments in fine tubular pores; common black (N 2/0) manganese stains; clear smooth boundary.

Bkqm2—37 to 60 inches; light yellowish brown (10YR 6/4), strongly cemented duripan, dark yellowish brown (10YR 4/4) moist; massive; few black (N 2/0), 2- to 10-millimeter manganese nodules; dominantly strongly cemented with silica but ranging to weakly cemented; few soft masses of lime filling cavities 2 to 5 millimeters across.

The depth to a duripan ranges from 20 to 40 inches. The A horizon has dry color of 10YR 5/2, 5/3, 5/4, 6/2, or 6/3 and moist color of 10YR 3/3, 3/4, 4/3, or 4/4. The content of clay ranges from 10 to 25 percent. Reaction is moderately acid to neutral.

The Bt horizon has dry color of 10YR 5/3 or 5/4 or 7.5YR 4/4 or 5/4 and moist color of 10YR 3/3, 4/4, or 5/4 or 7.5YR 4/4. It is clay or clay loam. The content of clay is 35 to 55 percent. Reaction is neutral or mildly alkaline.

The Bkqm horizon has dry color of 10YR 6/6, 6/4, or 6/3.

Medisaprists

Medisaprists in this survey area consist of very deep, very poorly drained, organic soils in tidal marshes. These soils formed in hydrophytic plant remains stratified with alluvium derived from mixed rock sources. They are regularly inundated by tidal water. Slope ranges from 0 to 2 percent.

Medisaprists are near Fluvaquents and Xeropsamments. Fluvaquents are mineral soils. They are in the slightly higher areas. Xeropsamments are sandy. They are in areas of dredge piles.

Reference pedon of Medisaprists, 0 to 2 percent slopes, frequently flooded, about 1.0 mile north of Antioch, in the Sherman Island Waterfowl Management Area, 450 feet east of the Antioch Boat Club clubhouse and 150 feet north of a levee; sampled on September 10, 1984; in an unsectionalized area, 38 degrees, 01 minute, 32 seconds north latitude, 121 degrees, 48 minutes, 01 second west longitude, Antioch Quadrangle:

A1—0 to 4 inches; light brownish gray (10YR 6/2) mucky clay, dark grayish brown (10YR 4/2) moist; massive; hard, friable, slightly sticky and slightly plastic; many medium and fine and common very fine roots; few very fine interstitial pores; electrical conductivity of 4.1 millimhos per centimeter; neutral; clear wavy boundary.

A2—4 to 8 inches; gray (5Y 6/1) mucky clay loam, dark olive gray (5Y 3/2) moist; massive; hard, friable, slightly sticky and nonplastic; many medium and fine and common very fine roots; few very fine interstitial pores; electrical conductivity of 3.0 millimhos per centimeter; neutral; clear wavy boundary.

Oa—8 to 28 inches; gray (5Y 5/1) mucky peat, black (5Y 2.5/2) moist; about 25 percent fibers, 5 percent rubbed; massive; hard, friable, slightly sticky and nonplastic; many medium and fine and common very fine roots; few very fine interstitial pores; electrical conductivity of 5.7 millimhos per centimeter; neutral; abrupt smooth boundary.

Cg1—28 to 32 inches; light brownish gray (2.5Y 6/2) sandy loam, very dark gray (5Y 3/1) moist; massive; slightly hard, very friable, nonsticky and nonplastic; many fine, common very fine, and few medium roots; few very fine interstitial pores; electrical conductivity of 1.7 millimhos per centimeter; mildly alkaline; clear smooth boundary.

Cg2—32 to 44 inches; light brownish gray (2.5Y 6/2) sandy loam, black (5Y 2.5/1) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots; few very fine interstitial pores; electrical conductivity of 1.2 millimhos per centimeter; mildly alkaline; clear smooth boundary.

Cg3—44 to 50 inches; light olive gray (5Y 6/2) sandy loam, dark greenish gray (5G 4/1) moist; massive; soft, very friable, nonsticky and nonplastic; few fine roots; few very fine interstitial pores; electrical conductivity of 1.8 millimhos per centimeter; moderately alkaline; abrupt smooth boundary.

O a1—50 to 56 inches; dark gray (10YR 4/1) muck, black (10YR 2/1) moist; less than 5 percent fibers rubbed and unrubbed; massive; hard, friable, nonsticky and nonplastic; electrical conductivity of 3.2 millimhos per centimeter; neutral; clear smooth boundary.

O'a2—56 to 60 inches; very dark gray (N 3/0) muck, black (N 2/0) moist; 5 percent fibers rubbed and unrubbed; massive; hard, friable, nonsticky and nonplastic; electrical conductivity of 2.3 millimhos per centimeter; neutral.

The reference pedon is an example of the soils within this category. It is not necessarily representative of these soils throughout the survey area.

These soils vary from one area to another. At least 16 inches of the upper 32 inches is sapric peat. In some pedons the sapric peat is 60 inches or more thick. Some pedons are not stratified with thin to thick layers of mineral material.

Color and organic matter content vary. Thin layers of hemic peat are in the upper part of some pedons. The texture of individual strata in the Cg horizon ranges from sand to silty clay. Salt accumulation varies from year to year because of saltwater intrusion and rainfall and flooding variability.

Mokelumne Series

The Mokelumne series consists of moderately deep, well drained soils on hills and the side slopes of terrace remnants. These soils formed in alluvium underlain by material weathered from weakly consolidated, clayey or sandy marine sediments high in content of kaolinite.

Coarse fragments above a claypan in the soils include dark metamorphic and quartzitic rocks that are unrelated to the marine sediments. Slope ranges from 2 to 30 percent.

Mokelumne soils are near Argonaut, Auburn, Creviscreek, Mokelumne Variant, and Vleck soils. Argonaut soils have mixed mineralogy. They are on foothills. Auburn soils have lithic contact at a depth of 10 to 28 inches. They are on foothills. Creviscreek soils are fine-loamy. They are on stream terraces. Mokelumne Variant soils are fine-loamy. They are on high terrace remnants. Vleck soils have a duripan at a depth of 20 to 40 inches. They are on the foot slopes of hills.

Soils of the Mokelumne series are clayey, kaolinitic, thermic Typic Haploxerults.

Typical pedon of Mokelumne gravelly loam, 2 to 15 percent slopes, about 3 miles east of Bridgehouse, 0.26 mile south of the intersection of Highway 16 and Ione Road, 0.34 mile east along a ranch road and 125 feet north of the road; 2,400 feet north and 540 feet east of the southwest corner of sec. 7, T. 7 N., R. 9 E., Carbondale Quadrangle:

A1—0 to 6 inches; pinkish gray (7.5YR 6/2) gravelly loam, brown (7.5YR 4/4) moist; massive; hard, friable, slightly sticky and nonplastic; many very fine roots; many very fine interstitial and many very fine and few fine tubular pores; about 25 percent subrounded gravel ½ inch to 2 inches in size; slightly acid; clear smooth boundary.

A2—6 to 10 inches; light brown (7.5YR 6/4) gravelly loam, brown (7.5YR 5/4) moist; massive; slightly hard, very friable, sticky and slightly plastic; common very fine roots; many very fine interstitial and common very fine and few fine tubular pores; few thin clay films bridging mineral grains; about 30 percent subrounded gravel and 5 percent cobbles; strongly acid; clear wavy boundary.

2Bt/E—10 to 12 inches; light red (2.5YR 6/6) clay that has pink (5YR 7/3) coatings; red (2.5YR 5/6) with reddish brown (5YR 5/3) coatings when moist; weak medium subangular blocky structure; very hard, firm, very sticky and plastic; common very fine roots on ped exteriors; common very fine tubular pores; many thin clay films on faces of peds and common thin clay films lining pores; E part tongues into the 2Bt2 horizon; about 5 percent subrounded gravel; strongly acid; clear irregular boundary.

2Bt1—12 to 20 inches; variegated light reddish brown (5YR 6/4) and red (2.5YR 5/6) clay, reddish brown (5YR 5/4) and red (2.5YR 5/8) moist; weak medium subangular blocky structure; very hard, firm, very sticky and plastic; common very fine roots on ped exteriors; common very fine tubular pores; many thin clay films on faces of peds and few thin clay films lining pores; about 5 percent subrounded gravel; base saturation of 19 percent; very strongly acid; clear wavy boundary.

2Bt2—20 to 31 inches; variegated pink (5YR 7/4), reddish yellow (5YR 7/6), and 15 percent white (2.5Y 8/2) clay, light reddish brown (5YR 6/4), reddish yellow (5YR 6/6), and light gray (2.5Y 7/2) moist; weak medium subangular blocky structure; very hard, firm, very sticky and slightly plastic; common very fine and few fine roots on ped exteriors and common coarse roots; common very fine tubular pores; many thin and few moderately thick clay films on faces of peds and few thin clay films lining pores; surface material in cracks less than 2 millimeters wide between peds; very strongly acid; gradual wavy boundary.

2BCt—31 to 39 inches; variegated 50 percent white (N 8/0), pink (5YR 7/4), and light reddish brown (5YR 6/4) clay, light gray (N 7/0), light reddish brown (5YR 6/4), and reddish brown (5YR 5/4) moist; weak medium subangular blocky structure; very hard, firm, sticky and slightly plastic; common coarse roots; few very fine tubular pores; few moderately thick and common thin clay films on faces of peds; very strongly acid; clear wavy boundary.

2Cr—39 inches; variegated 85 percent white (N 8/0), yellow (10YR 8/6), and light reddish brown (5YR 6/4), weakly consolidated, clayey sediments, light gray (N 7/0), yellow (10YR 7/6), and reddish brown (5YR 5/4) moist; few fine tubular pores; very few thin clay films along fractures; very strongly acid.

The depth to paralithic contact is 20 to 40 inches. The content of clay in the argillic horizon decreases by 20 to 30 percent of the maximum above the paralithic contact. Base saturation ranges from 15 to 35 percent throughout the argillic horizon.

The A horizon has dry color of 10YR 6/3, 6/4, 7/2, or 7/3 or 7.5YR 6/2, 5/4, 6/4, or 7/4. It has moist color of 10YR 3/3, 3/4, 5/3, or 5/4; 7.5YR 3/4, 4/4, or 5/4; or 5YR 4/4. The content of clay is 15 to 25 percent. The content of coarse fragments is 15 to 30 percent. It includes 0 to 5 percent cobbles. Reaction is strongly acid to slightly acid.

The 2Bt horizon is variegated with two or more colors in each subhorizon. The dominant color has hue of 10R to 10YR, value of 5 to 7 dry and 4 to 6 moist, and chroma of 4, 6, or 8 dry or moist. The minor colors have hue of 10YR to 5Y or are neutral in hue. They have value of 7 or 8 dry or moist and chroma of 0 to 2 dry or moist. The texture is clay or sandy clay. The content of clay is 40 to 70 percent. It decreases with increasing depth. The content of unrelated gravel that has moved into cracks from the horizons above is 0 to 5 percent. Reaction is extremely acid or very strongly acid.

The 2Cr horizon is variegated with two to more than four colors in the upper part but becomes more uniform with increasing depth. It has a dominant dry color of 2.5Y 7/2 or 8/2, 5Y 8/1 or 8/2, or N 8/0 and moist color of 10YR 7/1, 2.5Y 7/2, 5Y 7/1 or 6/3, or N 7/0. The minor colors include any of the colors in the 2Bt horizon. Reaction is extremely acid or very strongly acid.

Mokelumne Variant

The Mokelumne Variant consists of deep, well drained soils on high terrace remnants. These soils formed in alluvium underlain by sandy or clayey marine sediments and derived from mixed rock sources. Slope ranges from 2 to 8 percent.

Mokelumne Variant soils are near Creviscreek, Mokelumne, and Vleck soils. Creviscreek soils have 18 to 27 percent clay in the argillic horizon. They are on stream terraces. Mokelumne soils are clayey. They are on hills. Vleck soils are fine textured. They are on the foot slopes of hills.

Soils of the Mokelumne Variant are fine-loamy, mixed, thermic Typic Haploxerults.

Typical pedon of Mokelumne Variant sandy clay loam, 2 to 8 percent slopes, about 6.4 miles southwest of Malby Crossing, about 2,800 feet north and 2,000 feet west of the intersection of Scott Road and Latrobe Road; 650 feet east and 120 feet north of the southwest corner of sec. 21, T. 8 N., R. 8 E., Folsom SE Quadrangle:

A1—0 to 2 inches; brown (7.5YR 4/4) sandy clay loam, dark reddish brown (5YR 3/4) moist; weak very thick platy structure; hard, friable, nonsticky and slightly plastic; many very fine roots; common very fine tubular and interstitial pores; about 10 percent subrounded and angular gravel; partially decomposed oak leaves and mulch ¼ inch thick on the surface; moderately acid; abrupt smooth boundary.

A2—2 to 8 inches; brown (7.5YR 5/4) sandy clay loam, dark reddish brown (5YR 3/4) moist; massive; hard, friable, nonsticky and slightly plastic; common very fine roots; common very fine interstitial and common very fine and few fine tubular pores; very few thin clay films lining pores; about 10 percent subrounded fine gravel; moderately acid; clear smooth boundary.

BAt—8 to 15 inches; reddish brown (5YR 4/4) and yellowish red (5YR 5/6) sandy clay loam, dark reddish brown (5YR 3/4) and yellowish red (5YR 4/6) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine tubular and many fine interstitial pores; few thin clay films lining pores and bridging mineral grains; about 10 percent subrounded fine gravel; moderately acid; clear wavy boundary.

Bt1—15 to 20 inches; yellowish red (5YR 5/6 and 4/6) sandy clay loam, red (2.5YR 4/6) and dark reddish brown (2.5YR 3/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine and few medium and fine roots; many very fine interstitial and many fine and medium tubular pores; many thin clay films lining pores and bridging mineral grains; about 10 percent subrounded fine gravel; moderately acid; clear wavy boundary.

Bt2—20 to 28 inches; yellowish red (5YR 5/6) and reddish brown (5YR 5/4) gravelly sandy clay loam, red (2.5YR 4/6) and reddish brown (5YR 4/4) moist; massive; hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; many very fine interstitial and common fine and few medium tubular pores; many thin clay films bridging mineral grains and common thin clay films lining pores; about 15 percent subrounded gravel; stone line of dominantly quartz gravel at the lower boundary; slightly acid; abrupt wavy boundary.

2Bt—28 to 35 inches; red (2.5YR 5/6 and 4/8) gravelly clay, red (2.5YR 4/6 and 10R 4/8) moist; massive; slightly hard, friable, sticky and plastic; few very fine roots; few very fine interstitial and tubular pores; common moderately thick clay films lining pores and bridging mineral grains; about 30 percent angular and subrounded fine gravel; strongly acid; abrupt wavy boundary.

3Bt1—35 to 41 inches; variegated red (2.5YR 4/8) and reddish yellow (5YR 6/6) clay that has pale brown (10YR 6/3) streaks; red (10R 4/8), yellowish red (5YR 5/8), and pale brown (10YR 6/3) moist; red (2.5YR 4/8) matrix color, red (10YR 4/8) moist, dominant in the upper part of the horizon and minimal in the lower part; moderate coarse angular blocky structure; hard, very firm, sticky and very plastic; few very fine and fine roots; few very fine tubular pores; common moderately thick clay films lining pores and on faces of peds; common pressure faces on peds; extremely acid; clear wavy boundary.

3Bt2—41 to 49 inches; variegated very pale brown (10YR 7/4) and reddish yellow (7.5YR 7/6) clay, light yellowish brown (10YR 6/4) and reddish yellow (5YR 6/6) moist; strong very coarse angular blocky structure; hard, very firm, sticky and very plastic;

common fine roots; few very fine tubular pores; many thin clay films bridging mineral grains; many pressure faces on peds; extremely acid; clear wavy boundary.

3BCt—49 to 57 inches; variegated reddish yellow (7.5YR 6/6) and white (2.5Y 8/2) sandy clay loam, strong brown (7.5YR 5/6) and light gray (2.5Y 7/2) moist; moderate medium angular blocky structure; hard, friable, sticky and slightly plastic; common fine roots; few very fine interstitial and tubular pores; many moderately thick clay films on faces of peds and common thin clay films lining pores; few pressure faces on peds; extremely acid; clear wavy boundary.

3Cr—57 inches; white (2.5Y 8/2) and pink (7.5YR 7/4), weakly consolidated sandstone, light gray (2.5Y 7/2) and reddish yellow (7.5YR 6/6) moist; common moderately thick clay films on fractures, yellowish red (5YR 5/6) moist; extremely acid.

The depth to paralithic contact ranges from 40 to 60 inches. By weighted average, the content of clay in the family control section is 27 to 35 percent and the content of coarse fragments in the control section is 10 to 35 percent.

The A horizon has dry color of 7.5YR 4/4, 5/4, 6/4, 4/6, or 6/6 and moist color of 7.5YR 3/4 or 4/4 or 5YR 3/4, 4/4, or 4/6. The content of clay is 20 to 27 percent. The content of gravel is 5 to 15 percent. Reaction is strongly acid to slightly acid.

The Bt horizon has dry color of 7.5YR 6/6; 5YR 5/4, 4/6, or 5/6; or 2.5YR 4/6 or 4/8. It has moist color of 5YR 4/4 or 4/6 or 2.5YR 3/4, 3/6, or 4/6. It is sandy clay loam or loam. The content of clay is 25 to 35 percent. The content of coarse fragments is 5 to 30 percent. It includes 0 to 5 percent cobbles. Reaction is strongly acid to slightly acid.

The 2Bt horizon has dry color of 5YR 6/6 or 2.5YR 4/6, 5/6, 4/8, or 5/8 and moist color of 2.5YR 4/6, 5/6, or 4/8 or 10R 3/6 or 4/8. It is clay or clay loam. The content of clay is 35 to 45 percent. The content of coarse fragments is 15 to 50 percent. It includes 0 to 5 percent cobbles. At the time of deposition, this horizon appears to have been mixed with the underlying clay of the Ione Formation. Reaction is strongly acid or moderately acid.

The 3Bt horizon has a combination of colors. The dominant dry color is 5YR 5/6 or 6/6, 2.5YR 3/6 or 4/8, or 10R 4/4 in the upper part of the horizon and 7.5YR 7/6 or 10YR 8/1, 6/3, or 7/4 in the lower part. The dominant moist color is 5YR 5/6 or 6/6, 2.5YR 3/6, or 10R 3/6 or 4/8 in the upper part of the horizon and 10YR 7/1, 6/3, or 6/4 in the lower part. The content of clay is 40 to 70 percent. Reaction is extremely acid or very strongly acid.

The 3BCt horizon has dry color of 7.5YR 7/4, 6/6, or 7/6; 10YR 6/3 or 7/4; or 2.5Y 8/2. It has moist color of 7.5YR 5/6 or 6/6, 10YR 6/3 or 6/4, or 2.5Y 7/2. The content of clay is 25 to 35 percent.

The 3Cr horizon consists of weakly consolidated sediments that have a high content of clay or of sand and clay.

Natomas Series

The Natomas series consists of very deep, well drained soils in high areas on low terraces. These soils formed in alluvium derived from mixed rock sources. Slope ranges from 0 to 2 percent.

Natomas soils are near Americanos, Red Bluff, and San Joaquin soils and Xerorthents. Americanos soils are fine-silty. They are on low stream terraces. Red Bluff soils are fine textured. They are on high terraces. San Joaquin soils have a duripan. They are in the lower areas on the low terraces. Xerorthents have more than 60 percent coarse fragments. They are in areas of dredge tailings.

Soils of the Natomas series are fine-loamy, mixed, thermic Ultic Palexeralfs.

Typical pedon of Natomas loam, 0 to 2 percent slopes, about 2.5 miles southwest of the city of Folsom, 1,400 feet northeast of Folsom Boulevard from Highway 50 exit to a park gate on the west side of road, about 500 feet northwest along a dirt road and 10 feet southwest of a mining pit; in an unsectionalized area, T. 9 N., R. 7 E., 38 degrees, 38 minutes, 36 seconds north latitude, 121 degrees, 11 minutes, 12 seconds west longitude, Folsom Quadrangle:

A1—0 to 5 inches; brown (7.5YR 5/4) loam, dark brown (7.5YR 3/4) moist; massive; hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine interstitial pores; neutral; abrupt wavy boundary.

A2—5 to 17 inches; brown (7.5YR 5/4) loam, dark brown (7.5YR 3/4) moist; massive; hard, friable, slightly sticky and slightly plastic; common very fine and few fine and coarse roots; many very fine interstitial pores; neutral; clear wavy boundary.

BA—17 to 25 inches; yellowish red (5YR 4/6) loam, dark reddish brown (5YR 3/4) moist; massive; hard, friable, sticky and slightly plastic; few fine and very fine roots; common very fine interstitial pores; neutral; clear wavy boundary.

Bt1—25 to 33 inches; reddish brown (5YR 5/4) loam, reddish brown (5YR 4/4) moist; massive; very hard, friable, sticky and slightly plastic; few very fine and fine roots; common very fine interstitial pores; few thin clay films bridging sand grains; neutral; clear wavy boundary.

Bt2—33 to 45 inches; red (2.5YR 5/6) clay loam, dark red (2.5YR 3/6) moist; weak medium angular blocky structure; very hard, firm, sticky and plastic; few fine and coarse roots; few fine tubular pores; few thin clay films bridging sand grains and on faces of peds; slightly acid; gradual wavy boundary.

Bt3—45 to 59 inches; red (2.5YR 5/6) clay loam, red (2.5YR 4/6) moist; weak medium angular blocky structure; very hard, friable, sticky and plastic; few coarse roots; few very fine interstitial pores; few thin clay films bridging sand grains and on faces of peds and very few moderately thick clay films on faces of peds; common reddish yellow (7.5YR 7/6) sand grains on faces of peds, strong brown (7.5YR 4/6) moist; slightly acid; clear wavy boundary.

Bt4—59 to 78 inches; red (2.5YR 5/6) clay loam, red (2.5YR 4/6) moist; massive; hard, friable, sticky and plastic; few fine roots; few fine tubular and very fine interstitial pores; common moderately thick clay films bridging sand grains; many reddish yellow (7.5YR 7/6) sand grains along fractures, strong brown (7.5YR 4/6) moist; few fine stains, black (10YR 2/1) moist; moderately acid; clear wavy boundary.

2BC—78 to 84 inches; variegated yellowish red (5YR 5/6) and strong brown (7.5YR 5/6) sandy loam, dark red (2.5YR 3/6) and strong brown (7.5YR 4/6) moist; massive; hard, friable, slightly sticky and slightly plastic; few fine roots; common very fine interstitial pores; slightly acid.

By weighted average, the content of clay in the upper 20 inches of the argillic horizon is 27 to 35 percent. Base saturation is 50 to 75 percent throughout the argillic horizon. Some pedons have a 2Bt horizon below a depth of 50 inches. The content of coarse fragments in this horizon is 15 to 35 percent. It includes 0 to 5 percent cobbles.

The A horizon has dry color of 10YR 5/4 or 7.5YR 5/4 and moist color of 10YR 3/4 or 7.5YR 4/4, 3/4, or 3/3. The content of clay is 15 to 25 percent. Reaction is slightly acid or neutral.

The Bt horizon has dry color of 5YR 5/6, 5/4, or 4/6 or 2.5YR 5/6, 4/8, 4/6, or 4/4 and moist color of 5YR 4/6, 4/4, 3/6, or 3/4 or 2.5YR 4/6, 3/5, or 3/4. It is loam or clay loam. The content of clay is 20 to 35 percent. Reaction is moderately acid to neutral in the upper part of the horizon and strongly acid to slightly acid in the lower part.

The 2BC horizon has dry color of 7.5YR 6/6, 7/6, or 7/8 or 5YR 4/6 or 5/6. It has moist color of 7.5YR 4/6, 5/6, or 5/8; 5YR 4/6; or 2.5YR 3/6 or 4/6. It is sandy loam or coarse sandy loam. The content of clay is 15 to 20 percent. The content of coarse fragments is 0 to 35 percent. It includes 0 to 5 percent cobbles. Reaction is slightly acid or neutral.

Orangevale Series

The Orangevale series consists of very deep, well drained soils on dissected high terraces and their remnants and on hills. These soils formed in coarse textured alluvium derived from granitic rocks. Slope ranges from 2 to 25 percent.

Orangevale soils are near Fiddyment, Kaseberg, and Red Bluff soils and Xerarents and Xerolls. Fiddyment and Kaseberg soils have a duripan. They are on hills. Red Bluff soils are fine textured. They are on high terraces. Xerarents have fragments of an argillic horizon. They are in filled areas. Xerolls have a mollic epipedon. They are on terrace escarpments and on the steep and very steep side slopes of hills.

Soils of the Orangevale series are fine-loamy, mixed, thermic Ultic Haploxeralfs.

Typical pedon of Orangevale coarse sandy loam, 2 to 5 percent slopes, about 2.2 miles west of Folsom, 700 feet north on Filbert Avenue from the intersection of Filbert Avenue and Greenback Lane, 80 feet west of Filbert Avenue; in an unsectionalized area, T. 10 N., R. 7 E., 38 degrees, 40 minutes, 50 seconds north latitude, 121 degrees, 13 minutes, 00 seconds west longitude, Folsom Quadrangle:

Ap1—0 to 8 inches; yellowish brown (10YR 5/4) coarse sandy loam, dark yellowish brown (10YR 3/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few medium and coarse and common fine roots; common very fine and fine interstitial pores; moderately acid; clear smooth boundary.

Ap2—8 to 15 inches; yellowish brown (10YR 5/4) coarse sandy loam, dark yellowish brown (10YR 3/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; common fine roots; common very fine and fine interstitial pores; neutral; abrupt wavy boundary.

A/B—15 to 20 inches; mixed 75 percent yellowish brown (10YR 5/4) coarse sandy loam, dark yellowish brown (10YR 3/4) moist, and 25 percent strong brown (7.5YR 4/6) sandy clay loam, dark brown (7.5YR 3/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; common very fine and fine interstitial pores; few thin clay films bridging mineral grains; neutral; clear wavy boundary.

Bt1—20 to 29 inches; strong brown (7.5YR 4/6) sandy clay loam, dark brown (7.5YR 3/4) moist; massive; hard, friable, slightly sticky and slightly plastic; few fine tubular and common fine interstitial pores; many thin clay films bridging mineral grains and few thin clay films lining pores; neutral; gradual wavy boundary.

Bt2—29 to 39 inches; yellowish red (5YR 4/6) sandy clay loam, dark reddish brown (5YR 3/4) moist; massive; hard, friable, sticky and plastic; few fine tubular pores; many thin and few moderately thick clay films bridging mineral grains and few thin clay films lining pores; neutral; clear wavy boundary.

Bt3—39 to 48 inches; yellowish red (5YR 4/6) sandy clay loam, dark reddish brown (5YR 3/4) moist; massive; hard, friable, sticky and plastic; few very fine tubular pores; continuous, thin clay films bridging mineral grains, few thin clay films lining pores, and few moderately thick clay films in seams; neutral; gradual wavy boundary.

Bt4—48 to 57 inches; yellowish red (5YR 4/6) sandy clay loam, dark reddish brown (5YR 3/4) moist; massive; hard, friable, slightly sticky and slightly plastic; few very fine tubular and few fine interstitial pores; continuous, thin clay films bridging mineral grains, few thin clay films lining pores, and few moderately thick clay films in seams; neutral; clear wavy boundary.

Bt5—57 to 72 inches; variegated yellowish red (5YR 5/6) and dark yellowish brown (10YR 4/6) sandy clay loam, dark reddish brown (5YR 3/4) and dark yellowish brown (10YR 3/4) moist; massive; hard, friable, slightly sticky and nonplastic; few very fine interstitial pores; continuous, thin and few thick clay films bridging mineral grains and common moderately thick and few thick clay films in seams; neutral; clear wavy boundary.

Bt6—72 to 80 inches; yellowish red (5YR 4/6) coarse sandy loam, dark reddish brown (5YR 3/4) moist; massive; hard, friable, slightly sticky and slightly plastic; few very fine interstitial pores; many thin clay films bridging mineral grains and few moderately thick clay films in seams; neutral.

By weighted average, the content of clay in the family textural control section is 18 to 27 percent. Mineralogy is mixed but is dominantly kaolinitic. The content of coarse sand and very coarse sand is 20 to 35 percent throughout the profile. The upper 30 inches of the argillic horizon has 60 to 75 percent base saturation. Some pedons have a C horizon below a depth of 50 inches.

The A horizon has dry color of 10YR 5/4, 5/3, 5/2, or 4/3 or 7.5YR 5/4 and moist color of 10YR 3/4, 3/3, or 3/2 or 7.5YR 3/4. The content of clay is 8 to 16 percent. Reaction generally is slightly acid or neutral but can be moderately acid in heavily fertilized areas.

The Bt horizon has dry color of 7.5YR 6/4, 5/6, 5/4, or 4/6 or 5YR 5/6, 5/4, or 4/6 and moist color of 7.5YR 4/6, 4/4, or 3/4 or 5YR 4/6 or 3/4. It is coarse sandy loam or sandy clay loam. The content of clay is 20 to 30 percent in the upper part of the horizon and 15 to 20 percent in the lower part. Reaction is slightly acid or neutral.

Orthents

In this survey area Orthents consist of very deep, somewhat poorly drained to well drained, altered soils in filled areas on low flood plains. These soils formed in fill material derived from nearby soils and sediments of mixed origin. The fill material was used to elevate the land surface and thus reduce the hazard of flooding. Slope ranges from 0 to 2 percent.

Orthents are near Columbia and Laugenour soils. Columbia and Laugenour soils are coarse-loamy and do not consist of fill material.

Reference pedon of Orthents, in an area of Orthents-Urban land complex, 0 to 2 percent slopes, about 0.5 mile north of the city of Sacramento, within the Southern Pacific railroad yard, 1,200 feet south and 5,500 feet west of the intersection of Highway 160 and Richards Boulevard; in an unsectionalized area, T. 9 N., R. 4 E., 38 degrees, 35 minutes, 28 seconds north latitude, 121 degrees, 29 minutes, 48 seconds west longitude, Sacramento East Quadrangle:

Ap—0 to 9 inches; light yellowish brown (10YR 6/4) loam, dark yellowish brown (10YR 3/4) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine and common very fine roots; common very fine interstitial pores; neutral; clear wavy boundary.

C1—9 to 16 inches; light yellowish brown (10YR 6/4) silt loam, dark yellowish brown (10YR 4/4) moist; massive; slightly hard, very friable, nonsticky and slightly plastic; few very fine roots; many very fine interstitial and common very fine and few fine tubular pores; neutral; clear wavy boundary.

C2—16 to 32 inches; light yellowish brown (10YR 6/4) loam, dark brown (10YR 4/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine and few medium roots; many very fine interstitial and common very fine and few fine tubular pores; neutral; abrupt smooth boundary.

C3—32 to 49 inches; mixed pale brown (10YR 6/3) and brown (7.5YR 5/4) loam, dark brown

(10YR 4/3 and 7.5YR 3/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine and few medium roots; many very fine interstitial and common very fine and few fine tubular pores; remnants of leaves, pieces of wood, and fragments of clay throughout the horizon; neutral; clear smooth boundary.

C4—49 to 56 inches; pale brown (10YR 6/3) loamy sand, dark yellowish brown (10YR 4/4) moist; single grained; loose, nonsticky and nonplastic; few fine and very fine roots; many very fine interstitial and common fine tubular pores; slightly acid; abrupt wavy boundary.

C5—56 to 62 inches; yellowish brown (10YR 5/4) sandy loam, dark brown (7.5YR 4/4) moist; massive; soft, very friable, nonsticky and nonplastic; few fine and very fine roots; many very fine interstitial and common fine tubular pores; slightly acid.

The reference pedon is an example of the soils within this category. It is not necessarily representative of these soils throughout the survey area.

The soil properties vary because the soils consist of fill material. Hue is dominantly 10YR or 7.5YR. The texture is commonly loamy sand to silty clay loam.

Pardee Series

The Pardee series consists of shallow, well drained soils on hills. The surface typically has mound-intermound microrelief. These soils are on the mounds. They formed in gravelly and cobbly alluvium derived from mixed rock sources and underlain by unrelated basic andesitic tuffaceous conglomerate. The material above the andesitic conglomerate has dark metamorphic and quartzitic coarse fragments. Slope ranges from 3 to 15 percent.

Pardee soils are near Amador, Gillender, Hadselville, Pentz, and Ranchoseco soils. Amador and Pentz soils are not skeletal. They are on the mounds. Gillender, Hadselville, and Ranchoseco soils are very shallow. They are in the intermound areas. Hadselville and Pentz soils have a mollic epipedon.

Soils of the Pardee series are loamy-skeletal, mixed, thermic Lithic Mollic Haploxeralfs.

Typical pedon of Pardee gravelly loam, in an area of Pardee-Ranchoseco complex, 3 to 15 percent slopes, about 4.2 miles southeast of a power plant; 6,100 feet east and 710 feet north of the southeast corner of sec. 3, in an unsectionalized area, T. 5 N., R. 8 E., 38 degrees, 18 minutes, 39 seconds north latitude, 121 degrees, 03 minutes, 25 seconds west longitude, Goose Creek Quadrangle:

A1—0 to 1.5 inches; brown (7.5YR 5/4) gravelly loam, dark brown (7.5YR 3/4) moist; weak medium platy structure; slightly hard, friable, nonsticky and nonplastic; many very fine roots; common fine tubular and few fine interstitial pores; about 15 percent gravel; yellowish brown (10YR 5/4) stains on faces of peds; slightly acid; abrupt smooth boundary.

A2—1.5 to 6 inches; brown (7.5YR 5/4) gravelly loam, dark reddish brown (5YR 3/4) moist; weak medium and coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; few very fine interstitial and common very fine tubular pores; about 20 percent gravel; moderately acid; gradual wavy boundary.

BA—6 to 11 inches; brown (7.5YR 5/4) gravelly loam, dark reddish brown (5YR 3/4) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine roots; common medium and coarse tubular and many very fine tubular and interstitial pores; about 20 percent gravel; slightly acid; gradual wavy boundary.

Bt—11 to 16 inches; reddish brown (5YR 5/4) very gravelly loam, dark reddish brown (5YR 3/3) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine interstitial and many very fine and common fine tubular pores; common thin clay films bridging mineral grains; 2-inch-thick, discontinuous layer of yellowish red (5YR 5/6) very gravelly clay loam, dark reddish brown (5YR 3/4) moist, at the base of the horizon; about 45 percent gravel and 10 percent cobbles; slightly acid; abrupt wavy boundary.

2R—16 inches; conglomerate that has andesitic gravel and cobbles; silica coatings on the underside of some coarse fragments.

The depth to lithic contact ranges from 10 to 20 inches. Base saturation is 65 to 75 percent in the argillic horizon. Some pedons have a discontinuous 2Bt horizon, which weathered from the underlying conglomerate.

The A horizon has dry color of 7.5YR 5/4 or 5/6 or 5YR 5/4 and moist color of 7.5YR 3/4, 4/4, or 4/6 or 5YR 3/4. The content of clay is 8 to 18 percent. The content of gravel ranges from 15 to 25 percent. The content of cobbles is 0 to 5 percent. Reaction is slightly acid to strongly acid.

The Bt horizon has dry color of 5YR 4/6, 5/4, or 5/6 and moist color of 5YR 3/3 or 3/4 or 2.5YR 3/6 or 4/6. It is loam or clay loam. The content of clay is 18 to 30 percent. By weighted average, the content of coarse fragments ranges from 35 to 60 percent. It includes 10 to 30 percent cobbles. Reaction is moderately acid or slightly acid.

Pentz Series

The Pentz series consists of shallow, well drained soils on hills. Areas that have a slope of less than 30 percent generally are characterized by mound-intermound microrelief..These soils are on the mounds. They formed in material weathered from weakly consolidated basic andesitic tuffaceous sediments. Slope ranges from 2 to 50 percent.

Pentz soils are near Amador, Corning, Gillender, Hadselville, and Hicksville soils, Lithic Xerorthents, and Pardee, Peters, Ranchoseco, and Redding soils. Amador soils have an ochric epipedon. They are on the mounds. Corning soils have a fine textured argillic horizon. They are on high terraces. Gillender, Hadselville, and Ranchoseco soils and Lithic Xerorthents are very shallow. They are in the concave intermound areas. Hicksville soils are very deep. They are on low stream terraces. Pardee soils are loamy-skeletal. They are on the mounds. Peters soils are fine textured. They are in basins and swales on the side slopes of hills. Redding soils are moderately deep and have a fine textured argillic horizon underlain by a duripan. They are on high terraces.

Soils of the Pentz series are loamy, mixed, thermic, shallow Ultic Haploxerolls.

Typical pedon of Pentz fine sandy loam, in an area of Hadselville-Pentz complex, 2 to 30 percent slopes, about 3 miles south of Bridge House, 2.3 miles west of the intersection of Meiss Road and Ione Road, 225 feet east of a north-south fence, 320 feet north of Meiss Road; 1,550 feet south and 2,435 feet west of the northeast corner of sec. 22, T. 7 N., R. 8 E., Carbondale Quadrangle:

A1—0 to 4 inches; brown (10YR 5/3) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; many very fine and common fine roots; many very fine and few fine interstitial and common very fine tubular pores; about 5 percent gravel; moderately acid; clear smooth boundary.

A2—4 to 9 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; many very fine roots; common very fine and few fine tubular and many very fine interstitial pores; about 5 percent gravel; moderately acid; clear smooth boundary.

Bw—9 to 13 inches; brown (10YR 5/3) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine roots; many medium and common very fine tubular and many very fine interstitial pores; few thin clay films bridging mineral grains; about 5 percent gravel; slightly acid; clear smooth boundary.

Bt—13 to 16 inches; brown (10YR 5/3) fine sandy loam, very dark brown (10YR 2/2) moist; weak fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine roots; many medium and common very fine tubular and many fine interstitial pores; few thin clay films on faces of peds, bridging mineral grains, and lining pores; about 5 percent gravel; slightly acid; abrupt wavy boundary.

Cr—16 inches; variegated pale yellow (2.5Y 7/4), very dark grayish brown (2.5Y 3/2), and grayish brown (2.5Y 5/2), weakly consolidated andesitic sandstone, olive brown (2.5Y 4/4), very dark grayish brown (2.5Y 3/2), and light olive brown (2.5Y 5/4) moist; slightly acid.

The depth to paralithic contact is 10 to 20 inches. The content of organic matter in the mollic epipedon is 1 to 3 percent. Base saturation in the surface layer is 60 to 75 percent. The content of unrelated coarse fragments is 0 to 15 percent. It includes 0 to 5 percent cobbles.

The A horizon has dry color of 10YR 4/2, 4/3, 5/2, or 5/3 and moist color of 10YR 2/2, 3/2, or 3/3 or 7.5YR 3/2 or 3/3. The content of clay is 8 to 18 percent. Reaction is strongly acid to slightly acid.

The Bw horizon has dry color of 10YR 4/3, 5/2, 5/3, or 5/4 or 7.5YR 5/2 and moist color of 10YR 2/2, 3/2, or 3/3 or 7.5YR 3/2 or 3/3. It is sandy loam, fine sandy loam, or loam. The content of clay is 10 to 20 percent. Reaction is moderately acid to neutral.

The Bt horizon is fine sandy loam, sandy loam, loam, or sandy clay loam.

The color of the Cr horizon is commonly that of individual sand grains. The dominant color has hue of 10YR or 2.5Y or is N 6/0 or 5/0. This horizon consists of weakly consolidated or moderately consolidated andesitic sediments stratified with conglomerate and andesitic rock fragments.

Peters Series

The Peters series consists of shallow, well drained soils in slight depressions and swales on the side slopes of hills. These soils formed in material weathered from weakly consolidated basic andesitic tuffaceous sediments. Slope ranges from 1 to 8 percent.

Peters soils are near Amador, Gillender, Hadselville, Pentz, and Redding soils. Amador and Gillender soils are loamy and have an ochric epipedon. Hadselville and Pentz soils are loamy. They are on hills characterized by mound-intermound microrelief. Redding soils have a duripan at a depth of 20 to 40 inches. They are on high terraces.

Soils of the Peters series are clayey, montmorillonitic, thermic, shallow Typic Haploxerolls.

Typical pedon of Peters clay, 1 to 8 percent slopes, about 6.5 miles south of Bridgehouse, 3.2 miles southwest of the junction of the Southern Pacific Railroad tracks and Ione Road on Arroyo Seco Ranch Road, 1.2 miles north and 200 feet east of the junction of a north-south fence and the railroad tracks; 1,700 feet north and 200 feet east of the southeast corner of sec. 3, in an unsectionalized area, T. 6 N., R. 8 E., 38 degrees, 23 minutes, 56 seconds north latitude, 121 degrees, 04 minutes, 29 seconds west longitude, Carbondale Quadrangle:

A—0 to 18 inches; grayish brown (10YR 5/2) clay, very dark grayish brown (10YR 3/2) moist; moderate coarse angular blocky structure; very hard, firm, sticky and plastic; common fine and very fine roots; common fine tubular pores; moderately acid; abrupt smooth boundary.

Cr—18 inches; light gray (2.5Y 7/2), weakly consolidated andesitic tuffaceous fine grained sandstone, grayish brown (2.5Y 5/2) moist; neutral.

The depth to paralithic contact and the thickness of the mollic epipedon are 10 to 20 inches. Cracks ¼ to 1 inch wide extend to the Cr horizon when the soils are dry. The content of gravel ranges from 0 to 10 percent. By weighted average, the content of clay ranges from 40 to 60 percent.

The A horizon has dry color of 10YR 4/2 or 5/2 or 7.5YR 4/2 or 5/2 and moist color of 10YR 2/2 or 3/2 or 7.5YR 3/2. It is moderately acid to neutral. The Cr horizon is fine grained sandstone or mudstone.

Ranchoseco Series

The Ranchoseco series consists of very shallow, moderately well drained soils on hills. The surface typically has mound-intermound microrelief. These soils are in the intermound areas. They formed in gravelly and cobbly alluvium derived from mixed rock sources and underlain by unrelated basic andesitic tuffaceous conglomerate. The material above the andesitic conglomerate has dark metamorphic and quartzitic coarse fragments. Slope ranges from 3 to 15 percent.

Ranchoseco soils are near Amador, Gillender, Hadselville, Pardee, and Pentz soils. Amador, Pardee, and Pentz soils are shallow. They are on the mounds. Gillender and Hadselville soils are not skeletal. They are in the intermound areas. Hadselville and Pentz soils have a mollic epipedon.

Soils of the Ranchoseco series are loamy-skeletal, mixed, nonacid, thermic Lithic Xerorthents.

Typical pedon of Ranchoseco gravelly loam, in an area of Pardee-Ranchoseco complex, 3 to 15 percent slopes, about 4.2 miles southeast of the Rancho Seco Nuclear Power Plant; 6,110 feet east and 700 feet north of the southeast corner of sec. 3, in an unsectionalized area, T. 5 N., R. 8 E., 38 degrees, 18 minutes, 38 seconds north latitude, 121 degrees, 03 minutes, 23 seconds west longitude, Goose Creek Quadrangle:

A—0 to 3 inches; light yellowish brown (10YR 6/4) gravelly loam, dark brown (7.5YR 4/4) moist; strong brown (7.5YR 5/6) root stains, strong brown (7.5YR 4/6) moist; strong fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine interstitial pores; about 20 percent gravel and 10 percent cobbles; strongly acid; abrupt wavy boundary.

Bw—3 to 7 inches; light brown (7.5YR 6/4) very gravelly loam, dark brown (7.5YR 4/4) moist; strong brown (7.5YR 5/6) root stains, strong brown (7.5YR 4/6) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine interstitial pores; about 45 percent gravel and 15 percent cobbles; 1-inch-thick layer of dark brown (10YR 4/3) very gravelly clay, variegated dark brown (10YR 3/3) and brown (7.5YR 4/2) moist, weathered in place from the underlying horizon; slightly acid; abrupt wavy boundary.

2R—7 inches; andesitic conglomerate; silica coatings on the underside of coarse fragments.

The depth to lithic contact is 4 to 10 inches. By weighted average, the content of clay in the particle-size control section is 12 to 25 percent.

The A horizon has dry color of 10YR 6/2, 6/3, or 6/4 and moist color of 7.5YR 3/4, 4/3, or 4/4. The content of clay is 12 to 22 percent. The content of gravel is 15 to 25 percent, and the content of cobbles is 5 to 15 percent. Reaction is very strongly acid or moderately acid.

The Bw horizon has dry color of 7.5YR 6/4 or 5YR 6/3 and moist color of 7.5YR 3/4 or 4/4 or 5YR 4/4. It is very gravelly or very cobbly loam. The content of clay is 15 to 25 percent. The content of gravel is 25 to 45 percent, and the content of cobbles is 10 to 25 percent. Reaction is strongly acid to slightly acid.

Red Bluff Series

The Red Bluff series consists of very deep, well drained soils on high terraces. These soils formed in alluvium derived from mixed rock sources. Slope ranges from 0 to 5 percent.

Red Bluff soils are near Natomas, Redding, and San Joaquin soils and Xerorthents. Natomas soils are fine-loamy. They are on low terraces. Redding and San Joaquin soils have a duripan. San Joaquin soils are on low terraces. Redding soils are slightly lower on the landscape than the Red Bluff soils. Xerorthents have more than 60 percent coarse fragments. They are in areas of dredge tailings.

Soils of the Red Bluff series are fine, kaolinitic, thermic Ultic Palexeralfs.

Typical pedon of Red Bluff loam, 2 to 5 percent slopes, about 3.5 miles southeast of Mather Field, 5,000 feet north of the intersection of Kiefer and Sunrise Boulevards; 20 feet east and 300 feet south of the northwest corner of sec. 20, T. 8 N., R. 7 E., Buffalo Creek Quadrangle:

Ap1—0 to 5 inches; brown (7.5YR 5/4) loam, dark reddish brown (5YR 3/3) moist; dominantly moderate medium subangular blocky structure but moderate medium granular structure in the upper 1 inch; hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; many very fine and fine tubular and interstitial pores; about 5 percent gravel; strongly acid; clear wavy boundary.

Ap2—5 to 8 inches; brown (7.5YR 5/4) loam, dark reddish brown (5YR 3/3) moist; massive; hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine and few fine tubular and many very fine interstitial pores; about 8 percent gravel; strongly acid; clear smooth boundary.

Bt1—8 to 16 inches; reddish brown (5YR 5/4) clay loam, dark reddish brown (5YR 3/4) moist; massive; hard, very friable, slightly sticky and slightly plastic; common very fine roots; many very fine and common fine interstitial and tubular pores; few thin clay films bridging mineral grains and lining pores; about 5 percent gravel; moderately acid; gradual wavy boundary.

Bt2—16 to 25 inches; yellowish red (5YR 4/6) clay loam, dark reddish brown (5YR 3/4) moist; weak coarse subangular blocky structure; hard, very friable, slightly sticky and slightly plastic; common very fine roots; many very fine, common fine, and few medium tubular and many very fine and common fine interstitial pores; common thin clay films on faces of peds and bridging mineral grains and few thin clay films lining pores; common fine black stains and concretions in the matrix and lining pores react with hydrogen peroxide; about 5 percent gravel; moderately acid; clear wavy boundary.

2Bt1—25 to 32 inches; yellowish red (5YR 4/6) gravelly clay, dark red (2.5YR 3/6) moist; massive; hard, very friable, sticky and plastic; few very fine roots; many very fine and fine tubular and many very fine and common fine interstitial pores; common moderately thick clay films bridging mineral grains and common thin clay films lining pores; few fine black stains in the matrix react with hydrogen peroxide; about 5 percent weathered and 25 percent unweathered, subrounded gravel; slightly acid; gradual wavy boundary.

2Bt2—32 to 43 inches; red (2.5YR 4/6) gravelly clay, dark red (2.5YR 3/6) moist; moderate medium subangular blocky structure; hard, very friable, sticky and plastic; few very fine roots; common very fine tubular and fine interstitial pores; many moderately thick clay films on faces of peds, bridging mineral grains, and lining pores; few fine and medium black stains on faces of peds react with hydrogen peroxide; about 10 percent weathered and 25 percent unweathered, subrounded gravel; light reddish brown (5YR 6/4) sand and silt grains on faces of peds, in pores, and on fracture planes, reddish brown (5YR 4/4) moist; slightly acid; clear wavy boundary.

2BCt1—43 to 51 inches; yellowish red (5YR 4/6) very gravelly clay loam, red (2.5YR 4/6) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; few very fine roots; common very fine and fine tubular and very fine interstitial pores; many moderately thick clay films on faces of peds and on pebbles and common moderately thick and few thin clay films bridging mineral grains and lining pores; about 30 percent weathered and 25 percent unweathered, rounded and subrounded gravel; few to many pink (5YR 7/3) sand and silt grains, light reddish brown (5YR 6/4) moist, over the clay films on faces of peds and on pebbles; slightly acid; clear wavy boundary.

2BCt2—51 to 60 inches; very gravelly clay loam, red (2.5YR 4/6) dry and moist; weak coarse subangular blocky structure; hard, friable, sticky and plastic; few very fine roots; common very fine tubular and common very fine and few fine interstitial pores; many moderately thick clay films on faces of peds and bridging mineral grains and common moderately thick clay films lining pores; about 25 percent weathered and 20 percent unweathered, subrounded gravel; few to many pink (5YR 7/3) sand and silt grains, light reddish brown (5YR 6/4) moist, over the clay films on faces of peds and on pebbles; slightly acid; clear wavy boundary.

2BCt3—60 to 68 inches; light brown (7.5YR 6/4) very gravelly clay loam, reddish brown (5YR 5/4) moist; massive; hard, friable, sticky and plastic; common very fine and few fine tubular and common very fine interstitial pores; many thin and few thick clay films bridging mineral grains and common thin clay films lining pores; about 25 percent weathered and 25 percent unweathered, subangular and subrounded gravel; slightly acid.

By weighted average, the content of clay in the particle-size control section is 35 to 50 percent. Base saturation in the argillic horizon is 45 to 75 percent. Some pedons do not have a 2Bt horizon. Some do not have a Bt horizon.

The A horizon has dry color of 7.5YR 5/4, 4/4, 5/6, or 6/6 or 5YR 5/6 or 6/6 and moist color of 7.5YR 3/4 or 4/4 or 5YR 3/3, 3/4, or 4/4. The content of clay is 15 to 27 percent. The content of gravel is 5 to 15 percent. Reaction is strongly acid or moderately acid.

The upper part of the Bt horizon has dry color of 5YR 4/4, 4/6, 5/4, 5/6, 5/8, or 6/4 or 2.5YR 4/4, 5/4, 4/6, 5/6, or 4/8 and moist color of 5YR 3/4, 4/4, or 4/6 or 2.5YR 3/4, 3/6, or 4/6. It is clay loam or gravelly clay loam that is 27 to 35 percent clay and 5 to 35 percent gravel. Reaction is strongly acid to slightly acid.

The lower part of the Bt horizon has dry color of 5YR 4/4, 4/6, 5/4, or 5/6 or 2.5YR 3/4, 3/6, or 4/6 and moist color of 5YR 4/4, 3/6, or 4/6. It is clay loam, gravelly clay loam, or gravelly clay. The content of clay is 35 to 60 percent. The content of coarse fragments is 5 to 35 percent. It includes 0 to 5 percent cobbles and 0 to 15 percent weathered gravel. Reaction is moderately acid or slightly acid.

The 2Bt horizon has dry color of 7.5YR 5/4 or 6/4; 5YR 4/4, 4/6, or 5/6; or 2.5YR 3/4, 3/6, 4/6, or 4/8. It has moist color of 5YR 4/6 or 5/4 or 2.5YR 3/6 or 4/6. It is very gravelly clay loam, gravelly clay loam, or very gravelly clay. The content of clay is 30 to 50 percent. The content of coarse fragments is 20 to 60 percent. It includes 0 to 5 percent cobbles. About 15 to 30 percent of the coarse fragments is weathered gravel. This horizon is moderately acid or slightly acid.

Redding Series

The Redding series consists of moderately well drained soils on high terraces, terrace remnants, and the side slopes of terraces. These soils are moderately deep over a duripan. They formed in gravelly and cobbly alluvium derived from mixed rock sources. Slope ranges from 0 to 15 percent.

Redding soils are near Corning, Hadselville, Pentz, Red Bluff, and San Joaquin soils and Xerarents and Xerorthents. Corning and Red Bluff soils are very deep. They are on high terraces. Hadselville and Pentz soils have a mollic epipedon and are very shallow and shallow, respectively. They are on hills characterized by mound-intermound microrelief. San Joaquin soils have more than 75 percent base saturation in some part of the A horizon. They are on low terraces. Xerarents are in filled areas. Xerorthents have more than 60 percent coarse fragments. They are in areas of dredge tailings.

Soils of the Redding series are fine, mixed, thermic Abruptic Durixeralfs.

Typical pedon of Redding gravelly loam, 0 to 8 percent slopes, about 2.5 miles north of Sheldon; 75 feet south and 50 feet west of the northeast corner of sec. 15, T. 7 N., R. 6 E., Elk Grove Quadrangle:

A1—0 to 2 inches; strong brown (7.5YR 5/6) gravelly loam, dark reddish brown (5YR 3/4) moist; weak medium platy and moderate fine granular structure; hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; few very fine interstitial and common very fine and few fine tubular pores; about 17 percent subrounded gravel; strongly acid; abrupt wavy boundary.

A2—2 to 7 inches; strong brown (7.5YR 5/6) gravelly loam, dark reddish brown (5YR 3/4) moist; massive; hard, friable, slightly sticky and slightly plastic; many very fine and common fine roots; few very fine interstitial and common very fine and few fine tubular pores; about 17 percent subrounded gravel; strongly acid; clear wavy boundary.

BAt1—7 to 13 inches; yellowish red (5YR 5/6) loam, dark red (2.5YR 3/6) moist; massive; hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; many very fine and fine and common medium and coarse tubular pores; few thin clay films lining pores and bridging mineral grains; about 8 percent subrounded gravel; moderately acid; gradual wavy boundary.

BAt2—13 to 20 inches; yellowish red (5YR 5/6) gravelly loam, dark red (2.5YR 3/6) moist; massive; hard, friable, sticky and plastic; common very fine and fine roots; many very fine and fine and common medium and coarse tubular pores; common thin clay films lining pores and bridging mineral grains; about 30 percent gravel and 4 percent cobbles; moderately acid; abrupt wavy boundary.

Bt1—20 to 25 inches; reddish brown (5YR 4/4) and yellowish red (5YR 4/6) gravelly clay, dark red

(2.5YR 3/6) moist; strong coarse prismatic structure; very hard, firm, very sticky and plastic; common very fine and fine roots; many very fine and few fine tubular pores; continuous, thick clay films on faces of peds and lining pores; about 30 percent subrounded gravel; moderately acid; clear wavy boundary.

Bt2—25 to 28 inches; gravelly clay, reddish brown (5YR 4/4) dry and moist; common medium distinct yellowish red (5YR 4/6) mottles, dusky red (2.5YR 3/2) moist; strong coarse prismatic structure; very hard, firm, very sticky and plastic; common very fine and fine roots; many very fine and few fine tubular pores; continuous, thick clay films on faces of peds and lining pores; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist, ⅜ to ¾ inch thick at the bottom of the horizon and in some cracks near the bottom; about 30 percent gravel and 4 percent cobbles; moderately acid; abrupt wavy boundary.

2Bqm1—28 to 46 inches; reddish yellow (7.5YR 6/6), brown (7.5YR 4/4), and yellowish red (5YR 4/6), very gravelly, strongly cemented duripan, brown (7.5YR 4/4 and 5/4), yellowish red (5YR 4/6), and red (2.5YR 4/8) moist; massive; brittle; about 50 percent subrounded gravel and 5 percent cobbles; mildly alkaline; clear wavy boundary.

2Bqm2—46 to 66 inches; reddish yellow (7.5YR 6/6), brown (7.5YR 4/4), and yellowish red (5YR 4/6), very gravelly, weakly cemented duripan, brown (7.5YR 4/4 and 5/4), yellowish red (5YR 4/6), and red (2.5YR 4/8) moist; massive; brittle; about 50 percent subrounded gravel and 5 percent cobbles; mildly alkaline.

The depth to a duripan ranges from 20 to 40 inches. By weighted average, the content of clay in the particle-size control section ranges from 35 to 50 percent. The content of clay at the upper boundary of the Bt horizon increases by 20 to 40 percent within a distance of 1 inch. Some pedons do not have a Bt horizon.

The A horizon has dry color of 7.5YR 5/4, 5/6, or 6/4 or 5YR 5/4, 4/6, 5/6, or 4/8. It has moist color of 7.5YR 4/4; 5YR 3/4, 4/4, 3/6, or 4/6; or 2.5YR 3/6. It is loam or gravelly loam. The content of clay is 10 to 25 percent. The content of coarse fragments is 5 to 25 percent. It includes 0 to 5 percent cobbles. Base saturation is 35 to 75 percent. Reaction is strongly acid to slightly acid.

The BAt horizon has dry color of 5YR 5/4, 4/6, 5/6, 5/8, or 6/8 or 2.5YR 4/6 and moist color of 5YR 3/4 or 4/4 or 2.5YR 3/6 or 4/6. It is loam, gravelly loam, or gravelly clay loam. The content of clay is 18 to 30 percent. The content of coarse fragments is 10 to 35 percent. It includes 0 to 5 percent cobbles. Base saturation is 35 to 75 percent. Reaction is strongly acid to slightly acid.

The Bt horizon generally has dry color of 7.5YR 5/4 or 5/6, 5YR 4/4 or 4/6, or 2.5YR 5/6 or 5/8 and moist color of 5YR 3/4 or 4/4 or 2.5YR 3/6 or 4/6. In some pedons, however, the lower ½ inch to 2 inches of this horizon has dry color of 10YR 3/1 or 4/1 or 5YR 3/1 or 4/1. The texture is gravelly clay loam or gravelly clay. The content of clay is 35 to 60 percent. The content of coarse fragments is 15 to 35 percent. It includes 0 to 5 percent cobbles. Reaction is moderately acid or slightly acid.

The 2Bqm horizon has dry color of 10YR 5/3; 7.5YR 4/4, 5/4, 5/6, or 6/6; or 5YR 4/6. It has moist color of 10YR 4/3, 7.5YR 4/4 or 5/4, 5YR 4/6, or 2.5YR 3/6 or 4/8. It is a gravelly or very gravelly and cobbly duripan that is continuously cemented with silica. Cementation is weak to strong.

Reiff Series

The Reiff series consists of very deep, well drained soils on narrow, low flood plains. These soils formed in alluvium derived from mixed rock sources. Slope ranges from 0 to 2 percent.

Reiff soils are near Coyotecreek and Vina soils on high flood plains. Coyotecreek and Vina soils have a mollic epipedon. Also, Coyotecreek soils are fine-silty.

Soils of the Reiff series are coarse-loamy, mixed, nonacid, thermic Mollic Xerofluvents.

Typical pedon of Reiff fine sandy loam, 0 to 2 percent slopes, occasionally flooded, about 4.5 miles south of a power plant; 1,100 feet east and 300 feet north of the southwest corner of sec. 16, T. 5 N., R. 8 E., Goose Creek Quadrangle:

Oi—0.5 to 0; partially decomposed litter of twigs, leaves, grasses, and forbs; abrupt smooth boundary.

A—0 to 7 inches; brown (10YR 5/3) fine sandy loam, dark yellowish brown (10YR 3/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; common very fine interstitial and few very fine tubular pores; neutral; clear smooth boundary.

C1—7 to 19 inches; yellowish brown (10YR 5/4) fine sandy loam, dark yellowish brown (10YR 3/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; common very fine interstitial and few very fine tubular pores; neutral; clear smooth boundary.

C2—19 to 33 inches; light yellowish brown (10YR 6/4) very fine sandy loam, dark yellowish brown

(10YR 3/4) moist; massive; soft, very friable, slightly sticky and slightly plastic; few very fine and fine roots; few very fine interstitial and tubular pores; discontinuous lens of loamy fine sand 1 to 2 inches thick in the center of the horizon; neutral; abrupt smooth boundary.

C3—33 to 38 inches; light yellowish brown (10YR 6/4) sandy loam, dark yellowish brown (10YR 3/4) moist; massive; soft, very friable, slightly sticky and slightly plastic; few very fine roots; common very fine interstitial and few very fine tubular pores; neutral; abrupt wavy boundary.

C4—38 to 42 inches; yellowish brown (10YR 5/4) very fine sandy loam, dark yellowish brown (10YR 3/4) moist; massive; soft, very friable, slightly sticky and slightly plastic; few very fine roots; common very fine interstitial and tubular pores; few thin colloidal stains; neutral; abrupt smooth boundary.

C5—42 to 47 inches; brown (10YR 5/3) loamy sand, dark yellowish brown (10YR 3/4) moist; massive; loose, nonsticky and nonplastic; few very fine roots; many very fine interstitial pores; neutral; abrupt smooth boundary.

C6—47 to 58 inches; yellowish brown (10YR 5/4) very fine sandy loam, dark yellowish brown (10YR 3/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; common very fine interstitial and tubular pores; few thin colloidal stains; neutral; abrupt smooth boundary.

Ab—58 to 64 inches; dark brown (10YR 4/3) loam, very dark brown (10YR 2/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine interstitial and tubular pores; few thin clay films bridging mineral grains; neutral.

The soils are stratified. Individual strata commonly are 4 to 14 inches thick. The content of organic matter is 1 to 2 percent in the upper 6 inches. Pedons in cultivated areas do not have an O horizon.

The A horizon has dry color of 10YR 5/3 or 7.5YR 5/4 and moist color of 10YR 3/4 or 7.5YR 3/4. The content of clay is 5 to 15 percent. Reaction is slightly acid to mildly alkaline.

The C horizon has dry color of 10YR 5/2, 5/3, 5/4, 6/3, or 6/4 or 7.5YR 5/4 or 6/4 and moist color of 10YR 3/3, 3/4, or 4/3 or 7.5YR 4/4. It is stratified loamy sand, sandy loam, fine sandy loam, very fine sandy loam, or loam. The content of clay is 8 to 18 percent. Reaction is neutral or mildly alkaline.

Most pedons have an Ab horizon. This horizon has dry color of 10YR 3/2, 3/3, or 4/3 and moist color of 10YR 2/2, 3/2, or 3/3. It is loam or silt loam. The content of clay is 15 to 25 percent. Reaction is neutral or mildly alkaline.

Rindge Series

The Rindge series consists of very deep, very poorly drained, organic soils in reclaimed freshwater marshes. These soils are artificially drained. They formed in highly decomposed hydrophytic plant remains derived mainly from reeds and tules. Slope ranges from 0 to 2 percent.

Rindge soils are near Gazwell and Scribner soils. Gazwell soils are in backswamps. They are highly organic mineral soils. Scribner soils are fine-loamy mineral soils on the edges of backswamps.

Soils of the Rindge series are euic, thermic Typic Medisaprists.

Typical pedon of Rindge muck, partially drained, 0 to 2 percent slopes, about 3.2 miles east of Isleton, on the east side of Tyler Island, 2,000 feet north and 3,200 feet east of the point where Broad Slough and the Mokelumne River meet, 900 feet west of a levee, 50 feet north and 45 feet east of drainage ditches; in an unsectionalized area, T. 4 N., R. 4 E., 38 degrees, 09 minutes, 15 seconds north latitude, 121 degrees, 32 minutes, 40 seconds west longitude, Isleton Quadrangle:

Oap—0 to 16 inches; muck, black (N 2/0) broken face, black (N 2/0) rubbed and pressed; about 50 percent fibers, less than 1 percent rubbed; massive; slightly hard, friable, nonsticky and nonplastic; few very fine and fine roots; tule and reed fibers; slightly acid (in 0.01M calcium chloride); clear smooth boundary.

Oa1—16 to 40 inches; peat, black (N 2/0) broken face, black (N 2/0) rubbed and pressed; about 60 percent fibers, less than 1 percent rubbed; moderate very coarse subangular blocky structure; hard, friable, nonsticky and nonplastic; few very fine roots; tule and reed fibers; moderately acid (in 0.01M calcium chloride); clear smooth boundary.

Oa2—40 to 60 inches; peat, black (N 2/0) broken face, black (N 2/0) rubbed and pressed; about 80 percent fibers, 2 percent rubbed; massive; hard, friable, nonsticky and nonplastic; tule and reed fibers; very strongly acid (in 0.01M calcium chloride).

Colors in the typical pedon are for moist soil unless otherwise noted. The content of organic matter in the organic layers ranges from 35 to 65 percent.

The Oap horizon has dry color of 10YR 4/1 or 3/1 or N 2/0 and moist color of 10YR 4/1 or 2/1 or N 2/0. It is muck, mucky silt loam, or mucky clay loam. Reaction is very strongly acid to slightly acid where the surface layer is muck and moderately acid to neutral where the surface layer is mucky silt loam or mucky clay loam.

The Oa horizon has dry color of N 2/0 or 10YR 3/1 and moist color of N 2/0 or 10YR 2/1. It is highly decomposed organic material. Some pedons have moderately decomposed organic material below a depth of 45 inches. Reaction is very strongly acid to slightly acid.

Rossmoor Series

The Rossmoor series consists of very deep, well drained soils on high flood plains. These soils formed in alluvium derived from mixed rock sources. Slope ranges from 0 to 2 percent.

Rossmoor soils are near Americanos and Columbia soils and Xerofluvents and Xerorthents. Americanos soils have an argillic horizon. They are on low stream terraces. Columbia soils do not have a mollic epipedon. They are somewhat poorly drained and are on low flood plains. Xerofluvents are stratified and do not have a mollic epipedon. They are on low flood plains. Xerorthents have more than 60 percent coarse fragments in the control section. They are in areas of dredge tailings.

Soils of the Rossmoor series are coarse-loamy, mixed, thermic Fluventic Haploxerolls.

Typical pedon of Rossmoor fine sandy loam, 0 to 2 percent slopes, about 1.2 miles east of Rancho Cordova, 3,200 feet north and 4,400 feet west of the intersection of Folsom Boulevard and Coloma Road, 10 feet east of a farm road in the southwest corner of a field; in an unsectionalized area, T. 9 N., R. 6 E., 38 degrees, 35 minutes, 52 seconds north latitude, 121 degrees, 19 minutes, 05 seconds west longitude, Carmichael Quadrangle:

A—0 to 6 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 3/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; many very fine roots; few very fine tubular and common very fine interstitial pores; neutral; gradual smooth boundary.

AC—6 to 29 inches; yellowish brown (10YR 5/4) fine sandy loam, dark brown (10YR 3/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; common very fine roots; many very fine interstitial pores; neutral; diffuse smooth boundary.

C1—29 to 52 inches; yellowish brown (10YR 5/4) fine sandy loam, dark yellowish brown (10YR 3/4) moist; massive; hard, very friable, nonsticky and nonplastic; many very fine interstitial pores; neutral; diffuse smooth boundary.

C2—52 to 62 inches; brown (10YR 4/3) fine sandy loam, dark yellowish brown (10YR 3/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; many very fine interstitial pores; neutral.

By weighted average, the content of clay in the particle-size control section is 5 to 15 percent. The mollic epipedon is 7 to 16 inches thick. The content of organic matter is 2 to 3 percent. It decreases regularly with increasing depth and is 1 to 2 percent at a depth of 60 inches or more. Reaction is neutral or mildly alkaline throughout the profile.

The A horizon has dry color of 10YR 5/4, 5/3, or 5/2 and moist color of 10YR 3/3 or 3/2. The C horizon has dry color of 10YR 6/4, 5/4, or 4/3 and moist color of 10YR 3/4 or 3/3. It is fine sandy loam or sandy loam.

Sailboat Series

The Sailboat series consists of very deep, somewhat poorly drained soils on the natural levees of rivers and sloughs and on narrow, low flood plains along rivers and streams. These soils are artificially drained. They formed in alluvium derived from mixed rock sources. Slope ranges from 0 to 2 percent.

Sailboat soils are near Columbia, Cosumnes, Egbert, Gazwell, Laugenour, Scribner, and Valpac soils. Columbia and Laugenour soils are coarse-loamy. Cosumnes soils are fine textured. Egbert and Gazwell soils have a mollic epipedon and are fine textured. Scribner and Valpac soils have a mollic epipedon. Gazwell soils are in backswamps. Egbert and Valpac soils are on high flood plains. Scribner soils are at the edges of backswamps.

Soils of the Sailboat series are fine-loamy, mixed, nonacid, thermic Aquic Xerofluvents.

Typical pedon of Sailboat silt loam, partially drained, 0 to 2 percent slopes, about 4 miles south of the town of Courtland, 1,250 feet north of the River Mansion (Club Lido) on a levee road and 1,250 feet east on a dirt road, 45 feet south of the center of a dirt road; in an unsectionalized part of Grand Island, 38 degrees, 16 minutes, 23 seconds north latitude, 121 degrees, 34 minutes, 59 seconds west longitude, Courtland Quadrangle:

Ap—0 to 6 inches; light yellowish brown (10YR 6/4) silt loam, dark yellowish brown (10YR 4/4) moist; weak very fine subangular blocky structure; very hard, friable, slightly sticky and slightly plastic; common very fine and fine and few medium roots; common very fine tubular and interstitial pores; slightly acid; gradual smooth boundary.

A—6 to 16 inches; light yellowish brown (10YR 6/4) silt loam, dark yellowish brown (10YR 4/4) moist; weak very fine subangular blocky structure; hard, friable, sticky and plastic; common very fine and fine and few medium and coarse roots; common very fine and few fine tubular and few very fine interstitial pores; neutral; clear smooth boundary.

C—16 to 28 inches; very pale brown (10YR 7/4) silt loam, yellowish brown (10YR 5/4) moist; common fine distinct brownish yellow (10YR 6/6) mottles, yellowish brown (10YR 5/6) moist; moderate fine subangular blocky structure; slightly hard, friable, sticky and slightly plastic; common very fine and fine and few medium and coarse roots; common very fine and fine and few medium tubular and few very fine interstitial pores; mildly alkaline; abrupt smooth boundary.

2Akb—28 to 34 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; common medium distinct brownish yellow (10YR 6/6) mottles, yellowish brown (10YR 5/6) moist; weak fine granular structure; hard, friable, sticky and plastic; few very fine, fine, and coarse roots; common very fine and fine tubular and few very fine interstitial pores; strongly effervescent; lime segregated in common rounded fine soft masses; moderately alkaline; clear smooth boundary.

2C—34 to 49 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; common medium distinct yellowish brown (10YR 5/8) mottles, dark yellowish brown (10YR 3/6) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine, very fine, and medium roots; common very fine and fine tubular and common very fine interstitial pores; moderately alkaline; clear smooth boundary.

2Ck—49 to 62 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; common medium distinct yellowish brown (10YR 5/8) mottles, dark yellowish brown (10YR 3/6) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; few very fine, fine, medium, and coarse roots; common very fine and medium tubular and many very fine interstitial pores; slightly effervescent; lime segregated in few fine irregularly shaped soft masses; moderately alkaline.

Depth to the Ab horizon is 20 to 45 inches.

The A horizon has dry color of 10YR 6/3, 6/4, 7/3, or 7/4 and moist color of 10YR 4/3, 4/4, 5/3, or 5/4. The content of clay is 15 to 27 percent.

The C horizon has colors that are similar to those of the A horizon. It is stratified sandy loam, loam, silt loam, or silty clay loam. The content of clay is 18 to 35 percent. Reaction is neutral or mildly alkaline.

The 2Akb horizon has dry color of 10YR 4/2, 4/3, 5/2, 5/3, 6/2, or 6/3 or 2.5Y 5/2 and moist color of 10YR 3/2, 3/3, 4/2, or 4/3 or 2.5Y 4/2. It is clay loam or sandy clay loam. The content of clay is 25 to 35 percent. Reaction is mildly alkaline or moderately alkaline. This horizon is slightly effervescent or strongly effervescent.

The 2C and 2Ck horizons have dry color of 10YR 7/2 or 6/3 or 2.5Y 6/2 and moist color of 10YR 4/2 or 2.5Y 4/2. They are stratified loam or silt loam. The content of clay is 10 to 27 percent. Reaction is mildly alkaline or moderately alkaline.

Sailboat Variant

The Sailboat Variant consists of very deep, poorly drained soils that have a buried layer that is high in content of organic matter. These artificially drained soils are on low flood-plain splays. They formed in alluvium underlain by hydrophytic plant remains and derived from mixed rock sources. Slope ranges from 0 to 2 percent.

Sailboat Variant soils are near Gazwell soils. Gazwell soils are fine textured and have a buried organic layer at a depth of 28 to 39 inches. They are in backswamps.

Soils of the Sailboat Variant are fine-silty, mixed, nonacid, thermic Aquic Xerofluvents.

Typical pedon of Sailboat Variant silty clay loam, partially drained, 0 to 2 percent slopes, about 0.8 mile southwest of Emmaton, on Sherman Island, 370 feet west of Highway 160 and 180 feet south of a large ditch; in an unsectionalized area, 38 degrees, 04 minutes, 10 seconds north latitude, 121 degrees, 44 minutes, 08 seconds west longitude, Jersey Island Quadrangle:

Ap—0 to 9 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 4/3) moist; massive; hard, friable, sticky and slightly plastic; many very fine, common fine, and few medium roots; few very fine tubular and interstitial pores; mildly alkaline; abrupt smooth boundary.

C1—9 to 16 inches; stratified very pale brown (10YR 7/3 and 7/4) and yellow (10YR 7/6) silty clay loam, brown (10YR 5/3) and yellowish brown (10YR 5/4 and 5/6) moist; massive; hard, friable, sticky and slightly plastic; many very fine and common fine roots; few very fine tubular and interstitial pores; strata less than 1/16 inch thick within layers 1/2 to 1 inch thick; mildly alkaline; abrupt smooth boundary.

C2—16 to 23 inches; stratified grayish brown (10YR 5/2) and very pale brown (10YR 7/3) silty clay loam, dark grayish brown (10YR 4/2) and brown

(10YR 5/3) moist; common medium prominent yellowish red (5YR 4/6) mottles, dark brown (7.5YR 3/4) moist; massive; hard, friable, sticky and slightly plastic; common very fine roots; few very fine tubular and interstitial pores; strata less than 1/16 inch to 2 inches thick; neutral; abrupt smooth boundary.

2Ab1—23 to 26 inches; dark gray (10YR 4/1) mucky silty clay loam, black (10YR 2/1) moist; massive; slightly hard, very friable, nonsticky and slightly plastic; common very fine roots; common very fine and fine interstitial pores; strata less than 1/16 inch thick; neutral; abrupt smooth boundary.

2Ab2—26 to 33 inches; dark gray (10YR 4/1) mucky silty clay loam, black (10YR 2/1) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; common very fine and fine interstitial pores; discontinuous burnt layer at the lower boundary; mixed with 5 percent fragments of light gray (10YR 7/2) silty clay loam, grayish brown (10YR 5/2) moist, 1/8 to 1/2 inch in diameter; neutral; abrupt smooth boundary.

2Ab3—33 to 57 inches; mucky silt loam, black (10YR 2/1) dry and moist; about 5 percent fibers, less than 1 percent rubbed; massive; hard, very friable, nonsticky and nonplastic; few very fine roots; neutral; abrupt smooth boundary.

3Oa—57 to 64 inches; mucky peat, black (10YR 2/1) dry and moist; about 45 percent fibers, 10 percent rubbed; massive; hard, very friable, nonsticky and nonplastic; slightly acid.

Depth to the 2Ab horizon is 20 to 40 inches.

The Ap horizon has dry color of 10YR 7/3 or 6/3 and moist color of 10YR 4/3 or 3/3. The content of clay is 27 to 35 percent. The content of organic matter is 1 to 3 percent. Reaction is neutral or mildly alkaline.

The C horizon has dry color of 10YR 7/6, 7/4, 7/3, 6/3, or 5/2 and moist color of 10YR 5/6, 5/4, 5/3, 4/3, or 4/2. The content of clay is 27 to 35 percent. The content of organic matter is 1 to 3 percent.

The upper part of the 2Ab horizon has dry color of 10YR 5/1, 4/1, or 3/1 and moist color of 10YR 4/1, 3/1, or 2/1 or N 2/0. It is mucky silty clay loam or mucky clay loam. The content of clay is 27 to 35 percent. The content of organic matter ranges from 5 to 15 percent. Reaction is slightly acid or neutral.

The lower part of the 2Ab horizon has dry color of 10YR 3/1 or 2/1 and moist color of 10YR 2/1 or N 2/0. It is mucky silty clay loam, mucky clay loam, or mucky silt loam. The content of clay is 20 to 35 percent. The content of organic matter ranges from 10 to 25 percent. Reaction is slightly acid or neutral.

The 3Oa horizon has dry color of 10YR 3/1 or 2/1 and moist color of 10YR 2/1 or N 2/0. The content of organic matter ranges from 25 to 35 percent. Reaction is moderately acid or slightly acid.

San Joaquin Series

The San Joaquin series consists of moderately well drained soils on low terraces. These soils are moderately deep over a duripan. They formed in alluvium derived from dominantly granitic rock sources. Slope ranges from 0 to 8 percent.

San Joaquin soils are near Bruella, Clear Lake, Dierssen, Fiddyment, Galt, Hedge, Kimball, Madera, and Redding soils and Durixeralfs and Xerarents. Bruella soils are fine-loamy and do not have a duripan. They are on intermediate terrace remnants. Clear Lake and Galt soils have intersecting slickensides and have cracks that open to the surface. They are in basins. Dierssen soils have a mollic epipedon. They are on the rims of basins. Durixeralfs have an Ap horizon of clay loam, sandy clay loam, or clay. They are in cut areas. Fiddyment soils are fine-loamy. They are on hills. Hedge, Kimball, and Madera soils are in the slightly lower positions on the low terraces. Hedge soils are fine-loamy. Kimball soils are very deep. Madera soils have montmorillonitic mineralogy. Redding soils are fine textured. They are on high terraces. Xerarents have fragments of an argillic horizon in the control section. They are in filled areas.

Soils of the San Joaquin series are fine, mixed, thermic Abruptic Durixeralfs.

Typical pedon of San Joaquin silt loam, 0 to 3 percent slopes, about 2.6 miles south of Wilton, 0.3 mile south of the intersection of Walmort Road and Davis Road, and about 100 feet west of the graveled extension of Davis Road; in an unsectionalized area, T. 6 N., R. 6 E., 38 degrees, 22 minutes, 30 seconds north latitude, 120 degrees, 15 minutes, 36 seconds west longitude, Elk Grove Quadrangle:

A1—0 to 4 inches; strong brown (7.5YR 5/6) silt loam, brown (7.5YR 4/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; common very fine tubular and interstitial pores; the upper 1 inch is compact because of animal traffic; moderately acid; clear smooth boundary.

A2—4 to 7 inches; strong brown (7.5YR 5/6) silt loam, brown (7.5YR 4/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine interstitial and common very fine and few fine tubular pores; moderately acid; clear smooth boundary.

A3—7 to 16 inches; strong brown (7.5YR 5/6) silt loam, brown (7.5YR 4/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine and fine interstitial and common very fine and fine and few medium tubular pores; slightly acid; gradual smooth boundary.

A4—16 to 23 inches; strong brown (7.5YR 5/6) silt loam, brown (7.5YR 4/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine interstitial and common very fine and few fine and medium tubular pores; slightly acid; abrupt smooth boundary.

Bt—23 to 28 inches; yellowish red (5YR 5/6) clay loam, yellowish red (5YR 4/6) moist; moderate coarse prismatic structure; very hard, very firm, sticky and plastic; few very fine roots; few very fine tubular pores; continuous, moderately thick clay films on faces of peds; few small black (N 2/0) iron and manganese concretions; neutral; abrupt wavy boundary.

Bqm—28 to 39 inches; strong brown (7.5YR 5/6), indurated duripan, yellowish red (5YR 4/6) moist; iron and manganese stains in the upper part of the horizon; neutral; strongly effervescent; lime segregated in common fine filaments and seams; gradual wavy boundary.

Bq1—39 to 45 inches; yellowish brown (10YR 5/6), strongly cemented duripan, dark yellowish brown (10YR 4/4) moist; mildly alkaline; strongly effervescent; lime segregated in common fine filaments and seams; gradual wavy boundary.

Bq2—45 to 54 inches; yellowish brown (10YR 5/6), strongly cemented duripan, dark yellowish brown (10YR 4/4) moist; mildly alkaline; strongly effervescent; lime segregated in common fine filaments and seams; clear wavy boundary.

C—54 to 60 inches; yellowish brown (10YR 5/6) loam, dark yellowish brown (10YR 4/4) moist; massive; hard, friable, slightly sticky and plastic; few very fine and fine tubular pores; many thin clay films lining pores and bridging mineral grains; mildly alkaline.

The depth to a duripan ranges from 20 to 40 inches. Some pedons do not have a C horizon.

The A horizon has dry color of 10YR 5/3; 7.5YR 5/6, 5/4, or 6/6; or 5YR 5/6. It has moist color of 10YR 3/4 or 4/4; 7.5YR 3/4, 4/2, or 4/4; or 5YR 3/3 or 4/4. The content of clay is 10 to 25 percent.

The Bt horizon has dry color of 5YR 5/4 or 5/6; 7.5YR 5/4, 6/4, 5/6, or 6/6; or 2.5YR 3/4. It has moist color of 7.5YR 3/4, 4/4, or 4/6; 2.5YR 3/4; or 5YR 4/3, 4/4, or 4/6. It is clay loam or clay. The content of clay is 35 to 50 percent. Reaction is slightly acid to mildly alkaline.

The Bqm and Bq horizons are variegated. They have dry color of 10YR 7/3, 5/4, or 5/6 or 7.5YR 7/2, 6/4, 5/6, 4/4, or 4/6 and moist color of 10YR 4/4, 7.5YR 4/4 or 5/6, or 5YR 3/4 or 4/6. The duripan is 12 to 72 inches thick.

The C horizon is stratified sandy loam, silt loam, or loam. The content of clay is 10 to 25 percent. Reaction is neutral or mildly alkaline.

In the San Joaquin soils in map units 211, 212, and 220, the upper part of the argillic horizon is thicker than is defined as the range for the series. As a result, the content of clay, by weighted average, is 20 to 35 percent in the textural family control section. An abrupt boundary separates the upper and lower parts of the Bt horizon. These differences, however, do not significantly affect the use and management of the soils.

Scribner Series

The Scribner series consists of very deep, poorly drained soils on the edges of backswamps. These soils are artificially drained. They formed in alluvium derived from mixed rock sources. Slope ranges from 0 to 2 percent.

Scribner soils are near Dierssen, Egbert, Gazwell, Rindge, Sailboat, and Valpac soils. Dierssen soils have a fine textured argillic horizon and have a duripan at a depth of 20 to 40 inches. They are on the rims of basins. Egbert and Gazwell soils are fine textured. Egbert soils are on high flood plains. Gazwell soils are in backswamps. Rindge soils are organic. They are in freshwater marshes. Sailboat soils have an ochric epipedon. They are on the natural levees of low flood plains. Valpac soils have a mollic epipedon that is than 20 inches thick. They are on the natural levees of high flood plains.

Soils of the Scribner series are fine-loamy, mixed, thermic Cumulic Haplaquolls.

Typical pedon of Scribner clay loam, partially drained, 0 to 2 percent slopes, about 0.7 mile south of Hood, 0.57 mile south of the intersection of Hood-Franklin Road and Highway 160, about 0.4 mile southeast on a farm road, and 40 feet north of the farm road, near the edge of a pear orchard on a small abandoned site; 2,100 feet south and 1,400 feet east of the northeast corner of sec. 23, in an unsectionalized area, T. 6 N., R. 4 E., 38 degrees, 21 minutes, 30 seconds north latitude, 121 degrees, 30 minutes, 45 seconds west longitude, Courtland Quadrangle:

Ap1—0 to 4 inches; gray (10YR 5/1) clay loam, very dark gray (10YR 3/1) moist; weak fine subangular blocky structure, except for the upper 1 inch, which has moderate medium granular structure; very hard, firm, sticky and plastic; many very fine and few fine roots; common very fine tubular and interstitial pores; many wormcasts; neutral; clear smooth boundary.

Ap2—4 to 12 inches; mixed grayish brown (10YR 5/2) and strong brown (7.5YR 4/6) clay loam, very dark gray (10YR 3/1) moist; weak fine subangular blocky structure; very hard, firm, sticky and plastic; many very fine and few fine roots; common very fine tubular and interstitial pores; mildly alkaline; clear wavy boundary.

A—12 to 21 inches; gray (10YR 5/1) clay loam, very dark gray (10YR 3/1) moist; weak fine subangular blocky structure; very hard, firm, sticky and plastic; many very fine and few fine roots; common very fine tubular and interstitial pores; some bleached light gray (10YR 7/1) sand grains; moderately alkaline; clear wavy boundary.

Ab—21 to 39 inches; gray (10YR 5/1) clay loam, very dark gray (10YR 3/1) moist; common medium prominent yellowish red (5YR 5/8) mottles, yellowish red (5YR 5/6) moist; moderate fine angular blocky structure; very hard, firm, sticky and plastic; many very fine roots; common very fine tubular and interstitial pores; moderately alkaline; gradual wavy boundary.

C—39 to 51 inches; gray (10YR 5/1) clay loam, dark gray (10YR 4/1) moist; many fine and medium prominent yellowish red (5YR 5/8) mottles, yellowish red (5YR 5/6) moist; moderate medium angular blocky structure; very hard, firm, sticky and plastic; common very fine roots; common very fine tubular and interstitial pores; moderately alkaline; diffuse wavy boundary.

Ck—51 to 60 inches; light brownish gray (2.5Y 6/2) sandy clay loam, dark grayish brown (10YR 4/2) and brown (10YR 5/3) moist; many fine and medium prominent strong brown (7.5YR 5/6) mottles, yellowish red (5YR 5/6) moist; moderate medium angular blocky structure; extremely hard, very firm, sticky and plastic; common very fine roots; common very fine tubular and interstitial pores; strongly effervescent; lime segregated in few fine filaments; moderately alkaline.

By weighted average, the content of clay in the 10- to 40-inch control section is 25 to 35 percent. The content of fine sand or coarser textured sand is 15 to 45 percent. The mollic epipedon is more than 24 inches thick. It has an organic matter content of 2 to 10 percent.

The Ap horizon has dry color of 10YR 5/1, 4/1, 3/1, 5/2, or 4/2 or 7.5YR 4/6 and moist color of 10YR 3/1, 2/1, or 3/2. Reaction is slightly acid to mildly alkaline.

The A and Ab horizons have dry color of 10YR 5/1, 4/1, 3/1, 5/2, 4/2, or 3/2; 2.5Y 4/2; or N 2/0. They have moist color of 10YR 3/1, 2/1, 3/2, or 2/2; 2.5Y 3/2; or N 2/0. They are clay loam, silty clay loam, or silt loam. The content of clay is 25 to 35 percent. Reaction is neutral to moderately alkaline.

The C horizon has dry color of 10YR 6/1, 5/1, or 6/2 or 2.5Y 6/2 and moist color of 10YR 5/1, 4/1, 3/1, 4/2, or 5/3 or 2.5Y 4/2. It is stratified loam, silt loam, sandy clay loam, clay loam, or silty clay loam. Reaction is neutral to moderately alkaline.

Tehama Series

The Tehama series consists of very deep, well drained soils on low terraces. These soils formed in alluvium derived from sedimentary rock sources. Slope ranges from 0 to 2 percent.

Tehama soils are near Creviscreek, Hicksville, and San Joaquin soils. Creviscreek soils are fine-loamy. They are on stream terraces. Hicksville soils are fine-loamy and have a dark surface layer. They are on low stream terraces. San Joaquin soils have a duripan at a depth of 20 to 40 inches. They are in the slightly higher areas on low terraces.

Soils of the Tehama series are fine-silty, mixed, thermic Typic Haploxeralfs.

Typical pedon of Tehama loam, 0 to 2 percent slopes, about 4.9 miles south of Live Oak, 60 feet north of Carbondale Road; 2,470 feet south and 1,550 feet east of the northwest corner of sec. 31, T. 7 N., R. 9 E., Carbondale Quadrangle:

Ap—0 to 4 inches; yellowish brown (10YR 5/4) loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine and medium and common very fine roots; common very fine tubular and many very fine interstitial pores; about 5 percent fine angular gravel; moderately acid; abrupt wavy boundary.

A—4 to 11 inches; light yellowish brown (10YR 6/4) and strong brown (7.5YR 5/6) loam, brown (7.5YR 4/4) and strong brown (7.5YR 5/6) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; common fine tubular and many very fine tubular and interstitial pores; about 5 percent fine subangular gravel; slightly acid; clear wavy boundary.

BA—11 to 24 inches; reddish yellow (7.5YR 6/6) and pink (7.5YR 7/4) loam, strong brown (7.5YR 5/6) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; many very fine interstitial and tubular pores; common thin clay films bridging mineral grains and lining pores; about 5 percent fine subangular gravel; slightly acid; clear wavy boundary.

2Bt1—24 to 41 inches; light yellowish brown (10YR 6/4) silty clay loam, dark yellowish brown (10YR 4/4) moist; moderate medium prismatic structure; hard, firm, slightly sticky and plastic; few very fine roots; many very fine tubular and common very fine interstitial pores; many moderately thick clay films on faces of peds, brown (7.5YR 5/4) and dark brown (7.5YR 4/4) moist, common thin clay films bridging mineral grains, and common moderately thick clay films lining pores; neutral; clear wavy boundary.

2Bt2—41 to 59 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; few fine distinct yellowish brown (10YR 5/6) mottles, dark yellowish brown (10YR 4/6) moist; strong medium prismatic structure parting to strong coarse angular blocky; very hard, very firm, sticky and plastic; few very fine roots; many very fine tubular and few very fine interstitial pores; continuous, thick clay films on faces of peds, light yellowish brown (10YR 6/4) and dark yellowish brown (10YR 4/4) moist, many moderately thick clay films lining pores, and many thin clay films bridging mineral grains; mildly alkaline; gradual wavy boundary.

2Bt3—59 to 67 inches; light gray (2.5Y 7/2) clay loam, light olive brown (2.5Y 5/4) moist; common fine distinct yellowish brown (10YR 5/6) mottles, dark yellowish brown (10YR 4/6) moist; strong coarse subangular blocky structure; very hard, very firm, sticky and plastic; few very fine roots; many very fine tubular and common very fine interstitial pores; many thick clay films on faces of peds, reddish brown (5YR 5/4) and brown (7.5YR 4/4) moist, common moderately thick clay films lining pores, and common thin clay films bridging mineral grains; mildly alkaline.

The Ap and A horizons have dry color of 10YR 5/4, 6/4, or 7/4 or 7.5YR 5/6, 6/6, or 7/4. They have moist color of 10YR 4/3 or 4/4 or 7.5YR 4/4, 5/4, or 5/6. The content of clay is 12 to 20 percent. The content of gravel is 0 to 10 percent.

The 2Bt horizon has a dry matrix color of 10YR 6/3 or 6/4, 7.5YR 5/3 or 5/4, or 2.5Y 7/2. It has a moist matrix color of 10YR 4/4 or 5/3; 7.5YR 4/3, 4/4, or 5/6; or 2.5Y 5/4. The clay films on faces of peds have hue of 10YR, 7.5YR, or 5YR. The content of clay is 27 to 35 percent.

Tinnin Series

The Tinnin series consists of very deep, well drained soils on narrow ridges and mounds on the rims of basins and on low terraces. These soils formed in eolian material derived dominantly from granitic rock sources. They have been modified by water in some areas. Slope ranges from 0 to 8 percent.

Tinnin soils are near Dierssen and San Joaquin soils. Dierssen and San Joaquin soils have a fine textured argillic horizon and a duripan. Dierssen soils are on the rims of basins. San Joaquin soils are on low terraces.

Soils of the Tinnin series are sandy, mixed, thermic Entic Haploxerolls.

Typical pedon of Tinnin loamy sand, 0 to 2 percent slopes, about 2.6 miles northwest of Point Pleasant; about 900 feet east and 2,400 feet north of the southwest corner of sec. 24, T. 6 N., R. 4 E., Bruceville Quadrangle:

A1—0 to 12 inches; dark brown (10YR 4/3) loamy sand, very dark brown (10YR 2/2) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; many very fine interstitial and common very fine and few fine tubular pores; in the upper 2 inches, a krotovina that is 6 inches in diameter and is dark grayish brown (10YR 4/2) fine sand, very dark brown (10YR 2/2) moist; mildly alkaline; diffuse wavy boundary.

A2—12 to 24 inches; dark brown (10YR 4/3) sand, dark brown (10YR 3/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine and fine roots; many very fine interstitial and common very fine and fine tubular pores; a krotovina that is 4 inches in diameter and is filled with A1 material; mildly alkaline; gradual irregular boundary.

C1—24 to 50 inches; dark yellowish brown (10YR 4/4) loamy sand, dark brown (10YR 3/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; many very fine interstitial and common very fine and few fine tubular pores; a krotovina that is 12 inches in diameter and is filled with A1 material; neutral; diffuse wavy boundary.

C2—50 to 64 inches; yellowish brown (10YR 5/4) loamy sand, dark yellowish brown (10YR 3/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; many very fine interstitial pores; neutral.

The thickness of the mollic epipedon ranges from 10 to 28 inches. The content of organic matter is 1 to 2 percent. Some pedons have iron mottles with color of 7.5YR 5/6 or 5YR 5/6 or have some iron concretions in the C horizon. The C horizon may be slightly brittle when dry.

The A horizon has dry color of 10YR 5/2, 5/3, 4/2, or 4/3 and moist color of 10YR 2/2, 3/2, or 3/3. Reaction is slightly acid to mildly alkaline.

The C horizon has dry color of 10YR 6/4, 5/4, or 4/4 and moist color of 10YR 5/4, 5/3, 4/4, 4/3, 4/2, 3/4, or 3/3. It is loamy sand, loamy coarse sand, or sand. Reaction is neutral to moderately alkaline.

Valpac Series

The Valpac series consists of very deep, somewhat poorly drained soils on the natural levees of high flood plains. These soils are artificially drained. They formed in alluvium derived from mixed rock sources. Slope ranges from 0 to 2 percent.

Valpac soils are near Egbert, Sailboat, and Scribner soils. Egbert soils are fine textured. They are in backswamps. Sailboat soils have an ochric epipedon. They are on the natural levees of low flood plains. Scribner soils have a mollic epipedon that is more than 24 inches thick. They are on the edges of backswamps.

Soils of the Valpac series are fine-loamy, mixed, thermic Fluvaquentic Haploxerolls.

Typical pedon of Valpac loam, partially drained, 0 to 2 percent slopes, about 0.4 mile north of the town of Hood; 3,450 feet north and 400 feet west of the southeast corner of sec. 15, T. 6 N., R. 4 E., Courtland Quadrangle:

Ap1—0 to 10 inches; grayish brown (2.5Y 5/2) loam, very dark grayish brown (10YR 3/2) moist, very dark gray (10YR 3/1) moist and rubbed; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine and few fine roots; common very fine tubular pores; neutral; clear wavy boundary.

Ap2—10 to 19 inches; gray (10YR 5/1) and light yellowish brown (10YR 6/4) silt loam, very dark gray (10YR 3/1) and yellowish brown (10YR 5/4) moist; weak coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine and few fine roots; common very fine and fine interstitial and many very fine tubular pores; mildly alkaline; clear wavy boundary.

Ab—19 to 29 inches; light gray (10YR 6/1) loam, very dark grayish brown (10YR 3/2) moist; weak coarse angular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine and few fine roots; many very fine and common fine tubular and common very fine interstitial pores; common wormcasts; mildly alkaline; clear wavy boundary.

C—29 to 35 inches; light brownish gray (2.5Y 6/2) sandy loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine and few fine roots; many very fine interstitial and many very fine and common fine tubular pores; mildly alkaline; clear wavy boundary.

A′b—35 to 41 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (10YR 4/2) moist; few fine prominent reddish yellow (7.5YR 6/6) mottles, strong brown (7.5YR 5/6) moist; weak coarse angular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine and few fine roots; many very fine tubular and common very fine interstitial pores; mildly alkaline; clear wavy boundary.

C′1—41 to 55 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; few medium prominent brownish yellow (10YR 6/6) mottles, yellowish brown (10YR 5/8) moist; weak coarse angular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine and few fine roots; many very fine tubular and common very fine interstitial pores; mildly alkaline; clear wavy boundary.

C′2—55 to 61 inches; light brownish gray (2.5Y 6/2) silt loam, dark grayish brown (10YR 4/2) moist; few medium distinct reddish yellow (7.5YR 6/8) mottles, strong brown (7.5YR 5/8) moist; weak coarse angular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine and few fine roots; many very fine interstitial and tubular pores; moderately alkaline.

By weighted average, the content of clay in the 10- to 40-inch control section is 20 to 35 percent. The mollic epipedon is 10 to 20 inches thick and is, by volume, 1 to 3 percent organic matter. The depth to a buried A horizon is 20 to 40 inches.

The Ap horizon has dry color of 10YR 6/4, 5/2, 5/1, 4/2, or 4/1 or 2.5Y 5/2 and moist color of 10YR 5/4, 3/2, 3/1, or 2/2.

The C and C horizons have dry color of 10YR 7/2, 7/1, 6/3, or 6/2 or 2.5Y 6/2 and moist color of 10YR 5/2, 4/3, 4/2, 4/1, or 3/2 or 2.5Y 4/2. They are stratified fine sandy loam, sandy loam, loam, silt loam, or clay loam.

The Ab and A′b horizons have dry color of 10YR 6/1, 5/2, 5/1, or 4/1 or 2.5Y 6/2 or 5/2 and moist color of 10YR 4/2, 3/2, 3/1, 2/2, or 2/1. They are loam, clay loam, or silty clay loam. Reaction is mildly alkaline or moderately alkaline.

Valpac Variant

The Valpac Variant consists of very deep, poorly drained soils that have buried layers. These artificially drained soils are on low flood-plain splays. They formed in alluvium derived from mixed rock sources. The lower buried layer has a high content of hydrophytic plant remains. Slope ranges from 0 to 2 percent.

Valpac Variant soils are near Gazwell, Rindge, and Sailboat soils. Gazwell soils are fine textured and have a mollic epipedon that is more than 24 inches thick. They are in backswamps. Rindge soils formed in organic material in freshwater marshes. Sailboat soils have an ochric epipedon. They are on the natural levees of low flood plains.

Soils of the Valpac Variant are fine-loamy, mixed, thermic Fluvaquentic Haplaquolls.

Typical pedon of Valpac Variant sandy loam, partially drained, 0 to 2 percent slopes, about 2 miles east of Rio Vista, 1.1 miles north of the intersection of Highways 160 and 12 on Highway 160, about 0.55 mile east on a dirt road and 20 feet south of the dirt road; in an unsectionalized area, 38 degrees, 09 minutes, 57 seconds north latitude, 121 degrees, 39 minutes, 34 seconds west longitude, Rio Vista Quadrangle:

Ap—0 to 9 inches; grayish brown (10YR 5/2) sandy loam, very dark brown (10YR 2/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common fine and few medium roots; few very fine interstitial pores; neutral; abrupt wavy boundary.

A—9 to 16 inches; dark grayish brown (10YR 4/2) sandy loam, very dark brown (10YR 2/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine, fine, and medium roots; common very fine interstitial pores; mildly alkaline; abrupt wavy boundary.

C—16 to 19 inches; variegated light gray (10YR 7/2) and light brownish gray (10YR 6/2) sand, grayish brown (10YR 5/2) and dark grayish brown (10YR 4/2) moist; common large faint yellowish brown (10YR 5/6) mottles, dark yellowish brown (10YR 3/6) moist; single grained; loose, nonsticky and nonplastic; few very fine roots; common very fine interstitial pores; neutral; abrupt wavy boundary.

Ab1—19 to 25 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; few fine prominent yellow (10YR 7/6) and many fine distinct very dark gray (10YR 3/1) mottles, yellowish brown (10YR 5/8) and black (N 2/0) moist; massive; slightly hard, firm, slightly sticky and slightly plastic; few very fine, fine, and medium roots; few very fine interstitial and tubular pores; neutral; abrupt wavy boundary.

2Ab2—25 to 33 inches; very dark gray (10YR 3/1) mucky silty clay, black (N 2/0) moist; massive; slightly hard, firm, slightly sticky and slightly plastic; few very fine, fine, and medium roots; few very fine interstitial and fine tubular pores; thin strata of burnt peat, strong brown (7.5YR 4/6) moist; strongly acid (in 0.01M calcium chloride); clear wavy boundary.

2Ab3—33 to 55 inches; black (10YR 2/1) mucky silty clay loam, black (N 2/0) moist; massive; hard, friable, nonsticky and nonplastic; few very fine roots; few very fine interstitial pores; variegated with dark yellowish brown (10YR 4/4) plant fibers, dark yellowish brown (10YR 3/4) moist; very strongly acid (in 0.01M calcium chloride); clear wavy boundary.

2Ab4—55 to 60 inches; black (10YR 2/1) mucky clay, black (N 2/0) moist; massive; hard, friable, nonsticky and nonplastic; few very fine roots; few very fine interstitial pores; variegated with dark yellowish brown (10YR 4/4) plant fibers, dark yellowish brown (10YR 3/4) moist; very strongly acid (in 0.01M calcium chloride).

By weighted average, the content of clay in the 10- to 40-inch control section is 27 to 35 percent. The mollic epipedon ranges from 12 to 20 inches in thickness and is 1 to 3 percent organic matter. Depth to the 2Ab horizon is 20 to 40 inches. This horizon has an organic matter content of 10 to 27 percent.

The Ap and A horizons have dry color of 10YR 5/3, 5/2, 4/2, or 3/2 and moist color of 10YR 3/3, 3/2, or 2/2.

The C and Ab horizons have dry color of 10YR 7/3, 7/2, 6/2, or 5/2 and moist color of 10YR 5/2, 4/3, 4/2, or 3/2. They are stratified sand, sandy loam, silt loam, or loam. Reaction is neutral to moderately alkaline.

The 2Ab horizon has dry color of 10YR 4/2, 4/1, 3/1, or 2/1 and moist color of 10YR 3/2 or 3/1 or N 2/0. It is stratified mucky clay, mucky clay loam, mucky silty clay, mucky silty clay loam, muck, or mucky peat. The content of organic matter ranges from 10 to 30 percent in the mineral soil material. Reaction is very strongly acid or moderately acid, and pH increases after drying.

Vina Series

The Vina series consists of very deep, well drained soils on high flood plains. These soils formed in alluvium derived from mixed rock sources, including some granitic material. Slope ranges from 0 to 2 percent.

Vina soils are near Columbia, Coyotecreek, Reiff and Sailboat soils. Columbia, Reiff, and Sailboat soils have an ochric epipedon. They are on low flood plains. Coyotecreek soils are fine-silty. They are on high flood plains.

Soils of the Vina series are coarse-loamy, mixed, thermic Cumulic Haploxerolls.

Typical pedon of Vina fine sandy loam, 0 to 2 percent slopes, about 1 mile east of Sloughhouse, 0.9 mile west of the intersection of Dillard Road and Highway 16, at telephone pole number 495, and 120 feet south of Highway 16; in an unsectionalized area, T. 7 N., R. 7 E., 38 degrees, 29 minutes, 34 seconds north latitude, 121 degrees, 10 minutes, 35 seconds west longitude, Sloughhouse Quadrangle:

Ap1—0 to 5 inches; brown (10YR 4/3) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and few fine roots; many very fine and common fine interstitial pores; neutral; clear wavy boundary.

Ap2—5 to 12 inches; brown (10YR 4/3) loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; common very fine and few fine and coarse roots; few very fine tubular and many very fine and common fine interstitial pores; many wormcasts; neutral; clear wavy boundary.

A1—12 to 34 inches; brown (10YR 4/3) sandy loam, very dark grayish brown (10YR 3/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine and few fine roots; many very fine, common fine, and few medium tubular and common very fine and fine interstitial pores; many wormcasts; mildly alkaline; diffuse wavy boundary.

A2—34 to 51 inches; brown (10YR 4/3) loam, very dark grayish brown (10YR 3/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine and few fine and medium roots; many very fine, fine, and medium tubular and common very fine and fine interstitial pores; many wormcasts; mildly alkaline; diffuse wavy boundary.

C—51 to 61 inches; variegated brown (10YR 4/3 and 7.5YR 4/4) loam, dark brown (10YR 3/3 and 7.5YR 4/4) moist; massive; slightly hard, friable, sticky and slightly plastic; few very fine roots; many very fine and common fine tubular and common very fine interstitial pores; many wormcasts; mildly alkaline.

By weighted average, the content of clay in the 10- to 40-inch control section is 12 to 18 percent. The content of fine sand and coarser textured material is 15 to 35 percent. The mollic epipedon ranges from 24 to 54 inches in thickness. It has an organic matter content of 1 to 3 percent.

The Ap and A horizons have dry color of 10YR 5/3, 5/2, 4/3, or 4/2 and moist color of 10YR 3/3, 3/2, or 2/2 or 7.5YR 3/2. Reaction is slightly acid or neutral in the upper part and slightly acid to mildly alkaline in the lower part.

The C horizon has dry color of 10YR 5/4, 5/3, or 4/3 or 7.5YR 5/4 or 4/4 and moist color of 10YR 4/3, 3/4, or 3/3 or 7.5YR 4/4 or 3/4. It is sandy loam, fine sandy loam, or loam. Reaction is neutral or mildly alkaline. The horizon is noncalcareous.

Vleck Series

The Vleck series consists of moderately well drained soils on the foot slopes of hills. These soils are moderately deep over a duripan. They formed in alluvium of mixed origin underlain by material weathered from weakly consolidated rhyolitic tuffaceous sediments. The alluvium has dark metamorphic and quartzitic rocks unrelated to the underlying material. Slope ranges from 2 to 30 percent.

Vleck soils are near Amador, Creviscreek, Gillender, and Mokelumne soils. Amador and Gillender soils are on terraces characterized by mound-intermound microrelief. Amador soils are shallow. Gillender soils are very shallow. Creviscreek soils are fine-loamy. They are on stream terraces. Mokelumne soils have bedrock at a depth of 20 to 40 inches. They are on highly dissected terrace remnants.

Soils of the Vleck series are fine, montmorillonitic, thermic Abruptic Haplic Durixeralfs.

Typical pedon of Vleck gravelly loam, 2 to 15 percent slopes, about 0.9 mile south of Live Oak, about 1,200 feet north and 510 feet east of the southeast end of an airstrip; 1,520 feet east and 1,160 feet north of the southwest corner of sec. 11, T. 7 N., R. 8 E., Carbondale Quadrangle:

A1—0 to 9 inches; dominantly gray (10YR 6/1) gravelly loam, dark grayish brown (10YR 4/2) moist; common fine distinct yellowish brown (10YR 5/6) mottles, dark yellowish brown (10YR 4/6) moist; dominantly massive; upper half inch is light brownish gray (10YR 6/2), dark grayish brown (10YR 4/2) moist, and has moderate thick platy structure; hard, friable, nonsticky and nonplastic; many very fine roots; many very fine interstitial and tubular pores; about 20 percent rounded gravel; moderately acid; clear wavy boundary.

A2—9 to 13 inches; light gray (10YR 7/1) loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, friable, slightly sticky and nonplastic; common very fine roots; common very fine interstitial and common very fine and few fine tubular pores; common thin clay films bridging mineral grains; about 5 percent rounded gravel; moderately acid; abrupt wavy boundary.

2Bt/E—13 to 17 inches; light brownish gray (2.5Y 6/2) clay that has light gray (5Y 7/1) coatings on the top of columns and along vertical ped faces; olive gray (5Y 5/2) with dark gray (5Y 4/1) coatings when moist; strong coarse columnar structure; extremely hard, very firm, very sticky and very plastic; common very fine roots on ped exteriors; few very fine tubular pores; common thin clay films on faces of peds; slightly acid; clear wavy boundary.

2Bt—17 to 25 inches; light brownish gray (2.5Y 6/2) clay, olive gray (5Y 5/2) moist; strong coarse prismatic structure; extremely hard, very firm, very sticky and very plastic; common very fine roots on faces of peds; few very fine tubular pores; common slickensides; slightly acid; clear wavy boundary.

2Bt/Bq—25 to 32 inches; mixed pale yellow (5Y 7/3) and light brownish gray (2.5Y 6/2) sandy clay loam, olive (5Y 5/3) and olive gray (5Y 5/2) moist; massive; hard, firm, sticky and plastic; few very fine roots; few very fine tubular pores; many weakly cemented fragments from the underlying horizon; few thin clay films lining pores and bridging mineral grains; slightly acid; abrupt wavy boundary.

2Bqm1—32 to 37 inches; pale yellow (5Y 8/3), strongly cemented duripan, olive (5Y 5/3) moist; massive; brittle; few fine stains, black (10YR 2/1) dry and moist; neutral; clear wavy boundary.

2Bqm2—37 to 50 inches; pale yellow (5Y 8/3), strongly cemented duripan, olive (5Y 5/4) moist; massive; brittle; opal coatings along fractures; neutral; clear wavy boundary.

2Cr—50 inches; pale yellow (5Y 8/3), weakly consolidated rhyolitic tuffaceous sediments, olive (5Y 5/4) moist; mildly alkaline.

The depth to a duripan is 20 to 40 inches. Paralithic contact directly underlies the duripan. It is at a depth of 30 to 60 inches.

The A horizon has dry color of 10YR 6/1, 6/2, 6/3, 6/4, 7/1, or 7/2 and moist color of 10YR 4/2, 4/3, 5/2, 5/3, or 5/4 or 7.5YR 4/4. The content of clay is 10 to 20 percent. The content of gravel is 5 to 25 percent. Reaction is moderately acid or slightly acid.

The E horizon has dry color of 2.5Y 7/2 or 6/2 or 5Y 7/1 or 6/2 and moist color of 2.5Y 5/2 or 5Y 4/1 or 4/2. Reaction is moderately acid to neutral.

The 2Bt horizon has dry color of 10YR 6/3 or 7/2, 2.5Y 4/2 or 6/2, or 5Y 7/3 and moist color of 10YR 4/2, 4/3, 4/4, or 5/3; 2.5Y 5/2, 5/4, or 6/2; or 5Y 5/2 or 5/3. The content of clay is 40 to 60 percent. Reaction is moderately acid to neutral.

The 2Bt/Bq horizon has dry color of 10YR 7/2, 2.5Y 6/2 or 4/2, or 5Y 7/3 and moist color of 2.5Y 4/2 or 5/4 or 5Y 5/3 or 5/2. It is sandy clay loam or clay loam. The content of clay is 20 to 30 percent. Reaction is slightly acid to mildly alkaline.

The 2Bqm horizon has dry color of 2.5Y 7/2 or 5Y 6/2, 7/3, or 8/3 and moist color of 2.5Y 5/4 or 6/4 or 5Y 5/3, 5/4, or 6/3. It is 10 to 30 inches thick. Reaction is neutral or mildly alkaline.

Whiterock Series

The Whiterock series consists of very shallow and shallow, somewhat excessively drained soils on foothills. These soils formed in material weathered from vertically tilted metasedimentary rocks. Slope ranges from 3 to 30 percent.

Whiterock soils are near Argonaut, Auburn, and Mokelumne soils. Argonaut and Mokelumne soils have a fine textured argillic horizon and are moderately deep. Auburn soils have a cambic horizon and a ruptic-lithic contact. Argonaut and Auburn soils are on foothills. Mokelumne soils are on the hills and side slopes of terrace remnants.

Soils of the Whiterock series are loamy, mixed, nonacid, thermic Lithic Xerorthents.

Typical pedon of Whiterock loam, 3 to 30 percent slopes, about 2.5 miles west of Malby Crossing, 1,500 feet west of the junction of Whiterock Road and Scott Road, 600 feet north of Whiterock Road; 3,550 feet north and 1,500 feet west of the southeast corner of sec. 20, T. 9 N., R. 8 E., Folsom SE Quadrangle:

A1—0 to 1 inch; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; weak thin platy structure; slightly hard, friable, nonsticky and nonplastic; many fine and common very fine roots; common very fine interstitial and common very fine and fine tubular pores; mat of decomposed litter ¼ inch thick at the surface; about 10 percent angular gravel; strongly acid; abrupt smooth boundary.

A2—1 to 8 inches; very pale brown (10YR 7/3) loam, brown (10YR 4/3) moist; massive; slightly hard, friable, slightly sticky and nonplastic; common very fine roots; few very fine interstitial and common very fine tubular pores; about 10 percent angular gravel; moderately acid; abrupt irregular boundary.

R—8 inches; highly fractured and vertically tilted metasedimentary rock; common very fine roots between fractures, which are ¼ inch to 1½ inches apart.

The depth to lithic contact is 4 to 14 inches. The content of gravel ranges from 5 to 15 percent throughout the A horizon. By weighted average, the content of clay is 12 to 25 percent.

The A horizon generally has dry color of 10YR 6/2, 6/3, 6/4, or 7/3 or 2.5Y 6/2 or 7/2 and moist color of 10YR 4/2, 4/3, or 5/3 or 2.5Y 4/2 or 5/2. In some pedons, however, the upper ½ inch to 1½ inches has dry color of 10YR 4/2, 5/2, or 5/3 and moist color of 10YR 3/2 or 3/3.

Xerarents

Xerarents consist of moderately deep to very deep, well drained, altered soils that commonly have a buried soil. These soils are in filled areas on hills, low terraces, and high terraces. They formed in fill material mixed by grading, excavation, and leveling activities. The fill material is derived from nearby soils of mixed, mixed but dominantly granitic, or granitic origin. In some areas the soils are underlain by consolidated sediments. Slope ranges from 0 to 15 percent.

Xerarents are near Durixeralfs and Fiddyment, Galt, Kaseberg, Kimball, Madera, Orangevale, Red Bluff, Redding, and San Joaquin soils. The nearby soils do not have mechanically altered horizons below the surface layer. Durixeralfs and Fiddyment, Galt, Kimball, Madera, and San Joaquin soils are on low terraces. Kaseberg and Orangevale soils are on hills. Red Bluff and Redding soils are on high terraces.

Reference pedon of Xerarents, in an area of Urban land-Xerarents-Fiddyment complex, 0 to 8 percent slopes, in North Highlands, about 1,000 feet north and 110 feet east of the intersection of Don Julio Boulevard and Elkhorn Boulevard; in an unsectionalized area, T. 10 N., R. 6 E., 38 degrees, 41 minutes, 45 seconds north latitude, 121 degrees, 21 minutes, 01 second west longitude, Citrus Heights Quadrangle:

Ap—0 to 4 inches; mixed light yellowish brown (10YR 6/4) and pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; massive; hard, friable, slightly sticky and slightly plastic; about 5 percent fragments of an argillic horizon; about 15 percent very pale brown (10YR 7/3), irregularly shaped or round masses of pulverized siltstone between 1 and 20 millimeters in diameter; about 8 percent gravel; neutral; clear irregular boundary.

C1—4 to 12 inches; mixed very pale brown (10YR 7/3), light yellowish brown (10YR 6/4), pale brown (10YR 6/3), and yellowish brown (10YR 5/4) loam, yellowish brown (10YR 5/4), brown (10YR 4/3), and dark brown (10YR 3/3) moist; hard, friable, slightly sticky and slightly plastic; about 5 percent fragments of an argillic horizon; about 10 percent gravel consisting of fragments of a duripan and siltstone; neutral; clear irregular boundary.

C2—12 to 29 inches; mixed yellowish brown (10YR 5/4) and strong brown (7.5YR 5/6 and 4/6) loam, dark yellowish brown (10YR 3/4) and dark brown (10YR 4/3 and 7.5YR 3/4) moist; massive; hard, friable, slightly sticky and slightly plastic; about 15 percent fragments of an argillic horizon; about 5 percent gravel consisting of fragments of a duripan and siltstone; slightly acid; abrupt wavy boundary.

BAtb—29 to 33 inches; brown (10YR 5/3) loam, dark brown (7.5YR 3/4) moist; massive; hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine interstitial and tubular pores; few thin clay films bridging mineral grains; moderately acid; abrupt wavy boundary.

Btb—33 to 40 inches; brown (10YR 5/3) clay loam, dark brown (7.5YR 3/4) moist; weak coarse subangular blocky structure; very hard, firm, sticky and plastic; few very fine roots; common very fine interstitial and many very fine tubular pores; many thin clay films bridging mineral grains, common thin clay films lining pores, and many moderately thick clay films on faces of peds; at the bottom of the horizon, a layer of clay, dark brown (10YR 3/3) moist, ½ inch thick; slightly acid; abrupt wavy boundary.

Bqmb—40 to 45 inches; very pale brown (10YR 7/4) duripan that is indurated and weakly cemented with silica, yellowish brown (10YR 5/4) moist; many medium distinct yellow (10YR 7/6) and yellowish brown (10YR 5/8) mottles, strong brown (7.5YR 5/6 and 4/6) moist; massive; very hard or extremely hard; brittle; few very fine tubular pores; continuous, indurated, silica-cemented cap 1/16 to ½ inch thick; discontinuous white (10YR 8/2) strata of tuffaceous material as much as 1 inch thick; few fine very dark gray (10YR 3/1) concretions and stains on fracture planes; neutral; abrupt wavy boundary.

Cr1—45 to 54 inches; very pale brown (10YR 7/3) siltstone, yellowish brown (10YR 5/4) moist; common fine distinct reddish yellow (7.5YR 6/6) mottles, strong brown (7.5YR 4/6) moist; common very fine tubular and interstitial pores; few fine very dark gray (10YR 3/1) concretions; weakly consolidated in 60 percent of the mass; neutral; abrupt wavy boundary.

Cr2—54 to 60 inches; light gray (10YR 7/2) siltstone, grayish brown (10YR 5/2) moist; common fine prominent reddish yellow (7.5YR 6/6) mottles, distinct yellowish brown (10YR 5/6) moist; common very fine tubular and interstitial pores; weakly consolidated and brittle in 60 percent of the mass; neutral.

The reference pedon is an example of the soils within this category. It is not necessarily representative of these soils throughout the survey area.

These soils have fragments of an argillic horizon below the Ap horizon. The fragments are in some or all parts of the profile between depths of 12 and 40 inches. They are not arranged in any discernable order. The fill material is 12 to 60 inches thick. The depth to siltstone or sandstone in pedons that have a consolidated substratum is 20 to 80 inches.

The fill material varies as considerably as its source. It is a mixture of two or more colors, except for the Ap horizon in heavily cultivated areas. The material has hue of 10YR to 2.5YR, value of 4 to 7 when dry and 3 to 5 when moist, and chroma of 2, 3, 4, or 6 when dry or moist. The texture of individual horizons ranges from loamy sand to clay. It is commonly sandy loam, fine sandy loam, loam, silt loam, or sandy clay loam. Gravel commonly consists of fragments of siltstone, sandstone, or a duripan. The average content of gravel is 0 to 15 percent. In pedons that are near Red Bluff and Redding soils, the content of rounded or subrounded gravel is 15 to 25 percent and the content of cobbles is 0 to 5 percent. Reaction commonly is moderately acid to neutral but is strongly acid, mildly alkaline, or moderately alkaline in some pedons.

A buried soil is in most pedons. It consists of A, B, and C horizons similar to those of the associated Hedge, Hicksville, Kimball, Red Bluff, Redding, and San Joaquin soils or A and C horizons similar to those of the associated Clear Lake, Cosumnes, Galt, and Sailboat soils. In pedons that have a consolidated substratum, the buried soil consists of an A, B, C, or Cr horizon similar to that of the associated Fiddyment and Kaseberg soils. The buried soil is commonly truncated in areas where Xerarents are mapped in complex with Urban land.

Xerofluvents

Xerofluvents in this survey area consist of very deep, excessively drained to well drained, channeled soils on low flood plains and dissected remnants of high flood plains. These soils formed in alluvium derived from mixed rock sources. Slope ranges from 0 to 2 percent.

Xerofluvents are near Rossmoor soils, Riverwash, and Xerolls and Xerorthents. Rossmoor soils are coarse-loamy. They are on high flood plains. Riverwash does not have distinct soil properties. Xerolls have a mollic epipedon. They are on terrace escarpments and hills. Xerorthents are, by volume, more than 60 percent rock fragments in the control section. They are in areas of dredge tailings.

Reference pedon of Xerofluvents, 0 to 2 percent slopes, flooded, about 1.5 miles north of Rancho Cordova, 1,350 feet southwest along a bike trail from the intersection of the bike trail and Rossmoor Drive, 250 feet northwest along a service road and 25 feet east of the service road; in an unsectionalized area, T. 9 N., R. 6 E., 38 degrees, 37 minutes, 17 seconds north latitude, 121 degrees, 18 minutes, 12 seconds west longitude, Carmichael Quadrangle:

O—0.5 inch to 0; decaying leaves mixed with some sand; abrupt smooth boundary.

A—0 to 4 inches; pale brown (10YR 6/3) sand, dark brown (10YR 3/3) moist; single grained; loose, nonsticky and nonplastic; common very fine and medium and many fine roots; many very fine interstitial pores; slightly acid; clear smooth boundary.

C1—4 to 11 inches; pale brown (10YR 6/3) and light gray (10YR 7/2) sand, dark grayish brown (10YR 4/2) moist; single grained; loose, nonsticky and nonplastic; common very fine and fine roots; many very fine interstitial pores; slightly acid; abrupt smooth boundary.

C2—11 to 24 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine and fine and few medium roots; many very fine interstitial and few fine tubular pores; stratified with a 3-inch-thick layer of pale brown (10YR 6/3) fine sand, dark brown (10YR 3/3) moist; neutral; abrupt smooth boundary.

C3—24 to 35 inches; light brownish gray (10YR 6/2) loamy fine sand, dark brown (10YR 3/3) moist; single grained; loose, nonsticky and nonplastic; common very fine and fine and few coarse roots; many very fine interstitial and few very fine tubular pores; stratified with layers, ½ inch to 1½ inches thick, of brown (10YR 5/3) fine sandy loam, dark brown (10YR 3/3) moist; neutral; abrupt smooth boundary.

C4—35 to 53 inches; pale brown (10YR 6/3) loamy sand, dark brown (10YR 3/3) moist; single grained; loose, nonsticky and nonplastic; common very fine and few medium roots; many very fine interstitial pores; neutral; abrupt smooth boundary.

C5—53 to 60 inches; light yellowish brown (10YR 6/4) fine sandy loam, dark yellowish brown (10YR 4/4) moist; massive; soft, friable, nonsticky and nonplastic; common very fine and few fine roots; many very fine interstitial pores; slightly acid; abrupt smooth boundary.

C6—60 to 68 inches; light brownish gray (10YR 6/2) sand, dark grayish brown (10YR 4/2) moist; single grained; loose, nonsticky and nonplastic; common very fine roots; many very fine interstitial pores; slightly acid.

The reference pedon is an example of the soils within this category. It is not necessarily representative of these soils throughout the survey area.

The color of these soils is commonly that of the mineral grains. The soils are stratified. The individual strata are coarse sand, sand, fine sand, loamy sand, loamy fine sand, loamy coarse sand, sandy loam, or fine sandy loam. Some strata consist of gravel with little or no fine-earth material. By weighted average, the content of coarse fragments in the 10- to 40-inch control section ranges from 0 to 60 percent.

Xerolls

Xerolls consist of shallow to very deep, well drained and somewhat excessively drained soils on terrace escarpments and hills bordering drainageways and rivers. These soils formed in colluvium derived from mixed, granitic, or metabasic rock sources, depending on the location. Slope ranges from 30 to 70 percent.

Xerolls are near Andregg, Argonaut, Auburn, Fiddyment, Kaseberg, Red Bluff, and Redding soils and Xerarents and Xerorthents. Andregg soils have a cambic horizon. They are on foothills that have slopes of less than 15 percent. The other nearby soils do not have a mollic epipedon. Argonaut and Auburn soils are on foothills. Fiddyment and Kaseberg soils are on hills. Red Bluff and Redding soils are on high outwash terraces. Xerarents are in filled areas. Xerorthents have more than 60 percent coarse fragments. They are in areas of dredge tailings.

Reference pedon of Xerolls, 30 to 70 percent slopes, about 2.5 miles southwest of Folsom, 3,100 feet east and 1,550 feet south of the intersection of Hazel Avenue and Sunset Avenue; in an unsectionalized area, T. 9 N., R. 7 E., 38 degrees, 38 minutes, 55 seconds north latitude, 121 degrees, 12 minutes, 48 seconds west longitude, Folsom Quadrangle:

O—1 inch to 0; decomposing organic matter from grasses, forbs, and oak leaves.

A1—0 to 3 inches; brown (10YR 5/3) loam, very dark brown (10YR 2/2) moist; strong fine and medium granular structure; slightly hard, friable, nonsticky and nonplastic; many very fine roots; many very fine interstitial pores; neutral; gradual wavy boundary.

A2—3 to 10 inches; brown (10YR 5/3) very gravelly loam, very dark grayish brown (10YR 3/2) moist; strong coarse and very coarse granular structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; many very fine interstitial pores; about 40 percent gravel and 5 percent cobbles; neutral; clear wavy boundary.

Bt1—10 to 19 inches; dark yellowish brown (10YR 4/4) gravelly clay loam, dark brown (7.5YR 4/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; few fine tubular and common very fine interstitial pores; common thin clay films lining pores; about 30 percent gravel; slightly acid; clear wavy boundary.

2Bt2—19 to 31 inches; brown (7.5YR 5/4) very gravelly clay loam, dark brown (7.5YR 4/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; few very fine interstitial and tubular pores; common thin clay films lining pores; about 50 percent gravel and 5 percent cobbles; slightly acid; gradual wavy boundary.

2Bt3—31 to 44 inches; strong brown (7.5YR 4/6) very gravelly sandy clay loam, dark brown (7.5YR 3/4) moist; massive; slightly hard, friable, sticky and slightly plastic; few fine and very fine roots; few very fine interstitial and tubular pores; common thin clay films lining pores; about 50 percent gravel and 5 percent cobbles; moderately acid; gradual wavy boundary.

2BCt—44 to 60 inches; strong brown (7.5YR 4/6) very gravelly sandy clay loam, dark brown (7.5YR 3/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; few very fine interstitial and tubular pores; common thin clay films lining pores; about 50 percent gravel; strongly acid.

The reference pedon is an example of the soils within this category. It is not necessarily representative of these soils throughout the survey area.

The depth to paralithic contact ranges from 20 to 80 inches. Many pedons do not have paralithic contact. The mollic epipedon is 7 to 15 inches thick. Reaction is strongly acid to mildly alkaline throughout the profile. By weighted average, the content of coarse fragments in the control section ranges from 0 to 60 percent and the content of cobbles is 0 to 15 percent. Some pedons have a Bw horizon.

The A horizon has dry color of 10YR 5/2, 5/3, or 5/4 and moist color of 10YR 2/2, 3/2, or 3/3. It has an organic matter content of 1 to 4 percent. It is coarse sandy loam to clay loam. The Bt or Bw horizon is coarse sandy loam to silty clay loam.

Xeropsamments

Xeropsamments consist of very deep, moderately well drained to excessively drained soils in areas of dredge piles that have been deposited on flood plains and natural levees. These soils formed in recently dredged material removed from the bottom of channels. Slope ranges from 1 to 15 percent.

Xeropsamments are near Fluvaquents, Gazwell soils, and Medisaprists. Fluvaquents are very poorly drained or poorly drained. They are on flood plains or in tidal marshes. Gazwell soils are fine textured. They are in backswamps. Medisaprists are organic soils in tidal marshes.

Reference pedon of Xeropsamments, 1 to 15 percent slopes, in the Brannan Island State Recreation Area, about 1.2 miles northeast of the intersection of Highway 160 and Sherman Island East Levee Road along Highway 160, about 1,300 feet east of Highway 160, 410 feet west of a paved road, and 145 feet south of a utility pole; in an unsectionalized area, 38 degrees, 07 minutes, 10 seconds north latitude, 121 degrees, 41 minutes, 10 seconds west longitude, Jersey Island Quadrangle:

C1—0 to 2 inches; dark yellowish brown (10YR 4/4 and 3/4) sand, very dark grayish brown (10YR 3/2) and very dark brown (10YR 2/2) moist; single grained; loose, nonsticky and nonplastic; many very fine roots; many very fine and fine interstitial pores; neutral; abrupt smooth boundary.

C2—2 to 10 inches; yellowish brown (10YR 5/4) sand, dark yellowish brown (10YR 3/4) moist; single grained; loose, nonsticky and nonplastic; common very fine roots; many very fine and fine interstitial pores; strata of silt loam ½ inch to 2 inches thick; neutral; abrupt smooth boundary.

C3—10 to 49 inches; light yellowish brown (10YR 6/4) and very dark grayish brown (10YR 3/2) sand, dark yellowish brown (10YR 4/4) and very dark grayish brown (10YR 3/2) moist; single grained; loose, nonsticky and nonplastic; few very fine and fine roots; many very fine and fine interstitial pores; neutral; abrupt smooth boundary.

C4—49 to 59 inches; light yellowish brown (10YR 6/4) sand, dark yellowish brown (10YR 3/4) moist; single grained; loose, nonsticky and nonplastic; many very fine and fine interstitial pores; neutral; abrupt smooth boundary.

C5—59 to 64 inches; light yellowish brown (10YR 6/4) silt loam, dark yellowish brown (10YR 4/4) moist; common fine distinct light gray (10YR 7/2) and dark yellowish brown (10YR 3/6) mottles, dark grayish brown (10YR 4/2) and dark brown (7.5YR 3/4) moist; strong thin platy structure; soft, very friable, slightly sticky and slightly plastic; few very fine and medium roots; common very fine and fine interstitial and few very fine and fine tubular pores; neutral.

The reference pedon is an example of the soils within this category. It is not necessarily representative of these soils throughout the survey area.

The matrix color has hue of 10YR, 7.5YR, or 2.5Y. Some pedons have distinct or prominent mottles below a depth of 20 inches. The texture is sand or loamy sand in the 10- to 40-inch control section. Reaction is slightly acid or neutral.

Xerorthents

Xerorthents consist of very deep, somewhat excessively drained or excessively drained soils in areas of dredge tailings. These soils formed in material having a high content of gravel and cobbles derived dominantly from mixed rock sources. The material was deposited as tailings after most of the fine-earth material was washed from it and removed during gold dredging operations. Slope ranges from 0 to 50 percent.

Xerorthents are near Americanos, Natomas, Red Bluff, Redding, and Rossmoor soils and Xerofluvents. Americanos, Natomas, Red Bluff, and Redding soils have an argillic horizon. Americanos soils are on low stream terraces. Natomas soils are on low terraces. Red Bluff and Redding soils are on high terraces. Rossmoor soils have a mollic epipedon and less than 15 percent coarse fragments. They are on high flood plains. Xerofluvents have, by weighted average, less than 60 percent coarse fragments in the control section. They are on low flood plains.

Reference pedon of Xerorthents, dredge tailings, 2 to 50 percent slopes, about 1 mile south of Fair Oaks, 2,200 feet west and 3,950 feet south of the junction of Fair Oaks Boulevard and Sunrise Boulevard; in an unsectionalized area, T. 9 N., R. 6 E., 38 degrees, 37 minutes, 48 seconds north latitude, 121 degrees, 16 minutes, 39 seconds west longitude, Citrus Heights Quadrangle:

A—0 to 12 inches; light yellowish brown (10YR 6/4), extremely cobbly fine sandy loam, dark brown (10YR 3/3) moist; weak fine granular structure; slightly hard, very friable, nonsticky and slightly plastic; many very fine roots; few very fine tubular and few very fine and many coarse interstitial pores; about 5 percent stones, 35 percent cobbles, and 30 percent gravel; slightly acid; gradual wavy boundary.

C1—12 to 21 inches; variously colored, poorly sorted, well rounded stones, cobbles, and gravel; many coarse interstitial pores; about 5 percent stones, 55 percent cobbles, and 40 percent gravel; neutral; gradual wavy boundary.

C2—21 to 55 inches; pale brown (10YR 6/3) extremely cobbly fine sandy loam, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and slightly plastic; many very fine roots; few very fine and coarse interstitial pores; about 50 percent cobbles and 30 percent gravel; neutral; gradual wavy boundary.

C3—55 to 63 inches; pale brown (10YR 6/3) very cobbly fine sandy loam, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and slightly plastic; many very fine and few coarse interstitial and common very fine tubular pores; about 25 percent cobbles and 30 percent gravel; mildly alkaline.

The reference pedon is an example of the soils within this category. It is not necessarily representative of these soils throughout the survey area.

By weighted average, the content of rock fragments in the 10- to 40-inch control section ranges from 60 to 100 percent. The content of stones, the largest fragments, is 0 to 10 percent. In the control section, interstices, which are 1/16 inch to 4 inches in size, are void or are partially or completely filled with fine-earth material. Layers that consist of gravel, cobbles, and stones with little or no fine-earth material can occur in any horizon from the surface to the substratum, but they do not occur in some pedons. The texture, color, and content of rock fragments in individual horizons vary considerably.

Formation of the Soils

This section was prepared by Arlene J. Tugel, Soil Conservation Service. It was reviewed by Gordon L. Huntington, Department of Land, Air, and Water, University of California, Davis, and by Roy J. Shlemon, geological and environmental consultant.

Soil is generally defined as a natural growing medium for plants. It covers the surface of the earth as a three-dimensional body and is made up of organic and mineral material. The characteristics and properties of soil are determined by physical and chemical processes that result from the interaction of five soil-forming factors. These factors are climate, mainly the temperature and kind and amount of precipitation since the accumulation or exposure of the parent material; living organisms, mainly the plant cover and the organisms living in and on the soil; the length of time that the soil-forming factors have been operating; topography, mainly as it affects internal and external soil properties, such as drainage, aeration, susceptibility to erosion, and exposure to the sun and the wind; and parent material, including the texture and structure of the material as well as its mineralogical and chemical composition. The influence of any one of these factors varies from place to place; hence, soils may differ from place to place or within short distances. The interaction of all the factors determines the kind of soil that forms.

The soil-forming factors combine and interrelate to create soil properties that define soil horizons. The important diagnostic horizons in the soils of the county are a mollic epipedon, cambic and argillic horizons, and horizons exhibiting silica cementation.

A mollic epipedon is a thick, dark surface horizon with high base saturation. It formed in areas where organic matter accumulates faster than it oxidizes. It formed mainly through additions of organic matter to the soil in the form of decomposed roots and organic residue from the surface. In this survey area the mollic epipedon commonly occurs as the only diagnostic horizon in stratified recent soils, but it may occur in combination with a cambic horizon in unstratified recent soils.

Cambic horizons in this survey area are characterized by the mixing and alteration of the strata in the original parent material, which result in blocky soil structure, and by the movement of clay and release of iron oxides, which result in the formation of coatings on individual soil particles.

Argillic horizons are subsurface horizons characterized by the accumulation of illuvial clay. Prominent argillic horizons in this survey area generally are in soils that formed on early to late Pleistocene surfaces.

Silica-cemented horizons are characterized by durinodes or continuous or discontinuous silica cementation. The degree of cementation ranges from weak to strong. Duripans are massive, platy horizons that are continuously cemented with silica and in some areas with accessory iron and manganese. Platy or laminated duripans, with or without a thin, discontinuous laminar cap, are in soils that formed on Pleistocene surfaces. Because of their association with prominent argillic horizons, massive, indurated duripans capped with continuous silica-cemented laminar layers are probably the oldest duripans in the survey area.

The influences of the soil-forming factors and processes on the genesis and morphology of the soils in the survey area are summarized in the paragraphs that follow. Climate and living organisms are described under separate headings. The factors of time, topography, and parent material are described under the heading "Geomorphic Surfaces." Unless otherwise specified, information about the geologic formations identified in this section can be obtained from a publication of the California Department of Water Resources *(7)*.

Climate

Sacramento County has a mediterranean climate, which is characterized by hot, dry summers and cool, moist winters. Most of the rainfall occurs in the period November through April. The soil temperature regime is thermic, and the soil moisture regime is xeric or aquic. The warm temperatures and moist soil conditions in spring permit rapid chemical reactions. During periods of rainfall, water carrying dissolved or suspended material moves through the soil. Weathering is limited in the cool winter months, but leaching processes become active with the onset of seasonal rainfall. Weathering is most active in spring and least active in summer and late fall. In soils that have a high water table throughout most of the year, however, weathering can occur in summer and fall.

The air temperature in the survey area is moderated by the influence of the Pacific Ocean. It is slightly warmer during winter and slightly cooler during summer than is typical in nearby counties that have similar soils. As a result, the organic matter content in the surface layer of many soils in the eastern part of the county is at the higher end of the range that is allowed for their respective series. Examples are Corning, Redding, and San Joaquin soils. The relatively warmer winter temperatures increase grass production on these soils, and the relatively cooler summer temperatures decrease the rate at which organic matter decomposes and enhance the accumulation of organic matter.

The amount of rainfall throughout the county is sufficient to leach the soils of soluble salts. Significant amounts of exchangeable bases, however, have been leached only from soils on the older land surfaces. This variation may reflect the length of time that leaching has occurred, but it also indicates that the climates in the past may have been wetter and more conducive to leaching. The soils on flood plains commonly have a base saturation of more than 90 percent throughout, whereas San Joaquin soils, which are on the older land surfaces, have a base saturation of more than 75 percent in some or all parts of the profile above a claypan. Red Bluff soils are among the oldest soils in the county. Their base saturation is as low as 45 percent in the argillic horizon and is even lower in the surface layer.

Paleoclimatic influence also is indicated by properties of the Red Bluff soils. An atypical kaolinitic mineralogy, a high content of clay, a red color, a low pH, and a significant amount of iron and manganese staining distinguish these soils from other soils in the survey area. Presumably, a warmer and perhaps wetter paleoclimate influenced the weathering of clay minerals in the Red Bluff soils to kaolinite. Good subsurface drainage and the parent material also were factors *(13)*.

Living Organisms

The activities of living organisms, including soil flora, fauna, plants, and humans, all influence the formation and morphology of soils. Flora, such as bacteria and fungi, help to decompose organic matter. Some bacteria add atmospheric nitrogen to the soil. Fauna, such as earthworms, small insects, and rodents, mix soil material through burrowing and tunneling. Abandoned tunnels commonly are filled with loose soil material from the overlying horizons and transmit water more readily than the surrounding undisturbed soil material. The activity of rodents, as evidenced by krotovinas, is common in Orangevale soils.

The survey area has four main types of vegetation—tule marsh, riparian forest, annual grass, and oak-grass. Hydrophytic plants, such as tules and reeds, grow on Fluvaquents and other soils on unreclaimed islands in the Delta area. Mokelumne soils, which are in freshwater marshes, formed in thick deposits of decomposing tules and reeds that formerly grew at elevations near sea level. The thickness of these deposits is a result of a slow regional subsidence combined with a postglacial rise in sea level *(42)*. The content of organic matter in these soils ranges from 35 to 65 percent.

Small remnants of a broadleaf riparian forest are in uncultivated areas of Columbia soils along the American and Cosumnes Rivers. Annual grasses grow on most of the soils in rest of the survey area that are not cultivated or developed for urban uses. Annual grasses and blue oak grow in the eastern part of the county, in areas where the oak has not been cleared.

The accumulation of organic matter imparts a dark color to the surface layer of mineral soils. The content of organic matter is highest in soils that produce large amounts of vegetation and are subject to periodic saturation, which reduces the rate of decomposition. Commonly, these soils receive additional moisture because of flooding or a high water table. For example, Valpac soils, which have a seasonal high water table and are subject to flooding, produce an abundance of annual grasses, forbs, and some hydrophytic plants. They have a mollic epipedon that is 10 to 20 inches thick.

Mokelumne soils have surface accumulations of organic matter derived from the litter produced by a dense canopy of trees and shrubs. Even though the surface layer is not dark enough or thick enough to meet the specific requirements for a mollic epipedon, the organic matter fulfills another function in the soil-forming processes. The living organisms, primarily plants, provide a reservoir for mineral bases, which are cycled from the soil, through the plants, and back to the soil as part of the decomposing plant matter. This cyclical process is indicated by the distribution of bases in the soil profile. Base saturation is highest, approximately 45 percent, at the surface, where the organic matter accumulates, and decreases with increasing depth to less than 15 percent in the Cr horizon. The unusually low base saturation of these soils is inherited from the parent material, which consists of sediments of the Ione Formation. The surface layer, which is commonly separated from the underlying argillic horizon by a lithologic discontinuity, consists of old sediments, possibly hillslope alluvium, that were deposited on top of the material derived from the Ione Formation. This surface layer appears to be a mixture of material similar to that of the Arroyo Seco Formation and the sediments of the Ione Formation. The latter sediments are inherently low in content of mineral bases. Mokelumne soils are essentially "two-storied" soils having parent material derived from two different geologic units. Presumably, mineral weathering in the upper layer is the source of the bases that are cycled through the soils by plants.

Human activities have influenced the formation of numerous soils in Sacramento County. Many of these activities are described in the section "Altered Soils." The soils designated as Durixeralfs, Xerarents, Orthents, and Xeropsamments have been created or modified significantly by these activities. Also, Sailboat soils formed in hydraulic-mining sediments that were deposited on flood plains as the debris was carried downstream.

Geomorphic Surfaces

Field identification of geomorphic surfaces was made by Roger B. Parsons, research soil scientist, Soil Conservation Service.

The landscape in Sacramento County is the result of erosional and constructional processes acting on or affected by various geologic and constructional processes, which occurred in response to alternating changes in climate and fluctuating sea levels and were influenced by tectonic activities. In addition to periods of landscape instability during which the active processes of degradation and aggradation took place, cyclic periods of landscape stability also occurred *(40)*. The development or modification of the landscape in the county took place during the Pleistocene and Holocene Epochs *(27)*. Each of the surfaces is the result of an episode of landform development and is made up of component landforms. The soils on these surfaces formed in response to the factors of climate, living organisms, time, topography, and parent material. The time factor is determined by landscape stability or instability, and topography is reflected in the landform *(35)*. The parent material is determined by the geologic nature of the material in which the soils formed.

The age of the soil is equivalent to the age of the surface on which it occurs. Buried paleosols or exhumed paleosols, however, can be on younger surfaces. Soils can be much younger than the material in which they formed if they are on a degradational landform, such as a hillslope, or on an active surface, such as a terrace escarpment. For example, Pentz soils formed in material weathered from consolidated andesitic sediments of the Mehrten Formation, which is a Tertiary formation of early Pliocene age. These soils are on hills that were eroded during an episode of landform development that occurred in the middle of the Pleistocene *(27)*. Most of the erosion that formed these hills occurred a few million years after the material of the Mehrten Formation was laid down as valley fill sediments. The age of the Pentz soils is determined by the stability of the hillslope component on which it occurs and is not related to the age of the Mehrten Formation.

Determining the exact age of most soils in the survey area is difficult, but some "absolute" data are available. Relative ages can be estimated from the data available in other areas of the Sacramento-San Joaquin Valley. Age can also be inferred from the age of the geomorphic surface *(29, 30)*.

The relationship of soils and geomorphic surfaces was ascertained in the Cosumnes River watershed, east of Sloughhouse in Sacramento County. Six surfaces consisting of numerous component landforms were identified *(27)*. The relationships discovered in the Cosumnes River area were extended by reconnaissance to other parts of the county. See figure 19. Published sources were used for the subsurface stratigraphy in this figure *(38, 40)* and in figure 20 *(7)*. Because the surfaces have not been named, they are described under headings that represent the most extensive landform identified within the surface. These surfaces are low flood plains, high flood plains and basins, low stream terraces and dune features, low terraces, intermediate terraces and hills, and high terraces. The foothills of the Sierra Nevada also are described. The low terrace surfaces include three levels, and the high terrace surfaces include two levels. Additional study is needed to determine if any of these secondary levels are unique surfaces.

Specific surface drainage patterns and microrelief are mentioned in the following paragraphs. These features, such as poorly integrated drainage, mound-intermound microrelief, and patterned ground, are described in the section "Physiography, Relief, and Drainage."

Low flood plains.—The youngest geomorphic surface in Sacramento County consists of low flood plains. This is an active surface with component landforms that include nearly level tidal and freshwater marshes and backswamps in the Delta area, natural levees, flood-plain splays, and flood plains bordering the Sacramento, American, and Cosumnes Rivers and many smaller channels. Bar and channel topography is evident on the low flood plains along the American River and in a few small areas along the Cosumnes River. The low flood plains are frequently inundated unless they are protected by levees or upstream dams. The landscape is still changing as new channels are cut

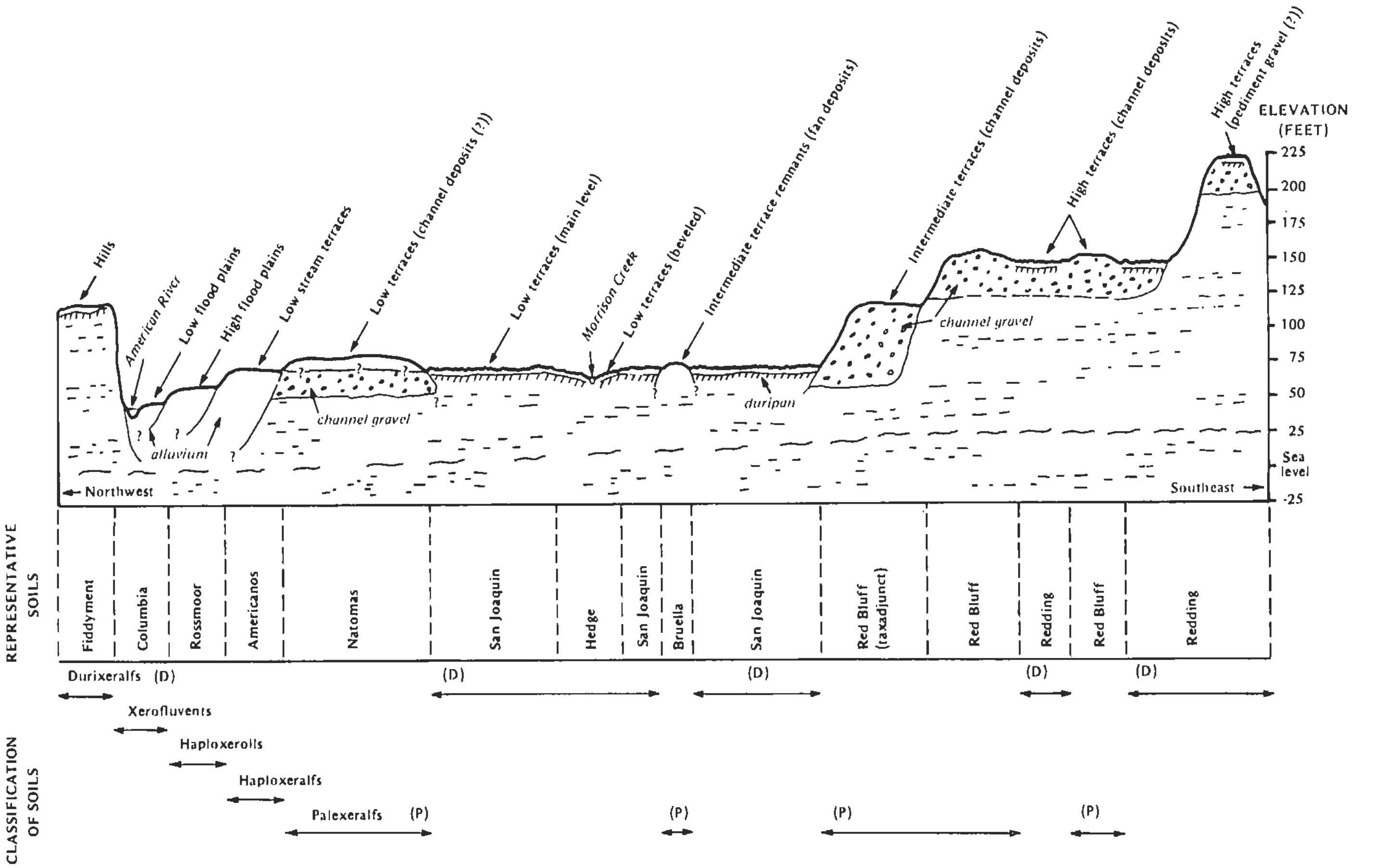

Figure 19.—Idealized cross section of the geomorphic surfaces, soils, and geology south of the American River in Sacramento County. The vertical scale is exaggerated.

and old channels are abandoned, as meanders migrate laterally, and as alluvial deposits move downstream. These changes are most noticeable in areas of Riverwash and Xerofluvents, where bar and channel topography is most common.

Alluvium moving downstream on the low flood plains in the county has buried older geomorphic surfaces. Upstream from areas where this alluvium is deposited on top of high flood plains, the low flood plains consist of Riverwash or channels. Burial of the high flood plains by the low flood plains and the elevation at which the low and high flood plains converge are controlled by the competence and gradient of the stream. The low and high flood plains converge near Sacramento, in an area about 4 miles upstream from the confluence of the Sacramento and American Rivers. In this area Columbia soils on low flood plains are adjacent to Rossmoor soils on high flood plains. Both soils are at the same elevation. Upstream from this area, the escarpment between the American River channel and the high flood plains increases to more than 20 feet near the Sunrise Boulevard bridge. Along the Cosumnes River, which is a less competent stream than the American River, Sailboat and Columbia soils bury Vina soils near Sloughhouse, which is about 20 miles upstream from the Delta. Another example of burial downstream from the point of convergence occurs along the Sacramento River and throughout the Delta, where sediments of natural levees on the low flood plains have buried parts of the high flood plains.

The very poorly drained Rindge soils are an example of soils in the freshwater marsh of the low flood plains. Mineral soils on the low flood plains, such as the somewhat poorly drained Sailboat and Cosumnes soils, are highly stratified. Other than a slight accumulation of organic matter in the surface layer, they are characterized by no profile development. A buried A horizon in these soils indicates that the parent material has buried the soils on high flood plains. Because the Sailboat and Cosumnes soils are not so low on the landscape as the Rindge soils, they are better drained. In areas adjacent to the major rivers and channels that are influenced by tides, however, the soils have a seasonal high water table as a result of seepage. This seepage has formed distinct and prominent mottles that indicate alternating reducing and oxidizing regimes and the translocation of iron. Low-chroma mottles, which indicate reducing conditions, are not evident within a depth of 36 inches.

The parent material of these mineral soils is stream alluvium derived from mixed sedimentary, granitic, and metamorphic rock sources. The texture of the soils is inherited from the parent material, which ranges from coarse textured to fine textured. Generally, the fine-silty and fine textured soils are downstream from the coarse-loamy and fine-loamy soils. The sandy soils are on flood-plain splays. Coarse fragments occur only in areas of Riverwash, Xerofluvents, and Xerorthents on this geomorphic surface.

High flood plains and basins.—These landforms are on an active surface that is somewhat older than that of the low flood plains. Unless protected by levees or upstream dams, the flood plains and basins are occasionally flooded. The components of this surface include backswamps, the edges of backswamps and natural levees in the Delta area; natural levees, backswamps, and flood plains along the Sacramento River; flood plains along the American and Cosumnes Rivers and other channels; and basins and basin rims in the American Basin. All of these components are nearly level.

The bar and channel topography of the high flood plains in the county is most prominent in areas along the American River. The channels in these areas are oriented approximately parallel to the stream. They make up a much smaller surface area than the nearly level bars. The expression of bar and channel microrelief is related to the competence of the stream that flowed through the area. The high flood plains along creeks in the eastern part of the survey area exhibit weak bar and channel topography and have some meander scars. Those along the Cosumnes River have weak microrelief because younger sediments have buried the lower areas of the high flood plains.

Rossmoor soils on the high flood plains converge with Americanos soils on the low stream terraces along the American River, in an area east of Sacramento about 7 miles from the mouth of the American River. Upstream, about 2 miles west of the Sunrise Boulevard bridge, the elevation of the escarpment between these surfaces increases to about 15 feet. The low stream terrace farther east has been removed by gold dredging activities.

Along the Cosumnes River and other channels in the survey area, sediments of the high flood plains commonly bury Hicksville soils on the low stream terraces at the mouth of tributary streams. Upstream along these tributaries, the low and high flood plains and low stream terraces are so intricately mixed and elevation differences are so minor that identifying the surfaces is difficult. The high flood plains converge with Dierssen soils on the basin rim, a component landform of the low terraces, hills, and high terraces that has been significantly cut by the high flood plains along the Cosumnes and American Rivers and the perennial creeks in the county.

Soils typical of the high flood plains in the Delta area are Cumulic Haplaquolls, such as the poorly drained Egbert soils in backswamps. Unlike the soils on the low flood plains, these soils have been in place long enough to have considerable accumulations of organic matter in the surface layer. Because they are low on the landscape, the fine textured Egbert soils formed in an aquic moisture regime and have numerous features resulting from wetness. They have a mollic epipedon that is 24 to 50 inches thick, an organic matter content of 2 to 10 percent in the control section, a high water table throughout the year, and gleyed colors. The gleyed colors commonly are masked by the high content of organic matter.

Soils typical of the basins are Pelloxererts, such as the somewhat poorly drained Clear Lake soils. A fluctuating water table has resulted in the accumulation of secondary carbonates in the A and C horizons. Intersecting slickensides and wedge-shaped aggregates indicate that these soils have been subject to alternating periods of wetting and drying and have been stable long enough for these features to form.

Well drained soils on the high flood plains are exemplified by Rossmoor soils, which have a mollic epipedon but show little other evidence of profile development. A lack of stratification in these soils suggests that the parent material may have been deposited during one or a few catastrophic floods or that bioturbation has resulted in uniformly textured soils.

The parent material of the soils on the high flood plains is stream alluvium that is commonly of mixed origin. The Liveoak soils along Dry Creek (the northern creek), formed in alluvium derived from mixed rock sources, dominantly granite. Coyotecreek soils formed in alluvium that is not influenced by granite. They are along streams with watersheds that do not extend eastward into areas of granitic rocks. The texture of the soils on this surface is inherited with little alteration from the parent material, which ranges from moderately coarse textured to fine textured. Generally, the parent material of the soils on the high flood plains has no coarse fragments.

Low stream terraces and dune features.—This is the least extensive geomorphic surface in Sacramento County and is the oldest surface related to the present drainage system *(27)*. Along the American River, the low end of the low stream terraces is protected from flooding by the Folsom Dam. Very weak bar and channel topography is evident on the low stream terraces along the American River. Much of the microrelief has been obliterated, however, by urban development. In the eastern part of the survey area, this surface consists of low stream terraces and small alluvial flats along drainageways where little downcutting has occurred. Most areas along these intermittent drainageways are occasionally flooded for very brief periods. The microrelief of the low stream terraces in the eastern part of the county consists of small channels of the low and high flood plains that meander across most of the surface.

The difference in elevation along the side slopes between the low stream terrace along the American River and the next higher level of the low terraces ranges from about 2 to 8 feet. Because much of this surface and the older adjacent terraces were removed by gold mining and excavating for gravel, however, determining precisely where the two surfaces may have converged is difficult.

The low stream terraces are not in the Delta area. They probably were either buried or cut away by the high flood plains. Dunes that formed at the same time as the low stream terraces or possibly at the same time as the high flood plains are near the Delta area and near the flood plain along the Sacramento River. The dunes consist of sandy deposits on top of sediments of the low terrace (the next older terrace) and its distal margin (basin rim). Tinnin soils are examples of soils on these dunes. They generally are gently sloping or moderately sloping but are nearly level in areas that have been leveled. They have a mollic epipedon, which indicates that these droughty soils have been stable long enough to have an accumulation of organic matter. Because of the coarse texture, the epipedon has not become massive and hard.

Soils that formed in the alluvium on the low stream terraces are represented by Mollic Haploxeralfs, such as the moderately well drained Hicksville soils. These soils have a grayish brown ochric epipedon that is massive and hard and an argillic horizon that has moderate structure. These features indicate that the soils have been in place long enough for the surface layer to become massive and hard, as is typical of Alfisols in a xeric climate *(50)*, and that they can support enough vegetation to maintain an accumulation of organic matter in the surface layer. Illuviated clay is indicated by common or many moderately thick clay films in the argillic horizon. The clay films are primarily on the faces of peds and are not evenly distributed throughout the matrix of the Bt horizon, indicating that these soils are not mature. Base saturation values of more than 75 percent indicate a minimal loss of bases.

The parent material of all the soils on this surface, except for the Tinnin soils, is stream alluvium derived from mixed rock sources. It commonly has no coarse fragments. In areas where Hicksville soils are on alluvial flats along the minor drainageways in the eastern part of the county, however, the parent material is local alluvium that has coarse fragments derived from the surrounding high terraces, hills, or foothills. The number of these coarse fragments increases with increasing depth.

Low terraces.—The most extensive geomorphic surface in Sacramento County consists of low terraces, which extend from north to south through the central and western parts of the county. When considered regionally as part of the entire Sacramento-San Joaquin Valley, the terraces are referred to as the "main valley floor," the "alluvial plain," or the "old alluvial fan" *(7, 17, 31)*. This surface, which is of late Pleistocene age, consists of two or three of the following levels: a main level, which makes up most of the surface; a low level, which is primarily in beveled areas that descend towards a drainageway; and a high level associated with an older major channel deposit that is near the surface in the Rancho Cordova area but extends westward into the subsurface below the main level *(40)*. The latter may represent an older episode of landscape development.

In addition to the beveled areas, other component landforms of the low level are local basins and basin rims at the distal margin of the low terraces where they approach the axis of the Sacramento-San Joaquin Valley. Stream terraces and the alluvial toe slopes of hills, on which Creviscreek soils occur, are also a component of the low level and are along creeks in the eastern part of the survey area.

The low terraces generally are nearly level. Extensive areas of the main level have slopes of less than 1 percent. Most areas of this surface do not have integrated drainage. Patterned ground is in unleveled areas of the main level and in small areas of the low level where the soils have a restrictive layer. It does not occur in areas on the high level, where the soils have no restrictive layers.

The low terraces cut into and then converge with remnants of intermediate terraces and the distal end of high terraces, such as the Elk Grove Outlier. This outlier is a high terrace remnant dissected from the main body of the original plain by an ancient channel of the American River. It is surrounded by low terraces *(39)*.

The moderately well drained San Joaquin soils, which are the most extensive soils in the survey area, are representative of the soils on the main level of the low terraces. These Abruptic Durixeralfs are relict paleosols that exhibit mature profile development. They have a duripan and an argillic horizon with an abrupt textural change at or near the upper boundary. Illuviation of clay from the ochric epipedon and weathering of clay in place are presumed to be the sources of the clay in the fine textured argillic horizon. Other than an abrupt boundary, there is no consistent evidence of a lithologic discontinuity at the claypan, such as irregular changes in the distribution of individual sand-sized fractions or changes in mineral composition, although there are minor changes in the content of some sand-sized fractions. Silica from the granitic component of the parent material and from volcanic ash is the primary cementing agent of the duripan. Iron and manganese are accessory cementing agents along with traces of carbonates in low areas. Although the exact age of the duripan is not known, a minimum age of 103,000 years has been determined for the sediments underlying the duripan *(15)*.

The beveled area of the low terraces is represented by the moderately well drained Hedge soils. Subsurface water moving laterally downslope through these soils has promoted the development of a very pale brown E horizon, a perched water table, and black iron and manganese concretions. In some pedons the E horizon has brittle, black laminar bands as much as ¼ inch thick.

The well drained Natomas soils are on the high level of the terraces. They are underlain by channel deposits. It is possible that the moderately fine textured soil material overlying the gravelly and cobbly channel material also extends into the subsurface below the main low terrace level. If so, the Natomas soils are on a landscape representing an older period of landscape development. If not, the overlying material may be an overbank deposit that is younger than the low terraces. The parent material, which is of mixed origin and contains dark, metamorphosed igneous rocks, is unlike that of other soils on the low terraces and has imparted its properties to the Natomas soils. A red subsoil caused by a high content of iron and the content of coarse fragments, which is as much as 10 percent in the upper 50 inches or more, are characteristics of the parent material. The parent material originally had a considerable amount of clay. The presence of clay films at a depth of 60 inches and the eluviation of clay from the A horizon indicate a deeply weathered argillic horizon even though the maximum clay content is 35 percent.

The soils on low terraces commonly have base saturation values of more than 75 percent in some part of the A and B horizons, indicating that they are old enough to have lost only moderate amounts of bases through leaching or that they have restrictive layers that inhibit leaching. The very deep, well drained Natomas soils are exceptions. They do not have restrictive layers and have base saturation values of 50 to 75 percent throughout the argillic horizon.

The parent material of the soils on this surface is primarily fine grained, fluvial and glacial alluvium derived from mixed rock sources, including granite in most areas *(51)*. The granitic influence is greatest in the soils mapped north of the American River, such as San Joaquin soils. These soils generally are only about 10 miles from a source of granitic rocks. San Joaquin silt loam, in the southern part of the county, however, is more than 25 miles from granitic rocks. Zones of sedimentary and metamorphic rocks are mixed with the granitic rocks. The parent material of the San Joaquin soils is identified as the Victor Formation *(33)* or the Riverbank Formation *(38)*. Other than the Natomas soils and the substratum of Creviscreek soils, which consist primarily of local alluvium with little granitic influence, the parent material of the soils on the low terraces has no coarse fragments.

Intermediate terraces and hills.—Surfaces of mid Pleistocene age consist of intermediate terrace remnants in areas of fan deposits, intermediate terraces associated with channel deposits, and hills. The fan terrace remnants are of minor extent and occur as small raised areas having convex slopes of 0 to 5 percent. They are commonly surrounded by the main level of the low terraces. Bruella soils are on these intermediate fan terrace remnants. The parent material of these soils is fan alluvium derived from granitic rock sources. The alluvium has no coarse fragments.

An intermediate terrace and related underlying channel deposits occur east of Mather Field, in a narrow band about 1.0 to 1.5 miles wide and extending in a southwesterly direction for about 8 miles beyond the channel deposits that extend southward into the subsurface east of Elk Grove *(40)*. Most areas of this terrace northeast of Mather Field were removed by gold dredging activities. Slopes are dominantly smooth and convex but are concave along small drainageways. The western escarpment of the terrace increases to 25 feet in height in a northeast direction and is dissected by small drainageways that flow to the west. Some of these drainageways cross from the eastern edge of the terrace, where they debouch from the escarpment of the high terraces. The terrace escarpment between this intermediate terrace and the high terraces is dominantly 20 to 25 feet high.

The well drained Red Bluff soils are dominant on the intermediate terraces. These mature soils have a thick, deeply weathered argillic horizon and a low base saturation. They have a slightly higher reaction in the A and B horizons than is typical for the Red Bluff series, which generally consists of older soils on high terraces. The parent material of the Red Bluff soils is gravelly alluvium derived from fluvial and glacial sources and laid down by an ancestral channel of the American River *(40)*. It consists of rounded pebbles and cobbles derived from mixed sources, including dark metamorphic, quartzitic, and andesitic rocks in a granitic sand matrix. These American River channel pebbles are approximately 600,000 years old, as regionally correlated from radiometrically dated sediments of a stratigraphic unit in the San Joaquin Valley *(40)*. Consequently, they are of mid Pleistocene age. Soils on hills in the eastern part of Sacramento County also are estimated to be of mid Pleistocene age *(27)*.

The hillslope components of this mid Pleistocene geomorphic surface include shoulder slopes, back slopes, foot slopes, and toe slopes. In many areas the hillslopes are in areas where the dissection of high terraces is so complete that the original surface no longer exists. The soils on these erosional remnants of older surfaces, such as Redding soils, are described in the paragraphs on high terraces. They are on the descending side slopes of the dissected high terraces and on the side slopes of terrace remnants. The hillslope components generally are gently rolling or rolling, but some areas are undulating, hilly, or steep.

The hillslopes have integrated drainage, and many areas have slope-oriented patterned ground *(27)*. Examples of soils in areas characterized by patterned ground are the well drained Pentz soils, which are on mounds, and the moderately well drained Hadselville soils, which are in intermound areas. These soils are shallow and very shallow, respectively, and formed in material derived from basic andesitic tuffaceous sediments of the Mehrten Formation. The soils in the intermound areas are moderately well drained because they receive additional surface runoff from areas upslope and from the adjacent mounds. It is assumed that the additional water moving through the intermound soils has influenced the exchangeable acidity levels in the upper 2 to 4 inches or even the entire profile if the soils are less than 10 inches deep. As in other mound-intermound soils in Sacramento County, the surface layer of the Hadselville soils is more acid than that of the Pentz soils. This relationship, however, should be verified.

Hills with concave foot slopes of mid and late Pleistocene age rise to heights of about 70 to 150 feet above their toe slopes and are in valleys of underfit streams in the eastern part of the county, south of the American River. These valleys are much broader than those that could be formed by the streams that flow through them today. Some of the valleys have been laterally truncated at the upstream or downstream end by subsequently lower base levels with nearly perpendicular drainage orientation. These valleys are common in areas where sediments of the Mehrten Formation, which has greater rock integrity, cap the back slopes of hills and are underlain by softer sediments of the Valley Springs Formation or, in a few areas, of the Ione Formation. The softer sediments give rise to concave foot slopes in areas of the moderately well drained Vleck soils. In this relict paleosol, an argillic horizon that is olive gray when moist formed in material derived from the underlying sediments of the Valley Springs Formation, which typically are greenish and have no coarse fragments. Consequently, a gravelly surface layer in these soils indicates that a lithologic discontinuity occurs at the abrupt upper boundary of the argillic horizon and the material above this boundary is hillslope alluvium or "pedisediment" that has moved downslope *(28)*. These soils, therefore, result from more than one episode of soil formation.

The genesis and morphology of the soils on the hillslopes of this surface are strongly influenced by the parent material. From the youngest to the oldest, the distinct features of the parent material are as follows: Arroyo Seco Gravel, which consists of sediments containing dark metamorphic, quartzitic, and andesitic pebbles and cobbles; the Laguna Formation, which consists of light colored, coarse grained to fine grained granitic sediments; the Mehrten Formation, which consists of gray andesitic tuffaceous sediments; the Valley Springs Formation, which consists of greenish rhyolitic tuffaceous sediments; and the Ione Formation, which consists of extremely acid, white kaolinitic clayey sediments or soft sandstone (fig. 20). The soils that formed in all of these materials, except for the Arroyo Seco Gravel, have a paralithic contact.

The Tertiary valley fill sediments of the Ione *(32)*, Valley Springs, Mehrten, and Laguna Formations were tilted slightly to the west by Sierran uplift and were cut during an episode that culminated in the deposition of Arroyo Seco Gravel of Pleistocene age. These sediments occur in a generalized sequence of exposure with Laguna at the west end and Ione at the east end. They are capped by remnants of Arroyo Seco Gravel

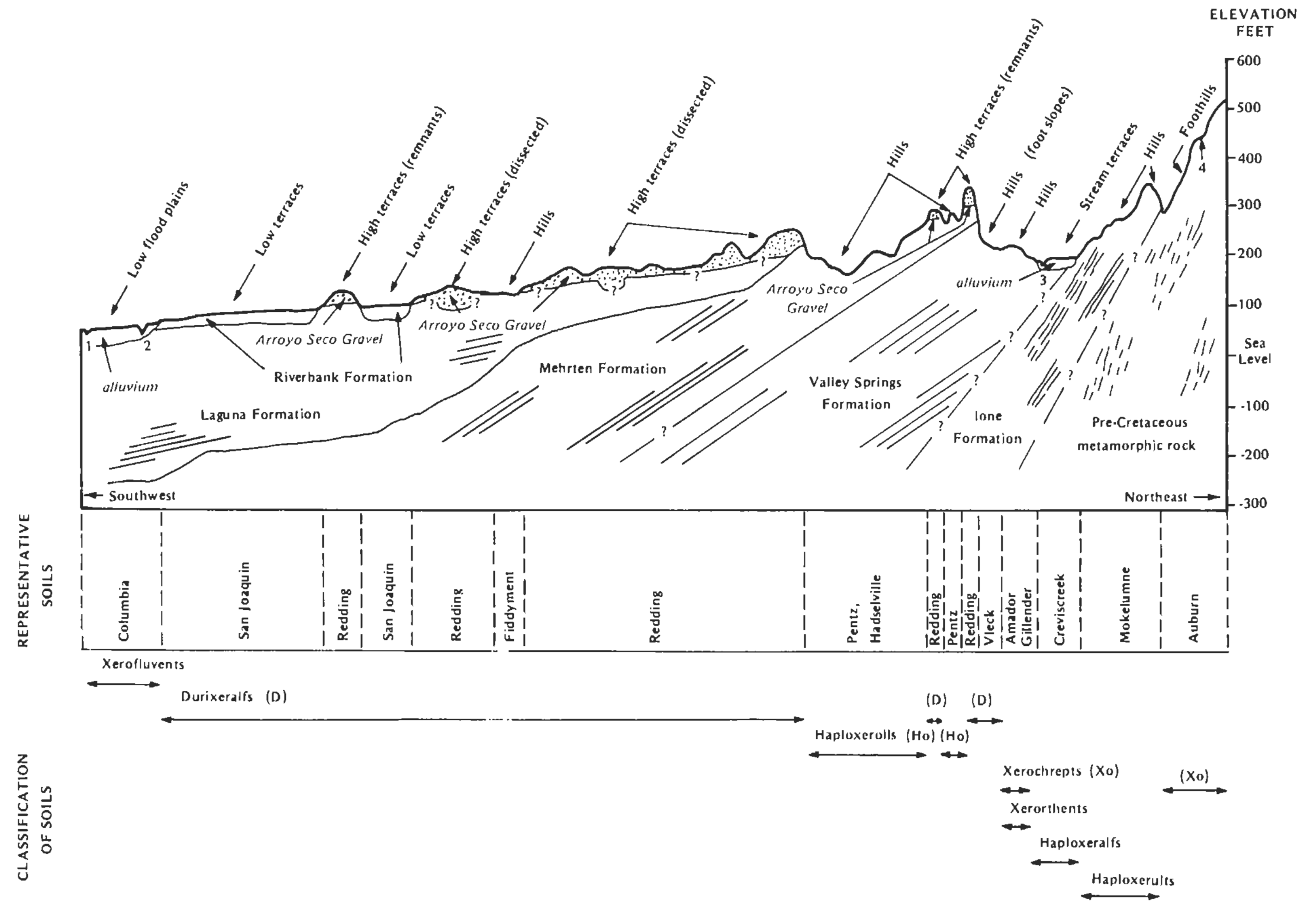

Figure 20.—Cross section showing the relationship of geomorphic surfaces, soils, and geology in the eastern part of Sacramento County. The vertical scale is exaggerated. The number 1 indicates Deer Creek; 2, the Cosumnes River; 3, Arkansas Creek; and 4, the Sacramento-Amador County line.

(33). Downcutting during the mid and late Pleistocene carved the eastern parts of Sacramento County into hills that exposed the various formations, which are the parent materials of the soils in that part of the county. Mixing of hillslope alluvium occurs, especially in areas where remnant pebbles and cobbles of the Arroyo Seco Gravel have moved downslope from their original sites of deposition.

High terraces.—The oldest of the geomorphic surfaces in Sacramento County consists of high terraces in the eastern part of the county. It occurs as two dissected terrace levels that are made up of gravelly material deposited at different times. The Arroyo Seco Gravel that is both north and south of the Cosumnes River is presumed to consist of numerous channel deposits, one of which is associated with the lower terrace level and is identified as the older Fair Oaks channel *(40)*. The highest and oldest of these deposits may be a relatively thin veneer of gravel on a pediment surface, as it was originally described *(33)*. One possible explanation is that the sediments are channel deposits of an ancestral American River *(41)*.

North of the Cosumnes River, the oldest level forms a drainage divide between the American and Cosumnes Rivers. The high terraces generally are nearly level to undulating but are gently rolling in dissected areas. Locally, only isolated summits of the high terraces remain. In nearly level areas of the high terraces, the surface relief consists of patterned ground. Surface drainage is not integrated. Ponding occurs in low areas.

Patterned ground occurs in areas of soils having a layer that restricts permeability, such as the very slowly permeable claypan in Corning soils, whereas it does not occur in areas of the moderately slowly permeable Red Bluff soils.

The two levels of the high terraces that occur north of the Cosumnes River appear to converge upstream. This convergence may be the result of the lateral migration of an ancestral American River channel that formed the lower level. Parts of both levels in this area, however, have been destroyed by gold dredging activities.

Soils on both of the high terrace levels north of the Cosumnes River are typified by Typic Durixeralfs and Ultic Palexeralfs, such as Redding soils and Red Bluff soils, respectively. South of the Cosumnes River, Redding and Corning soils are typical of this surface. Red Bluff soils do not occur south of the Cosumnes River. The oldest level of the high terraces is estimated to be of early Pleistocene age *(27, 38)*. These soils are pedologically mature and have strongly developed profiles.

The moderately well drained Redding soils have both an argillic horizon and a duripan. The argillic horizon typically consists of an upper part, in which the content of clay is 20 to 30 percent, and a lower part, which is a claypan in which the content of clay is 35 to 50 percent. The two parts are separated by an abrupt boundary. The duripan consists of gravel, with or without cobbles, and a sandy granitic matrix cemented with silica and iron. The source of silica is presumed to be the granitic component of the parent material and volcanic glass (ash). The very fine sand fraction of the argillic horizon has 5 to 7 percent glass aggregates *(22)*, which is the greatest amount in any of the soils in the county that have a duripan.

Corning soils have some of the same morphological features as the Redding soils, but they do not have a duripan and typically do not have an argillic horizon consisting of an upper part and a lower part. In some areas where the depth to a claypan is approximately 40 inches, similar soils have an argillic horizon with an upper boundary above the claypan. The material above the claypan in the Redding and Corning soils has a base saturation of 35 to 75 percent. Because of very slow permeability, the claypan in each of these soils is not significantly leached of bases.

Although deposited at different times as either a pediment veneer or as glaciofluvial outwash, the parent material of the soils on the high terraces is gravelly alluvium consisting of well rounded, dark metamorphic, quartzitic, and andesitic pebbles and cobbles with an iron-rich matrix of granitic sand and clay. Weathering of the parent material provides iron that imparts red and yellowish red colors to the soils. Because the material was deposited from the east, the coarse fragments decrease in size and quantity to the west. For example, the Redding soils to the east have a higher content of gravel and cobbles than those at their western extremity. Redding loam, which has less than 15 percent gravel, is mapped in the southwest area of the high terraces.

Foothills.—The foothills of the Sierra Nevada in the northeastern part of Sacramento County occur as a complex physiographic region. The component landforms are presumably contemporaneous with all or almost all of the previously described geomorphic surfaces. Narrow flood plains and low stream terraces are included in the region, but hills, high strath terraces, and foothills are the major landforms. Hillslopes, which are mostly undulating to rolling, were formed by erosion and dissection during episodes of landscape development after the early Pleistocene. Most of the hillslopes are stable, although some metastable slopes of 15 to 30 percent are in areas of Auburn and Whiterock soils. Remnants of a high strath terrace or possibly a pediment at elevations similar to those of the high terraces are undulating or gently rolling. Rolling to hilly foothills are at elevations above the high strath terraces.

The moderately deep Argonaut taxadjunct is an example of the soils on foothills. It has a claypan underlain by a paralithic contact. The geomorphic stability of these soils is enhanced by their position on concave hillslopes, where they are protected from erosion, and by their high content of iron, which is derived from basic metaandesite parent material. The iron helps to bind these soils together, thus making them less susceptible to erosion *(43)*. A stone line commonly overlies the claypan in these soils, indicating that more than one episode of soil formation has affected this paleosol.

Other soils on foothills are the shallow and moderately deep Auburn soils and the shallow Auburn taxadjunct. These soils are generally similar, but the Auburn taxadjunct has a weakly developed argillic horizon and a lithic contact over highly fractured amphibolite schist and schistose quartz diabase porhyrite and the Auburn soils have a cambic horizon and a lithic contact underlain by infrequently fractured diabase or amphibolite schist.

Parent material strongly influences the genesis and morphology of the soils on foothills. The Logtown Ridge Formation *(19)*, which consists of amphibolite, greenstone, and other metaigneous rocks, underlies the Auburn and Argonaut soils. The very shallow Whiterock soils are underlain by slate and shale of the Mariposa Formation. The moderately deep, moderately coarse textured Andregg soils are underlain by granitic rock. The formation names on the newer geology maps and the soils mapped in areas of those formations in Sacramento County are as follows: Salt Springs Slate, Whiterock soils; Copper Hill Volcanics, the Argonaut taxadjunct and Auburn soils; and Gopher Ridge Volcanics, the Auburn taxadjunct *(9)*.

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Glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvial fan. The fanlike deposit of a stream where it issues from a gorge upon a plain or of a tributary stream near or at its junction with its main stream.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Altered soils. Soils that have been significantly modified by human activities, primarily land leveling and construction.

Animal unit month (AUM). The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 2.5
Low	2.5 to 5.0
Moderate	5.0 to 7.5
High	7.5 to 10.0
Very high	more than 10.0

Back slope. The geomorphic component that forms the steepest inclined surface and principal element of many hillsides. Back slopes in profile are commonly steep, are linear, and may or may not include cliff segments.

Backswamp. A swamp or marshy depression in an area on a flood plain where drainage is poor because of the natural levees of a river.

Bar and channel topography. The microrelief common on flood plains. The ridgelike bars commonly consist of accumulations of coarse textured sediments, whereas the channels are finer textured.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation-exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bioturbation. The churning and stirring of sediments by organisms.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Brush management. Use of mechanical, chemical, or biological methods to make conditions favorable for reseeding or to reduce or eliminate competition from woody vegetation and thus to allow understory grasses and forbs to recover. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Canopy. The leafy crown of trees or shrubs.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Chemical treatment. Control of unwanted vegetation through the use of chemicals.

Chiseling. Tillage with an implement having one or more soil-penetrating points that loosen the subsoil and bring clods to the surface. A form of emergency tillage to control soil blowing.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A very slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Coarse fragments. Mineral or rock particles larger than 2 millimeters in diameter.

Coarse textured soil. Sand or loamy sand.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material. Material that is 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material is 35 to 60 percent of these rock fragments, and extremely cobbly soil material is more than 60 percent.

Colluvium. Soil material, rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conglomerate. A coarse grained, clastic rock composed of rounded to subangular rock fragments more than 2 millimeters in diameter. It commonly has a matrix of sand and finer material. Conglomerate is the consolidated equivalent of gravel.

Conservation cropping system. Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are:

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—Readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—Adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cropping system. Growing crops according to a planned system of rotation and management practices.

Crop residue management. Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cross-slope farming. Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Delta. A body of alluvium having a surface that is nearly flat and fan shaped; deposited at or near the mouth of a river or stream where it enters a body of relatively quiet water, generally a sea, lake, or bay.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

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

Excessively drained.—These soils have very high and high hydraulic conductivity and a low water-holding capacity. They are not suited to crop production unless irrigated.

Somewhat excessively drained.—These soils have high hydraulic conductivity and a low water-holding capacity. Without irrigation, only a narrow range of crops can be grown and yields are low.

Well drained.—These soils have an intermediate water-holding capacity. They retain optimum amounts of moisture, but they are not wet close enough to the surface or long enough during the growing season to adversely affect yields.

Moderately well drained.—These soils are wet close enough to the surface or long enough that planting or harvesting operations or yields of some field crops are adversely affected unless a drainage system is installed. Moderately well drained soils commonly have a layer with low hydraulic conductivity, a wet layer relatively high in the profile, additions of water by seepage, or some combination of these.

Somewhat poorly drained.—These soils are wet close enough to the surface or long enough that planting or harvesting operations or crop growth is markedly restricted unless a drainage system is installed. Somewhat poorly drained soils commonly have a layer with low hydraulic conductivity, a wet layer high in the profile, additions of water through seepage, or a combination of these.

Poorly drained.—These soils commonly are so wet at or near the surface during a considerable part of the year that field crops cannot be grown under natural conditions. Poorly drained conditions are caused by a saturated zone, a layer with low hydraulic conductivity, seepage, or a combination of these.

Very poorly drained.—These soils are wet to the surface most of the time. The wetness prevents the growth of important crops (except for rice) unless a drainage system is installed.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Ephemeral stream. A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Synonym: scarp.

Excess fines (in tables). Excess silt and clay in the soil.

The soil does not provide a source of gravel or sand for construction purposes.

Extrusive rock. Igneous rock derived from deep-seated molten matter (magma) emplaced on the earth's surface.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grain is grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fan terrace. A relict alluvial fan, no longer a site of active deposition, incised by younger and lower alluvial surfaces.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fill slope. A sloping surface consisting of excavated soil material from a road cut. It commonly is on the downhill side of the road.

Fine textured soil. Sandy clay, silty clay, or clay.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Fluvial. Of or pertaining to rivers; produced by river action, as a fluvial plain.

Foothill. A steeply sloping upland that has relief of as much as 1,000 feet (or 300 meters) and fringes a mountain range or high-plateau escarpment.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gilgai. Commonly a succession of microbasins and microknolls in nearly level areas or of microvalleys and microridges parallel with the slope. Typically, the microrelief of Vertisols—clayey soils having a high coefficient of expansion and contraction with changes in moisture content.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glaciofluvial deposits (geology). Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is more than 15 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter. In nongravelly soils the content of gravel is 0 to 15 percent, in gravelly soils it is 15 to 35 percent, in very gravelly soils it is 35 to 60 percent, and in extremely gravelly soils it is more than 60 percent.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance. In this survey area silica is the dominant cementing agent.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

High-residue crops. Crops such as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline; hillsides generally have slopes of more than 15 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the "Soil Survey Manual." The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Igneous rock. Rock formed by solidification from a molten or partially molten state. Major varieties include plutonic and volcanic rock. Examples are andesite, basalt, and granite.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intermittent stream. A stream, or reach of a stream, that flows for prolonged periods only when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:

Basin (or level basin).—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Trickle.—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Krotovina. An irregular tubular or tunnellike structure in the soil; made by a burrowing animal and subsequently filled with material from another horizon.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Light textured soil. Sand or loamy sand.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Low strength. The soil is not strong enough to support loads.

Mechanical treatment. Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Metastable slope. A slope that is relatively stable at the present time but may become active if the environmental balance is disturbed, for instance, by road construction or the destruction of vegetation.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent.* The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Mountain. A natural elevation of the land surface, rising more than 1,000 feet above surrounding lowlands, commonly of restricted summit area (relative to a plateau) and generally having steep sides and considerable bare-rock surface. A mountain can occur as a single, isolated mass or in a group forming a chain or range.

Muck. Dark colored, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Mucky peat. Organic soil material intermediate between muck and peat. (See Hemic soil material.)

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it generally is low in relief.

Paleosol. Soil that formed on a landscape of the past and under conditions generally different from those of the present day. After the soil formed, it may have been buried or covered by more recent rocks or may have remained on the surface and been subject to a new evolution.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan.*

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Largely undecomposed organic matter in which the original plant fibers constitute almost all of the material that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil, adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid permeability or an impermeable layer near the surface, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Proper grazing use. Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep-sided channel resulting from accelerated erosion. A rill generally is a few inches deep and not wide enough to be an obstacle to farm machinery.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber after rubbing, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saprolite (soil science). Unconsolidated residual material underlying the soil and grading to hard bedrock below.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slick spot. A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil generally is silty or clayey, is slippery when wet, and is low in productivity.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey the following slope classes are recognized:

Nearly level	0 to 2 percent
Gently sloping or undulating	2 to 5 percent

Moderately sloping or gently rolling	5 to 8 percent
Strongly sloping or rolling	8 to 15 percent
Moderately steep or hilly	15 to 30 percent
Steep	30 to 50 percent
Very steep	50 to 75 percent

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Sodic (alkali) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher), or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Soft bedrock. Bedock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stone line. A concentration of coarse fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 6 to 15 inches (15 to 38 centimeters) in length if flat.

Strath terrace. An extensive remnant of a flat valley bottom that belonged to a former erosion cycle and that has undergone dissection by a rejuvenated stream following uplift.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular. Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from soil blowing and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below the A horizon.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the E horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Surface layer. Technically, the A horizon. Generally, that part of the profile that is highest in content of organic matter and darkest in color.

Tailwater. The water just downstream of a structure.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geomorphic). A steplike surface that represents the former position of an outwash plain, flood plain, alluvial plain, fan, lake, or seashore.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Tuffaceous sediments. Compacted deposits made up of volcanic fragments less than 4 millimeters in diameter that were transported by water.

Underfit stream. A stream that appears to be too small to have eroded the valley in which it flows; a common result of drainage changes caused by capture, by glaciers, or by climatic variations.

Underlying material. The part of the soil below the A or AC horizon. It is relatively unaffected by the processes of soil formation.

Unstable fill (in tables). Risk of caving or sloughing on banks of fill material.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil..

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Windthrow. The action of uprooting and tipping over trees by the wind.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION AT SACRAMENTO, CALIFORNIA

(Recorded in the period 1941-70)

Month	Temperature			Average number of growing degree days*	Average precipitation
	Average daily maximum	Average daily minimum	Average		
	°F	°F	°F	Units	In
January	53.2	39.0	46.1	0	3.95
February	59.2	42.6	50.9	25	2.86
March	64.4	44.4	54.4	136	2.31
April	71.3	47.8	59.6	288	1.66
May	78.5	52.1	65.3	474	.54
June	86.0	56.5	71.3	639	.14
July	92.6	59.1	75.9	803	0
August	91.1	58.7	74.9	772	.06
September	87.5	57.5	72.5	675	.22
October	77.0	52.0	64.5	450	1.01
November	63.7	44.9	54.3	129	2.24
December	53.6	40.3	47.0	0	3.26
Yearly:					
Average	---	---	61.4	---	18.25
Total	---	---	---	4,391	---

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maxiumum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 degrees F).

TABLE 2.--TEMPERATURE AND PRECIPITATION AT FOLSOM, CALIFORNIA

Month	Temperature			Average number of growing degree days[3]	Average precipitation[4]
	Average daily maximum[1]	Average daily minimum[1]	Average[2]		
	°F	°F	°F	Units	In
January	54.3	36.5	45.8	0	4.81
February	59.8	39.6	50.0	0	3.99
March	65.2	42.4	54.1	127	3.61
April	72.2	45.7	59.3	279	1.96
May	80.7	50.3	66.0	496	1.01
June	89.4	55.8	73.2	696	.23
July	97.1	60.0	78.9	896	.01
August	95.2	58.1	76.8	831	.02
September	89.5	55.0	72.1	663	.40
October	78.8	48.8	63.8	428	1.18
November	66.1	41.7	54.0	120	2.52
December	55.8	37.4	46.7	0	4.10
Yearly:					
Average	---	---	61.7	---	23.84
Total	---	---	---	4,536	---

[1] Period of record 1905-52.
[2] Period of record 1890-1952.
[3] A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maxiumum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 degrees F).
[4] Period of record 1893-1952.

TABLE 3.--TEMPERATURE AND PRECIPITATION AT ANTIOCH, CALIFORNIA

(Recorded at Antioch Fiberboard Mills)

Month	Temperature			Average number of growing degree days[4]	Average precipitation[5]
	Average daily maximum[1]	Average daily minimum[2]	Average[3]		
	°F	°F	°F	Units	In
January	54.2	37.2	46.7	0	2.67
February	60.7	40.4	50.8	25	2.20
March	66.8	42.5	55.1	158	1.89
April	73.5	46.3	60.5	315	.87
May	79.7	50.5	65.6	484	.43
June	87.0	56.2	72.5	675	.10
July	91.2	57.2	75.7	771	Trace
August	89.8	55.4	74.2	750	.02
September	86.8	54.3	71.6	648	.25
October	77.5	49.0	64.0	434	.59
November	65.6	41.2	54.3	129	1.23
December	56.0	38.0	48.0	0	2.50
Yearly:					
Average	---	---	61.6	---	12.75
Total	---	---	---	4,389	---

[1] Period of record 1917-60.
[2] Period of record 1918-60.
[3] Period of record 1881-1960.
[4] A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maxiumum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 degrees F).
[5] Period of record 1878-1960.

TABLE 4.--LENGTH OF GROWING SEASON AND PROBABILITY OF FREEZING TEMPERATURES

(Probability calculated after given dates in spring and before given dates in fall)

Station	°F*	Percentage in spring									Days in growing season	Percentage in fall								
		10	20	30	40	50	60	70	80	90		10	20	30	40	50	60	70	80	90
Sacramento	32	3/21	3/11	3/4	2/25	2/19	2/13	2/6	1/28	1/16	282	11/12	11/17	11/20	11/24	11/28	12/1	12/5	12/10	12/20
	28	2/16	2/7	1/31	1/24	1/17	1/10	1/10	---	---	336	11/26	12/3	12/8	12/12	12/19	12/26	---	---	---

* Temperature at which killing frost is calculated to occur.

TABLE 5.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
101	Amador-Gillender complex, 2 to 15 percent slopes	6,320	1.0
102	Americanos-Urban land complex, 0 to 2 percent slopes	3,390	0.5
103	Andregg coarse sandy loam, 2 to 8 percent slopes	740	0.1
104	Andregg coarse sandy loam, 8 to 15 percent slopes	610	0.1
105	Andregg-Urban land complex, 2 to 8 percent slopes	560	0.1
106	Andregg-Urban land complex, 8 to 15 percent slopes	210	*
107	Argonaut-Auburn complex, 3 to 8 percent slopes	8,300	1.3
108	Argonaut-Auburn-Urban land complex, 3 to 8 percent slopes	760	0.1
109	Auburn silt loam, 2 to 30 percent slopes	6,850	1.1
110	Auburn-Argonaut-Rock outcrop complex, 8 to 30 percent slopes	3,710	0.6
111	Bruella sandy loam, 0 to 2 percent slopes	2,250	0.4
112	Bruella sandy loam, 2 to 5 percent slopes	1,180	0.2
113	Capay clay loam, 0 to 2 percent slopes, occasionally flooded	1,100	0.2
114	Clear Lake clay, partially drained, 0 to 2 percent slopes, frequently flooded	2,770	0.4
115	Clear Lake clay, hardpan substratum, drained, 0 to 1 percent slopes	16,330	2.6
116	Columbia sandy loam, partially drained, 0 to 2 percent slopes	1,130	0.2
117	Columbia sandy loam, drained, 0 to 2 percent slopes	2,680	0.4
118	Columbia sandy loam, drained, 0 to 2 percent slopes, occasionally flooded	2,770	0.4
119	Columbia sandy loam, clayey substratum, partially drained, 0 to 2 percent slopes	340	0.1
120	Columbia sandy loam, clayey substratum, drained, 0 to 2 percent slopes	3,110	0.5
121	Columbia sandy loam, clayey substratum, drained, 0 to 2 percent slopes, occasionally flooded	4,390	0.7
122	Columbia fine sandy loam, partially drained, 0 to 2 percent slopes	280	*
123	Columbia silt loam, drained, 2 to 5 percent slopes	620	0.1
124	Columbia-Urban land complex, drained, 0 to 2 percent slopes	1,170	0.2
125	Corning complex, 0 to 8 percent slopes	14,990	2.4
126	Corning-Redding complex, 8 to 30 percent slopes	2,880	0.5
127	Cosumnes silt loam, partially drained, 0 to 2 percent slopes	6,000	1.0
128	Cosumnes silt loam, drained, 0 to 2 percent slopes	4,180	0.7
129	Cosumnes silt loam, drained, 0 to 2 percent slopes, occasionally flooded	3,310	0.5
130	Cosumnes-Urban land complex, partially drained, 0 to 2 percent slopes	1,790	0.3
131	Coyotecreek silt loam, 0 to 2 percent slopes, occasionally flooded	1,570	0.2
132	Creviscreek sandy loam, 0 to 3 percent slopes	2,510	0.4
133	Dierssen sandy loam, drained, 0 to 2 percent slopes	530	0.1
134	Dierssen sandy clay loam, drained, 0 to 2 percent slopes	8,000	1.3
135	Dierssen clay loam, deep, drained, 0 to 2 percent slopes	1,960	0.3
136	Dumps	540	0.1
137	Durixeralfs, 0 to 1 percent slopes	2,410	0.4
138	Durixeralfs-Galt complex, 0 to 2 percent slopes	590	0.1
139	Egbert clay, 0 to 2 percent slopes	630	0.1
140	Egbert clay, drained, 2 to 5 percent slopes	440	0.1
141	Egbert clay, partially drained, 0 to 2 percent slopes	15,430	2.5
142	Egbert clay, partially drained, 0 to 2 percent slopes, frequently flooded	630	0.1
143	Egbert-Urban land complex, partially drained, 0 to 2 percent slopes	1,430	0.2
144	Fiddyment fine sandy loam, 0 to 1 percent slopes	950	0.2
145	Fiddyment fine sandy loam, 1 to 8 percent slopes	5,620	0.9
146	Fiddyment loam, 1 to 15 percent slopes	1,480	0.2
147	Fiddyment-Orangevale complex, 2 to 8 percent slopes	490	0.1
148	Fiddyment-Orangevale-Urban land complex, 2 to 8 percent slopes	4,010	0.6
149	Fiddyment-Urban land complex, 1 to 8 percent slopes	4,100	0.7
150	Fluvaquents, 0 to 2 percent slopes, frequently flooded	1,280	0.2
151	Galt clay, leveled, 0 to 1 percent slopes	6,540	1.0
152	Galt clay, 0 to 2 percent slopes	6,430	1.0
153	Galt clay, 2 to 5 percent slopes	670	0.1
154	Galt-Urban land complex, 0 to 2 percent slopes	2,860	0.5
155	Gazwell mucky clay, partially drained, 0 to 2 percent slopes	24,710	3.9
156	Hadselville-Pentz complex, 2 to 30 percent slopes	18,740	3.0
157	Hedge loam, 0 to 2 percent slopes	4,040	0.6
158	Hicksville loam, 0 to 2 percent slopes, occasionally flooded	3,120	0.5
159	Hicksville gravelly loam, 0 to 2 percent slopes, occasionally flooded	1,890	0.3
160	Hicksville sandy clay loam, 0 to 2 percent slopes, occasionally flooded	1,990	0.3
161	Jacktone clay, drained, 0 to 2 percent slopes	2,200	0.3
162	Kaseberg-Fiddyment-Urban land complex, 2 to 15 percent slopes	1,030	0.2

See footnote at end of table.

TABLE 5.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
163	Keyes sandy loam, 2 to 15 percent slopes	1,270	0.2
164	Kimball silt loam, 0 to 2 percent slopes	1,610	0.3
165	Kimball silt loam, 2 to 8 percent slopes	960	0.2
166	Kimball-Urban land complex, 0 to 2 percent slopes	2,550	0.4
167	Lang fine sandy loam, drained, 0 to 2 percent slopes	500	0.1
168	Lang-Urban land complex, drained, 0 to 2 percent slopes	270	*
169	Laugenour loam, partially drained, 0 to 2 percent slopes	1,840	0.3
170	Laugenour-Urban land complex, partially drained, 0 to 2 percent slopes	320	0.1
171	Lithic Xerorthents, 2 to 8 percent slopes	430	0.1
172	Liveoak sandy clay loam, 0 to 2 percent slopes, occasionally flooded	1,600	0.3
173	Liveoak-Urban land complex, 0 to 2 percent slopes	280	*
174	Madera loam, 0 to 2 percent slopes	3,540	0.6
175	Madera loam, 2 to 8 percent slopes	630	0.1
176	Madera-Galt complex, 0 to 2 percent slopes	1,800	0.3
177	Medisaprists, 0 to 2 percent slopes, frequently flooded	1,600	0.3
178	Mokelumne gravelly loam, 2 to 15 percent slopes	2,180	0.3
179	Mokelumne-Pits, mine complex, 15 to 50 percent slopes	380	0.1
180	Mokelumne Variant sandy clay loam, 2 to 8 percent slopes	1,120	0.2
181	Natomas loam, 0 to 2 percent slopes	1,320	0.2
182	Natomas-Xerorthents, dredge tailings complex, 0 to 50 percent slopes	390	0.1
183	Orangevale coarse sandy loam, 2 to 5 percent slopes	1,480	0.2
184	Orangevale-Kaseberg-Urban land complex, 2 to 8 percent slopes	680	0.1
185	Orangevale-Kaseberg-Urban land complex, 8 to 25 percent slopes	1,590	0.3
186	Orthents-Urban land complex, 0 to 2 percent slopes	330	0.1
187	Pardee-Ranchoseco complex, 3 to 15 percent slopes	3,800	0.6
188	Pentz-Lithic Xerorthents complex, 30 to 50 percent slopes	1,660	0.3
189	Peters clay, 1 to 8 percent slopes	950	0.2
190	Pits	1,790	0.3
191	Red Bluff loam, 0 to 2 percent slopes	3,690	0.6
192	Red Bluff loam, 2 to 5 percent slopes	3,420	0.5
193	Red Bluff-Redding complex, 0 to 5 percent slopes	7,160	1.1
194	Red Bluff-Urban land complex, 0 to 5 percent slopes	770	0.1
195	Red Bluff-Xerarents complex, 0 to 2 percent slopes	1,330	0.2
196	Red Bluff-Xerorthents, dredge tailings complex, 2 to 50 percent slopes	1,280	0.2
197	Redding loam, 2 to 8 percent slopes	6,660	1.1
198	Redding gravelly loam, 0 to 8 percent slopes	30,970	4.8
199	Reiff fine sandy loam, 0 to 2 percent slopes, occasionally flooded	1,770	0.3
200	Rindge muck, partially drained, 0 to 2 percent slopes	2,170	0.3
201	Rindge mucky silt loam, partially drained, 0 to 2 percent slopes	9,700	1.5
202	Rindge mucky clay loam, 0 to 2 percent slopes	240	*
203	Riverwash	360	0.1
204	Rossmoor fine sandy loam, 0 to 2 percent slopes	770	0.1
205	Rossmoor-Urban land complex, 0 to 2 percent slopes	3,890	0.6
206	Sailboat silt loam, partially drained, 0 to 2 percent slopes	10,010	1.6
207	Sailboat silt loam, drained, 0 to 2 percent slopes	1,440	0.2
208	Sailboat silt loam, drained, 0 to 2 percent slopes, occasionally flooded	3,350	0.5
209	Sailboat-Urban land complex, partially drained, 0 to 2 percent slopes	770	0.1
210	Sailboat Variant silty clay loam, partially drained, 0 to 2 percent slopes	690	0.1
211	San Joaquin fine sandy loam, 0 to 3 percent slopes	8,730	1.4
212	San Joaquin fine sandy loam, 3 to 8 percent slopes	3,920	0.6
213	San Joaquin silt loam, leveled, 0 to 1 percent slopes	55,920	8.8
214	San Joaquin silt loam, 0 to 3 percent slopes	28,810	4.5
215	San Joaquin silt loam, 3 to 8 percent slopes	8,670	1.4
216	San Joaquin-Durixeralfs complex, 0 to 1 percent slopes	4,010	0.6
217	San Joaquin-Galt complex, leveled, 0 to 1 percent slopes	9,850	1.6
218	San Joaquin-Galt complex, 0 to 3 percent slopes	5,300	0.8
219	San Joaquin-Urban land complex, 0 to 2 percent slopes	14,610	2.3
220	San Joaquin-Urban land complex, 0 to 3 percent slopes	7,300	1.2
221	San Joaquin-Xerarents complex, leveled, 0 to 1 percent slopes	5,140	0.8
222	Scribner clay loam, partially drained, 0 to 2 percent slopes	8,990	1.4
223	Slickens	440	0.1
224	Tehama loam, 0 to 2 percent slopes	1,130	0.2
225	Tinnin loamy sand, 0 to 2 percent slopes	940	0.1

See footnote at end of table.

TABLE 5.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
226	Tinnin-Urban land complex, 2 to 8 percent slopes	360	0.1
227	Urban land	12,180	1.9
228	Urban land-Natomas complex, 0 to 2 percent slopes	2,040	0.3
229	Urban land-Xerarents-Fiddyment complex, 0 to 8 percent slopes	22,010	3.5
230	Valpac loam, partially drained, 0 to 2 percent slopes	4,710	0.7
231	Valpac-Urban land complex, partially drained, 0 to 2 percent slopes	650	0.1
232	Valpac Variant sandy loam, partially drained, 0 to 2 percent slopes	1,120	0.2
233	Vina fine sandy loam, 0 to 2 percent slopes	1,220	0.2
234	Vina fine sandy loam, 0 to 2 percent slopes, occasionally flooded	600	0.1
235	Vleck gravelly loam, 2 to 15 percent slopes	2,380	0.4
236	Vleck-Amador-Pits, mine complex, 15 to 50 percent slopes	1,170	0.2
237	Whiterock loam, 3 to 30 percent slopes	10,190	1.6
238	Xerarents-San Joaquin complex, 0 to 1 percent slopes	3,390	0.5
239	Xerarents-Redding complex, 0 to 2 percent slopes	1,070	0.2
240	Xerarents-Urban land-San Joaquin complex, 0 to 5 percent slopes	8,900	1.4
241	Xerarents-Urban land-Fiddyment complex, 8 to 15 percent slopes	1,740	0.3
242	Xerofluvents, 0 to 2 percent slopes, flooded	1,968	0.3
243	Xerolls, 30 to 70 percent slopes	1,070	0.2
244	Xeropsamments, 1 to 15 percent slopes	980	0.2
245	Xerorthents, dredge tailings, 2 to 50 percent slopes	17,320	2.8
246	Xerorthents, dredge tailings-Urban land complex, 0 to 2 percent slopes	3,030	0.5
	Water areas	6,380	1.0
	Total	629,088	100.0

* Less than 0.1 percent.

TABLE 6.--PRIME FARMLAND

(Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name)

Map symbol	Soil name
111	Bruella sandy loam, 0 to 2 percent slopes (where irrigated)
112	Bruella sandy loam, 2 to 5 percent slopes (where irrigated)
113	Capay clay loam, 0 to 2 percent slopes, occasionally flooded (where irrigated)
114	Clear Lake clay, partially drained, 0 to 2 percent slopes, frequently flooded (where irrigated and either protected from flooding or not frequently flooded during the growing season)
115	Clear Lake clay, hardpan substratum, drained, 0 to 1 percent slopes (where irrigated)
116	Columbia sandy loam, partially drained, 0 to 2 percent slopes (where irrigated)
117	Columbia sandy loam, drained, 0 to 2 percent slopes (where irrigated)
118	Columbia sandy loam, drained, 0 to 2 percent slopes, occasionally flooded (where irrigated)
119	Columbia sandy loam, clayey substratum, partially drained, 0 to 2 percent slopes (where irrigated)
120	Columbia sandy loam, clayey substratum, drained, 0 to 2 percent slopes (where irrigated)
121	Columbia sandy loam, clayey substratum, drained, 0 to 2 percent slopes, occasionally flooded (where irrigated)
122	Columbia fine sandy loam, partially drained, 0 to 2 percent slopes (where irrigated)
123	Columbia silt loam, drained, 2 to 5 percent slopes (where irrigated)
127	Cosumnes silt loam, partially drained, 0 to 2 percent slopes (where irrigated)
128	Cosumnes silt loam, drained, 0 to 2 percent slopes (where irrigated)
129	Cosumnes silt loam, drained, 0 to 2 percent slopes, occasionally flooded (where irrigated)
131	Coyotecreek silt loam, 0 to 2 percent slopes, occasionally flooded (where irrigated)
132	Creviscreek sandy loam, 0 to 3 percent slopes (where irrigated)
135	Dierssen clay loam, deep, drained, 0 to 2 percent slopes (where irrigated)
139	Egbert clay, 0 to 2 percent slopes (where irrigated and drained)
140	Egbert clay, drained, 2 to 5 percent slopes (where irrigated)
141	Egbert clay, partially drained, 0 to 2 percent slopes (where irrigated)
142	Egbert clay, partially drained, 0 to 2 percent slopes, frequently flooded (where irrigated and either protected from flooding or not frequently flooded during the growing season)
155	Gazwell mucky clay, partially drained, 0 to 2 percent slopes (where irrigated)
158	Hicksville loam, 0 to 2 percent slopes, occasionally flooded (where irrigated)
159	Hicksville gravelly loam, 0 to 2 percent slopes, occasionally flooded (where irrigated)
160	Hicksville sandy clay loam, 0 to 2 percent slopes, occasionally flooded (where irrigated)
167	Lang fine sandy loam, drained, 0 to 2 percent slopes (where irrigated)
169	Laugenour loam, partially drained, 0 to 2 percent slopes (where irrigated)
172	Liveoak sandy clay loam, 0 to 2 percent slopes, occasionally flooded (where irrigated)
181	Natomas loam, 0 to 2 percent slopes (where irrigated)
183	Orangevale coarse sandy loam, 2 to 5 percent slopes (where irrigated)
191	Red Bluff loam, 0 to 2 percent slopes (where irrigated)
192	Red Bluff loam, 2 to 5 percent slopes (where irrigated)
199	Reiff fine sandy loam, 0 to 2 percent slopes, occasionally flooded (where irrigated)
200	Rindge muck, partially drained, 0 to 2 percent slopes (where irrigated)
201	Rindge mucky silt loam, partially drained, 0 to 2 percent slopes (where irrigated)
202	Rindge mucky clay loam, 0 to 2 percent slopes (where irrigated and drained)
204	Rossmoor fine sandy loam, 0 to 2 percent slopes (where irrigated)
206	Sailboat silt loam, partially drained, 0 to 2 percent slopes (where irrigated)
207	Sailboat silt loam, drained, 0 to 2 percent slopes (where irrigated)
208	Sailboat silt loam, drained, 0 to 2 percent slopes, occasionally flooded (where irrigated)
210	Sailboat Variant silty clay loam, partially drained, 0 to 2 percent slopes (where irrigated)
222	Scribner clay loam, partially drained, 0 to 2 percent slopes (where irrigated)
224	Tehama loam, 0 to 2 percent slopes (where irrigated)
230	Valpac loam, partially drained, 0 to 2 percent slopes (where irrigated)
232	Valpac Variant sandy loam, partially drained, 0 to 2 percent slopes (where irrigated)
233	Vina fine sandy loam, 0 to 2 percent slopes (where irrigated)
234	Vina fine sandy loam, 0 to 2 percent slopes, occasionally flooded (where irrigated)

TABLE 7.--YIELDS PER ACRE OF CROPS AND PASTURE

(Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil. Only the soils that are used as cropland or pasture are listed)

Soil name and map symbol	Alfalfa hay	Corn	Wheat	Pears	Rice	Pasture	Tomatoes
	Tons	Tons	Tons	Tons	Tons	AUM*	Tons
111----------------------- Bruella	8	4.5	2.5	---	---	12	---
112----------------------- Bruella	8	---	2.5	---	---	12	---
113----------------------- Capay	---	5.0	2.5	---	4.5	12	28
114----------------------- Clear Lake	---	5.0	---	---	---	12	28
115----------------------- Clear Lake	8	5.0	2.5	---	4.5	12	28
116----------------------- Columbia	8	4.5	3.0	19	---	---	28
117, 118------------------ Columbia	8	4.5	3.0	---	---	12	28
119----------------------- Columbia	8	4.5	3.0	---	---	---	28
120, 121------------------ Columbia	8	4.5	3.0	---	---	12	28
122----------------------- Columbia	8	---	3.0	19	---	---	---
123----------------------- Columbia	---	---	---	19	---	---	---
125----------------------- Corning-Corning	---	---	---	---	---	10	---
127----------------------- Cosumnes	---	5.0	3.0	---	4.5	---	28
128----------------------- Cosumnes	9	5.0	3.0	---	4.5	12	28
129----------------------- Cosumnes	9	5.0	3.0	---	---	12	28
131----------------------- Coyotecreek	8	5.0	3.0	---	---	12	28
132----------------------- Creviscreek	---	---	---	---	---	12	---
133, 134, 135------------- Dierssen	3	3.8	2.5	---	3.0	10	18
139----------------------- Egbert	---	4.5	2.5	---	---	12	---

See footnotes at end of table.

TABLE 7.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Alfalfa hay	Corn	Wheat	Pears	Rice	Pasture	Tomatoes
	Tons	Tons	Tons	Tons	Tons	AUM*	Tons
140----------------------- Egbert	---	---	3.0	---	---	---	---
141----------------------- Egbert	5	5.0	3.0	14	---	12	28
142----------------------- Egbert	---	5.0	---	---	---	12	28
144----------------------- Fiddyment	---	---	---	---	---	10	---
145----------------------- Fiddyment	---	---	---	---	---	10	---
151, 152------------------ Galt	---	5.0	2.5	---	4.5	12	18
155----------------------- Gazwell	5	5.0	3.0	14	---	---	28
157----------------------- Hedge	---	---	---	---	---	10	---
158----------------------- Hicksville	---	5.0	3.0	---	---	12	---
161----------------------- Jacktone	---	5.0	2.5	---	4.5	---	---
164----------------------- Kimball	---	3.8	2.5	---	3.8	12	---
165----------------------- Kimball	---	---	---	---	---	12	---
167----------------------- Lang	8	3.6	2.5	---	---	---	25
169----------------------- Laugenour	8	4.5	3.0	19	---	---	28
172----------------------- Liveoak	8	5.0	3.0	---	---	12	---
174----------------------- Madera	6	3.8	2.5	---	3.0	10	---
175----------------------- Madera	---	---	---	---	---	10	---
176----------------------- Madera-Galt	---	---	---	---	4.0	---	---
183----------------------- Orangevale	---	---	---	---	---	12	---
191----------------------- Red Bluff	---	---	---	---	---	12	---

See footnotes at end of table.

TABLE 7.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Alfalfa hay	Corn	Wheat	Pears	Rice	Pasture	Tomatoes
	Tons	Tons	Tons	Tons	Tons	AUM*	Tons
195**: Red Bluff-Xerarents	---	4.5	2.0	---	---	12	---
197, 198: Redding	---	---	---	---	---	10	---
199: Reiff	8	4.5	3.0	---	---	12	28
200, 201: Rindge	---	5.0	3.0	---	---	---	---
202: Rindge	---	4.5	2.5	---	---	---	---
204: Rossmoor	8	---	---	---	---	---	---
206: Sailboat	8	5.0	3.0	19	---	12	28
207, 208: Sailboat	8	5.0	3.0	---	---	12	28
210: Sailboat Variant	5	4.5	3.0	---	---	---	---
211: San Joaquin	---	---	---	---	---	10	---
212: San Joaquin	---	---	---	---	---	10	---
213, 214: San Joaquin	3	3.8	2.5	---	3.0	10	18
215: San Joaquin	---	---	---	---	---	10	---
216**: San Joaquin-Durixeralfs	2	3.8	2.5	---	3.0	10	15
217: San Joaquin-Galt	3	3.8	2.5	---	3.0	10	18
221**: San Joaquin-Xerarents	4	4.0	2.5	---	3.0	10	20
222: Scribner	8	5.0	3.0	17	---	12	28
224: Tehama	---	---	---	---	---	10	---
225: Tinnin	8	3.6	2.5	17	---	---	25
230: Valpac	8	5.0	3.0	19	---	12	28

See footnotes at end of table.

TABLE 7.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Alfalfa hay	Corn	Wheat	Pears	Rice	Pasture	Tomatoes
	Tons	Tons	Tons	Tons	Tons	AUM*	Tons
232----------------------- Valpac Variant	---	5.0	3.0	---	---	---	28
233----------------------- Vina	8	5.0	3.0	---	---	12	28
234----------------------- Vina	8	5.0	3.0	---	---	12	---
238**--------------------- Xerarents-San Joaquin	4	4.0	2.5	---	3.0	10	24
239----------------------- Xerarents-Redding	---	---	---	---	---	10	---

* Animal unit month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--LAND CAPABILITY

(N is for nonirrigated; I is for irrigated)

Soil name and map symbol	Land capability	
	N	I
101----------------------- Amador-Gillender	VIs	---
102*---------------------- Americanos-Urban land	---	---
103----------------------- Andregg	IIIe	IIIe
104----------------------- Andregg	IVe	IVe
105*---------------------- Andregg-Urban land	---	---
106*---------------------- Andregg-Urban land	---	---
107----------------------- Argonaut-Auburn	IVe	---
108*---------------------- Argonaut-Auburn-Urban land	---	---
109----------------------- Auburn	VIe	---
110*---------------------- Auburn-Argonaut-Rock outcrop	VIe	---
111----------------------- Bruella	IIIc	I
112----------------------- Bruella	IIIe	IIe
113----------------------- Capay	IIIw	IIw
114----------------------- Clear Lake	IVw	IVw
115----------------------- Clear Lake	IIIs	IIs
116----------------------- Columbia	IIIw	IIw
117----------------------- Columbia	IIIs	IIs
118, 119------------------ Columbia	IIIw	IIw
120----------------------- Columbia	IIIs	IIs

See footnote at end of table.

TABLE 8.--LAND CAPABILITY--Continued

Soil name and map symbol	Land capability	
	N	I
121, 122: Columbia	IIIw	IIw
123: Columbia	IIIe	IIe
124*: Columbia-Urban land	---	---
125: Corning-Corning	IIIe	IIe
126: Corning-Redding	VIe	---
127: Cosumnes	IIIw	IIw
128: Cosumnes	IIIs	IIs
129: Cosumnes	IIIw	IIw
130*: Cosumnes-Urban land	---	---
131: Coyotecreek	IIIw	IIw
132: Creviscreek	IIIs	IIs
133, 134, 135: Dierssen	IIIw	IIIw
136*. Dumps		
137: Durixeralfs	IVs	IVs
138: Durixeralfs-Galt	IVs	---
139: Egbert	IVw	IVw
140: Egbert	IIIe	IIe
141: Egbert	IIIw	IIw
142: Egbert	IVw	IVw
143*: Egbert-Urban land	---	---

See footnote at end of table.

TABLE 8.--LAND CAPABILITY--Continued

Soil name and map symbol	Land capability	
	N	I
144----------------------- Fiddyment	IIIs	IIIs
145----------------------- Fiddyment	IVe	IVe
146----------------------- Fiddyment	IVe	---
147----------------------- Fiddyment-Orangevale	IVe	IVe
148*---------------------- Fiddyment-Orangevale-Urban land	---	---
149*---------------------- Fiddyment-Urban land	---	---
150----------------------- Fluvaquents	VIIw	---
151, 152------------------ Galt	IIIs	IIIs
153----------------------- Galt	IIIe	---
154*---------------------- Galt-Urban land	---	---
155----------------------- Gazwell	IIIw	IIIw
156----------------------- Hadselville-Pentz	VIs	---
157----------------------- Hedge	IIIs	IIIs
158, 159------------------ Hicksville	IIIw	IIw
160----------------------- Hicksville	IIIw	IIw
161----------------------- Jacktone	IIIs	IIIs
162*---------------------- Kaseberg-Fiddyment-Urban land	---	---
163----------------------- Keyes	VIe	---
164----------------------- Kimball	IIIs	IIIs
165----------------------- Kimball	IIIe	IIIe

See footnote at end of table.

TABLE 8.--LAND CAPABILITY--Continued

Soil name and map symbol	Land capability	
	N	I
166*: Kimball-Urban land	---	---
167: Lang	IIIw	IIw
168*: Lang-Urban land	---	---
169: Laugenour	IIIw	IIw
170*: Laugenour-Urban land	---	---
171: Lithic Xerorthents	VIIs	---
172: Liveoak	IIIw	IIw
173*: Liveoak-Urban land	---	---
174: Madera	IVs	IVs
175: Madera	IVe	IVe
176: Madera-Galt	IVs	---
177: Medisaprists	VIIw	---
178: Mokelumne	IVe	---
179*: Mokelumne-Pits	VIIe	---
180: Mokelumne Variant	IIIe	---
181: Natomas	IIIc	I
182*: Natomas-Xerorthents	VIIs	---
183: Orangevale	IIIe	IIe
184*: Orangevale-Kaseberg-Urban land	---	---
185*: Orangevale-Kaseberg-Urban land	---	---

See footnote at end of table.

TABLE 8.--LAND CAPABILITY--Continued

Soil name and map symbol	Land capability	
	N	I
186*: Orthents-Urban land	---	---
187: Pardee-Ranchoseco	VIs	---
188*: Pentz-Lithic Xerorthents	VIIe	---
189: Peters	IVe	---
190*. Pits		
191: Red Bluff	IIIs	IIs
192: Red Bluff	IIIe	---
193: Red Bluff-Redding	IVe	---
194*: Red Bluff-Urban land	---	---
195*: Red Bluff-Xerarents	IIIs	IIs
196*: Red Bluff-Xerorthents	VIIs	---
197: Redding	IIIe	IIIe
198: Redding	IVe	IVe
199: Reiff	IIIw	IIw
200, 201: Rindge	IIIw	IIIw
202: Rindge	IVw	IVw
203*: Riverwash	VIIIw	---
204: Rossmoor	IIIc	I
205*: Rossmoor-Urban land	---	---
206: Sailboat	IIIw	IIw

See footnote at end of table.

TABLE 8.--LAND CAPABILITY--Continued

Soil name and map symbol	Land capability	
	N	I
207----------------------- Sailboat	IIIc	I
208----------------------- Sailboat	IIIw	IIw
209*---------------------- Sailboat-Urban land	---	---
210----------------------- Sailboat Variant	IIIw	IIIw
211----------------------- San Joaquin	IIIs	IIIs
212----------------------- San Joaquin	IIIe	IIIe
213, 214------------------ San Joaquin	IIIs	IIIs
215----------------------- San Joaquin	IIIe	IIIe
216*---------------------- San Joaquin-Durixeralfs	IVs	IVs
217----------------------- San Joaquin-Galt	IIIs	IIIs
218----------------------- San Joaquin-Galt	IIIs	---
219*---------------------- San Joaquin-Urban land	---	---
220*---------------------- San Joaquin-Urban land	---	---
221*---------------------- San Joaquin-Xerarents	IIIs	IIIs
222----------------------- Scribner	IIIw	IIw
223* Slickens		
224----------------------- Tehama	IIIs	IIs
225----------------------- Tinnin	IVe	IIIs
226*---------------------- Tinnin-Urban land	---	---
227*. Urban land		

See footnote at end of table.

TABLE 8.--LAND CAPABILITY--Continued

Soil name and map symbol	Land capability	
	N	I
228----------------------- Urban land-Natomas	---	---
229*---------------------- Urban land-Xerarents	---	---
230----------------------- Valpac	IIIw	IIw
231*---------------------- Valpac-Urban land	---	---
232----------------------- Valpac Variant	IIIw	IIIw
233----------------------- Vina	IIIc	I
234----------------------- Vina	IIIw	IIw
235----------------------- Vleck	IVe	---
236*---------------------- Vleck-Amador-Pits	VIIe	---
237----------------------- Whiterock	VIIs	---
238----------------------- Xerarents-San Joaquin	IIIs	IIIs
239----------------------- Xerarents-Redding	IIIs	IIIs
240*---------------------- Xerarents-Urban land- San Joaquin	---	---
241*---------------------- Xerarents-Urban land- Fiddyment	---	---
242----------------------- Xerofluvents	VIw	---
243----------------------- Xerolls	VIIe	---
244----------------------- Xeropsamments	VIe	IVs
245----------------------- Xerorthents	VIIIs	---
246*---------------------- Xerorthents-Urban land	---	---

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--STORIE INDEX RATING

(Absence of an entry indicates that the soil was not rated)

Map symbol	Map unit	Rating factors A	B	C	X	Index	Grade	Limitation in X factor
101	Amador-Gillender complex, 2 to 15 percent slopes					28*	4	
	Amador part	50	100	85	90x90	---	---	Fertility, microrelief.
	Gillender part	30	100	85	90x95	---	---	Fertility, microrelief.
102	Americanos-Urban land complex, 0 to 2 percent slopes					<10**	6	
	Americanos part	90	100	100	100	---	---	None.
	Urban land part.							
103	Andregg coarse sandy loam, 2 to 8 percent slopes	65	75	90	90	39	4	Fertility.
104	Andregg coarse sandy loam, 8 to 15 percent slopes	65	75	85	90	37	4	Fertility.
105	Andregg-Urban land complex, 2 to 8 percent slopes					<10**	6	
	Andregg part	65	75	90	90	---	---	Fertility.
	Urban land part.							
106	Andregg-Urban land complex, 8 to 15 percent slopes					<10**	6	
	Andregg part	65	75	85	90	---	---	Fertility.
	Urban land part.							
107	Argonaut-Auburn complex, 3 to 8 percent slopes					28*	4	
	Argonaut part	27	100	90	100	---	---	None.
	Auburn part	40	100	90	95	---	---	Fertility.
108	Argonaut-Auburn-Urban land complex, 3 to 8 percent slopes					<10**	6	
	Argonaut part	27	100	90	100	---	---	None.
	Auburn part	35	100	90	95	---	---	Fertility.
	Urban land part.							
109	Auburn silt loam, 2 to 30 percent slopes	40	100	75	95	28	4	Fertility.
110	Auburn-Argonaut-Rock outcrop complex, 8 to 30 percent slopes					21*		
	Auburn part	40	100	70	95	---	---	Fertility.
	Argonaut part	27	100	70	100	---	---	None.
	Rock outcrop part.							
111	Bruella sandy loam, 0 to 2 percent slopes	80	95	100	90	68	2	Fertility.
112	Bruella sandy loam, 2 to 5 percent slopes	80	95	95	90	65	2	Fertility.
113	Capay clay loam, 0 to 2 percent slopes, occasionally flooded	85	85	100	90x80	52	3	Drainage, occasional flooding.
114	Clear Lake clay, partially drained, 0 to 2 percent slopes, frequently flooded	85	55	100	80x60	22	4	Drainage, frequent flooding.
115	Clear Lake clay, hardpan substratum, drained, 0 to 1 percent slopes	50	55	100	90	25	4	Drainage.

See footnotes at end of table.

TABLE 9.--STORIE INDEX RATING--Continued

Map symbol	Map unit	Rating factors A	B	C	X	Index	Grade	Limitation in X factor
116	Columbia sandy loam, partially drained, 0 to 2 percent slopes	95	95	100	80	72	2	Drainage.
117	Columbia sandy loam, drained, 0 to 2 percent slopes	95	95	100	95	86	1	Rare flooding.
118	Columbia sandy loam, drained, 0 to 2 percent slopes, occasionally flooded	95	95	100	80	72	2	Occasional flooding.
119	Columbia sandy loam, clayey substratum, partially drained, 0 to 2 percent slopes	85	85	100	80	65	2	Drainage.
120	Columbia sandy loam, clayey substratum, drained, 0 to 2 percent slopes	85	95	100	95	77	2	Rare flooding.
121	Columbia sandy loam, clayey substratum, drained, 0 to 2 percent slopes, occasionally flooded	85	95	100	80	65	2	Occasional flooding.
122	Columbia fine sandy loam, partially drained, 0 to 2 percent slopes	100	100	100	90x95	85	1	Drainage, rare flooding.
123	Columbia silt loam, drained, 2 to 5 percent slopes	100	100	95	90x95	81	1	Drainage, rare flooding.
124	Columbia-Urban land complex, drained, 0 to 2 percent slopes					<10**	6	
	Columbia part	85	95	100	90x95	---	---	Drainage, rare flooding.
	Urban land part.							
125	Corning complex, 0 to 8 percent slopes	60	70	90	95	36	4	Drainage.
126	Corning-Redding complex, 8 to 30 percent slopes					22*	4	
	Corning part	63	70	70	90	---	---	Fertility.
	Redding part	22	70	85	90	---	---	Fertility.
127	Cosumnes silt loam, partially drained, 0 to 2 percent slopes	85	100	100	80	68	2	Drainage.
128	Cosumnes silt loam, drained, 0 to 2 percent slopes	85	100	100	95	81	1	Rare flooding.
129	Cosumnes silt loam, drained, 0 to 2 percent slopes, occasionally flooded	85	100	100	80	68	2	Occasional flooding.
130	Cosumnes-Urban land complex, partially drained, 0 to 2 percent slopes					<10**	6	
	Cosumnes part	85	100	100	85	---	---	Drainage.
	Urban land part.							
131	Coyotecreek silt loam, 0 to 2 percent slopes, occasionally flooded	100	100	100	80	80	1	Occasional flooding.
132	Creviscreek sandy loam, 0 to 3 percent slopes	85	95	95	95x90	66	2	Fertility, drainage.
133	Dierssen sandy loam, drained, 0 to 2 percent slopes	30	95	100	80x95	22	4	Fertility, drainage.

See footnotes at end of table.

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TABLE 9.--STORIE INDEX RATING--Continued

Map symbol	Map unit	Rating factors A	B	C	X	Index	Grade	Limitation in X factor
134	Dierssen sandy clay loam, drained, 0 to 2 percent slopes	30	80	100	80x95	18	5	Fertility, drainage.
135	Dierssen clay loam, deep, drained, 0 to 2 percent slopes	40	85	100	80	27	4	Drainage.
136	Dumps.							
137	Durixeralfs, 0 to 1 percent slopes	25	50	100	95	12	5	Fertility.
138	Durixeralfs-Galt complex, 0 to 2 percent slopes					12*	5	
	Durixeralfs part	25	50	95	95	---	---	Fertility.
	Galt part	30	55	100	90	---	---	Drainage.
139	Egbert clay, 0 to 2 percent slopes	95	55	100	40x95	20	4	Drainage, rare flooding.
140	Egbert clay, drained, 2 to 5 percent slopes	95	55	95	90	45	3	Drainage.
141	Egbert clay, partially drained, 0 to 2 percent slopes	100	55	100	60x95	31	4	Drainage, rare flooding.
142	Egbert clay, partially drained, 0 to 2 percent slopes, frequently flooded	100	55	100	60x60	20	4	Drainage, frequent flooding.
143	Egbert-Urban land complex, partially drained, 0 to 2 percent slopes					<10**	6	
	Egbert part	100	55	100	60x95	---	---	Drainage, rare flooding.
	Urban land part.							
144	Fiddyment fine sandy loam, 0 to 1 percent slopes	28	100	100	100	28	4	None.
145	Fiddyment fine sandy loam, 1 to 8 percent slopes	28	100	90	100	25	4	None.
146	Fiddyment loam, 0 to 15 percent slopes	28	100	85	100	24	4	None.
147	Fiddyment-Orangevale complex, 2 to 8 percent slopes					36*	4	
	Fiddyment part	28	100	90	100	---	---	None.
	Orangevale part	85	80	90	90	---	---	Fertility.
148	Fiddyment-Orangevale-Urban land complex, 2 to 8 percent slopes					<10**	6	
	Fiddyment part	28	100	90	100	---	---	None.
	Orangevale part	85	80	90	90	---	---	Fertility.
	Urban land part.							
149	Fiddyment-Urban land complex, 1 to 8 percent slopes					<10**	6	
	Fiddyment part	28	100	90	100	---	---	None.
	Urban land part.							
150	Fluvaquents, 0 to 2 percent slopes, frequently flooded	100	90	100	15x60x90	7	6	Drainage, salinity, microrelief.

See footnotes at end of table.

TABLE 9.--STORIE INDEX RATING--Continued

Map symbol	Map unit	Rating factors A	B	C	X	Index	Grade	Limitation in X factor
151	Galt clay, leveled, 0 to 1 percent slopes	30	55	100	90	15	5	Drainage.
152	Galt clay, 0 to 2 percent slopes	30	55	98	85	14	5	Drainage.
153	Galt clay, 2 to 5 percent slopes	30	55	93	95	15	5	Drainage.
154	Galt-Urban land complex, 0 to 2 percent slopes					<10**	6	
	Galt part	30	55	100	90	---	---	Drainage.
	Urban land part.							
155	Gazwell mucky clay, partially drained, 0 to 2 percent slopes	95	80	100	60x95	43	3	Drainage, rare flooding.
156	Hadselville-Pentz complex, 2 to 30 percent slopes					24*	4	
	Hadselville part	30	95	75	95	---	---	Fertility.
	Pentz part	45	100	75	95x90	---	---	Fertility, microrelief.
157	Hedge loam, 0 to 2 percent slopes	35	100	100	95x90	30	4	Fertility, microrelief.
158	Hicksville loam, 0 to 2 percent slopes, occasionally flooded	85	100	100	90x80	61	2	Drainage, occasional flooding.
159	Hicksville gravelly loam, 0 to 2 percent slopes, occasionally flooded	85	80	100	90x80	49	3	Drainage, occasional flooding.
160	Hicksville sandy clay loam, 0 to 2 percent slopes, occasionally flooded	85	80	100	85x80	46	3	Drainage, occasional flooding.
161	Jacktone clay, drained, 0 to 2 percent slopes	35	60	100	95	20	4	Rare flooding.
162	Kaseberg-Fiddyment-Urban land complex, 2 to 15 percent slopes					<10**	6	
	Kaseberg part	25	100	85	100	---	---	None.
	Fiddyment part	28	100	85	100	---	---	None.
	Urban land part.							
163	Keyes sandy loam, 2 to 15 percent slopes	15	95	85	95x95	11	5	Fertility, microrelief.
164	Kimball silt loam, 0 to 2 percent slopes	55	100	100	100	55	3	None.
165	Kimball silt loam, 2 to 8 percent slopes	55	100	90	100	49	3	None.
166	Kimball-Urban land complex, 0 to 2 percent slopes					<10**	6	
	Kimball part	55	100	100	100	---	---	None.
	Urban land part.							
167	Lang fine sandy loam, drained, 0 to 2 percent slopes	80	100	97	90x95	66	2	Drainage, rare flooding.

See footnotes at end of table.

TABLE 9.--STORIE INDEX RATING--Continued

Map symbol	Map unit	Rating factors A	B	C	X	Index	Grade	Limitation in X factor
168	Lang-Urban land complex, drained, 0 to 2 percent slopes					<10**	6	
	Lang part	80	100	97	90x95	---	---	Drainage, rare flooding.
	Urban land part.							
169	Laugenour loam, partially drained, 0 to 2 percent slopes	100	100	100	60x95	57	3	Drainage, rare flooding.
170	Laugenour-Urban land complex, partially drained, 0 to 2 percent slopes					<10**	6	
	Laugenour part	100	100	100	60x95	---	---	Drainage, rare flooding
	Urban land part.							
171	Lithic Xerorthents, 2 to 8 percent slopes	10	90	90	100	8	6	None.
172	Liveoak sandy clay loam, 0 to 2 percent slopes, occasionally flooded	100	80	100	80	64	2	Occasional flooding.
173	Liveoak-Urban land complex, 0 to 2 percent slopes					<10**	6	
	Liveoak part	100	80	100	95	---	---	Rare flooding.
	Urban land part.							
174	Madera loam, 0 to 2 percent slopes	20	100	100	100	20	4	None.
175	Madera loam, 2 to 8 percent slopes	20	100	90	100	18	5	None.
176	Madera-Galt complex, 0 to 2 percent slopes					18*	5	
	Madera part	20	100	100	100	---	---	None.
	Galt part	30	55	98	85	---	---	Drainage.
177	Medisaprists, 0 to 2 percent slopes, frequently flooded	100	85	100	25x20	4	6	Drainage, frequent flooding.
178	Mokelumne gravelly loam, 2 to 15 percent slopes	30	60	85	80	12	5	Fertility.
179	Mokelumne-Pits, mine complex, 15 to 50 percent slopes					5*	6	
	Mokelumne part	30	60	40	80	---	---	Fertility.
	Pits, mine part.							
180	Mokelumne Variant sandy clay loam, 2 to 8 percent slopes	80	80	90	85	49	3	Fertility.
181	Natomas loam, 0 to 2 percent slopes	85	100	100	95	81	1	Fertility.
182	Natomas-Xerorthents, dredge tailings complex, 0 to 50 percent slopes					18*	5	
	Natomas part	85	100	35	95	---	---	Fertility.
	Xerorthents, dredge tailings part	50	40	35	80	---	---	Microrelief.
183	Orangevale coarse sandy loam, 2 to 5 percent slopes	85	80	95	90	58	3	Fertility.

See footnotes at end of table.

TABLE 9.--STORIE INDEX RATING--Continued

Map symbol	Map unit	Rating factors A	B	C	X	Index	Grade	Limitation in X factor
184	Orangevale-Kaseberg-Urban land complex, 2 to 8 percent slopes					<10**	6	
	Orangevale part	85	80	90	100	---	---	Fertility.
	Kaseberg part	25	100	90	100	---	---	None.
	Urban land part.							
185	Orangevale-Kaseberg-Urban land complex, 8 to 25 percent slopes					<10**	6	
	Orangevale part	85	80	80	90	---	---	Fertility.
	Kaseberg part	25	100	80	100	---	---	None.
	Urban land part.							
186	Orthents-Urban land complex, 0 to 2 percent slopes					<10**	6	
	Orthents part	90	100	100	70x95	---	---	Drainage, rare flooding.
	Urban land part.							
187	Pardee-Ranchoseco complex, 3 to 15 percent slopes					14*	5	
	Pardee part	35	80	85	90x90	---	---	Fertility, microrelief.
	Ranchoseco part	20	60	85	90x90	---	---	Fertility, microrelief.
188	Pentz-Lithic Xerorthents complex, 30 to 50 percent slopes					11*	5	
	Pentz part	45	100	30	95	---	---	Fertility.
	Lithic Xerorthents part	20	95	30	95	---	---	Fertility.
189	Peters clay, 1 to 8 percent slopes	50	60	90	95	26	4	Drainage.
190	Pits.							
191	Red Bluff loam, 0 to 2 percent slopes	60	100	100	90	54	3	Fertility.
192	Red Bluff loam, 2 to 5 percent slopes	60	100	95	90	51	3	Fertility.
193	Red Bluff-Redding complex, 0 to 5 percent slopes					34*	4	
	Red Bluff part	60	100	95	90	---	---	Fertility.
	Redding part	20	80	95	90	---	---	Fertility.
194	Red Bluff-Urban land complex, 0 to 5 percent slopes					<10**	6	
	Red Bluff part	60	100	95	90	---	---	Fertility.
	Urban land part.							
195	Red Bluff-Xerarents complex, 0 to 2 percent slopes					48*	3	
	Red Bluff part	60	100	100	90	---	---	Fertility.
	Xerarents part	45	100	100	90	---	---	Fertility.
196	Red Bluff-Xerorthents, dredge tailings complex, 2 to 50 percent slopes					13*	5	
	Red Bluff part	60	100	35	90	---	---	Fertility.
	Xerorthents, dredge tailings part	50	40	35	80	---	---	Microrelief.
197	Redding loam, 2 to 8 percent slopes	25	100	90	90	20	4	Fertility.
198	Redding gravelly loam, 0 to 8 percent slopes	25	80	90	90	16	5	Fertility.

See footnotes at end of table.

TABLE 9.--STORIE INDEX RATING--Continued

Map symbol	Map unit	Rating factors A	B	C	X	Index	Grade	Limitation in X factor
199	Reiff fine sandy loam, 0 to 2 percent slopes, occasionally flooded	95	100	100	80	76	2	Occasional flooding.
200	Rindge muck, partially drained, 0 to 2 percent slopes	100	100	100	60x95	57	3	Drainage, rare flooding.
201	Rindge mucky silt loam, partially drained, 0 to 2 percent slopes	100	100	100	60x95	57	3	Drainage, rare flooding.
202	Rindge mucky clay loam, 0 to 2 percent slopes	100	90	100	40x95x90	31	4	Drainage, rare flooding, salinity.
203	Riverwash	80	30	100	20x60	3	6	Frequent flooding, microrelief.
204	Rossmoor fine sandy loam, 0 to 2 percent slopes	100	100	100	95	95	1	Rare flooding.
205	Rossmoor-Urban land complex, 0 to 2 percent slopes					<10**	6	
	Rossmoor part	100	100	100	95	---	---	Rare flooding.
	Urban land part.							
206	Sailboat silt loam, partially drained, 0 to 2 percent slopes	100	100	100	60x95	57	3	Drainage, rare flooding.
207	Sailboat silt loam, drained, 0 to 2 percent slopes	100	100	100	80x95	76	2	Drainage, rare flooding.
208	Sailboat silt loam, drained, 0 to 2 percent slopes, occasionally flooded	100	100	100	80x80	64	2	Drainage, occasional flooding.
209	Sailboat-Urban land complex, partially drained, 0 to 2 percent slopes					<10**	6	
	Sailboat part	100	100	100	60x95	---	---	Drainage, rare flooding.
	Urban land part.							
210	Sailboat Variant silty clay loam, partially drained, 0 to 2 percent slopes	100	90	100	60x95	51	3	Drainage, rare flooding.
211	San Joaquin fine sandy loam, 0 to 3 percent slopes	30	100	97	95	28	4	Fertility.
212	San Joaquin fine sandy loam, 3 to 8 percent slopes	30	100	90	95	26	4	Fertility.
213	San Joaquin silt loam, leveled, 0 to 1 percent slopes	30	100	100	95	28	4	Fertility.
214	San Joaquin silt loam, 0 to 3 percent slopes	30	100	97	95	28	4	Fertility.
215	San Joaquin silt loam, 3 to 8 percent slopes	30	100	90	95	26	4	Fertility.

See footnotes at end of table.

TABLE 9.--STORIE INDEX RATING--Continued

Map symbol	Map unit	Rating factors A	B	C	X	Index	Grade	Limitation in X factor
216	San Joaquin-Durixeralfs complex, 0 to 1 percent slopes					21*	4	
	San Joaquin part	30	100	100	95	---	---	Fertility.
	Durixeralfs part	25	50	100	95	---	---	Fertility.
217	San Joaquin-Galt complex, leveled, 0 to 1 percent slopes					23*	4	
	San Joaquin part	20	100	100	95	---	---	Fertility.
	Galt part	30	100	100	95	---	---	Fertility.
218	San Joaquin-Galt complex, 0 to 3 percent slopes					22*	4	
	San Joaquin part	30	100	97	95	---	---	Fertility.
	Galt part	30	55	97	95	---	---	Drainage.
219	San Joaquin-Urban land complex, 0 to 2 percent slopes					<10**	6	
	San Joaquin part	30	100	100	95	---	---	Fertility.
	Urban land part.							
220	San Joaquin-Urban land complex, 0 to 3 percent slopes					<10**	6	
	San Joaquin part	30	100	100	95	---	---	Fertility.
	Urban land part.							
221	San Joaquin-Xerarents complex, leveled, 0 to 1 percent slopes					31*	4	
	San Joaquin part	30	100	100	95	---	---	Fertility.
	Xerarents part	40	90	100	95	---	---	Fertility.
222	Scribner clay loam, partially drained, 0 to 2 percent slopes	100	85	100	60x95	48	3	Drainage, rare flooding.
223	Slickens	80	80	100	90x30	17	5	Fertility, ponding.
224	Tehama loam, 0 to 2 percent slopes	85	100	100	95	81	1	Fertility.
225	Tinnin loamy sand, 0 to 2 percent slopes	95	80	97	95x95	66	2	Fertility, rare flooding.
226	Tinnin-Urban land complex, 2 to 8 percent slopes					<10**	6	
	Tinnin part	95	80	90	95	---	---	Fertility.
	Urban land part.							
227	Urban land.							
228	Urban land-Natomas complex, 0 to 2 percent slopes					<10**	6	
	Urban land part.							
	Natomas part	85	100	100	95	---	---	Fertility.
229	Urban land-Xerarents-Fiddyment complex, 0 to 8 percent slopes					<10**	6	
	Urban land part.							
	Xerarents part	45	100	90	90	---	---	Fertility.
	Fiddyment part	28	100	90	100	---	---	None.
230	Valpac loam, partially drained, 0 to 2 percent slopes	100	100	100	60x95	57	3	Drainage, rare flooding.

See footnotes at end of table.

TABLE 9.--STORIE INDEX RATING--Continued

Map symbol	Map unit	Rating factors A	B	C	X	Index	Grade	Limitation in X factor
231	Valpac-Urban land complex, partially drained, 0 to 2 percent slopes					<10**	6	
	Valpac part	100	100	100	60x95	---	---	Drainage, rare flooding.
	Urban land part.							
232	Valpac Variant sandy loam, partially drained, 0 to 2 percent slopes	90	95	100	40x95	32	4	Drainage, rare flooding.
233	Vina fine sandy loam, 0 to 2 percent slopes	100	100	100	95	95	1	Rare flooding.
234	Vina fine sandy loam, 0 to 2 percent slopes, occasionally flooded	100	100	100	80	80	1	Occasional flooding.
235	Vleck gravelly loam, 2 to 15 percent slopes	20	80	85	90	12	5	Fertility.
236	Vleck-Amador-Pits, mine complex, 15 to 50 percent slopes					8*	6	
	Vleck part	20	100	40	90	---	---	Fertility.
	Amador part	50	95	40	90	---	---	Fertility.
	Pits, mine part.							
237	Whiterock loam, 3 to 30 percent slopes	25	100	75	95	18	5	Fertility.
238	Xerarents-San Joaquin complex, 0 to 1 percent slopes					36*	4	
	Xerarents part	45	90	100	95	---	---	Fertility.
	San Joaquin part	30	100	100	95	---	---	Fertility.
239	Xerarents-Redding complex, 0 to 2 percent slopes					25*	4	
	Xerarents part	45	70	100	90	---	---	Fertility.
	Redding part	25	100	100	90	---	---	Fertility.
240	Xerarents-Urban land-San Joaquin complex, 0 to 5 percent slopes					<10**	6	
	Xerarents part	45	90	95	95	---	---	Fertility.
	Urban land part.							
	San Joaquin part	30	100	100	95	---	---	Fertility.
241	Xerarents-Urban land-Fiddyment complex, 8 to 15 percent slopes					<10**	6	
	Xerarents part	45	100	80	95	---	---	Fertility.
	Urban land part.							
	Fiddyment part	28	100	85	100	---	---	None.
242	Xerofluvents, 0 to 2 percent slopes, flooded	90	60	100	20x60	6	6	Frequent flooding, microrelief.
243	Xerolls, 30 to 70 percent slopes	85	80	20	100	14	5	None.
244	Xeropsamments, 1 to 15 percent slopes	85	60	85	95x95	39	4	Fertility, rare flooding.
245	Xerorthents, dredge tailings, 2 to 50 percent slopes	50	40	35	95x80	5	6	Fertility, microrelief.

See footnotes at end of table.

TABLE 9.--STORIE INDEX RATING--Continued

Map symbol	Map unit	Rating factors A	B	C	X	Index	Grade	Limitation in X factor
246	Xerorthents, dredge tailings-Urban land complex, 0 to 2 percent slopes------------					<10**	6	
	Xerorthents, dredge tailings part--------	50	40	100	95	---	---	Fertility.
	Urban land part.							

* Value is a weighted average of the component part ratings.
** Rated nonagricultural because of urban land use.

TABLE 10.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES

(Only the soils that support rangeland vegetation suitable for grazing are listed)

Soil name and map symbol	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
101*:					
Amador	Shallow Loamy (18d)	Favorable	3,000	Soft chess	40
		Normal	1,800	Ripgut brome	15
		Unfavorable	700	Foxtail fescue	10
				Filaree	5
				Wild oat	5
Gillender	Very Shallow Loamy Intermound (18d)	Favorable	1,600	Mouse barley	10
		Normal	700	Annual hairgrass	10
		Unfavorable	200	Soft chess	10
				Annual ryegrass	5
				Toad rush	5
				Beethistle eryngo	5
107*:					
Argonaut	Loamy (18d)	Favorable	3,400	Soft chess	25
		Normal	2,400	Annual ryegrass	20
		Unfavorable	1,000	Wild oat	10
				Filaree	10
				Ripgut brome	5
				Foxtail fescue	5
				Mouse barley	5
				Clover	5
				Burclover	5
Auburn	Shallow Loamy (18d)	Favorable	3,200	Soft chess	30
		Normal	2,000	Wild oat	15
		Unfavorable	1,000	Ripgut brome	5
				Red brome	5
				Foxtail fescue	5
				Mouse barley	5
				Burclover	5
				Clover	5
				Filaree	5
109 Auburn	Shallow Loamy (18d)	Favorable	3,200	Soft chess	30
		Normal	2,000	Wild oat	15
		Unfavorable	1,000	Ripgut brome	5
				Red brome	5
				Foxtail fescue	5
				Mouse barley	5
				Burclover	5
				Clover	5
				Filaree	5
110*:					
Auburn	Shallow Loamy (18d)	Favorable	3,200	Soft chess	30
		Normal	2,000	Wild oat	15
		Unfavorable	1,000	Ripgut brome	5
				Red brome	5
				Foxtail fescue	5
				Mouse barley	5
				Burclover	5
				Clover	5
				Filaree	5

See footnotes at end of table.

TABLE 10.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
110*:					
Argonaut	Loamy (18d)	Favorable	3,400	Soft chess	25
		Normal	2,400	Annual ryegrass	20
		Unfavorable	1,000	Wild oat	10
				Filaree	10
				Ripgut brome	5
				Foxtail fescue	5
				Mouse barley	5
				Clover	5
				Burclover	5
Rock outcrop.					
125*:					
Corning, well drained	Gravelly Loamy (17d)	Favorable	3,200	Soft chess	25
		Normal	2,500	Wild oat	10
		Unfavorable	1,000	Ripgut brome	10
				Foxtail fescue	10
				Filaree	10
				Mouse barley	5
				Red brome	5
				Clover	5
				Annual lupine	5
Corning, moderately well drained	Gravelly Loamy Intermound (17d).	Favorable	1,600	Soft chess	25
		Normal	1,100	Ripgut brome	10
		Unfavorable	500	Foxtail fescue	10
				Filaree	10
				Toad rush	10
				Mouse barley	5
				Clover	5
				Beethistle eryngo	5
126*:					
Corning	Gravelly Loamy (17d)	Favorable	3,200	Soft chess	25
		Normal	2,500	Wild oat	10
		Unfavorable	1,000	Ripgut brome	10
				Foxtail fescue	10
				Filaree	10
				Mouse barley	5
				Red brome	5
				Clover	5
				Annual lupine	5
Redding	Gravelly Loamy (17d)	Favorable	3,000	Soft chess	35
		Normal	2,400	Foxtail fescue	15
		Unfavorable	1,000	Filaree	15
				Mouse barley	10
				Wild oat	5
				Ripgut brome	5
				Clover	5
132 Creviscreek	Loamy Stream Terrace (17d)	Favorable	4,000	Soft chess	30
		Normal	2,800	Wild oat	10
		Unfavorable	1,200	Foxtail fescue	10
				Ripgut brome	10
				Filaree	10
				Clover	5
				Mouse barley	5

See footnotes at end of table.

TABLE 10.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
138*: Durixeralfs.					
Galt	Clayey (17d)	Favorable	4,500	Soft chess	25
		Normal	3,000	Annual ryegrass	20
		Unfavorable	1,500	Mouse barley	10
				Foxtail fescue	10
				Ripgut brome	5
				Wild oat	5
				Clover	5
				Filaree	5
				Soft blow wives	5
145 Fiddyment	Loamy Claypan (17d)	Favorable	3,000	Soft chess	25
		Normal	2,000	Wild oat	15
		Unfavorable	1,000	Filaree	10
				Ripgut brome	10
				Italian ryegrass	5
				Foxtail fescue	5
				Clover	5
				Mouse barley	5
				Red brome	5
152, 153 Galt	Clayey (17d)	Favorable	4,500	Soft chess	25
		Normal	3,000	Annual ryegrass	20
		Unfavorable	1,500	Mouse barley	10
				Foxtail fescue	10
				Ripgut brome	5
				Wild oat	5
				Clover	5
				Filaree	5
				Soft blow wives	5
156*: Hadselville	Very Shallow Loamy Intermound (18d)	Favorable	2,400	Soft chess	35
		Normal	1,000	Foxtail fescue	20
		Unfavorable	300	Smooth catsear	10
				Toad rush	5
				Beethistle eryngo	5
				Mouse barley	5
Pentz	Shallow Loamy (18d)	Favorable	3,500	Soft chess	40
		Normal	2,200	Ripgut brome	10
		Unfavorable	1,000	Wild oat	5
				Red brome	5
				Filaree	5
				Burclover	5
				Mouse barley	5
				Foxtail fescue	5
157 Hedge	Loamy Stream Terrace (17d)	Favorable	4,500	Soft chess	25
		Normal	3,200	Annual ryegrass	25
		Unfavorable	1,500	Foxtail fescue	15
				Ripgut brome	5
				Clover	5
				Filaree	5

See footnotes at end of table.

TABLE 10.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
158, 159: Hicksville	Loamy Stream Terrace (17d)	Favorable	4,500	Soft chess	25
		Normal	3,200	Wild oat	10
		Unfavorable	1,500	Ripgut brome	10
				Foxtail fescue	5
				Mouse barley	5
				Needlegrass	5
				Filaree	5
160: Hicksville	Loamy Stream Terrace (17d)	Favorable	4,500	Soft chess	25
		Normal	3,200	Wild oat	10
		Unfavorable	1,500	Ripgut brome	10
				Foxtail fescue	5
				Mouse barley	5
				Needlegrass	5
				Filaree	5
				Annual ryegrass	5
163: Keyes	Shallow Loamy (18d)	Favorable	3,400	Soft chess	35
		Normal	2,000	Wild oat	20
		Unfavorable	1,000	Filaree	10
				Foxtail fescue	10
				Mouse barley	5
				Annual ryegrass	5
174, 175: Madera	Loamy Claypan (17d)	Favorable	3,400	Soft chess	35
		Normal	2,200	Filaree	15
		Unfavorable	1,000	Foxtail fescue	15
				Annual ryegrass	10
				Ripgut brome	5
				Wild oat	5
				Smooth cats ear	5
176*:					
Madera	Loamy Claypan (17d)	Favorable	3,400	Soft chess	35
		Normal	2,200	Filaree	15
		Unfavorable	1,000	Foxtail fescue	15
				Annual ryegrass	10
				Ripgut brome	5
				Wild oat	5
				Smooth cats ear	5
Galt	Clayey (17d)	Favorable	4,000	Annual ryegrass	25
		Normal	2,800	Soft chess	15
		Unfavorable	1,300	Foxtail fescue	10
				Toad rush	5
				Ripgut brome	5
				Wild oat	5
				Clover	5
				Mouse barley	5
				Filaree	5
				Soft blow wives	5
				Beethistle eryngo	5

See footnotes at end of table.

TABLE 10.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
178------ Mokelumne	Live Oak/Annual Grass-Loamy (18d).	Favorable	1,000	Ripgut brome	20
		Normal	600	Wild oat	10
		Unfavorable	400	Interior live oak	10
				Soft chess	5
				Filaree	5
				Annual hairgrass	5
				Blue oak	5
				Carex	5
				Manzanita	5
				Digger pine	5
179*:					
Mokelumne------	Loamy (18d)------	Favorable	3,500	Soft chess	35
		Normal	2,500	Clover	15
		Unfavorable	1,000	Wild oat	10
				Filaree	10
				Annual hairgrass	5
				Ripgut brome	5
				Blue oak	5
Pits.					
180------ Mokelumne Variant	Blue Oak/Annual Grass-Loamy (17d).	Favorable	3,500	Soft chess	30
		Normal	2,600	Ripgut brome	15
		Unfavorable	1,000	Clover	15
				Filaree	10
				Foxtail fescue	5
				Wild oat	5
				Blue oak	5
187*:					
Pardee------	Gravelly Loamy (17d)------	Favorable	3,200	Soft chess	35
		Normal	2,200	Wild oat	15
		Unfavorable	1,000	Ripgut brome	10
				Filaree	10
				Foxtail fescue	10
				Mouse barley	5
				Smooth catsear	5
Ranchoseco------	Gravelly Loamy Intermound (17d).	Favorable	2,000	Soft chess	15
		Normal	1,500	Mouse barley	15
		Unfavorable	500	Clover	10
				Beethistle eryngo	10
				Howell foxtail	10
				Annual hairgrass	5
				Brodiaea	5
				Toad rush	5
188*:					
Pentz------	Shallow Loamy (18d)------	Favorable	3,500	Soft chess	40
		Normal	2,200	Ripgut brome	10
		Unfavorable	1,000	Wild oat	5
				Red brome	5
				Filaree	5
				Burclover	5
				Mouse barley	5
				Foxtail fescue	5

See footnotes at end of table.

TABLE 10.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
188*:					
Lithic Xerorthents.					
189 Peters	Shallow Clayey (18d)	Favorable	4,000	Soft chess	25
		Normal	3,200	Annual ryegrass	15
		Unfavorable	1,500	Wild oat	10
				Filaree	10
				Ripgut brome	5
				Red brome	5
				Burclover	5
				Mouse barley	5
				Foxtail fescue	5
				Clover	5
191, 192 Red Bluff	Loamy (17d)	Favorable	4,400	Soft chess	30
		Normal	3,000	Wild oat	15
		Unfavorable	1,000	Foxtail fescue	15
				Filaree	10
				Ripgut brome	5
				Mouse barley	5
				Clover	5
193*:					
Red Bluff	Loamy (17d)	Favorable	4,400	Soft chess	30
		Normal	3,000	Wild oat	15
		Unfavorable	1,000	Foxtail fescue	15
				Filaree	10
				Ripgut brome	5
				Mouse barley	5
				Clover	5
Redding	Gravelly Loamy (17d)	Favorable	3,000	Soft chess	35
		Normal	2,400	Foxtail fescue	15
		Unfavorable	1,000	Filaree	15
				Mouse barley	10
				Wild oat	5
				Ripgut brome	5
				Clover	5
196*:					
Red Bluff	Loamy (17d)	Favorable	4,400	Soft chess	30
		Normal	3,000	Wild oat	15
		Unfavorable	1,000	Foxtail fescue	15
				Filaree	10
				Ripgut brome	5
				Mouse barley	5
				Clover	5
Xerorthents.					
197, 198 Redding	Gravelly Loamy (17d)	Favorable	3,000	Soft chess	35
		Normal	2,400	Foxtail fescue	15
		Unfavorable	1,000	Filaree	15
				Mouse barley	10
				Wild oat	5
				Ripgut brome	5
				Clover	5

See footnotes at end of table.

TABLE 10.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
214, 215 San Joaquin	Loamy (17d)	Favorable	4,500	Soft chess	20
		Normal	3,300	Annual ryegrass	20
		Unfavorable	1,200	Ripgut brome	15
				Foxtail fescue	15
				Filaree	15
				Clover	10
				Mouse barley	5
218*:					
San Joaquin	Loamy (17d)	Favorable	4,500	Soft chess	20
		Normal	3,300	Annual ryegrass	20
		Unfavorable	1,200	Ripgut brome	15
				Foxtail fescue	15
				Filaree	15
				Clover	10
				Mouse barley	5
Galt	Clayey (17d)	Favorable	4,000	Annual ryegrass	25
		Normal	2,800	Soft chess	15
		Unfavorable	1,300	Foxtail fescue	10
				Toad rush	5
				Ripgut brome	5
				Wild oat	5
				Clover	5
				Mouse barley	5
				Filaree	5
				Soft blow wives	5
				Beethistle eryngo	5
224 Tehama	Loamy (17**)	Favorable	4,500	Soft chess	35
		Normal	3,200	Wild oat	10
		Unfavorable	1,200	Foxtail fescue	10
				Filaree	10
				Ripgut brome	5
				Clover	5
235 Vleck	Loamy Claypan (17**)	Favorable	3,500	Soft chess	35
		Normal	2,500	Annual ryegrass	20
		Unfavorable	1,000	Foxtail fescue	5
				Filaree	5
				Clover	5
				Needlegrass	5
				Toad rush	5
236*:					
Vleck	Loamy Claypan (17**)	Favorable	3,500	Soft chess	35
		Normal	2,500	Annual ryegrass	20
		Unfavorable	1,000	Foxtail fescue	5
				Filaree	5
				Clover	5
				Needlegrass	5
				Toad rush	5
Amador	Shallow Loamy (18d)	Favorable	3,000	Soft chess	40
		Normal	1,800	Ripgut brome	15
		Unfavorable	700	Foxtail fescue	10
				Filaree	5
				Wild oat	5
Pits.					

See footnotes at end of table.

TABLE 10.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
237---------------- Whiterock	Blue Oak/Annual Grass-Very Shallow Loamy (18d).	Favorable	2,500	Soft chess	25
		Normal	1,500	Foxtail fescue	15
		Unfavorable	800	Ripgut brome	10
				Red brome	5
				Wild oat	5
				Filaree	5
				Mouse barley	5
				Nitgrass	5
				Blue oak	5
				Geranium	5
				Poverty brome	5

* See description of the map unit for composition and behavior characteristics of the map unit.
** Vleck soils are in MLRA 18, but the characteristic vegetation is similar to that of other soils in Loamy Claypan (17d) range site.

TABLE 11.--RECREATIONAL DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the "Glossary." See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
101*:					
Amador	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: erodes easily.	Severe: depth to rock.
Gillender	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Moderate: dusty.	Severe: depth to rock.
102*:					
Americanos	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.	Slight.
Urban land.					
103 Andregg	Slight	Slight	Moderate: slope, small stones, depth to rock.	Slight	Moderate: depth to rock.
104 Andregg	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope, depth to rock.
105*:					
Andregg	Slight	Slight	Moderate: slope, small stones, depth to rock.	Slight	Moderate: depth to rock.
Urban land.					
106*:					
Andregg	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope, depth to rock.
Urban land.					
107*:					
Argonaut	Moderate: percs slowly, dusty.	Moderate: percs slowly, dusty.	Moderate: slope, small stones, depth to rock.	Moderate: dusty.	Moderate: depth to rock.
Auburn	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Moderate: dusty.	Severe: depth to rock.
108*:					
Argonaut	Moderate: percs slowly, dusty.	Moderate: percs slowly, dusty.	Moderate: slope, small stones, depth to rock.	Moderate: dusty.	Moderate: depth to rock.
Auburn	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Moderate: dusty.	Severe: depth to rock.

See footnote at end of table.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
108*: Urban land.					
109------------------- Auburn	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Moderate: slope, dusty.	Severe: slope, depth to rock.
110*: Auburn---------------	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Moderate: slope, dusty.	Severe: slope, depth to rock.
Argonaut-------------	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, dusty.	Severe: slope.
Rock outcrop.					
111------------------- Bruella	Slight----------	Slight----------	Slight----------	Slight----------	Slight.
112------------------- Bruella	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
113------------------- Capay	Severe: flooding.	Slight----------	Moderate: flooding.	Slight----------	Moderate: flooding.
114------------------- Clear Lake	Severe: flooding.	Moderate: flooding, too clayey.	Severe: flooding.	Moderate: too clayey, flooding.	Severe: flooding, too clayey.
115------------------- Clear Lake	Severe: flooding.	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.	Severe: too clayey.
116, 117-------------- Columbia	Severe: flooding.	Slight----------	Slight----------	Slight----------	Moderate: droughty.
118------------------- Columbia	Severe: flooding.	Slight----------	Moderate: flooding.	Slight----------	Moderate: droughty, flooding.
119, 120-------------- Columbia	Severe: flooding.	Slight----------	Slight----------	Slight----------	Moderate: droughty.
121------------------- Columbia	Severe: flooding.	Slight----------	Moderate: flooding.	Slight----------	Moderate: droughty, flooding.
122------------------- Columbia	Severe: flooding.	Slight----------	Slight----------	Slight----------	Moderate: droughty.
123------------------- Columbia	Severe: flooding.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.	Slight.
124*: Columbia-------------	Severe: flooding.	Slight----------	Slight----------	Slight----------	Moderate: droughty.
Urban land.					

See footnote at end of table.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
125*:					
Corning, well drained	Moderate: small stones, percs slowly.	Moderate: small stones, percs slowly.	Severe: small stones.	Moderate: dusty.	Moderate: small stones, droughty.
Corning, moderately well drained--------	Moderate: small stones, percs slowly.	Moderate: small stones, percs slowly.	Severe: small stones.	Slight----------	Moderate: small stones, droughty.
126*:					
Corning--------------	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope, dusty.	Severe: slope.
Redding--------------	Moderate: slope, small stones, percs slowly.	Moderate: slope, small stones, percs slowly.	Severe: slope, small stones.	Moderate: dusty.	Moderate: small stones, large stones, slope.
127, 128-------------- Cosumnes	Severe: flooding.	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.	Slight.
129------------------- Cosumnes	Severe: flooding.	Moderate: dusty.	Moderate: flooding, dusty.	Moderate: dusty.	Moderate: flooding.
130*:					
Cosumnes-------------	Severe: flooding.	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.	Slight.
Urban land					
131------------------- Coyotecreek	Severe: flooding.	Moderate: dusty.	Moderate: flooding, dusty.	Moderate: dusty.	Moderate: flooding.
132------------------- Creviscreek	Slight----------	Slight----------	Moderate: small stones.	Slight----------	Moderate: droughty.
133, 134, 135--------- Dierssen	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
136*. Dumps					
137. Durixeralfs					
138*:					
Durixeralfs.					
Galt-----------------	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.	Severe: too clayey.
139------------------- Egbert	Severe: flooding, wetness, too clayey.	Severe: wetness, too clayey.	Severe: too clayey, wetness.	Severe: wetness, too clayey.	Severe: too clayey.

See footnote at end of table.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
140, 141 Egbert	Severe: flooding, too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.
142 Egbert	Severe: flooding, too clayey.	Severe: too clayey.	Severe: too clayey, flooding.	Severe: too clayey.	Severe: flooding, too clayey.
143*:					
Egbert	Severe: flooding, too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.
Urban land.					
144 Fiddyment	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: percs slowly.	Severe: erodes easily.	Moderate: droughty, depth to rock.
145 Fiddyment	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, depth to rock, percs slowly.	Severe: erodes easily.	Moderate: droughty, depth to rock.
146 Fiddyment	Moderate: slope, percs slowly, dusty.	Moderate: slope, percs slowly, dusty.	Severe: slope.	Severe: erodes easily.	Moderate: droughty, slope, depth to rock.
147*:					
Fiddyment	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, depth to rock, percs slowly.	Severe: erodes easily.	Moderate: droughty, depth to rock.
Orangevale	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
148*:					
Fiddyment	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, depth to rock, percs slowly.	Severe: erodes easily.	Moderate: droughty, depth to rock.
Orangevale	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
Urban land.					
149*:					
Fiddyment	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, depth to rock, percs slowly.	Severe: erodes easily.	Moderate: droughty, depth to rock.
Urban land.					
150. Fluvaquents					

See footnote at end of table.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
151, 152: Galt	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.	Severe: too clayey.
153: Galt	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey, slope.	Moderate: too clayey.	Severe: too clayey.
154*:					
Galt	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.	Severe: too clayey.
Urban land.					
155: Gazwell	Severe: flooding, too clayey, excess humus.	Severe: too clayey, excess humus.	Severe: too clayey, excess humus.	Severe: too clayey, excess humus.	Severe: too clayey.
156*:					
Hadselville	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Moderate: slope.	Severe: slope, depth to rock.
Pentz	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Moderate: slope.	Severe: slope, depth to rock.
157: Hedge	Severe: flooding, wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, cemented pan.
158: Hicksville	Severe: flooding.	Moderate: dusty.	Moderate: small stones, flooding, dusty.	Moderate: dusty.	Moderate: flooding.
159: Hicksville	Severe: flooding.	Moderate: small stones.	Severe: small stones.	Moderate: dusty.	Moderate: small stones, flooding.
160: Hicksville	Severe: flooding.	Slight	Moderate: small stones, flooding.	Slight	Moderate: flooding.
161: Jacktone	Severe: flooding.	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.	Severe: too clayey.
162*:					
Kaseberg	Severe: depth to rock, cemented pan.	Severe: depth to rock, cemented pan.	Severe: slope, depth to rock, cemented pan.	Severe: erodes easily.	Severe: depth to rock.
Fiddyment	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: droughty, slope, depth to rock.
Urban land.					

See footnote at end of table.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
163------------------- Keyes	Severe: depth to rock, cemented pan.	Severe: depth to rock, cemented pan.	Severe: slope, depth to rock.	Slight----------	Severe: depth to rock.
164------------------- Kimball	Moderate: percs slowly, dusty.	Moderate: percs slowly, dusty.	Moderate: small stones, percs slowly.	Moderate: dusty.	Slight.
165------------------- Kimball	Moderate: percs slowly, dusty.	Moderate: percs slowly, dusty.	Moderate: slope, small stones, percs slowly.	Moderate: dusty.	Slight.
166*:					
Kimball--------------	Moderate: percs slowly, dusty.	Moderate: percs slowly, dusty.	Moderate: small stones, percs slowly.	Moderate: dusty.	Slight.
Urban land.					
167------------------- Lang	Severe: flooding.	Slight----------	Slight----------	Slight----------	Moderate: droughty.
168*:					
Lang-----------------	Severe: flooding.	Slight----------	Slight----------	Slight----------	Moderate: droughty.
Urban land.					
169------------------- Laugenour	Severe: flooding.	Slight----------	Slight----------	Slight----------	Slight.
170*:					
Laugenour------------	Severe: flooding.	Slight----------	Slight----------	Slight----------	Slight.
Urban land.					
171. Lithic Xerorthents					
172------------------- Liveoak	Severe: flooding.	Slight----------	Moderate: flooding.	Slight----------	Moderate: flooding.
173*:					
Liveoak--------------	Severe: flooding.	Slight----------	Slight----------	Slight----------	Slight.
Urban land.					
174------------------- Madera	Moderate: percs slowly.	Moderate: percs slowly, dusty.	Moderate: percs slowly.	Severe: erodes easily.	Moderate: cemented pan.
175------------------- Madera	Moderate: percs slowly.	Moderate: percs slowly, dusty.	Moderate: slope, cemented pan, percs slowly.	Severe: erodes easily.	Moderate: cemented pan.

See footnote at end of table.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
176*:					
Madera	Moderate: percs slowly.	Moderate: percs slowly, dusty.	Moderate: percs slowly.	Severe: erodes easily.	Moderate: cemented pan.
Galt	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, too clayey.
177. Medisaprists					
178 Mokelumne	Moderate: slope, small stones, percs slowly.	Moderate: slope, small stones, percs slowly.	Severe: slope, small stones.	Moderate: dusty.	Moderate: small stones, droughty, slope.
179*:					
Mokelumne	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope, dusty.	Severe: slope.
Pits.					
180 Mokelumne Variant	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, small stones, percs slowly.	Slight	Slight.
181 Natomas	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.	Slight.
182*:					
Natomas	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.	Slight.
Xerorthents.					
183 Orangevale	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
184*:					
Orangevale	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
Kaseberg	Severe: depth to rock, cemented pan.	Severe: depth to rock, cemented pan.	Severe: depth to rock, cemented pan.	Severe: erodes easily.	Severe: depth to rock.
Urban land.					
185*:					
Orangevale	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Kaseberg	Severe: depth to rock, cemented pan.	Severe: depth to rock, cemented pan.	Severe: slope, depth to rock, cemented pan.	Severe: erodes easily.	Severe: depth to rock.
Urban land.					

See footnote at end of table.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
186*:					
Orthents.					
Urban land.					
187*:					
Pardee	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, small stones, depth to rock.	Moderate: dusty.	Severe: depth to rock.
Ranchoseco	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, small stones.	Slight	Severe: depth to rock.
188*:					
Pentz	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.
Lithic Xerorthents.					
189 Peters	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Moderate: too clayey.	Severe: depth to rock.
190*. Pits					
191 Red Bluff	Moderate: dusty.	Moderate: dusty.	Moderate: small stones, dusty.	Moderate: dusty.	Slight.
192 Red Bluff	Moderate: dusty.	Moderate: dusty.	Moderate: slope, small stones, dusty.	Moderate: dusty.	Slight.
193*:					
Red Bluff	Moderate: dusty.	Moderate: dusty.	Moderate: slope, small stones, dusty.	Moderate: dusty.	Slight.
Redding	Moderate: small stones, percs slowly.	Moderate: small stones, percs slowly.	Severe: small stones.	Moderate: dusty.	Moderate: small stones, large stones.
194*:					
Red Bluff	Moderate: dusty.	Moderate: dusty.	Moderate: slope, small stones, dusty.	Moderate: dusty.	Slight.
Urban land.					
195*:					
Red Bluff	Moderate: dusty.	Moderate: dusty.	Moderate: small stones, dusty.	Moderate: dusty.	Slight.
Xerarents.					

See footnote at end of table.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
196*:					
Red Bluff	Moderate: dusty.	Moderate: dusty.	Moderate: slope, small stones, dusty.	Moderate: dusty.	Slight.
Xerorthents.					
197 Redding	Moderate: percs slowly, dusty.	Moderate: percs slowly, dusty.	Moderate: slope, small stones, cemented pan.	Severe: erodes easily.	Moderate: cemented pan.
198 Redding	Moderate: small stones, percs slowly.	Moderate: small stones, percs slowly.	Severe: small stones.	Moderate: dusty.	Moderate: small stones, large stones.
199 Reiff	Severe: flooding.	Slight	Moderate: small stones, flooding.	Slight	Moderate: flooding.
200 Rindge	Severe: flooding, excess humus.	Severe: excess humus.	Severe: excess humus.	Severe: excess humus.	Severe: excess humus.
201, 202 Rindge	Severe: flooding.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
203* Riverwash					
204 Rossmoor	Severe: flooding.	Slight	Slight	Slight	Slight.
205*:					
Rossmoor	Severe: flooding.	Slight	Slight	Slight	Slight.
Urban land.					
206 Sailboat	Severe: flooding.	Moderate: percs slowly.	Moderate: percs slowly.	Slight	Slight.
207 Sailboat	Severe: flooding.	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.	Slight.
208 Sailboat	Severe: flooding.	Moderate: dusty.	Moderate: flooding, dusty.	Moderate: dusty.	Moderate: flooding.
209*:					
Sailboat	Severe: flooding.	Moderate: percs slowly.	Moderate: percs slowly.	Slight	Slight.
Urban land.					
210 Sailboat Variant	Severe: flooding.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.

See footnote at end of table.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
211------------------- San Joaquin	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: percs slowly.	Slight----------	Moderate: droughty, cemented pan.
212------------------- San Joaquin	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, cemented pan, percs slowly.	Slight----------	Moderate: droughty, cemented pan.
213, 214-------------- San Joaquin	Moderate: percs slowly.	Moderate: percs slowly, dusty.	Moderate: percs slowly.	Severe: erodes easily.	Moderate: cemented pan.
215------------------- San Joaquin	Moderate: percs slowly.	Moderate: percs slowly, dusty.	Moderate: slope, cemented pan, percs slowly.	Severe: erodes easily.	Moderate: cemented pan.
216*:					
San Joaquin----------	Moderate: percs slowly.	Moderate: percs slowly, dusty.	Moderate: percs slowly.	Severe: erodes easily.	Moderate: cemented pan.
Durixeralfs.					
217*:					
San Joaquin----------	Moderate: percs slowly.	Moderate: percs slowly, dusty.	Moderate: percs slowly.	Severe: erodes easily.	Moderate: cemented pan.
Galt-----------------	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.	Moderate: cemented pan.
218*:					
San Joaquin----------	Moderate: percs slowly.	Moderate: percs slowly, dusty.	Moderate: percs slowly.	Severe: erodes easily.	Moderate: cemented pan.
Galt-----------------	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, too clayey.
219*:					
San Joaquin----------	Moderate: percs slowly.	Moderate: percs slowly, dusty.	Moderate: percs slowly.	Severe: erodes easily.	Moderate: cemented pan.
Urban land.					
220*:					
San Joaquin----------	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: percs slowly.	Slight----------	Moderate: droughty, cemented pan.
Urban land.					
221*:					
San Joaquin----------	Moderate: percs slowly.	Moderate: percs slowly, dusty.	Moderate: percs slowly.	Severe: erodes easily.	Moderate: cemented pan.

See footnote at end of table.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
221*:					
Xerarents.					
222-------------------- Scribner	Severe: flooding.	Moderate: percs slowly.	Moderate: percs slowly.	Slight----------	Slight.
223*. Slickens					
224-------------------- Tehama	Slight----------	Moderate: dusty.	Moderate: small stones, dusty.	Severe: erodes easily.	Slight.
225-------------------- Tinnin	Severe: flooding.	Moderate: too sandy.	Moderate: small stones, too sandy.	Moderate: too sandy.	Moderate: droughty.
226*:					
Tinnin---------------	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, small stones, too sandy.	Moderate: too sandy.	Moderate: droughty.
Urban land.					
227*. Urban land					
228*:					
Urban land.					
Natomas--------------	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.	Slight.
229*:					
Urban land.					
Xerarents.					
Fiddyment------------	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: droughty, depth to rock.
230-------------------- Valpac	Severe: flooding.	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.	Slight.
231*:					
Valpac---------------	Severe: flooding.	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.	Slight.
Urban land.					
232-------------------- Valpac Variant	Severe: flooding.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
233-------------------- Vina	Severe: flooding.	Slight----------	Moderate: small stones.	Slight----------	Slight.

See footnote at end of table.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
234------------------- Vina	Severe: flooding.	Slight----------	Moderate: small stones, flooding.	Slight----------	Moderate: flooding.
235------------------- Vleck	Moderate: slope, small stones, percs slowly.	Moderate: slope, small stones, percs slowly.	Severe: slope, small stones.	Slight----------	Moderate: small stones, droughty, slope.
236*:					
Vleck----------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Amador---------------	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.
Pits.					
237------------------- Whiterock	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: erodes easily.	Severe: slope, depth to rock.
238. Xerarents.					
San Joaquin----------	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: percs slowly.	Slight----------	Moderate: cemented pan.
239*: Xerarents.					
Redding--------------	Moderate: percs slowly, dusty.	Moderate: percs slowly, dusty.	Moderate: small stones.	Severe: erodes easily.	Moderate: cemented pan.
240*: Xerarents.					
Urban land.					
San Joaquin----------	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, cemented pan, percs slowly.	Slight----------	Moderate: cemented pan.
241*: Xerarents.					
Urban land.					
Fiddyment------------	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: droughty, depth to rock.
242. Xerofluvents					
243. Xerolls					

See footnote at end of table.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
244. Xeropsamments					
245. Xerorthents					
246*: Xerorthents.					
Urban land.					

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--WILDLIFE HABITAT

(See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Wetland wildlife	Rangeland wildlife
101*:										
Amador	Poor	Poor	Fair	Very poor.	Poor	Very poor.	Very poor.	---	---	Poor.
Gillender	Very poor.	Very poor.	Very poor.	---	Very poor.	Very poor.	Very poor.	---	---	Very poor.
102*:										
Americanos	Fair	Good	Good	Fair	Good	Fair	Fair	Good	Fair	---
Urban land.										
103, 104 Andregg	Fair	Good	Good	Fair	Good	Very poor.	Very poor.	Good	Very poor.	Good.
105*, 106*:										
Andregg	Fair	Good	Good	Fair	Good	Very poor.	Very poor.	Good	Very poor.	Good.
Urban land.										
107*:										
Argonaut	Fair	Good	Good	Poor	Poor	Poor	Poor	Fair	Poor	Fair.
Auburn	Poor	Fair	Fair	Very poor.	Poor	Poor	Poor	Fair	Poor	Fair.
108*:										
Argonaut	Fair	Good	Good	Poor	Poor	Poor	Poor	Fair	Poor	Fair.
Auburn	Poor	Fair	Fair	Very poor.	Poor	Poor	Poor	Fair	Poor	Fair.
Urban land.										
109 Auburn	Poor	Fair	Fair	Very poor.	Poor	Very poor.	Very poor.	Fair	Very poor	Fair.
110*:										
Auburn	Poor	Fair	Fair	Very poor.	Poor	Very poor.	Very poor.	Fair	Very poor	Fair.
Argonaut	Fair	Good	Good	Poor	Poor	Very poor.	Very poor.	Fair	Very poor.	Fair.
Rock outcrop.										
111 Bruella	Good	Good	Good	Good	Good	Good	Fair	Good	Fair	Good.
112 Bruella	Good	Good	Good	Good	Good	Poor	Poor	Good	Poor	Good.
113 Capay	Good	Good	Good	Very poor.	Very poor.	Good	Good	Fair	Good	Poor.

See footnote at end of table.

TABLE 12.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Hard- wood trees	Shrubs	Wetland plants	Shallow water areas	Open- land wild- life	Wetland wild- life	Rangeland wildlife
114 Clear Lake	Good	Good	Good	Very poor.	Very poor.	Good	Good	Fair	Good	---
115 Clear Lake	Good	Good	Good	Very poor.	Very poor.	Good	Good	Fair	Good	---
116 Columbia	Good	Good	Good	Fair	Good	Good	Fair	Good	Fair	---
117, 118 Columbia	Good	Good	Good	Fair	Good	Fair	Poor	Good	Fair	Good.
119 Columbia	Good	Good	Good	Fair	Good	Good	Good	Good	Good	---
120, 121 Columbia	Good	Good	Good	Fair	Good	Fair	Good	Good	Fair	---
122 Columbia	Good	Good	Good	Fair	Good	Good	Good	Good	Good	---
123 Columbia	Fair	Good	Good	Fair	Good	Poor	Poor	Fair	Poor	---
124*:										
Columbia	Good	Good	Good	Fair	Good	Good	Fair	Good	Fair	---
Urban land.										
125*:										
Corning, well drained	Fair	Good	Fair	Very poor.	Poor	Poor	Poor	Fair	Poor	Fair.
Corning, moderately well drained	Fair	Good	Fair	Very poor.	Poor	Poor	Poor	Fair	Poor	Fair.
126*:										
Corning	Poor	Fair	Fair	Very poor.	Poor	Very poor.	Very poor.	Fair	Very poor.	Fair.
Redding	Poor	Good	Fair	Very poor.	Poor	Very poor.	Very poor.	Fair	Very poor.	Fair.
127 Cosumnes	Good	Good	Good	Fair	Good	Good	Good	Good	Good	---
128, 129 Cosumnes	Good	Good	Good	Fair	Good	Fair	Good	Good	Fair	---
130*:										
Cosumnes	Good	Good	Good	Fair	Good	Good	Good	Good	Good	---
Urban land.										
131 Coyotecreek	Good	Good	Good	Good	Good	Good	Poor	Good	Fair	---

See footnote at end of table.

TABLE 12.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Wetland wildlife	Rangeland wildlife
132----------------- Creviscreek	Good	Good	Good	Poor	Fair	Very poor.	Very poor.	Good	Very poor.	Fair.
133, 134, 135------ Dierssen	Good	Fair	Good	Poor	Poor	Good	Good	Fair	Good	---
136*. Dumps										
137. Durixeralfs										
138*: Durixeralfs.										
Galt---------------	Fair	Fair	Good	Very poor.	Very poor.	Good	Good	Fair	Good	Fair.
139----------------- Egbert	Fair	Fair	Good	Poor	Poor	Good	Good	Fair	Good	---
140----------------- Egbert	Fair	Good	Good	Poor	Poor	Poor	Poor	Fair	Poor	---
141----------------- Egbert	Good	Good	Good	Poor	Poor	Good	Good	Good	Good	---
142----------------- Egbert	Poor	Good	Good	Poor	Poor	Good	Good	Good	Good	---
143*: Egbert-------------	Good	Good	Good	Poor	Poor	Good	Good	Good	Good	---
Urban land.										
144, 145, 146------ Fiddyment	Fair	Good	Good	Poor	Fair	Very poor.	Very poor.	Good	Very poor.	Fair.
147*: Fiddyment----------	Fair	Good	Good	Poor	Fair	Very poor.	Very poor.	Good	Very poor.	Fair.
Orangevale---------	Fair	Good	Good	Poor	Fair	Poor	Poor	Good	Poor	Fair.
148*: Fiddyment----------	Fair	Good	Good	Very poor.	Fair	Very poor.	Very poor.	Good	Very poor.	Fair.
Orangevale---------	Fair	Good	Good	Poor	Fair	Poor	Poor	Good	Poor	---
Urban land.										
149*: Fiddyment----------	Fair	Good	Good	Poor	Fair	Very poor.	Very poor.	Fair	Very poor.	Fair.
Urban land.										

See footnote at end of table.

TABLE 12.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Shrubs	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Wetland wildlife	Rangeland wildlife
150. Fluvaquents										
151, 152----------- Galt	Good	Fair	Good	Very poor.	Very poor.	Good	Good	Fair	Good	Fair.
153---------------- Galt	Good	Fair	Good	Very poor.	Very poor.	Poor	Poor	Fair	Poor	Fair.
154*:										
Galt--------------	Fair	Fair	Good	Very poor.	Very poor.	Good	Good	Fair	Very poor.	Fair.
Urban land.										
155---------------- Gazwell	Good	Good	Good	Poor	Fair	Good	Good	Good	Good	---
156*:										
Hadselville-------	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	---	---	Very poor.
Pentz-------------	Poor	Fair	Good	Very poor.	Poor	Very poor.	Very poor.	---	---	Fair.
157---------------- Hedge	Good	Fair	Good	Poor	Fair	Good	Fair	Good	Fair	Fair.
158, 159, 160------ Hicksville	Good	Good	Good	Fair	Good	Good	Good	Good	Fair	Good.
161---------------- Jacktone	Good	Fair	Good	Very poor.	Very poor.	Good	Good	Fair	Good	Fair.
162*:										
Kaseberg----------	Poor	Fair	Fair	Very poor.	Poor	Very poor.	Very poor.	Fair	Very poor.	Fair.
Fiddyment---------	Fair	Good	Good	Poor	Fair	Very poor.	Very poor.	Fair	Very poor.	Fair.
Urban land.										
163---------------- Keyes	Poor	Fair	Good	Very poor.	Very poor.	Very poor.	Very poor.	Fair	---	Fair.
164---------------- Kimball	Good	Good	Good	Poor	Poor	Good	Fair	Good	Poor	Fair.
165---------------- Kimball	Good	Good	Good	Poor	Poor	Poor	Poor	Good	Poor	Fair.
166*:										
Kimball-----------	Good	Good	Good	Poor	Poor	Good	Good	Good	Good	Fair.
Urban land.										
167---------------- Lang	Fair	Fair	Fair	Poor	Fair	Poor	Poor	Fair	Poor	---

See footnote at end of table.

TABLE 12.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Shrubs	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Wetland wildlife	Rangeland wildlife
168*:										
Lang	Fair	Fair	Fair	Poor	Fair	Poor	Poor	Fair	Poor	---
Urban land.										
169 Laugenour	Good	Good	Good	Fair	Good	Fair	Fair	Good	Fair	---
170*:										
Laugenour	Good	Good	Good	Fair	Good	Fair	Fair	Good	Fair	---
Urban land.										
171. Lithic Xerorthents										
172 Liveoak	Good	Good	Good	Good	Good	Good	Fair	Good	Fair	---
173*:										
Liveoak	Good	Good	Good	Good	Good	Good	Fair	Good	Fair	---
Urban land.										
174, 175 Madera	Fair	Fair	Fair	Very poor.	Very poor.	Good	Good	Fair	Good	Fair.
176*:										
Madera	Fair	Fair	Fair	Very poor.	Very poor.	Good	Good	Fair	Good	Fair.
Galt	Fair	Fair	Good	Very poor.	Very poor.	Good	Good	Fair	Good	Fair.
177. Medisaprists										
178 Mokelumne	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Very poor.	Fair.
179*:										
Mokelumne	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Very poor.	Fair.
Pits.										
180 Mokelumne Variant	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Very poor.	Fair.
181 Natomas	Fair	Good	Good	Fair	Good	Fair	Fair	Good	Fair	Good.
182*:										
Natomas	Fair	Good	Good	Fair	Good	Fair	Fair	Good	Fair	Good.
Xerorthents.										
183 Orangevale	Fair	Good	Good	Poor	Fair	Poor	Poor	Good	Poor	Fair.

See footnote at end of table.

TABLE 12.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Shrubs	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Wetland wildlife	Rangeland wildlife
184*:										
Orangevale	Fair	Good	Good	Poor	Fair	Poor	Poor	Good	Poor	Fair.
Kaseberg	Poor	Fair	Fair	Very poor.	Poor	Very poor.	Very poor.	Fair	Very poor.	Poor.
Urban land.										
185*:										
Orangevale	Poor	Fair	Good	Poor	Fair	Very poor.	Very poor.	Fair	Very poor.	Fair.
Kaseberg	Poor	Fair	Fair	Very poor.	Poor	Very poor.	Very poor.	Fair	Very poor.	Poor.
Urban land.										
186*:										
Orthents.										
Urban land.										
187*:										
Pardee	Very poor.	Very poor.	Fair	Very poor.	Fair	Very poor.	Very poor.	---	---	Fair.
Ranchoseco	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	---	---	Poor.
188*:										
Pentz	Very poor.	Fair	Good	Very poor.	Poor	Very poor.	Very poor.	---	---	Fair.
Lithic Xerorthents.										
189 Peters	Poor	Poor	Good	Very poor.	Very poor.	Very poor.	Very poor.	Poor	---	Fair.
190*. Pits										
191, 192 Red Bluff	Fair	Good	Good	Poor	Fair	Very poor.	Very poor.	Good	Very poor.	Fair.
193*:										
Red Bluff	Fair	Good	Good	Poor	Fair	Poor	Poor	Good	Poor	Fair.
Redding	Fair	Good	Fair	Very poor.	Poor	Poor	Fair	Fair	Fair	Fair.
194*:										
Red Bluff	Fair	Good	Good	Poor	Fair	Poor	Poor	Good	Poor	Fair.
Urban land.										

See footnote at end of table.

TABLE 12.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Wetland wildlife	Rangeland wildlife
195*:										
Red Bluff	Fair	Good	Good	Poor	Fair	Fair	Fair	Good	Fair	Fair.
Xerarents.										
196*:										
Red Bluff	Fair	Good	Good	Poor	Fair	Poor	Poor	Good	Poor	Fair.
Xerorthents.										
197 Redding	Fair	Good	Fair	Very poor.	Poor	Very poor.	Poor	Fair	Poor	Fair.
198 Redding	Fair	Good	Fair	Very poor.	Poor	Poor	Poor	Fair	Poor	Fair.
199 Reiff	Good	Good	Good	Fair	Good	Good	Poor	Good	Fair	---
200, 201, 202 Rindge	Good	Good	Good	Poor	Good	Good	Good	Good	Good	---
203*. Riverwash										
204 Rossmoor	Good	Good	Good	Fair	Good	Good	Fair	Good	Fair	---
205*:										
Rossmoor	Good	Good	Good	Fair	Good	Good	Fair	Good	Fair	---
Urban land.										
206 Sailboat	Good	Good	Good	Good	Good	Good	Fair	Good	Fair	---
207, 208 Sailboat	Good	Good	Good	Good	Good	Fair	Fair	Good	Fair	---
209*:										
Sailboat	Good	Good	Good	Good	Good	Good	Fair	Good	Fair	---
Urban land.										
210 Sailboat Variant	Good	Good	Good	Good	Good	Good	Good	Good	Good	---
211 San Joaquin	Good	Good	Good	Poor	Poor	Good	Good	Good	Good	Fair.
212 San Joaquin	Good	Good	Good	Poor	Poor	Poor	Poor	Good	Poor	Fair.
213, 214 San Joaquin	Good	Good	Good	Poor	Poor	Good	Good	Good	Good	Fair.

See footnote at end of table.

TABLE 12.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Shrubs	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Wetland wildlife	Rangeland wildlife
215---------------- San Joaquin	Good	Good	Good	Poor	Poor	Poor	Poor	Good	Poor	Fair.
216*:										
San Joaquin-------	Good	Good	Good	Poor	Poor	Good	Good	Good	Good	Fair.
Durixeralfs.										
217*:										
San Joaquin-------	Good	Good	Good	Poor	Poor	Good	Good	Good	Good	Fair.
Galt--------------	Good	Good	Good	Very poor.	Very poor.	Good	Good	Fair	Good	---
218*:										
San Joaquin-------	Good	Good	Good	Poor	Poor	Good	Good	Good	Good	Fair.
Galt--------------	Fair	Fair	Good	Very poor.	Very poor.	Good	Good	Fair	Good	Fair.
219*, 220*:										
San Joaquin-------	Good	Good	Good	Poor	Poor	Good	Good	Good	Good	Fair.
Urban land.										
221*:										
San Joaquin-------	Good	Good	Good	Poor	Poor	Good	Good	Good	Good	Fair.
Xerarents.										
222---------------- Scribner	Good	Good	Good	Good	Good	Good	Good	Good	Good	---
223*. Slickens										
224---------------- Tehama	Good	Good	Good	Poor	Poor	Good	Good	Good	Good	Good.
225---------------- Tinnin	Fair	Poor	Fair	Poor	Poor	Poor	Very poor.	Poor	Very poor.	Poor.
226*:										
Tinnin------------	Fair	Poor	Fair	Poor	Poor	Poor	Very poor.	Poor	Very poor.	Poor.
Urban land.										
227*. Urban land										
228*:										
Urban land.										
Natomas-----------	Fair	Good	Good	Fair	Good	Fair	Fair	Good	Fair	Good.

See footnote at end of table.

TABLE 12.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba-ceous plants	Hard-wood trees	Shrubs	Wetland plants	Shallow water areas	Open-land wild-life	Wetland wild-life	Rangeland wildlife
229*:										
Urban land.										
Xerarents.										
Fiddyment	Fair	Good	Good	Very poor.	Fair	Very poor.	Very poor.	Fair	Very poor.	Fair.
230 Valpac	Good	Good	Good	Good	Good	Good	Fair	Good	Fair	---
231*:										
Valpac	Good	Good	Good	Good	Good	Good	Fair	Good	Fair	---
Urban land.										
232 Valpac Variant	Good	Good	Good	Good	Good	Good	Good	Good	Good	---
233 Vina	Good	Good	Good	Good	Good	Good	Fair	Good	Fair	---
234 Vina	Good	Good	Good	Poor	Good	Good	Fair	Good	Fair	---
235 Vleck	Fair	Fair	Fair	Very poor.	Very poor.	Very poor.	Very poor.	Fair	Very poor.	Poor.
236*:										
Vleck	Poor	Fair	Fair	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Poor.
Amador	Poor	Poor	Fair	Very poor.	Poor	Very poor.	Very poor.	---	Very poor.	Poor.
Pits.										
237 Whiterock	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Poor.
238*:										
Xerarents.										
San Joaquin	Good	Good	Good	Poor	Poor	Good	Good	Good	Good	Fair.
239*:										
Xerarents.										
Redding	Fair	Good	Fair	Very poor.	Poor	Poor	Fair	Fair	Poor	Fair.
240*:										
Xerarents.										
Urban land.										
San Joaquin	Good	Good	Good	Poor	Poor	Poor	Poor	Good	Poor	Fair.

See footnote at end of table.

TABLE 12.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Shrubs	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Wetland wildlife	Rangeland wildlife
241*:										
Xerarents.										
Urban land.										
Fiddyment	Fair	Good	Good	Very poor.	Fair	Very poor.	Very poor.	Fair	Very poor.	Fair.
242. Xerofluvents										
243. Xerolls										
244. Xeropsamments										
245. Xerorthents										
246*:										
Xerorthents.										
Urban land.										

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--BUILDING SITE DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the "Glossary." See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
101*:						
Amador	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, slope.	Severe: depth to rock.
Gillender	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, slope.	Severe: depth to rock.
102*:						
Americanos	Slight	Slight	Slight	Slight	Moderate: low strength.	Slight.
Urban land.						
103 Andregg	Moderate: depth to rock.	Slight	Moderate: depth to rock.	Moderate: slope.	Slight	Moderate: depth to rock.
104 Andregg	Moderate: depth to rock, slope.	Moderate: slope.	Moderate: depth to rock, slope.	Severe: slope.	Moderate: slope.	Moderate: slope, depth to rock.
105*:						
Andregg	Moderate: depth to rock.	Slight	Moderate: depth to rock.	Moderate: slope.	Slight	Moderate: depth to rock.
Urban land.						
106*:						
Andregg	Moderate: depth to rock, slope.	Moderate: slope.	Moderate: depth to rock, slope.	Severe: slope.	Moderate: slope.	Moderate: slope, depth to rock.
Urban land.						
107*:						
Argonaut	Moderate: depth to rock, too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Moderate: depth to rock.
Auburn	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
108*:						
Argonaut	Moderate: depth to rock, too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Moderate: depth to rock.
Auburn	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
Urban land.						

See footnotes at end of table.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
109: Auburn	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
110*:						
Auburn	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
Argonaut	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope.
Rock outcrop.						
111, 112: Bruella	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Slight.
113: Capay	Severe: cutbanks cave.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength, flooding.	Moderate: flooding.
114: Clear Lake	Severe: cutbanks cave.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: low strength, flooding, shrink-swell.	Severe: flooding, too clayey.
115: Clear Lake	Severe: cutbanks cave.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
116, 117: Columbia	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Moderate: droughty.
118: Columbia	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: droughty, flooding.
119, 120: Columbia	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding, shrink-swell.	Severe: flooding.	Moderate: flooding.	Moderate: droughty.
121: Columbia	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding, shrink-swell.	Severe: flooding.	Severe: flooding.	Moderate: droughty, flooding.
122: Columbia	Severe: cutbanks cave, excess humus.	Severe: subsides, flooding.	Severe: subsides, flooding, low strength.	Severe: subsides, flooding.	Severe: subsides.	Moderate: droughty.
123: Columbia	Severe: cutbanks cave.	Severe: flooding, subsides.	Severe: flooding, subsides.	Severe: flooding, subsides.	Severe: flooding, subsides.	Slight.
124*:						
Columbia	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding, shrink-swell.	Severe: flooding.	Moderate: flooding.	Moderate: droughty.

See footnotes at end of table.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
124*: Urban land.						
125*: Corning, well drained	Moderate: too clayey.	Slight	Slight	Moderate: slope.	Severe: shrink-swell.	Moderate: small stones, droughty.
Corning, moderately well drained	Moderate: too clayey.	Slight	Slight	Moderate: slope.	Severe: shrink-swell.	Moderate: small stones, droughty.
126*: Corning	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, shrink-swell.	Severe: slope.
Redding	Severe: cemented pan.	Moderate: slope, cemented pan.	Severe: cemented pan.	Severe: slope.	Moderate: cemented pan, slope.	Moderate: small stones, large stones, slope.
127 Cosumnes	Moderate: too clayey, wetness.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: low strength, shrink-swell.	Slight.
128 Cosumnes	Moderate: too clayey.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: low strength, shrink-swell.	Slight.
129 Cosumnes	Moderate: too clayey, flooding.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: low strength, flooding, shrink-swell.	Moderate: flooding.
130*: Cosumnes	Moderate: too clayey, wetness.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: low strength, shrink-swell.	Slight.
Urban land.						
131 Coyotecreek	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
132 Creviscreek	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Slight	Moderate: droughty.
133, 134 Dierssen	Severe: cemented pan, wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, cemented pan.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.
135 Dierssen	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, shrink-swell, wetness.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.

See footnotes at end of table.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
136*. Dumps						
137. Durixeralfs						
138*: Durixeralfs.						
138*: Galt	Severe: cemented pan, cutbanks cave.	Severe: shrink-swell.	Severe: cemented pan, shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Severe: too clayey.
139 Egbert	Severe: wetness.	Severe: subsides, flooding, wetness.	Severe: subsides, flooding, wetness.	Severe: subsides, flooding, wetness.	Severe: subsides, shrink-swell, low strength.	Severe: too clayey.
140 Egbert	Moderate: too clayey.	Severe: subsides, flooding, shrink-swell.	Severe: subsides, flooding, shrink-swell.	Severe: subsides, flooding, shrink-swell.	Severe: subsides, shrink-swell, low strength.	Severe: too clayey.
141 Egbert	Moderate: too clayey, wetness.	Severe:** flooding, shrink-swell.	Severe:** flooding, shrink-swell.	Severe:** flooding, shrink-swell.	Severe:** low strength, shrink-swell.	Severe: too clayey.
142 Egbert	Moderate: too clayey, wetness, flooding.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: low strength, flooding, shrink-swell.	Severe: flooding, too clayey.
143*: Egbert	Moderate: too clayey, wetness.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: low strength, shrink-swell.	Severe: too clayey.
Urban land.						
144 Fiddyment	Moderate: depth to rock, cemented pan.	Moderate: shrink-swell.	Moderate: depth to rock, cemented pan.	Moderate: shrink-swell.	Severe: low strength.	Moderate: droughty, depth to rock.
145 Fiddyment	Moderate: depth to rock, cemented pan.	Moderate: shrink-swell.	Moderate: depth to rock, cemented pan.	Moderate: shrink-swell, slope.	Severe: low strength.	Moderate: droughty, depth to rock.
146 Fiddyment	Moderate: depth to rock, cemented pan, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: slope, shrink-swell.	Severe: low strength, shrink-swell.	Moderate: droughty, slope, depth to rock.
147*: Fiddyment	Moderate: depth to rock, cemented pan.	Moderate: shrink-swell.	Moderate: depth to rock, cemented pan.	Moderate: shrink-swell, slope.	Severe: low strength.	Moderate: droughty, depth to rock.

See footnotes at end of table.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
147*:						
Orangevale-------	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell.	Moderate: droughty.
148*:						
Fiddyment--------	Moderate: depth to rock, cemented pan.	Moderate: shrink-swell.	Moderate: depth to rock, cemented pan.	Moderate: shrink-swell, slope.	Severe: low strength.	Moderate: droughty, depth to rock.
Orangevale-------	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell.	Moderate: droughty.
Urban land.						
149*:						
Fiddyment--------	Moderate: depth to rock, cemented pan.	Moderate: shrink-swell.	Moderate: depth to rock, cemented pan.	Moderate: shrink-swell, slope.	Severe: low strength.	Moderate: droughty, depth to rock.
Urban land.						
150. Fluvaquents						
151, 152, 153----- Galt	Severe: cemented pan, cutbanks cave.	Severe: shrink-swell.	Severe: cemented pan, shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Severe: too clayey.
154*:						
Galt-------------	Severe: cemented pan, cutbanks cave.	Severe: shrink-swell.	Severe: cemented pan, shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Severe: too clayey.
Urban land.						
155--------------- Gazwell	Severe: excess humus, wetness.	Severe: subsides, flooding, low strength.	Severe: subsides, flooding, wetness.	Severe: subsides, flooding, low strength.	Severe: subsides, low strength.	Severe: too clayey.
156*:						
Hadselville------	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.
Pentz------------	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.
157--------------- Hedge	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Moderate: wetness, flooding.	Moderate: wetness, cemented pan.
158--------------- Hicksville	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.

See footnotes at end of table.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
159: Hicksville	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: small stones, flooding.
160: Hicksville	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
161: Jacktone	Severe: cemented pan, cutbanks cave.	Severe: flooding, shrink-swell.	Severe: flooding, cemented pan, shrink-swell.	Severe: flooding, shrink-swell.	Severe: low strength, shrink-swell.	Severe: too clayey.
162*:						
Kaseberg	Severe: depth to rock, cemented pan.	Moderate: slope, depth to rock, cemented pan.	Severe: depth to rock, cemented pan.	Severe: slope.	Moderate: depth to rock, cemented pan, slope.	Severe: depth to rock.
Fiddyment	Moderate: depth to rock, cemented pan, slope.	Moderate: shrink-swell, slope.	Moderate: depth to rock, cemented pan, slope.	Severe: slope.	Severe: low strength.	Moderate: droughty, slope, depth to rock.
Urban land.						
163: Keyes	Severe: depth to rock, cemented pan.	Severe: shrink-swell, cemented pan.	Severe: depth to rock, cemented pan, shrink-swell.	Severe: shrink-swell, slope, cemented pan.	Severe: cemented pan, shrink-swell, low strength.	Severe: depth to rock.
164, 165: Kimball	Moderate: too clayey.	Severe: shrink-swell.	Moderate: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
166*:						
Kimball	Moderate: too clayey.	Severe: shrink-swell.	Moderate: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
Urban land.						
167: Lang	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Moderate: droughty.
168*:						
Lang	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Moderate: droughty.
Urban land.						
169: Laugenour	Moderate: wetness.	Severe:** flooding.	Severe:** flooding.	Severe:** flooding.	Moderate:** flooding.	Slight.
170*:						
Laugenour	Moderate: wetness.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Slight.
Urban land.						

See footnotes at end of table.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
171. Lithic Xerorthents						
172 Liveoak	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
173*:						
Liveoak	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Slight.
Urban land.						
174 Madera	Severe: cemented pan.	Moderate: shrink-swell.	Severe: cemented pan.	Moderate: shrink-swell.	Moderate: cemented pan, shrink-swell.	Moderate: cemented pan.
175 Madera	Severe: cemented pan.	Moderate: shrink-swell.	Severe: cemented pan.	Moderate: shrink-swell, slope.	Moderate: cemented pan, shrink-swell.	Moderate: cemented pan.
176*:						
Madera	Severe: cemented pan.	Moderate: shrink-swell.	Severe: cemented pan.	Moderate: shrink-swell.	Moderate: cemented pan, shrink-swell.	Moderate: cemented pan.
Galt	Severe: cemented pan, cutbanks cave, ponding.	Severe: ponding, shrink-swell.	Severe: ponding, cemented pan.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.	Severe: ponding, too clayey.
177. Medisaprists						
178 Mokelumne	Moderate: depth to rock, too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: depth to rock, slope, shrink-swell.	Severe: slope.	Moderate: shrink-swell, low strength, slope.	Moderate: small stones, droughty, slope.
179*:						
Mokelumne	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Pits.						
180 Mokelumne Variant	Moderate: too clayey.	Moderate: shrink-swell.	Severe: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell.	Slight.
181 Natomas	Slight	Slight	Moderate: shrink-swell.	Slight	Moderate: low strength.	Slight.
182*:						
Natomas	Slight	Slight	Moderate: shrink-swell.	Slight	Moderate: low strength.	Slight.
Xerorthents.						
183 Orangevale	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: droughty.

See footnotes at end of table.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
184*:						
Orangevale	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell.	Moderate: droughty.
Kaseberg	Severe: depth to rock, cemented pan.	Moderate: depth to rock, cemented pan.	Severe: depth to rock, cemented pan.	Moderate: slope, depth to rock, cemented pan.	Moderate: depth to rock, cemented pan.	Severe: depth to rock.
Urban land.						
185*:						
Orangevale	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Kaseberg	Severe: depth to rock, cemented pan.	Moderate: slope, depth to rock, cemented pan.	Severe: depth to rock, cemented pan.	Severe: slope.	Moderate: depth to rock, cemented pan, slope.	Severe: depth to rock.
Urban land.						
186*:						
Orthents.						
Urban land.						
187*:						
Pardee	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: depth to rock.
Ranchoseco	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: depth to rock.
188*:						
Pentz	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.
Lithic Xerorthents.						
189 Peters	Severe: depth to rock.	Severe: shrink-swell.	Severe: depth to rock.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Severe: depth to rock.
190*. Pits						
191, 192 Red Bluff	Moderate: too clayey.	Slight	Moderate: shrink-swell.	Slight	Moderate: low strength.	Slight.
193*:						
Red Bluff	Moderate: too clayey.	Slight	Moderate: shrink-swell.	Slight	Moderate: low strength.	Slight.

See footnotes at end of table.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
193*:						
Redding----------	Severe: cemented pan.	Moderate: cemented pan.	Severe: cemented pan.	Moderate: cemented pan.	Moderate: cemented pan, low strength.	Moderate: small stones, large stones.
194*:						
Red Bluff--------	Moderate: too clayey.	Slight---------	Moderate: shrink-swell.	Slight---------	Moderate: low strength.	Slight.
Urban land.						
195*:						
Red Bluff--------	Moderate: too clayey.	Slight---------	Moderate: shrink-swell.	Slight---------	Moderate: low strength.	Slight.
Xerarents.						
196*:						
Red Bluff--------	Moderate: too clayey.	Slight---------	Moderate: shrink-swell.	Slight---------	Moderate: low strength.	Slight.
Xerorthents.						
197--------------- Redding	Severe: cemented pan.	Moderate: cemented pan.	Severe: cemented pan.	Moderate: slope, cemented pan.	Moderate: cemented pan, low strength.	Moderate: cemented pan.
198--------------- Redding	Severe: cemented pan.	Moderate: cemented pan.	Severe: cemented pan.	Moderate: slope, cemented pan.	Moderate: cemented pan, low strength.	Moderate: small stones, large stones.
199--------------- Reiff	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
200--------------- Rindge	Severe: excess humus, wetness.	Severe: subsides, flooding, low strength.	Severe: subsides, flooding, wetness.	Severe: subsides, flooding, low strength.	Severe: subsides.	Severe: excess humus.
201, 202---------- Rindge	Severe: excess humus, wetness.	Severe: subsides, flooding, low strength.	Severe: subsides, flooding, wetness.	Severe: subsides, flooding, low strength.	Severe: subsides.	Moderate: wetness.
203*. Riverwash						
204--------------- Rossmoor	Slight---------	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Slight.
205*:						
Rossmoor---------	Slight---------	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Slight.
Urban land.						
206--------------- Sailboat	Moderate: wetness.	Severe:** flooding.	Severe:** flooding.	Severe:** flooding.	Moderate:** low strength, flooding, shrink-swell.	Slight.

See footnotes at end of table.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
207--------------- Sailboat	Slight---------	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: low strength, flooding, shrink-swell.	Slight.
208--------------- Sailboat	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
209*:						
Sailboat---------	Moderate: wetness.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: low strength, flooding, shrink-swell.	Slight.
Urban land.						
210--------------- Sailboat Variant	Severe: excess humus, wetness.	Severe: subsides, flooding.	Severe: subsides, flooding, wetness.	Severe: subsides, flooding.	Severe: subsides, low strength.	Moderate: wetness.
211, 212---------- San Joaquin	Severe: cemented pan.	Severe: shrink-swell.	Severe: cemented pan, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: droughty, cemented pan.
213, 214, 215----- San Joaquin	Severe: cemented pan.	Severe: shrink-swell.	Severe: cemented pan, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: cemented pan.
216*:						
San Joaquin------	Severe: cemented pan.	Severe: shrink-swell.	Severe: cemented pan, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: cemented pan.
Durixeralfs.						
217*:						
San Joaquin------	Severe: cemented pan.	Severe: shrink-swell.	Severe: cemented pan, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: cemented pan.
Galt-------------	Severe: cemented pan, cutbanks cave.	Severe: shrink-swell.	Severe: cemented pan, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: cemented pan.
218*:						
San Joaquin------	Severe: cemented pan.	Severe: shrink-swell.	Severe: cemented pan, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: cemented pan.
Galt-------------	Severe: cemented pan, cutbanks cave, ponding.	Severe: ponding, shrink-swell.	Severe: ponding, cemented pan.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.	Severe: ponding, too clayey.
219*:						
San Joaquin------	Severe: cemented pan.	Severe: shrink-swell.	Severe: cemented pan, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: cemented pan.

See footnotes at end of table.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
219*:						
Urban land.						
220*:						
San Joaquin------	Severe: cemented pan.	Severe: shrink-swell.	Severe: cemented pan, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: droughty, cemented pan.
Urban land.						
221*:						
San Joaquin------	Severe: cemented pan.	Severe: shrink-swell.	Severe: cemented pan, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: cemented pan.
Xerarents.						
222--------------- Scribner	Moderate: wetness.	Severe:*** subsides, flooding.	Severe:*** subsides, flooding.	Severe:*** subsides, flooding.	Severe:*** subsides, low strength.	Slight.
223*. Slickens						
224--------------- Tehama	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
225--------------- Tinnin	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Moderate: droughty.
226*:						
Tinnin-----------	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Slight---------	Moderate: droughty.
Urban land.						
227*. Urban land						
228*:						
Urban land.						
Natomas----------	Slight---------	Slight---------	Moderate: shrink-swell.	Slight---------	Moderate: low strength.	Slight.
229*:						
Urban land.						
Xerarents.						
Fiddyment--------	Moderate: depth to rock, cemented pan.	Moderate: shrink-swell.	Moderate: depth to rock, cemented pan.	Moderate: shrink-swell, slope.	Severe: low strength.	Moderate: droughty, depth to rock.
230--------------- Valpac	Moderate: wetness.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: shrink-swell, flooding.	Slight.

See footnotes at end of table.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
231*:						
Valpac	Moderate: wetness.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: shrink-swell, flooding.	Slight.
Urban land.						
232 Valpac Variant	Severe: cutbanks cave, excess humus, wetness.	Severe: subsides, flooding, low strength.	Severe: subsides, flooding, wetness.	Severe: subsides, flooding, low strength.	Severe: subsides, low strength.	Moderate: wetness.
233 Vina	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Slight.
234 Vina	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
235 Vleck	Severe: cemented pan.	Severe: shrink-swell.	Severe: cemented pan, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: small stones, droughty, slope.
236*:						
Vleck	Severe: cemented pan, slope.	Severe: shrink-swell, slope.	Severe: cemented pan, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
Amador	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.
Pits.						
237 Whiterock	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
238*:						
Xerarents.						
San Joaquin	Severe: cemented pan.	Severe: shrink-swell.	Severe: cemented pan, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: droughty, cemented pan.
239*:						
Xerarents.						
Redding	Severe: cemented pan.	Moderate: cemented pan.	Severe: cemented pan.	Moderate: cemented pan.	Moderate: cemented pan.	Moderate: cemented pan.
240*:						
Xerarents.						
Urban land.						
San Joaquin	Severe: cemented pan.	Severe: shrink-swell.	Severe: cemented pan, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: droughty, cemented pan.

See footnotes at end of table.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
241*:						
Xerarents.						
Urban land.						
Fiddyment--------	Moderate: depth to rock, cemented pan, slope.	Moderate: shrink-swell, slope.	Moderate: depth to rock, cemented pan, slope.	Severe: slope.	Severe: low strength.	Moderate: droughty, slope, depth to rock.
242. Xerofluvents						
243. Xerolls						
244. Xeropsamments						
245. Xerorthents						
246*:						
Xerorthents.						
Urban land.						

* See description of the map unit for composition and behavior characteristics of the map unit.
** Subsidence is a limitation in most areas in MLRA 16.
*** Subsidence is not a limitation in most areas north of Locke.

TABLE 14.--SANITARY FACILITIES

(Some terms that describe restrictive soil features are defined in the "Glossary." See text for definitions of "slight," "good," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
101*:					
Amador	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.
Gillender	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.
102*:					
Americanos	Moderate: percs slowly.	Moderate: seepage.	Slight	Slight	Fair: thin layer.
Urban land.					
103 Andregg	Severe: depth to rock.	Severe: seepage, depth to rock.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: depth to rock.
104 Andregg	Severe: depth to rock.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: depth to rock.
105*:					
Andregg	Severe: depth to rock.	Severe: seepage, depth to rock.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: depth to rock.
Urban land.					
106*:					
Andregg	Severe: depth to rock.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: depth to rock.
Urban land.					
107*:					
Argonaut	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: depth to rock, too clayey, hard to pack.
Auburn	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.
108*:					
Argonaut	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: depth to rock, too clayey, hard to pack.

See footnotes at end of table.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
108*:					
Auburn	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.
Urban land.					
109 Auburn	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
110*:					
Auburn	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
Argonaut	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: depth to rock, too clayey, hard to pack.
Rock outcrop.					
111, 112 Bruella	Severe: percs slowly.	Severe: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
113 Capay	Severe: flooding, percs slowly.	Severe: flooding**.	Severe: flooding, wetness.	Severe: flooding.	Fair: too clayey.
114 Clear Lake	Severe: flooding, wetness, percs slowly.	Severe: flooding**.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack.
115 Clear Lake	Severe: percs slowly.	Moderate: cemented pan.	Severe: cemented pan, too clayey.	Moderate: flooding, cemented pan.	Poor: too clayey, hard to pack.
116 Columbia	Severe: wetness.	Severe: seepage, wetness.	Severe: wetness.	Severe: seepage, wetness.	Fair: wetness.
117 Columbia	Moderate: flooding, percs slowly.	Severe: seepage.	Moderate: flooding.	Severe: seepage.	Good.
118 Columbia	Severe: flooding.	Severe: seepage, flooding**.	Severe: flooding.	Severe: flooding, seepage.	Good.
119 Columbia	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Severe: wetness, too clayey.	Severe: seepage, wetness.	Poor: too clayey, hard to pack.
120 Columbia	Severe: percs slowly.	Severe: seepage.	Severe: too clayey.	Severe: seepage.	Poor: too clayey, hard to pack.
121 Columbia	Severe: flooding, percs slowly.	Severe: seepage, flooding**.	Severe: flooding, too clayey.	Severe: flooding, seepage.	Poor: too clayey, hard to pack.

See footnotes at end of table.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
122 Columbia	Severe: subsides, percs slowly.	Severe: seepage.	Severe: seepage, wetness, too sandy.	Severe: seepage.	Poor: too sandy.
123 Columbia	Severe: subsides.	Severe: seepage.	Severe: seepage, wetness, too sandy.	Severe: seepage.	Poor: too sandy.
124*:					
Columbia	Severe: percs slowly.	Severe: seepage.	Severe: too clayey.	Severe: seepage.	Poor: too clayey, hard to pack.
Urban land.					
125*:					
Corning, well drained	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Poor: small stones.
Corning, moderately well drained	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Poor: small stones.
126*:					
Corning	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: small stones, slope.
Redding	Severe: cemented pan.	Severe: cemented pan, slope.	Severe: cemented pan.	Severe: cemented pan.	Poor: cemented pan, small stones.
127 Cosumnes	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
128 Cosumnes	Severe: percs slowly.	Slight	Severe: too clayey.	Moderate: flooding.	Poor: too clayey, hard to pack.
129 Cosumnes	Severe: flooding, percs slowly.	Severe: flooding**.	Severe: flooding, too clayey.	Severe: flooding.	Poor: too clayey, hard to pack.
130*:					
Cosumnes	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
Urban land.					
131 Coyotecreek	Severe: flooding, percs slowly.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Good.

See footnotes at end of table.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
132----------------- Creviscreek	Severe: wetness.	Severe: seepage, wetness.	Severe: depth to rock, too sandy.	Severe: seepage.	Poor: too sandy, small stones.
133, 134------------ Dierssen	Severe: cemented pan, wetness.	Severe: cemented pan, wetness.	Severe: cemented pan, wetness.	Severe: cemented pan, wetness.	Poor: cemented pan, too clayey, hard to pack.
135----------------- Dierssen	Severe: wetness, percs slowly.	Severe: wetness.	Severe: cemented pan, wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
136*. Dumps					
137. Durixeralfs					
138*: Durixeralfs.					
Galt---------------	Severe: cemented pan, percs slowly.	Severe: cemented pan.	Severe: cemented pan, too clayey.	Severe: cemented pan.	Poor: cemented pan, too clayey, hard to pack.
139----------------- Egbert	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
140----------------- Egbert	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Moderate: flooding.	Poor: too clayey, hard to pack.
141----------------- Egbert	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey.
142----------------- Egbert	Severe: flooding, wetness, percs slowly.	Severe: flooding**, wetness.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey.
143*: Egbert-------------	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey.
Urban land.					
144, 145------------ Fiddyment	Severe: depth to rock, cemented pan, percs slowly.	Severe: depth to rock, cemented pan.	Severe: depth to rock, cemented pan.	Severe: depth to rock, cemented pan.	Poor: depth to rock.

See footnotes at end of table.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
146-----------------Fiddyment	Severe: depth to rock, cemented pan, percs slowly.	Severe: depth to rock, cemented pan, slope.	Severe: depth to rock, cemented pan.	Severe: depth to rock, cemented pan.	Poor: depth to rock.
147*:					
Fiddyment----------	Severe: depth to rock, cemented pan, percs slowly.	Severe: depth to rock, cemented pan.	Severe: depth to rock, cemented pan.	Severe: depth to rock, cemented pan.	Poor: depth to rock.
Orangevale---------	Moderate: percs slowly***.	Severe: seepage.	Severe: seepage.	Slight-----------	Good.
148*:					
Fiddyment----------	Severe: depth to rock, cemented pan, percs slowly.	Severe: depth to rock, cemented pan.	Severe: depth to rock, cemented pan.	Severe: depth to rock, cemented pan.	Poor: depth to rock.
Orangevale---------	Moderate: percs slowly.	Severe: seepage.	Severe: seepage.	Slight-----------	Good.
Urban land.					
149*:					
Fiddyment----------	Severe: depth to rock, cemented pan, percs slowly.	Severe: depth to rock, cemented pan.	Severe: depth to rock, cemented pan.	Severe: depth to rock, cemented pan.	Poor: depth to rock.
Urban land.					
150. Fluvaquents					
151, 152, 153-------Galt	Severe: cemented pan, percs slowly.	Severe: cemented pan.	Severe: cemented pan, too clayey.	Severe: cemented pan.	Poor: cemented pan, too clayey, hard to pack.
154*:					
Galt---------------	Severe: cemented pan, percs slowly.	Severe: cemented pan.	Severe: cemented pan, too clayey.	Severe: cemented pan.	Poor: cemented pan, too clayey, hard to pack.
Urban land.					
155-----------------Gazwell	Severe: subsides, wetness, poor filter.	Severe: seepage, excess humus, wetness.	Severe: seepage, wetness, excess humus.	Severe: seepage, wetness.	Poor: excess humus.
156*:					
Hadselville--------	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.

See footnotes at end of table.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
156*:					
Pentz	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
157 Hedge	Severe: cemented pan, wetness, percs slowly.	Severe: cemented pan, wetness.	Severe: wetness.	Severe: cemented pan, wetness.	Poor: cemented pan, wetness.
158 Hicksville	Severe: flooding, percs slowly.	Severe: flooding**.	Severe: flooding, wetness.	Severe: flooding.	Fair: too clayey.
159 Hicksville	Severe: flooding, percs slowly.	Severe: flooding**.	Severe: flooding, wetness.	Severe: flooding.	Fair: too clayey, small stones.
160 Hicksville	Severe: flooding, wetness, percs slowly.	Severe: flooding**, wetness.	Severe: flooding, depth to rock.	Severe: flooding.	Fair: depth to rock, too clayey, wetness.
161 Jacktone	Severe: cemented pan, percs slowly.	Severe: cemented pan.	Severe: cemented pan, wetness, too clayey.	Severe: cemented pan.	Poor: cemented pan, too clayey, hard to pack.
162*:					
Kaseberg	Severe: depth to rock, cemented pan.	Severe: depth to rock, cemented pan, slope.	Severe: depth to rock.	Severe: depth to rock, cemented pan.	Poor: depth to rock.
Fiddyment	Severe: depth to rock, cemented pan, percs slowly.	Severe: depth to rock, cemented pan, slope.	Severe: depth to rock, cemented pan.	Severe: depth to rock, cemented pan.	Poor: depth to rock.
Urban land.					
163 Keyes	Severe: depth to rock, cemented pan.	Severe: depth to rock, cemented pan, slope.	Severe: depth to rock, cemented pan, too clayey.	Severe: depth to rock, cemented pan.	Poor: depth to rock, too clayey, hard to pack.
164 Kimball	Severe: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
165 Kimball	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
166*:					
Kimball	Severe: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
Urban land.					

See footnotes at end of table.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
167-----------------Lang	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: too sandy.
168*:					
Lang---------------	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: too sandy.
Urban land.					
169-----------------Laugenour	Severe: wetness.	Severe: seepage, wetness.	Severe: wetness.	Severe: seepage, wetness.	Fair: wetness.
170*:					
Laugenour----------	Severe: wetness.	Severe: seepage, wetness.	Severe: wetness.	Severe: seepage, wetness.	Fair: wetness.
Urban land.					
171. Lithic Xerorthents					
172-----------------Liveoak	Severe: flooding.	Severe: seepage, flooding**.	Severe: flooding, seepage.	Severe: flooding.	Good.
173*:					
Liveoak------------	Moderate: flooding.	Severe: seepage.	Severe: seepage.	Moderate: flooding.	Good.
Urban land.					
174, 175------------Madera	Severe: cemented pan, percs slowly.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Poor: cemented pan.
176*:					
Madera-------------	Severe: cemented pan, percs slowly.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Poor: cemented pan.
Galt---------------	Severe: cemented pan, ponding, percs slowly.	Severe: cemented pan, ponding.	Severe: cemented pan, ponding, too clayey.	Severe: cemented pan, ponding.	Poor: cemented pan, too clayey, hard to pack.
177. Medisaprists					
178-----------------Mokelumne	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, too acid.	Severe: depth to rock.	Poor: depth to rock, too acid.
179*:					
Mokelumne----------	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too acid.	Severe: depth to rock, slope.	Poor: depth to rock, slope, too acid.

See footnotes at end of table.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
179*: Pits.					
180----------------- Mokelumne Variant	Severe: percs slowly.	Moderate: seepage, depth to rock, slope.	Severe: depth to rock, too clayey, too acid.	Moderate: depth to rock.	Poor: too clayey, hard to pack, too acid.
181----------------- Natomas	Severe: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
182*: Natomas------------	Severe: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
Xerorthents.					
183----------------- Orangevale	Moderate: percs slowly.	Severe: seepage.	Severe: seepage.	Slight-----------	Good.
184*: Orangevale---------	Moderate: percs slowly.	Severe: seepage.	Severe: seepage.	Slight-----------	Good.
Kaseberg-----------	Severe: depth to rock, cemented pan.	Severe: depth to rock, cemented pan.	Severe: depth to rock.	Severe: depth to rock, cemented pan.	Poor: depth to rock.
Urban land.					
185*: Orangevale---------	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope.	Poor: slope.
Kaseberg-----------	Severe: depth to rock, cemented pan.	Severe: depth to rock, cemented pan, slope.	Severe: depth to rock.	Severe: depth to rock, cemented pan.	Poor: depth to rock.
Urban land.					
186*: Orthents.					
Urban land.					
187*: Pardee-------------	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock, small stones.
Ranchoseco---------	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.

See footnotes at end of table.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
188*:					
Pentz	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
Lithic Xerorthents.					
189 Peters	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: depth to rock, too clayey, hard to pack.
190*. Pits					
191 Red Bluff	Severe: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Poor: small stones.
192 Red Bluff	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Poor: small stones.
193*:					
Red Bluff	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Poor: small stones.
Redding	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Poor: cemented pan, small stones.
194*:					
Red Bluff	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Poor: small stones.
Urban land.					
195*:					
Red Bluff	Severe: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Poor: small stones.
Xerarents.					
196*:					
Red Bluff	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Poor: small stones.
Xerorthents.					
197 Redding	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Poor: cemented pan.
198 Redding	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Poor: cemented pan, small stones.

See footnotes at end of table.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
199----------------- Reiff	Severe: flooding.	Severe: seepage, flooding**.	Severe: flooding.	Severe: flooding, seepage.	Fair: too sandy.
200, 201, 202------- Rindge	Severe: subsides, wetness, poor filter.	Severe: seepage, excess humus, wetness.	Severe: seepage, wetness, excess humus.	Severe: seepage, wetness.	Poor: wetness, excess humus.
203*. Riverwash					
204----------------- Rossmoor	Moderate: flooding.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
205*:					
Rossmoor-----------	Moderate: flooding.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
Urban land.					
206----------------- Sailboat	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: wetness.
207----------------- Sailboat	Severe: percs slowly.	Moderate: seepage.	Moderate: flooding.	Moderate: flooding.	Good.
208----------------- Sailboat	Severe: flooding, percs slowly.	Severe: flooding**.	Severe: flooding.	Severe: flooding.	Good.
209*:					
Sailboat-----------	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: wetness.
Urban land.					
210----------------- Sailboat Variant	Severe: subsides, wetness.	Severe: seepage, excess humus, wetness.	Severe: seepage, wetness, excess humus.	Severe: seepage, wetness.	Poor: hard to pack.
211, 212, 213, 214, 215----------------- San Joaquin	Severe: cemented pan, percs slowly.	Severe: cemented pan.	Severe: cemented pan, too clayey.	Severe: cemented pan.	Poor: cemented pan, too clayey.
216*:					
San Joaquin--------	Severe: cemented pan, percs slowly.	Severe: cemented pan.	Severe: cemented pan, too clayey.	Severe: cemented pan.	Poor: cemented pan, too clayey.
Durixeralfs.					

See footnotes at end of table.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
217*:					
San Joaquin	Severe: cemented pan, percs slowly.	Severe: cemented pan.	Severe: cemented pan, too clayey.	Severe: cemented pan.	Poor: cemented pan, too clayey.
Galt	Severe: cemented pan, percs slowly.	Severe: cemented pan.	Severe: cemented pan, too clayey.	Severe: cemented pan.	Poor: cemented pan, too clayey, hard to pack.
218*:					
San Joaquin	Severe: cemented pan, percs slowly.	Severe: cemented pan.	Severe: cemented pan, too clayey.	Severe: cemented pan.	Poor: cemented pan, too clayey.
Galt	Severe: cemented pan, ponding, percs slowly.	Severe: cemented pan, ponding.	Severe: cemented pan, ponding, too clayey.	Severe: cemented pan, ponding.	Poor: cemented pan, too clayey, hard to pack.
219*, 220*:					
San Joaquin	Severe: cemented pan, percs slowly.	Severe: cemented pan.	Severe: cemented pan, too clayey.	Severe: cemented pan.	Poor: cemented pan, too clayey.
Urban land.					
221*:					
San Joaquin	Severe: cemented pan, percs slowly.	Severe: cemented pan.	Severe: cemented pan, too clayey.	Severe: cemented pan.	Poor: cemented pan, too clayey.
Xerarents.					
222 Scribner	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
223*. Slickens					
224 Tehama	Severe: percs slowly.	Slight	Moderate: too clayey.	Slight	Fair: too clayey.
225 Tinnin	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: too sandy, thin layer.
226*:					
Tinnin	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: too sandy, thin layer.
Urban land.					
227*. Urban land					

See footnotes at end of table.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
228*:					
Urban land.					
Natomas	Severe: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
229*:					
Urban land.					
Xerarents.					
Fiddyment	Severe: depth to rock, cemented pan, percs slowly.	Severe: depth to rock, cemented pan.	Severe: depth to rock, cemented pan.	Severe: depth to rock, cemented pan.	Poor: depth to rock.
230 Valpac	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
231*:					
Valpac	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
Urban land.					
232 Valpac Variant	Severe: subsides, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness, too clayey.	Severe: seepage, wetness.	Poor: too clayey, hard to pack.
233 Vina	Moderate: flooding, percs slowly***.	Moderate: seepage.	Moderate: flooding.	Moderate: flooding.	Good.
234 Vina	Severe: flooding.	Severe: flooding**.	Severe: flooding.	Severe: flooding.	Good.
235 Vleck	Severe: depth to rock, cemented pan, percs slowly.	Severe: depth to rock, cemented pan, slope.	Severe: depth to rock, cemented pan.	Severe: depth to rock, cemented pan.	Poor: depth to rock, too clayey, hard to pack.
236*:					
Vleck	Severe: depth to rock, cemented pan, percs slowly.	Severe: depth to rock, cemented pan, slope.	Severe: depth to rock, cemented pan, slope.	Severe: depth to rock, cemented pan, slope.	Poor: depth to rock, too clayey, hard to pack.
Amador	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
Pits.					
237 Whiterock	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.

See footnotes at end of table.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
238*:					
Xerarents.					
San Joaquin--------	Severe: cemented pan, percs slowly.	Severe: cemented pan.	Severe: cemented pan, too clayey.	Severe: cemented pan.	Poor: cemented pan, too clayey.
239*:					
Xerarents.					
Redding------------	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Poor: cemented pan.
240*:					
Xerarents.					
Urban land.					
San Joaquin--------	Severe: cemented pan, percs slowly.	Severe: cemented pan.	Severe: cemented pan, too clayey.	Severe: cemented pan.	Poor: cemented pan, too clayey.
241*:					
Xerarents.					
Urban land.					
Fiddyment----------	Severe: depth to rock, cemented pan, percs slowly.	Severe: depth to rock, cemented pan, slope.	Severe: depth to rock, cemented pan.	Severe: depth to rock, cemented pan.	Poor: depth to rock.
242. Xerofluvents					
243. Xerolls					
244. Xeropsamments					
245. Xerorthents					
246*:					
Xerorthents.					
Urban land.					

* See description of the map unit for composition and behavior characteristics of the map unit.
** If floodwater cannot enter or damage sewage lagoons because of low velocity or a depth of less than 5 feet, disregard flooding.
*** Recheck to see if rating should be slight.

TABLE 15.--CONSTRUCTION MATERIALS

(Some terms that describe restrictive soil features are defined in the "Glossary." See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
101*:				
Amador	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock.
Gillender	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones.
102*:				
Americanos	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Urban land.				
103 Andregg	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, small stones.
104 Andregg	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, small stones, slope.
105*:				
Andregg	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, small stones.
Urban land.				
106*:				
Andregg	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, small stones, slope.
Urban land.				
107*:				
Argonaut	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Auburn	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones.
108*:				
Argonaut	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.

See footnote at end of table.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
108*:				
Auburn	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones.
Urban land.				
109 Auburn	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
110*:				
Auburn	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
Argonaut	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Rock outcrop.				
111, 112 Bruella	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Good.
113 Capay	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
114 Clear Lake	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
115 Clear Lake	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
116, 117, 118 Columbia	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
119, 120, 121 Columbia	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
122 Columbia	Fair: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
123 Columbia	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
124*:				
Columbia	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
Urban land.				

See footnote at end of table.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
125*:				
Corning, well drained	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
Corning, moderately well drained	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
126*:				
Corning	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Redding	Poor: cemented pan.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
127, 128, 129 Cosumnes	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
130*:				
Cosumnes	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Urban land.				
131 Coyotecreek	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
132 Creviscreek	Fair: depth to rock, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
133, 134, 135 Dierssen	Poor: cemented pan, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
136*. Dumps				
137. Durixeralfs				
138*: Durixeralfs.				
Galt	Poor: cemented pan, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
139 Egbert	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.

See footnote at end of table.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
140-------------------- Egbert	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
141, 142-------------- Egbert	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
143*:				
Egbert----------------	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Urban land.				
144, 145, 146--------- Fiddyment	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, cemented pan, too clayey.
147*:				
Fiddyment------------	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, cemented pan, too clayey.
Orangevale-----------	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
148*:				
Fiddyment------------	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, cemented pan, too clayey.
Orangevale-----------	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Urban land.				
149*:				
Fiddyment------------	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, cemented pan, too clayey.
Urban land.				
150. Fluvaquents				
151, 152, 153--------- Galt	Poor: cemented pan, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
154*:				
Galt-----------------	Poor: cemented pan, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Urban land.				

See footnote at end of table.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
155: Gazwell	Poor: low strength.	Improbable: excess humus.	Improbable: excess humus.	Poor: too clayey.
156*:				
Hadselville	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
Pentz	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
157: Hedge	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: cemented pan, small stones, thin layer.
158: Hicksville	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
159: Hicksville	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
160: Hicksville	Fair: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
161: Jacktone	Poor: cemented pan, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
162*:				
Kaseberg	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, cemented pan.
Fiddyment	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, cemented pan, too clayey.
Urban land.				
163: Keyes	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, cemented pan, small stones.
164, 165: Kimball	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.

See footnote at end of table.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
166*:				
Kimball	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Urban land.				
167 Lang	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
168*:				
Lang	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
Urban land.				
169 Laugenour	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
170*:				
Laugenour	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
Urban land.				
171. Lithic Xerorthents				
172 Liveoak	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, area reclaim.
173*:				
Liveoak	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, area reclaim.
Urban land.				
174, 175 Madera	Poor: cemented pan.	Improbable: excess fines.	Improbable: excess fines.	Poor: cemented pan.
176*:				
Madera	Poor: cemented pan.	Improbable: excess fines.	Improbable: excess fines.	Poor: cemented pan.
Galt	Poor: cemented pan, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
177. Medisaprists				
178 Mokelumne	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, too acid.

See footnote at end of table.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
179*:				
Mokelumne	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, too acid, slope.
Pits.				
180 Mokelumne Variant	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
181 Natomas	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
182*:				
Natomas	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
Xerorthents.				
183 Orangevale	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
184*:				
Orangevale	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Kaseberg	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, cemented pan.
Urban land.				
185*:				
Orangevale	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Kaseberg	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, cemented pan.
Urban land.				
186*:				
Orthents.				
Urban land.				
187*:				
Pardee	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones.
Ranchoseco	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones.

See footnote at end of table.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
188*:				
Pentz	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
Lithic Xerorthents.				
189 Peters	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, too clayey.
190*. Pits				
191, 192 Red Bluff	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
193*:				
Red Bluff	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
Redding	Poor: cemented pan.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
194*:				
Red Bluff	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
Urban land.				
195*:				
Red Bluff	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
Xerarents.				
196*:				
Red Bluff	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
Xerorthents.				
197, 198 Redding	Poor: cemented pan.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
199 Reiff	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, small stones.
200, 201, 202 Rindge	Poor: low strength.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus.
203*. Riverwash				

See footnote at end of table.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
204------------------- Rossmoor	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Good.
205*:				
Rossmoor-------------	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Good.
Urban land.				
206, 207, 208--------- Sailboat	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Good.
209*:				
Sailboat-------------	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Good.
Urban land.				
210------------------- Sailboat Variant	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
211, 212, 213, 214, 215------------------ San Joaquin	Poor: cemented pan.	Improbable: excess fines.	Improbable: excess fines.	Poor: cemented pan.
216*:				
San Joaquin----------	Poor: cemented pan.	Improbable: excess fines.	Improbable: excess fines.	Poor: cemented pan.
Durixeralfs.				
217*:				
San Joaquin----------	Poor: cemented pan.	Improbable: excess fines.	Improbable: excess fines.	Poor: cemented pan.
Galt-----------------	Poor: cemented pan, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
218*:				
San Joaquin----------	Poor: cemented pan.	Improbable: excess fines.	Improbable: excess fines.	Poor: cemented pan.
Galt-----------------	Poor: cemented pan, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
219*, 220*:				
San Joaquin----------	Poor: cemented pan.	Improbable: excess fines.	Improbable: excess fines.	Poor: cemented pan.
Urban land.				
221*:				
San Joaquin----------	Poor: cemented pan.	Improbable: excess fines.	Improbable: excess fines.	Poor: cemented pan.
Xerarents.				

See footnote at end of table.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
222 Scribner	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
223*. Slickens				
224 Tehama	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
225 Tinnin	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, small stones.
226*: Tinnin	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, small stones.
Urban land.				
227*. Urban land				
228*: Urban land.				
Natomas	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
229*: Urban land.				
Xerarents.				
Fiddyment	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, cemented pan, too clayey.
230 Valpac	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
231*: Valpac	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Urban land.				
232 Valpac Variant	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
233, 234 Vina	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
235 Vleck	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.

See footnote at end of table.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
236*:				
Vleck	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
Amador	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
Pits.				
237 Whiterock	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
238*: Xerarents.				
San Joaquin	Poor: cemented pan.	Improbable: excess fines.	Improbable: excess fines.	Poor: cemented pan.
239*: Xerarents.				
Redding	Poor: cemented pan.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
240*: Xerarents.				
Urban land.				
San Joaquin	Poor: cemented pan.	Improbable: excess fines.	Improbable: excess fines.	Poor: cemented pan.
241*: Xerarents.				
Urban land.				
Fiddyment	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, cemented pan, too clayey.
242. Xerofluvents				
243. Xerolls				
244. Xeropsamments				
245. Xerorthents				
246*: Xerorthents.				
Urban land.				

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--WATER MANAGEMENT

(Some terms that describe restrictive soil features are defined in the "Glossary." See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
101*:						
Amador	Severe: depth to rock, slope.	Severe: thin layer, piping.	Deep to water	Slope, depth to rock, erodes easily.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Gillender	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.
102*:						
Americanos	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
Urban land.						
103 Andregg	Severe: seepage.	Severe: piping.	Deep to water	Depth to rock, slope.	Depth to rock	Depth to rock.
104 Andregg	Severe: seepage, slope.	Severe: piping.	Deep to water	Depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.
105*:						
Andregg	Severe: seepage.	Severe: piping.	Deep to water	Depth to rock, slope.	Depth to rock	Depth to rock.
Urban land.						
106*:						
Andregg	Severe: seepage, slope.	Severe: piping.	Deep to water	Depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.
Urban land.						
107*:						
Argonaut	Moderate: depth to rock, slope.	Severe: thin layer.	Deep to water	Percs slowly, depth to rock, slope.	Depth to rock, percs slowly.	Depth to rock, percs slowly.
Auburn	Severe: depth to rock.	Severe: thin layer, piping.	Deep to water	Depth to rock, slope.	Depth to rock	Depth to rock.
108*:						
Argonaut	Moderate: depth to rock, slope.	Severe: thin layer.	Deep to water	Percs slowly, depth to rock, slope.	Depth to rock, percs slowly.	Depth to rock, percs slowly.
Auburn	Severe: depth to rock.	Severe: thin layer, piping.	Deep to water	Depth to rock, slope.	Depth to rock	Depth to rock.
Urban land.						

See footnotes at end of table.

TABLE 16.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
109--------------- Auburn	Severe: depth to rock, slope.	Severe: thin layer, piping.	Deep to water	Depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.
110*:						
Auburn-----------	Severe: depth to rock, slope.	Severe: thin layer, piping.	Deep to water	Depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.
Argonaut---------	Severe: slope.	Severe: thin layer.	Deep to water	Percs slowly, depth to rock, slope.	Slope, depth to rock, percs slowly.	Slope, depth to rock, percs slowly.
Rock outcrop.						
111--------------- Bruella	Slight---------	Moderate: piping.	Deep to water	Favorable------	Favorable------	Favorable.
112--------------- Bruella	Moderate: slope.	Moderate: piping.	Deep to water	Slope----------	Favorable------	Favorable.
113--------------- Capay	Slight---------	Slight---------	Deep to water**	Percs slowly, flooding.	Percs slowly---	Percs slowly.
114--------------- Clear Lake	Slight---------	Moderate: hard to pack, wetness.	Deep to water**	Slow intake, percs slowly, flooding.	Percs slowly---	Percs slowly.
115--------------- Clear Lake	Moderate: cemented pan.	Moderate: thin layer, hard to pack.	Deep to water	Slow intake, percs slowly.	Percs slowly---	Percs slowly.
116, 117---------- Columbia	Severe: seepage.	Severe: piping.	Deep to water	Droughty-------	Favorable------	Droughty.
118--------------- Columbia	Severe: seepage.	Severe: piping.	Deep to water	Droughty, flooding.	Favorable------	Droughty.
119--------------- Columbia	Severe: seepage.	Moderate: hard to pack, wetness.	Deep to water**	Droughty, percs slowly.	Percs slowly---	Droughty.
120--------------- Columbia	Severe: seepage.	Moderate: hard to pack.	Deep to water	Droughty, percs slowly.	Percs slowly---	Droughty.
121--------------- Columbia	Severe: seepage.	Moderate: hard to pack.	Deep to water	Droughty, percs slowly, flooding.	Percs slowly---	Droughty.
122--------------- Columbia	Severe: seepage.	Severe: piping.	Subsides-------	Droughty, soil blowing.	Too sandy, soil blowing.	Droughty.
123--------------- Columbia	Severe: seepage.	Severe: piping.	Subsides-------	Slope, erodes easily.	Erodes easily, too sandy.	Erodes easily.
124*:						
Columbia---------	Severe: seepage.	Moderate: hard to pack.	Deep to water	Droughty, percs slowly.	Percs slowly---	Droughty.
Urban land.						

See footnotes at end of table.

TABLE 16.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
125*:						
Corning, well drained	Moderate: seepage, slope.	Slight	Deep to water	Slope, droughty, percs slowly.	Percs slowly	Droughty, percs slowly.
Corning, moderately well drained	Moderate: seepage, slope.	Slight	Deep to water	Slope, droughty, percs slowly.	Percs slowly	Droughty, percs slowly.
126*:						
Corning	Severe: slope.	Slight	Deep to water	Slope, droughty, percs slowly.	Slope, percs slowly.	Slope, droughty, percs slowly.
Redding	Severe: slope.	Severe: thin layer.	Deep to water	Slope, droughty, percs slowly.	Slope, cemented pan.	Slope, droughty, cemented pan.
127 Cosumnes	Slight	Moderate: hard to pack, wetness.	Deep to water**	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
128 Cosumnes	Slight	Moderate: hard to pack.	Deep to water	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
129 Cosumnes	Slight	Moderate: hard to pack.	Deep to water	Percs slowly, erodes easily, flooding.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
130*:						
Cosumnes	Slight	Moderate: hard to pack, wetness.	Deep to water**	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Urban land.						
131 Coyotecreek	Slight	Severe: piping.	Deep to water	Erodes easily, flooding.	Erodes easily	Erodes easily.
132 Creviscreek	Severe: seepage.	Severe: seepage.	Deep to water**	Droughty	Too sandy	Droughty.
133, 134 Dierssen	Moderate: cemented pan.	Severe: thin layer, wetness.	Percs slowly, cemented pan.	Wetness, percs slowly, cemented pan.	Cemented pan, wetness, percs slowly.	Wetness, cemented pan, percs slowly.
135 Dierssen	Moderate: cemented pan.	Severe: wetness.	Percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
136*. Dumps						
137. Durixeralfs						
138*: Durixeralfs.						

See footnotes at end of table.

TABLE 16.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
138*:						
Galt	Moderate: cemented pan.	Moderate: thin layer, hard to pack.	Deep to water	Slow intake, percs slowly, cemented pan.	Cemented pan, percs slowly.	Cemented pan, percs slowly.
139 Egbert	Slight	Severe: wetness.	Percs slowly, subsides.	Wetness, slow intake, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
140 Egbert	Moderate: slope.	Moderate: hard to pack.	Deep to water	Slope, slow intake, percs slowly.	Percs slowly	Percs slowly.
141 Egbert	Slight	Moderate: hard to pack, wetness.	Deep to water**	Slow intake, percs slowly.	Percs slowly	Percs slowly.
142 Egbert	Slight	Moderate: hard to pack, wetness.	Deep to water**	Slow intake, percs slowly, flooding.	Percs slowly	Percs slowly.
143*:						
Egbert	Slight	Moderate: hard to pack, wetness.	Deep to water**	Slow intake, percs slowly.	Percs slowly	Percs slowly.
Urban land.						
144 Fiddyment	Moderate: depth to rock, cemented pan.	Severe: thin layer.	Deep to water	Droughty, percs slowly.	Depth to rock, cemented pan.	Erodes easily, droughty.
145 Fiddyment	Moderate: depth to rock, cemented pan, slope.	Severe: thin layer.	Deep to water	Slope, droughty, percs slowly.	Depth to rock, cemented pan.	Erodes easily, droughty.
146 Fiddyment	Severe: slope.	Severe: thin layer.	Deep to water	Slope, droughty, percs slowly.	Slope, depth to rock, cemented pan.	Slope, erodes easily, droughty.
147*:						
Fiddyment	Moderate: depth to rock, cemented pan, slope.	Severe: thin layer.	Deep to water	Slope, droughty, percs slowly.	Depth to rock, cemented pan.	Erodes easily, droughty.
Orangevale	Moderate: seepage, slope.	Moderate: thin layer.	Deep to water	Slope, droughty.	Favorable	Droughty.
148*:						
Fiddyment	Moderate: depth to rock, cemented pan, slope.	Severe: thin layer.	Deep to water	Slope, droughty, percs slowly.	Depth to rock, cemented pan.	Erodes easily, droughty.
Orangevale	Moderate: seepage, slope.	Moderate: thin layer.	Deep to water	Slope, droughty.	Favorable	Droughty.

See footnotes at end of table.

TABLE 16.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
148*: Urban land.						
149*: Fiddyment	Moderate: depth to rock, cemented pan, slope.	Severe: thin layer.	Deep to water	Slope, droughty, percs slowly.	Depth to rock, cemented pan.	Erodes easily, droughty.
Urban land.						
150. Fluvaquents						
151, 152 Galt	Moderate: cemented pan.	Moderate: thin layer, hard to pack.	Deep to water	Slow intake, percs slowly, cemented pan.	Cemented pan, percs slowly.	Cemented pan, percs slowly.
153 Galt	Moderate: cemented pan, slope.	Moderate: thin layer, hard to pack.	Deep to water	Slow intake, percs slowly, cemented pan.	Cemented pan, percs slowly.	Cemented pan, percs slowly.
154*: Galt	Moderate: cemented pan.	Moderate: thin layer, hard to pack.	Deep to water	Slow intake, percs slowly, cemented pan.	Cemented pan, percs slowly.	Cemented pan, percs slowly.
Urban land.						
155 Gazwell	Severe: seepage.	Severe: excess humus, wetness.	Subsides	Wetness, soil blowing.	Wetness, soil blowing.	Favorable.
156*: Hadselville	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
Pentz	Severe: depth to rock, slope.	Severe: thin layer, piping.	Deep to water	Depth to rock, slope.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
157 Hedge	Moderate: seepage, cemented pan.	Severe: piping.	Cemented pan	Wetness, cemented pan, erodes easily.	Cemented pan, erodes easily, wetness.	Wetness, erodes easily, cemented pan.
158 Hicksville	Moderate: seepage.	Moderate: thin layer, piping.	Deep to water	Flooding	Favorable	Favorable.
159 Hicksville	Slight	Moderate: thin layer.	Deep to water	Flooding	Favorable	Favorable.
160 Hicksville	Moderate: depth to rock.	Severe: thin layer.	Deep to water	Flooding	Favorable	Favorable.
161 Jacktone	Moderate: cemented pan.	Moderate: thin layer, hard to pack.	Deep to water	Slow intake, percs slowly, cemented pan.	Cemented pan, percs slowly.	Cemented pan, percs slowly.

See footnotes at end of table.

TABLE 16.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
162*:						
Kaseberg	Severe: depth to rock, cemented pan, slope.	Severe: depth to rock, piping.	Deep to water	Slope, depth to rock, cemented pan.	Slope, depth to rock, cemented pan.	Slope, erodes easily, depth to rock.
Fiddyment	Severe: slope.	Severe: thin layer.	Deep to water	Slope, droughty, percs slowly.	Slope, depth to rock, cemented pan.	Slope, erodes easily, droughty.
Urban land.						
163 Keyes	Severe: depth to rock, cemented pan, slope.	Severe: thin layer.	Deep to water	Slope, droughty, percs slowly.	Slope, depth to rock, cemented pan.	Slope, droughty, depth to rock.
164 Kimball	Slight	Moderate: piping.	Deep to water	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
165 Kimball	Moderate: slope.	Moderate: piping.	Deep to water	Slope, percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
166*:						
Kimball	Slight	Moderate: piping.	Deep to water	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Urban land.						
167 Lang	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, soil blowing.	Too sandy, soil blowing.	Droughty.
168*:						
Lang	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, soil blowing.	Too sandy, soil blowing.	Droughty.
Urban land.						
169 Laugenour	Severe: seepage.	Severe: piping.	Deep to water**	Erodes easily	Erodes easily	Erodes easily.
170*:						
Laugenour	Severe: seepage.	Severe: piping.	Deep to water**	Erodes easily	Erodes easily	Erodes easily.
Urban land.						
171. Lithic Xerorthents						
172 Liveoak	Severe: seepage.	Moderate: thin layer.	Deep to water	Flooding	Favorable	Favorable.
173*:						
Liveoak	Severe: seepage.	Moderate: thin layer.	Deep to water	Favorable	Favorable	Favorable.

See footnotes at end of table.

TABLE 16.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
173*: Urban land.						
174 Madera	Moderate: cemented pan.	Severe: piping, thin layer.	Deep to water	Percs slowly	Cemented pan, erodes easily.	Erodes easily.
175 Madera	Moderate: cemented pan, slope.	Severe: piping, thin layer.	Deep to water	Slope, percs slowly.	Cemented pan, erodes easily.	Erodes easily.
176*: Madera	Moderate: cemented pan.	Severe: piping, thin layer.	Deep to water	Percs slowly	Cemented pan, erodes easily.	Erodes easily.
Galt	Moderate: cemented pan.	Severe: ponding.	Ponding, percs slowly, cemented pan.	Ponding, slow intake, percs slowly.	Cemented pan, ponding, percs slowly.	Wetness, cemented pan, percs slowly.
177. Medisaprists						
178 Mokelumne	Severe: slope.	Severe: hard to pack.	Deep to water	Slope, droughty, percs slowly.	Slope, depth to rock, percs slowly.	Slope, droughty, depth to rock.
179*: Mokelumne	Severe: slope.	Severe: hard to pack.	Deep to water	Slope, droughty, percs slowly.	Slope, depth to rock, percs slowly.	Slope, droughty, depth to rock.
Pits.						
180 Mokelumne Variant	Moderate: depth to rock, slope.	Severe: hard to pack.	Deep to water	Slope, percs slowly, too acid.	Percs slowly	Percs slowly.
181 Natomas	Moderate: seepage.	Slight	Deep to water	Favorable	Favorable	Favorable.
182*: Natomas	Moderate: seepage.	Slight	Deep to water	Favorable	Favorable	Favorable.
Xerorthents.						
183 Orangevale	Moderate: seepage, slope.	Moderate: thin layer.	Deep to water	Slope, droughty.	Favorable	Droughty.
184*: Orangevale	Moderate: seepage, slope.	Moderate: thin layer.	Deep to water	Slope, droughty.	Favorable	Droughty.
Kaseberg	Severe: depth to rock, cemented pan.	Severe: depth to rock, piping.	Deep to water	Slope, depth to rock, cemented pan.	Depth to rock, cemented pan.	Erodes easily, depth to rock.

See footnotes at end of table.

TABLE 16.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
184*:						
Urban land.						
185*:						
Orangevale	Severe: slope.	Moderate: thin layer.	Deep to water	Slope, droughty.	Slope	Slope, droughty.
Kaseberg	Severe: depth to rock, cemented pan, slope.	Severe: depth to rock, piping.	Deep to water	Slope, depth to rock, cemented pan.	Slope, depth to rock, cemented pan.	Slope, erodes easily, depth to rock.
Urban land.						
186*:						
Orthents.						
Urban land.						
187*:						
Pardee	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Slope, droughty.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Ranchoseco	Severe: depth to rock, slope.	Moderate: large stones.	Deep to water	Slope, large stones, droughty.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
188*:						
Pentz	Severe: depth to rock, slope.	Severe: thin layer, piping.	Deep to water	Depth to rock, slope.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Lithic Xerorthents.						
189 Peters	Severe: depth to rock.	Severe: thin layer.	Deep to water	Slope, slow intake, percs slowly.	Slope, slow intake, percs slowly.	Depth to rock.
190*. Pits						
191 Red Bluff	Slight	Moderate: piping.	Deep to water	Favorable	Favorable	Favorable.
192 Red Bluff	Moderate: slope.	Slight	Deep to water	Slope	Favorable	Favorable.
193*:						
Red Bluff	Moderate: slope.	Slight	Deep to water	Slope	Favorable	Favorable.
Redding	Moderate: cemented pan.	Severe: thin layer.	Deep to water	Droughty, percs slowly.	Cemented pan	Droughty, cemented pan.
194*:						
Red Bluff	Slight	Slight	Deep to water	Favorable	Favorable	Favorable.
Urban land.						

See footnotes at end of table.

TABLE 16.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes, and levees	Features affecting-- Drainage	Features affecting-- Irrigation	Features affecting-- Terraces and diversions	Features affecting-- Grassed waterways
195*:						
Red Bluff	Slight	Slight	Deep to water	Favorable	Favorable	Favorable.
Xerarents.						
196*:						
Red Bluff	Moderate: slope.	Slight	Deep to water	Slope	Favorable	Favorable.
Xerorthents.						
197 Redding	Moderate: cemented pan, slope.	Severe: piping.	Deep to water	Slope, percs slowly, cemented pan.	Cemented pan, erodes easily.	Erodes easily, cemented pan.
198 Redding	Moderate: cemented pan, slope.	Severe: thin layer.	Deep to water	Slope, droughty, percs slowly.	Cemented pan	Droughty, cemented pan.
199 Reiff	Severe: seepage.	Severe: piping.	Deep to water	Flooding	Too sandy	Favorable.
200, 201, 202 Rindge	Severe: seepage.	Severe: excess humus, wetness.	Subsides	Wetness, soil blowing.	Wetness, soil blowing.	Favorable.
203*. Riverwash						
204 Rossmoor	Severe: seepage.	Severe: piping.	Deep to water	Favorable	Favorable	Favorable.
205*:						
Rossmoor	Severe: seepage.	Severe: piping.	Deep to water	Favorable	Favorable	Favorable.
Urban land.						
206, 207 Sailboat	Moderate: seepage.	Severe: piping.	Deep to water**	Erodes easily	Erodes easily	Erodes easily.
208 Sailboat	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily, flooding.	Erodes easily	Erodes easily.
209*:						
Sailboat	Moderate: seepage.	Severe: piping.	Deep to water**	Erodes easily	Erodes easily	Erodes easily.
Urban land.						
210 Sailboat Variant	Severe: seepage.	Severe: piping, excess humus, wetness.	Subsides	Wetness, erodes easily.	Erodes easily, wetness.	Erodes easily.
211 San Joaquin	Moderate: cemented pan.	Severe: thin layer.	Deep to water	Droughty, percs slowly.	Cemented pan	Cemented pan.

See footnotes at end of table.

TABLE 16.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
212----- San Joaquin	Moderate: cemented pan, slope.	Severe: thin layer.	Deep to water	Slope, droughty, percs slowly.	Cemented pan---	Cemented pan.
213, 214----- San Joaquin	Moderate: cemented pan.	Severe: thin layer.	Deep to water	Percs slowly---	Cemented pan, erodes easily.	Erodes easily, cemented pan.
215----- San Joaquin	Moderate: cemented pan, slope.	Severe: thin layer.	Deep to water	Slope, percs slowly.	Cemented pan, erodes easily.	Erodes easily, cemented pan.
216*:						
San Joaquin------	Moderate: cemented pan.	Severe: thin layer.	Deep to water	Percs slowly---	Cemented pan, erodes easily.	Erodes easily, cemented pan.
Durixeralfs.						
217*:						
San Joaquin------	Moderate: cemented pan.	Severe: thin layer.	Deep to water	Percs slowly---	Cemented pan, erodes easily.	Erodes easily, cemented pan.
Galt-------------	Moderate: cemented pan.	Moderate: thin layer, hard to pack.	Deep to water	Percs slowly, cemented pan, erodes easily.	Cemented pan, erodes easily, percs slowly.	Erodes easily, cemented pan, percs slowly.
218*:						
San Joaquin------	Moderate: cemented pan.	Severe: thin layer.	Deep to water	Percs slowly---	Cemented pan, erodes easily.	Erodes easily, cemented pan.
Galt-------------	Moderate: cemented pan.	Severe: ponding.	Ponding, percs slowly, cemented pan.	Ponding, slow intake, percs slowly.	Cemented pan, ponding, percs slowly.	Wetness, cemented pan, percs slowly.
219*:						
San Joaquin------	Moderate: cemented pan.	Severe: thin layer.	Deep to water	Percs slowly---	Cemented pan, erodes easily.	Erodes easily, cemented pan.
Urban land.						
220*:						
San Joaquin------	Moderate: cemented pan.	Severe: thin layer.	Deep to water	Droughty, percs slowly.	Cemented pan---	Cemented pan.
Urban land.						
221*:						
San Joaquin------	Moderate: cemented pan.	Severe: thin layer.	Deep to water	Percs slowly---	Cemented pan, erodes easily.	Erodes easily, cemented pan.
Xerarents.						
222----- Scribner	Slight---------	Moderate: piping, wetness.	Deep to water**	Favorable------	Favorable------	Favorable.
223*. Slickens						
224----- Tehama	Slight---------	Severe: thin layer.	Deep to water	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.

See footnotes at end of table.

TABLE 16.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
225: Tinnin	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake.	Too sandy, soil blowing.	Droughty.
226*:						
Tinnin	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
Urban land.						
227*. Urban land						
228*:						
Urban land.						
Natomas	Moderate: seepage.	Slight	Deep to water	Favorable	Favorable	Favorable.
229*:						
Urban land.						
Xerarents.						
Fiddyment	Moderate: depth to rock, cemented pan.	Severe: thin layer.	Deep to water	Slope, droughty, percs slowly.	Depth to rock, cemented pan.	Erodes easily, droughty.
230: Valpac	Slight	Severe: piping.	Deep to water**	Erodes easily	Erodes easily	Erodes easily.
231*:						
Valpac	Slight	Severe: piping.	Deep to water**	Erodes easily	Erodes easily	Erodes easily.
Urban land.						
232: Valpac Variant	Severe: seepage.	Severe: excess humus, wetness.	Subsides	Wetness, soil blowing.	Wetness, soil blowing.	Favorable.
233: Vina	Moderate: seepage.	Severe: piping.	Deep to water	Favorable	Erodes easily	Erodes easily.
234: Vina	Moderate: seepage.	Severe: piping.	Deep to water	Flooding	Erodes easily	Erodes easily.
235: Vleck	Severe: slope.	Moderate: thin layer, hard to pack.	Deep to water	Slope, droughty, percs slowly.	Slope, depth to rock, cemented pan.	Slope, droughty, depth to rock.
236*:						
Vleck	Severe: slope.	Severe: thin layer.	Deep to water	Slope, percs slowly, depth to rock.	Slope, depth to rock, cemented pan.	Slope, erodes easily, depth to rock.

See footnotes at end of table.

TABLE 16.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
236*:						
Amador	Severe: depth to rock, slope.	Severe: thin layer, piping.	Deep to water	Slope, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Pits.						
237 Whiterock	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Depth to rock, slope, erodes easily.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
238*:						
Xerarents.						
San Joaquin	Moderate: cemented pan.	Severe: thin layer.	Deep to water	Droughty, percs slowly.	Cemented pan	Cemented pan.
239*:						
Xerarents.						
Redding	Moderate: cemented pan.	Severe: piping.	Deep to water	Percs slowly, cemented pan.	Cemented pan, erodes easily.	Erodes easily, cemented pan.
240*:						
Xerarents.						
Urban land.						
San Joaquin	Moderate: cemented pan.	Severe: thin layer.	Deep to water	Droughty, percs slowly.	Cemented pan	Cemented pan.
241*:						
Xerarents.						
Urban land.						
Fiddyment	Severe: slope.	Severe: thin layer.	Deep to water	Slope, droughty, percs slowly.	Slope, depth to rock, cemented pan.	Slope, erodes easily, droughty.
242. Xerofluvents						
243. Xerolls						
244. Xeropsamments						
245. Xerorthents						
246*:						
Xerorthents.						
Urban land.						

* See description of the map unit for composition and behavior characteristics of the map unit.
** If the soil is irrigated, consider other restrictive drainage features.

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TABLE 17.--ENGINERING INDEX PROPERTIES

(The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated)

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
101*:											
Amador----------	0-6	Loam-------------	ML	A-4	0	85-100	75-100	70-85	50-60	25-35	NP-10
	6-19	Loam, sandy loam	ML, SM	A-4	0	85-100	75-100	50-85	40-60	20-35	NP-10
	19	Weathered bedrock	---	---	---	---	---	---	---	---	---
Gillender-------	0-4	Loam-------------	ML	A-4	0-5	85-100	75-100	65-85	50-60	25-35	NP-10
	4-7	Sandy loam, loam	SM, ML	A-4	0-5	85-100	75-100	50-85	35-60	20-35	NP-10
	7	Weathered bedrock	---	---	---	---	---	---	---	---	---
102*:											
Americanos------	0-8	Silt loam--------	ML	A-4	0	100	100	95-100	75-85	25-35	NP-10
	8-36	Silt loam, loam	ML	A-4	0	100	100	95-100	85-95	30-40	5-10
	36-54	Silt loam, loam	ML	A-4	0	100	100	95-100	75-85	25-35	NP-5
	54-62	Sandy loam-------	SM	A-2, A-4	0	95-100	85-100	50-60	25-45	---	NP
Urban land.											
103, 104---------	0-11	Coarse sandy loam	SM	A-2, A-4	0	95-100	85-100	50-60	25-45	---	NP
Andregg	11-32	Coarse sandy loam, sandy loam.	SM	A-2, A-4	0	95-100	85-100	50-60	25-45	---	NP
	32	Weathered bedrock	---	---	---	---	---	---	---	---	---
105*, 106*:											
Andregg---------	0-11	Coarse sandy loam	SM	A-2, A-4	0	95-100	85-100	50-60	25-45	---	NP
	11-32	Coarse sandy loam, sandy loam.	SM	A-2, A-4	0	95-100	85-100	50-60	25-45	---	NP
	32	Weathered bedrock	---	---	---	---	---	---	---	---	---
Urban land.											
107*:											
Argonaut--------	0-8	Loam-------------	ML, CL-ML	A-4	0-5	80-100	75-95	70-90	50-80	20-30	NP-10
	8-14	Clay loam, gravelly clay loam, gravelly loam.	CL	A-6	5-10	75-95	70-90	65-85	50-60	25-40	10-20
	14-29	Clay, gravelly clay, clay loam.	CH, CL	A-7	0-5	75-100	70-90	65-85	60-80	40-60	20-35
	29	Weathered bedrock	---	---	---	---	---	---	---	---	---
Auburn----------	0-14	Loam-------------	ML, CL-ML	A-4	0-10	95-100	75-95	70-90	50-80	20-30	NP-10
	14	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
108*:											
Argonaut--------	0-8	Loam-------------	ML, CL-ML	A-4	0-5	80-100	75-95	70-90	50-80	20-30	NP-10
	8-14	Clay loam, gravelly clay loam, gravelly loam.	CL	A-6	5-10	75-95	70-90	65-85	50-60	25-40	10-20
	14-29	Clay, gravelly clay, clay loam.	CH, CL	A-7	0-5	75-100	70-90	65-85	60-80	40-60	20-35
	29	Weathered bedrock	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
108*:											
Auburn----------	0-14	Loam------------	ML, CL-ML	A-4	0-10	95-100	75-95	70-90	50-80	20-30	NP-10
	14	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Urban land.											
109-------------- Auburn	0-16	Silt loam--------	ML, CL-ML	A-4	0-10	95-100	75-95	70-90	50-80	20-30	NP-10
	16	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
110*:											
Auburn----------	0-14	Loam------------	ML, CL-ML	A-4	0-10	95-100	75-95	70-90	50-80	20-30	NP-10
	14	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Argonaut--------	0-8	Loam------------	ML, CL-ML	A-4	0-5	80-100	75-95	70-90	50-80	20-30	NP-10
	8-14	Clay loam, gravelly clay loam, gravelly loam.	CL	A-6	5-10	75-95	70-90	65-85	50-60	25-40	10-20
	14-29	Clay, gravelly clay, clay loam.	CH, CL	A-7	0-5	75-100	70-90	65-85	60-80	40-60	20-35
	29	Weathered bedrock	---	---	---	---	---	---	---	---	---
Rock outcrop.											
111, 112--------- Bruella	0-18	Sandy loam-------	SM-SC, SM	A-4	0	95-100	95-100	60-70	35-50	20-30	NP-10
	18-42	Sandy clay loam, sandy loam.	SC	A-6	0	95-100	95-100	65-80	35-50	30-40	10-15
	42-61	Sandy clay loam, clay loam.	SC, CL	A-6	0	95-100	95-100	65-80	35-60	30-40	10-20
113-------------- Capay	0-5	Clay loam--------	CL	A-7	0	100	100	95-100	85-95	40-50	15-25
	5-28	Clay, silty clay	CL, CH	A-7	0	100	100	95-100	85-95	40-60	20-35
	28-67	Silty clay loam, clay loam.	CL	A-7	0	100	100	95-100	75-95	40-50	15-25
114-------------- Clear Lake	0-43	Clay-------------	CH, CL	A-7	0	100	100	95-100	85-95	40-70	20-40
	43-61	Stratified sandy clay loam to clay loam.	SC, CL	A-6	0	100	100	65-95	35-60	30-40	10-20
115-------------- Clear Lake	0-15	Clay-------------	CL, CH	A-7	0	100	100	90-100	80-95	40-60	20-35
	15-34	Clay, silty clay	CL, CH	A-6, A-7	0	100	100	90-100	80-95	35-55	15-30
	34-48	Clay loam, silty clay loam.	CL	A-6, A-7	0	100	100	75-95	65-85	30-45	10-20
	48-64	Cemented---------	---	---	---	---	---	---	---	---	---
116, 117, 118---- Columbia	0-11	Sandy loam-------	SM, SM-SC	A-2, A-4	0	100	95-100	65-90	30-50	20-30	NP-10
	11-60	Stratified sand to silt loam.	SM	A-4	0	100	95-100	60-90	35-50	20-25	NP-5
119, 120, 121---- Columbia	0-11	Sandy loam-------	SM, SM-SC	A-2, A-4	0	100	95-100	65-90	30-50	20-30	NP-10
	11-43	Stratified sand to silt loam.	SM	A-4	0	100	95-100	60-90	35-50	20-25	NP-5
	43-64	Clay loam, silty clay loam, clay.	CL, CH	A-7	0	100	95-100	90-100	75-95	40-60	20-35

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification Unified	Classification AASHTO	Frag- ments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
122-------------- Columbia	0-14	Fine sandy loam	SM, SM-SC	A-2, A-4	0	100	100	65-90	30-50	20-30	NP-10
	14-42	Stratified sand to silt loam.	SM	A-4	0	100	100	60-90	35-50	20-30	NP-5
	42-54	Stratified silt loam to silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-95	25-40	5-15
	54-67	Mucky clay loam	OL, ML	A-8, A-5	0	100	100	90-100	70-95	40-50	5-10
123-------------- Columbia	0-12	Silt loam--------	ML	A-4	0	100	100	90-100	80-90	25-35	NP-10
	12-60	Stratified sand to silt loam.	SM	A-4	0	100	100	60-90	35-50	20-25	NP-5
124*:											
Columbia--------	0-11	Sandy loam-------	SM, SM-SC	A-2, A-4	0	100	95-100	65-90	30-50	20-30	NP-10
	11-43	Stratified sand to silt loam.	SM	A-4	0	100	95-100	60-90	35-50	20-25	NP-5
	43-64	Clay loam, silty clay loam, clay.	CL, CH	A-7	0	100	95-100	90-100	75-95	40-60	20-35
Urban land.											
125*:											
Corning, well drained--------	0-28	Gravelly loam----	SM, SM-SC	A-4	0-5	75-90	60-80	60-70	40-50	25-35	5-10
	28-47	Gravelly clay loam, gravelly clay.	SC, CL, GC, CH	A-7	0-5	70-80	60-75	55-75	40-60	40-60	20-35
	47-62	Stratified gravelly loamy coarse sand to gravelly sandy clay loam.	SC, SM-SC	A-2, A-4, A-6	0-5	60-75	50-75	35-60	25-40	20-35	5-15
Corning, moderately well drained-------	0-20	Gravelly sandy loam, gravelly fine sandy loam.	SM	A-2	0-5	75-90	60-80	40-60	25-35	20-30	NP-5
	20-32	Clay, clay loam	CL, CH	A-7	0-5	80-100	75-85	65-85	55-70	40-60	20-35
	32-60	Stratified gravelly loamy coarse sand to gravelly clay loam.	SC, SM-SC	A-2, A-4, A-6	0-5	60-75	50-75	35-60	25-40	20-35	5-15
126*:											
Corning---------	0-28	Gravelly loam----	SM, SM-SC	A-4	0-5	75-90	60-80	60-70	40-50	25-35	5-10
	28-47	Gravelly clay loam, gravelly clay.	SC, CL, GC, CH	A-7	0-5	70-80	60-75	55-75	40-60	40-60	20-35
	47-62	Stratified gravelly loamy coarse sand to gravelly sandy clay loam.	SC, SM-SC	A-2, A-4, A-6	0-5	60-75	50-75	35-60	25-40	20-35	5-15

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
126*:											
Redding----------	0-7	Gravelly loam----	SC, SM-SC, GC, GM-GC	A-4, A-6	0-15	55-90	50-75	45-70	35-50	20-35	5-15
	7-20	Gravelly loam, gravelly clay loam.	CL, CL-ML, GC, GM-GC	A-4, A-6	0-5	55-90	50-80	45-70	35-55	25-40	5-15
	20-28	Gravelly clay loam, gravelly clay.	GC, CH, CL	A-7	0-5	55-80	50-75	45-70	40-60	40-60	15-30
	28-66	Cemented----------	---	---	---	---	---	---	---	---	---
127, 128, 129---- Cosumnes	0-8	Silt loam--------	ML	A-4	0	100	95-100	90-100	70-85	30-40	5-10
	8-21	Stratified silty clay loam to clay.	CL, CH	A-6, A-7	0	100	95-100	90-100	70-95	35-60	15-30
	21-43	Stratified clay loam to clay.	CH, CL	A-7	0	100	95-100	90-100	75-95	40-60	20-35
	43-60	Stratified clay loam to clay.	CH, CL	A-7	0	100	95-100	90-100	70-95	40-55	20-30
130*:											
Cosumnes---------	0-8	Silt loam--------	ML	A-4	0	100	95-100	90-100	70-85	30-40	5-10
	8-21	Stratified silty clay loam to clay.	CL, CH	A-6, A-7	0	100	95-100	90-100	70-95	35-60	15-30
	21-43	Stratified clay loam to clay.	CH, CL	A-7	0	100	95-100	90-100	75-95	40-60	20-35
	43-60	Stratified clay loam to clay.	CH, CL	A-7	0	100	95-100	90-100	70-95	40-55	20-30
Urban land.											
131-------------- Coyotecreek	0-15	Silt loam--------	CL-ML, ML	A-4	0	100	100	90-100	85-90	25-35	5-10
	15-58	Loam, silt loam	CL-ML, ML	A-4	0	100	100	95-100	85-90	25-35	5-10
	58-65	Stratified fine sandy loam to clay loam.	CL-ML, CL	A-4, A-6	0	95-100	90-100	70-100	50-85	25-35	5-15
132-------------- Creviscreek	0-21	Sandy loam-------	SM	A-2, A-4	0	80-100	75-100	50-70	25-40	20-30	NP-5
	21-29	Sandy loam, sandy clay loam, gravelly sandy clay loam.	SC, SM-SC, GC, GM-GC	A-2, A-4, A-6	0	55-100	50-95	35-80	25-50	25-35	5-15
	29-57	Stratified extremely gravelly sand to clay loam.	SM, GM, SM-SC, GM-GC	A-1, A-2	0-10	40-85	30-75	20-50	10-35	20-30	NP-10
	57	Weathered bedrock	---	---	---	---	---	---	---	---	---
133-------------- Dierssen	0-12	Sandy loam-------	SM-SC, SM	A-4	0	100	95-100	50-75	36-50	20-30	NP-10
	12-19	Sandy clay loam, clay loam.	SC, CL	A-6	0	100	95-100	75-95	35-60	30-40	10-20
	19-33	Clay loam, clay	CL, CH	A-7	0	100	95-100	90-100	70-95	40-60	20-35
	33-60	Cemented----------	---	---	---	---	---	---	---	---	---
134-------------- Dierssen	0-14	Sandy clay loam	SC	A-6	0	100	95-100	75-95	35-50	30-40	10-20
	14-31	Clay loam, clay	CL, CH	A-7	0	100	95-100	90-100	70-95	40-60	20-35
	31-60	Cemented----------	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification Unified	Classification AASHTO	Frag- ments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
135--------------	0-15	Clay loam--------	CL	A-6	0	100	95-100	85-95	65-85	30-40	10-20
Dierssen	15-24	Clay loam, clay	CL	A-7, A-6	0	100	95-100	90-100	70-95	35-60	15-25
	24-41	Clay-------------	CL, CH	A-7	0	100	100	90-100	85-95	40-60	20-35
	41-70	Cemented---------	---	---	---	---	---	---	---	---	---
136*. Dumps											
137. Durixeralfs											
138*: Durixeralfs.											
Galt------------	0-13	Clay-------------	CL, CH	A-7	0	100	100	90-100	75-95	45-65	20-40
	13-32	Clay, silty clay	CL, CH	A-7	0	100	100	90-100	75-95	45-65	20-40
	32-60	Cemented---------	---	---	---	---	---	---	---	---	---
139--------------	0-20	Clay-------------	CL, CH	A-7	0	100	100	90-100	75-95	40-60	20-35
Egbert	20-60	Silty clay loam, clay loam, clay.	CL, CH	A-7	0	100	100	90-100	70-95	40-60	20-35
140--------------	0-40	Clay-------------	CL, CH	A-7	0	100	100	90-100	75-95	40-60	15-30
Egbert	40-60	Silty clay loam, clay loam, clay.	CL, CH	A-7	0	100	100	90-100	70-95	40-60	15-35
141, 142---------	0-18	Clay-------------	CL, CH	A-7	0	100	100	90-100	75-95	40-60	20-35
Egbert	18-46	Silty clay loam, clay loam, clay.	CL, CH	A-7	0	100	100	90-100	70-95	40-60	15-35
	46-60	Stratified sandy clay loam to clay loam.	CL, SC	A-6	0	100	100	75-95	35-65	30-40	10-20
143*:											
Egbert----------	0-18	Clay-------------	CL, CH	A-7	0	100	100	90-100	75-95	40-60	20-35
	18-46	Silty clay loam, clay loam, clay.	CL, CH	A-7	0	100	100	90-100	70-95	40-60	15-35
	46-60	Stratified sandy clay loam to clay loam.	CL, SC	A-6	0	100	100	75-95	35-65	30-40	10-20
Urban land.											
144--------------	0-8	Fine sandy loam	SM	A-4	0	95-100	90-100	70-85	35-50	25-35	NP-10
Fiddyment	8-22	Loam-------------	ML, CL-ML	A-4	0	95-100	90-100	70-95	50-65	25-35	5-10
	22-30	Sandy clay loam, clay loam.	CL, SC	A-6, A-7	0	95-100	90-100	80-95	40-75	35-45	15-25
	30-36	Indurated--------	---	---	---	---	---	---	---	---	---
	36	Weathered bedrock	---	---	---	---	---	---	---	---	---
145--------------	0-8	Fine sandy loam	SM	A-4	0	95-100	90-100	70-85	35-50	25-35	NP-10
Fiddyment	8-15	Loam-------------	ML, CL-ML	A-4	0	95-100	90-100	70-95	50-65	25-35	5-10
	15-28	Sandy clay loam, clay loam.	CL, SC	A-6, A-7	0	95-100	90-100	80-95	40-75	35-45	15-25
	28-40	Indurated--------	---	---	---	---	---	---	---	---	---
	40	Weathered bedrock	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct					Pct	
146----------------	0-14	Loam-------------	ML	A-4	0	95-100	90-100	80-95	50-65	25-35	NP-10
Fiddyment	14-28	Clay loam, clay	CL, CH	A-7	0	100	95-100	90-100	75-95	40-60	20-35
	28-34	Indurated--------	---	---	---	---	---	---	---	---	---
	34	Weathered bedrock	---	---	---	---	---	---	---	---	---
147*:											
Fiddyment-------	0-8	Fine sandy loam	SM	A-4	0	95-100	90-100	70-85	35-50	25-35	NP-10
	8-15	Loam-------------	ML, CL-ML	A-4	0	95-100	90-100	70-95	50-65	25-35	5-10
	15-28	Sandy clay loam, clay loam.	CL, SC	A-6, A-7	0	95-100	90-100	80-95	40-75	35-45	15-25
	28-40	Indurated--------	---	---	---	---	---	---	---	---	---
	40	Weathered bedrock	---	---	---	---	---	---	---	---	---
Orangevale------	0-15	Coarse sandy loam	SM	A-2, A-4	0	100	100	60-70	25-40	15-25	NP-5
	15-20	Coarse sandy loam, sandy clay loam.	SM-SC	A-4	0	100	95-100	60-75	35-50	20-30	5-10
	20-72	Sandy clay loam	SC	A-6	0	100	95-100	70-80	35-50	30-40	10-20
	72-80	Coarse sandy loam	SM, SM-SC	A-2	0	100	95-100	60-70	25-35	20-30	NP-10
148*:											
Fiddyment-------	0-8	Fine sandy loam	SM	A-4	0	95-100	90-100	70-85	35-50	25-35	NP-10
	8-15	Loam-------------	ML, CL-ML	A-4	0	95-100	90-100	70-95	50-65	25-35	5-10
	15-28	Sandy clay loam, clay loam.	CL, SC	A-6, A-7	0	95-100	90-100	80-95	40-75	35-45	15-25
	28-40	Indurated--------	---	---	---	---	---	---	---	---	---
	40	Weathered bedrock	---	---	---	---	---	---	---	---	---
Orangevale------	0-15	Coarse sandy loam	SM	A-2, A-4	0	100	100	60-70	25-40	15-25	NP-5
	15-20	Coarse sandy loam, sandy clay loam.	SM-SC	A-4	0	100	95-100	60-75	35-50	20-30	5-10
	20-72	Sandy clay loam	SC	A-6	0	100	95-100	70-80	35-50	30-40	10-20
	72-80	Coarse sandy loam	SM, SM-SC	A-2	0	100	95-100	60-70	25-35	20-30	NP-10
Urban land.											
149*:											
Fiddyment-------	0-8	Fine sandy loam	SM	A-4	0	95-100	90-100	70-85	35-50	25-35	NP-10
	8-15	Loam-------------	ML, CL-ML	A-4	0	95-100	90-100	70-95	50-65	25-35	5-10
	15-28	Sandy clay loam, clay loam.	CL, SC	A-6, A-7	0	95-100	90-100	80-95	40-75	35-45	15-25
	28-40	Indurated--------	---	---	---	---	---	---	---	---	---
	40	Weathered bedrock	---	---	---	---	---	---	---	---	---
Urban land.											
150. Fluvaquents											
151, 152, 153----	0-13	Clay-------------	CL, CH	A-7	0	100	100	90-100	75-95	45-65	20-40
Galt	13-32	Clay, silty clay	CL, CH	A-7	0	100	100	90-100	75-95	45-65	20-40
	32-60	Cemented---------	---	---	---	---	---	---	---	---	---
154*:											
Galt------------	0-13	Clay-------------	CL, CH	A-7	0	100	100	90-100	75-95	45-65	20-40
	13-32	Clay, silty clay	CL, CH	A-7	0	100	100	90-100	75-95	45-65	20-40
	32-60	Cemented---------	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
154*: Urban land.											
155-------------- Gazwell	0-30	Mucky clay-------	OL, OH	A-8	0	100	100	95-100	85-95	40-60	10-25
	30-36	Mucky silty clay, mucky clay.	OL, OH	A-8	0	100	100	95-100	85-95	40-60	10-25
	36-60	Muck, mucky peat	PT	A-8	---	---	---	---	---	---	---
156*: Hadselville-----	0-7	Sandy loam-------	SM	A-4	0-5	85-100	75-100	55-70	35-50	20-30	NP-5
	7	Weathered bedrock	---	---	---	---	---	---	---	---	---
Pentz-----------	0-9	Fine sandy loam	SM, SM-SC	A-4	0-5	85-100	75-95	50-75	35-50	20-30	NP-10
	9-16	Sandy loam, loam, fine sandy loam.	SM-SC, SM, CL-ML, ML	A-4	0-5	85-100	75-100	55-85	40-60	25-35	5-10
	16	Weathered bedrock	---	---	---	---	---	---	---	---	---
157-------------- Hedge	0-14	Loam-------------	CL-ML, ML	A-4	0	100	95-100	75-85	50-60	25-35	5-10
	14-23	Loam, fine sandy loam.	CL-ML, ML, SM-SC, SM	A-4	0	95-100	90-100	70-85	40-60	25-35	5-10
	23-31	Clay loam, sandy clay loam.	CL, SC	A-6	0	100	95-100	85-95	40-65	30-40	10-20
	31-38	Loam-------------	CL-ML, CL	A-4, A-6	0	100	95-100	85-95	60-75	25-35	5-15
	38-44	Cemented---------	---	---	---	---	---	---	---	---	---
	44-60	Sandy loam-------	SM	A-2, A-4	0	100	95-100	60-70	30-40	20-30	NP-5
158-------------- Hicksville	0-13	Loam-------------	CL-ML, ML	A-4	0	90-100	75-100	60-90	50-60	25-35	5-10
	13-43	Clay loam, sandy clay loam.	CL, SC	A-6	0	85-95	75-100	65-95	45-75	30-40	10-20
	43-64	Sandy clay loam, sandy loam.	SM-SC, SM	A-4	0	85-100	75-100	50-85	35-50	25-35	5-10
159-------------- Hicksville	0-13	Gravelly loam----	SM-SC, SM, GM-GC, GM	A-4	0	60-85	50-75	45-65	35-50	25-35	5-10
	13-43	Gravelly clay loam, gravelly sandy clay loam.	SC, GC	A-2, A-6	0	60-85	50-75	45-70	25-50	30-40	10-20
	43-65	Stratified very gravelly loamy sand to clay loam.	GM-GC, GM	A-1, A-2	0-5	40-65	25-50	15-40	5-30	20-30	NP-10
160-------------- Hicksville	0-6	Sandy clay loam	SM-SC, SC	A-4, A-6	0	90-100	75-100	60-90	35-50	25-35	5-15
	6-28	Clay loam, sandy clay loam.	CL, SC	A-6	0	85-95	75-100	65-95	45-75	30-40	10-20
	28-42	Stratified very gravelly loamy sand.	GM-GC, GM	A-1, A-2	0-5	40-65	25-50	15-40	5-30	20-30	NP-10
	42-48	Weathered bedrock	---	---	---	---	---	---	---	---	---
161-------------- Jacktone	0-11	Clay-------------	CL, CH	A-7	0	100	100	90-100	80-95	40-60	20-35
	11-34	Clay loam, clay	CL, CH	A-7	0	100	100	85-100	80-95	40-60	20-35
	34-52	Indurated--------	---	---	---	---	---	---	---	---	---
	52-60	Stratified sandy loam to clay loam.	CL-ML, CL	A-4, A-6	0	80-100	75-100	60-85	50-75	25-40	5-15

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
162*:											
Kaseberg--------	0-18	Loam-------------	ML	A-4	0	100	95-100	95-100	60-85	25-35	NP-5
	18-19	Indurated--------	---	---	---	---	---	---	---	---	---
	19-22	Weathered bedrock	---	---	---	---	---	---	---	---	---
Fiddyment-------	0-8	Fine sandy loam	SM	A-4	0	95-100	90-100	70-85	35-50	25-35	NP-10
	8-15	Loam-------------	ML, CL-ML	A-4	0	95-100	90-100	70-95	50-65	25-35	5-10
	15-28	Sandy clay loam, clay loam.	CL, SC	A-6, A-7	0	95-100	90-100	80-95	40-75	35-45	15-25
	28-40	Indurated--------	---	---	---	---	---	---	---	---	---
	40	Weathered bedrock	---	---	---	---	---	---	---	---	---
Urban land.											
163-------------- Keyes	0-9	Sandy loam-------	SC, SM-SC	A-4	0-5	90-100	85-95	50-65	35-50	20-30	NP-10
	9-15	Gravelly clay loam, gravelly sandy clay loam.	GC, CL	A-2, A-6	0-10	55-80	50-75	45-70	25-65	30-40	10-20
	15-19	Gravelly clay, gravelly clay loam.	GC, CL, CH	A-7	0-10	55-80	50-75	50-70	40-65	40-65	20-35
	19-25	Indurated--------	---	---	---	---	---	---	---	---	---
	25-35	Weathered bedrock	---	---	---	---	---	---	---	---	---
164, 165--------- Kimball	0-24	Silt loam--------	ML	A-4	0	85-100	80-100	60-95	50-65	25-35	NP-10
	24-36	Clay, clay loam	CH, CL	A-7	0	90-100	85-100	80-100	75-95	45-65	20-35
	36-60	Sandy clay loam, sandy loam, clay loam.	SC, CL, SM-SC, CL-ML	A-6, A-4	0	80-100	75-100	50-85	40-60	25-35	5-15
166*:											
Kimball---------	0-24	Silt loam--------	ML	A-4	0	85-100	80-100	60-95	50-65	25-35	NP-10
	24-36	Clay, clay loam	CH, CL	A-7	0	90-100	85-100	80-100	75-95	45-65	20-35
	36-60	Sandy clay loam, sandy loam, clay loam.	SC, CL, SM-SC, CL-ML	A-6, A-4	0	80-100	75-100	50-85	40-60	25-35	5-15
Urban land.											
167-------------- Lang	0-12	Fine sandy loam	SM	A-2, A-4	0	100	95-100	60-75	30-45	20-30	NP-5
	12-60	Stratified sand to loamy fine sand.	SM	A-2	0	100	95-100	50-70	15-30	---	NP
168*:											
Lang------------	0-12	Fine sandy loam	SM	A-2, A-4	0	100	95-100	60-75	30-45	20-30	NP-5
	12-60	Stratified sand to loamy fine sand.	SM	A-2	0	100	95-100	50-70	15-30	---	NP
Urban land.											
169-------------- Laugenour	0-16	Loam-------------	ML, CL-ML	A-4	0	100	100	85-95	60-75	25-35	5-10
	16-39	Fine sandy loam, sandy loam.	SM, SM-SC	A-4	0	100	100	75-85	40-50	20-30	NP-10
	39-60	Stratified very fine sandy loam to loam.	ML, CL-ML	A-4	0	100	100	75-85	50-75	25-35	5-10

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
170*:											
Laugenour	0-16	Loam	ML, CL-ML	A-4	0	100	100	85-95	60-75	25-35	5-10
	16-39	Fine sandy loam, sandy loam.	SM, SM-SC	A-4	0	100	100	75-85	40-50	20-30	NP-10
	39-60	Stratified very fine sandy loam to loam.	ML, CL-ML	A-4	0	100	100	75-85	50-75	25-35	5-10
Urban land.											
171. Lithic Xerorthents											
172 Liveoak	0-18	Sandy clay loam	SM-SC, SM	A-4	0	100	95-100	70-85	35-50	25-35	5-10
	18-48	Sandy clay loam, sandy loam.	SM-SC, SM	A-4	0	100	95-100	70-85	35-50	25-35	5-10
	48-60	Stratified gravelly loamy coarse sand to sandy loam.	SM	A-1, A-2	0	75-100	50-100	30-60	15-30	20-25	NP-5
173*:											
Liveoak	0-18	Sandy clay loam	SM-SC, SM	A-4	0	100	95-100	70-85	35-50	25-35	5-10
	18-48	Sandy clay loam, sandy loam.	SM-SC, SM	A-4	0	100	95-100	70-85	35-50	25-35	5-10
	48-60	Stratified gravelly loamy coarse sand to sandy loam.	SM	A-1, A-2	0	75-100	50-100	30-60	15-30	20-25	NP-5
Urban land.											
174, 175 Madera	0-15	Loam	CL-ML, ML	A-4	0	95-100	95-100	75-90	50-65	25-35	5-10
	15-29	Clay, sandy clay, clay loam.	CL, CH, SC	A-7	0	100	95-100	80-95	40-80	40-60	20-35
	29-60	Indurated	---	---	---	---	---	---	---	---	---
176*:											
Madera	0-15	Loam	CL-ML, ML	A-4	0	95-100	95-100	75-90	50-65	25-35	5-10
	15-29	Clay, sandy clay, clay loam.	CL, CH, SC	A-7	0	100	95-100	80-95	40-80	40-60	20-35
	29-60	Indurated	---	---	---	---	---	---	---	---	---
Galt	0-13	Clay	CL, CH	A-7	0	100	100	90-100	75-95	45-65	20-40
	13-32	Clay, silty clay	CL, CH	A-7	0	100	100	90-100	75-95	45-65	20-40
	32-60	Cemented	---	---	---	---	---	---	---	---	---
177. Medisaprists											
178 Mokelumne	0-10	Gravelly loam	SM-SC, SC	A-4	0-5	60-85	55-75	45-65	35-50	25-35	5-10
	10-39	Clay, sandy clay	CH, MH, SC	A-7	0	95-100	95-100	85-95	40-90	50-65	20-35
	39-46	Weathered bedrock	---	---	---	---	---	---	---	---	---
179*:											
Mokelumne	0-10	Gravelly loam	SM-SC, SC	A-4	0-5	60-85	55-75	45-65	35-50	25-35	5-10
	10-39	Clay, sandy clay	CH, MH, SC	A-7	0	95-100	95-100	85-95	40-90	50-65	20-35
	39-46	Weathered bedrock	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
179*: Pits.											
180 Mokelumne Variant	0-15	Sandy clay loam	SM-SC, SM	A-4	0	80-100	75-95	60-85	35-50	25-35	5-10
	15-28	Sandy clay loam, gravelly sandy clay loam, loam.	SC, SM-SC, GM-GC, GC	A-2, A-4, A-6	0-5	65-100	55-95	40-85	25-50	25-35	5-15
	28-35	Gravelly clay loam, gravelly clay, very gravelly clay loam.	SC, GC, CL	A-2, A-7	0-5	40-85	35-75	30-65	25-60	40-50	20-25
	35-49	Clay	MH	A-7	0	100	95-100	90-95	75-90	50-70	20-35
	49-57	Sandy clay loam	SC	A-6	0	100	100	80-90	35-50	30-40	10-20
	57-63	Weathered bedrock	---	---	---	---	---	---	---	---	---
181 Natomas	0-17	Loam	CL, CL-ML	A-4, A-6	0	100	95-100	80-90	50-65	25-35	5-15
	17-33	Loam, clay loam	CL	A-6	0	100	95-100	80-90	55-75	25-35	10-20
	33-78	Clay loam	CL	A-6	0	100	95-100	85-95	70-80	30-40	15-25
	78-84	Stratified gravelly coarse sandy loam to sandy loam.	SM-SC	A-2, A-4	0-5	65-100	60-100	45-70	25-50	25-30	5-10
182*: Natomas	0-17	Loam	CL, CL-ML	A-4, A-6	0	100	95-100	80-90	50-65	25-35	5-15
	17-33	Loam, clay loam	CL	A-6	0	100	95-100	80-90	55-75	25-35	10-20
	33-78	Clay loam	CL	A-6	0	100	95-100	85-95	70-80	30-40	15-25
	78-84	Stratified gravelly coarse sandy loam to sandy loam.	SM-SC	A-2, A-4	0-5	65-100	60-100	45-70	25-50	25-30	5-10
Xerorthents.											
183 Orangevale	0-15	Coarse sandy loam	SM	A-2, A-4	0	100	100	60-70	25-40	15-25	NP-5
	15-20	Coarse sandy loam, sandy clay loam.	SM-SC	A-4	0	100	95-100	60-75	35-50	20-30	5-10
	20-72	Sandy clay loam	SC	A-6	0	100	95-100	70-80	35-50	30-40	10-20
	72-80	Coarse sandy loam	SM, SM-SC	A-2	0	100	95-100	60-70	25-35	20-30	NP-10
184*, 185*: Orangevale	0-15	Coarse sandy loam	SM	A-2, A-4	0	100	100	60-70	25-40	15-25	NP-5
	15-20	Coarse sandy loam, sandy clay loam.	SM-SC	A-4	0	100	95-100	60-75	35-50	20-30	5-10
	20-72	Sandy clay loam	SC	A-6	0	100	95-100	70-80	35-50	30-40	10-20
	72-80	Coarse sandy loam	SM, SM-SC	A-2	0	100	95-100	60-70	25-35	20-30	NP-10
Kaseberg	0-18	Loam	ML	A-4	0	100	95-100	95-100	60-85	25-35	NP-5
	18-19	Indurated	---	---	---	---	---	---	---	---	---
	19-22	Weathered bedrock	---	---	---	---	---	---	---	---	---
Urban land.											
186*: Orthents.											

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
186*:											
Urban land.											
187*:											
Pardee----------	0-11	Gravelly loam----	GM, SM, GM-GC, SM-SC	A-4	0-5	55-80	50-75	45-65	35-50	20-30	NP-10
	11-16	Very cobbly loam, very gravelly clay loam, very gravelly loam.	GC, GM-GC	A-6, A-4	15-45	50-65	40-60	40-55	35-50	25-35	5-15
	16	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Ranchoseco------	0-3	Gravelly loam----	SM, GM	A-4	5-15	65-80	60-75	55-70	35-50	25-35	NP-10
	3-7	Very gravelly loam, very cobbly loam.	GM, GM-GC	A-2	15-40	50-60	35-55	30-45	25-35	25-35	5-10
	7	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
188*:											
Pentz-----------	0-9	Fine sandy loam	SM, SM-SC	A-4	0-5	85-100	75-95	50-75	35-50	20-30	NP-10
	9-16	Sandy loam, loam, fine sandy loam.	SM-SC, SM, CL-ML, ML	A-4	0-5	85-100	75-100	55-85	40-60	25-35	5-10
	16	Weathered bedrock	---	---	---	---	---	---	---	---	---
Lithic Xerorthents.											
189-------------- Peters	0-18	Clay-------------	CL, CH	A-7	0-5	95-100	80-100	75-100	70-95	40-60	25-35
	18	Weathered bedrock	---	---	---	---	---	---	---	---	---
190*. Pits											
191-------------- Red Bluff	0-8	Loam-------------	CL-ML, CL	A-4, A-6	0	80-100	75-95	65-80	50-60	25-35	5-15
	8-25	Clay loam--------	CL	A-6	0	80-100	75-95	70-85	60-75	30-40	10-20
	25-68	Clay loam, gravelly clay loam, clay.	CL, GC	A-6, A-7	0-5	55-95	50-90	45-85	40-80	35-50	15-30
192-------------- Red Bluff	0-8	Loam-------------	CL-ML, CL	A-4, A-6	0	80-100	75-95	65-80	50-60	25-35	5-15
	8-25	Clay loam, gravelly clay loam.	CL, GC	A-6	0	55-95	50-95	45-85	35-70	30-40	10-20
	25-43	Clay loam, gravelly clay loam, gravelly clay.	CL, GC	A-6, A-7	0-5	55-95	50-90	45-85	40-80	35-50	15-30
	43-68	Gravelly clay loam, very gravelly clay loam, very gravelly clay.	GC	A-6, A-7, A-2	0-5	40-80	30-70	25-65	20-50	30-45	10-20

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
193*:											
Red Bluff-------	0-8	Loam-------------	CL-ML, CL	A-4, A-6	0	80-100	75-95	65-80	50-60	25-35	5-15
	8-25	Clay loam, gravelly clay loam.	CL, GC	A-6	0	55-95	50-95	45-85	35-70	30-40	10-20
	25-43	Clay loam, gravelly clay loam, gravelly clay.	CL, GC	A-6, A-7	0-5	55-95	50-90	45-85	40-80	35-50	15-30
	43-68	Gravelly clay loam, very gravelly clay loam, very gravelly clay.	GC	A-6, A-7, A-2	0-5	40-80	30-70	25-65	20-50	30-45	10-20
Redding---------	0-7	Gravelly loam----	SC, SM-SC, GC, GM-GC	A-4, A-6	0-15	55-90	50-75	45-70	35-50	20-35	5-15
	7-20	Gravelly loam, gravelly clay loam.	CL, CL-ML, GC, GM-GC	A-4, A-6	0-5	55-85	50-80	45-70	35-55	25-40	5-15
	20-28	Gravelly clay loam, gravelly clay.	GC, CH, CL	A-7	0-5	55-80	50-75	45-70	40-60	40-60	15-30
	28-66	Indurated--------	---	---	---	---	---	---	---	---	---
194*:											
Red Bluff-------	0-8	Loam-------------	CL-ML, CL	A-4, A-6	0	80-100	75-95	65-80	50-60	25-35	5-15
	8-25	Clay loam, gravelly clay loam.	CL, GC	A-6	0	55-95	50-95	45-85	35-70	30-40	10-20
	25-43	Clay loam, gravelly clay loam, gravelly clay.	CL, GC	A-6, A-7	0-5	55-95	50-90	45-85	40-80	35-50	15-30
	43-68	Gravelly clay loam, very gravelly clay loam, very gravelly clay.	GC	A-6, A-7, A-2	0-5	40-80	30-70	25-65	20-50	30-45	10-20
Urban land.											
195*:											
Red Bluff-------	0-8	Loam-------------	CL-ML, CL	A-4, A-6	0	80-100	75-95	65-80	50-60	25-35	5-15
	8-25	Clay loam, gravelly clay loam.	CL, GC	A-6	0	55-95	50-95	45-85	35-70	30-40	10-20
	25-43	Clay loam, gravelly clay loam, gravelly clay.	CL, GC	A-6, A-7	0-5	55-95	50-90	45-85	40-80	35-50	15-30
	43-68	Gravelly clay loam, very gravelly clay loam, very gravelly clay.	GC	A-6, A-7, A-2	0-5	40-80	30-70	25-65	20-50	30-45	10-20
Xerarents.											

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
196*:											
Red Bluff	0-8	Loam	CL-ML, CL	A-4, A-6	0	80-100	75-95	65-80	50-60	25-35	5-15
	8-25	Clay loam, gravelly clay loam.	CL, GC	A-6	0	55-95	50-95	45-85	35-70	30-40	10-20
	25-43	Clay loam, gravelly clay loam, gravelly clay.	CL, GC	A-6, A-7	0-5	55-95	50-90	45-85	40-80	35-50	15-30
	43-68	Gravelly clay loam, very gravelly clay loam, very gravelly clay.	GC	A-6, A-7, A-2	0-5	40-80	30-70	25-65	20-50	30-45	10-20
Xerorthents.											
197 Redding	0-7	Loam	CL-ML, CL	A-4, A-6	0-5	80-95	75-90	60-80	50-65	20-35	5-15
	7-20	Loam, clay loam, gravelly loam.	CL-ML, CL	A-4, A-6	0-5	65-95	60-90	55-80	50-65	25-40	5-15
	20-28	Clay loam, clay, gravelly clay.	CL, CH	A-7	0-5	65-95	60-90	55-85	50-75	40-60	15-30
	28-66	Cemented	---	---	---	---	---	---	---	---	---
198 Redding	0-7	Gravelly loam	SC, SM-SC, GC, GM-GC	A-4, A-6	0-15	55-90	50-75	45-70	35-50	20-35	5-15
	7-20	Gravelly loam, gravelly clay loam.	CL, CL-ML, GC, GM-GC	A-4, A-6	0-5	55-85	50-80	45-70	35-55	25-40	5-15
	20-28	Gravelly clay loam, gravelly clay.	GC, CH, CL	A-7	0-5	55-80	50-75	45-70	40-60	40-60	15-30
	28-66	Indurated	---	---	---	---	---	---	---	---	---
199 Reiff	0-7	Fine sandy loam	SM	A-4	0	95-100	75-100	50-70	35-50	20-30	NP-5
	7-58	Stratified loamy sand to loam.	SM, ML, SM-SC, CL-ML	A-4	0	95-100	75-100	50-80	35-60	20-30	NP-10
	58-65	Stratified loam to silt loam.	CL-ML, CL	A-4, A-6	0	95-100	75-100	65-95	50-80	25-35	5-15
200 Rindge	0-16	Muck	PT	A-8	---	---	---	---	---	---	---
	16-60	Mucky-peat, peat	PT	A-8	---	---	---	---	---	---	---
201 Rindge	0-13	Mucky silt loam	OL, ML	A-5, A-7	0	100	100	90-100	75-95	40-50	5-18
	13-60	Mucky peat, peat	PT	A-8	---	---	---	---	---	---	---
202 Rindge	0-15	Mucky clay loam	OL, ML	A-5, A-8	0	100	100	90-100	70-95	40-50	5-10
	15-60	Mucky-peat, peat	PT	A-8	---	---	---	---	---	---	---
203*. Riverwash											
204 Rossmoor	0-6	Fine sandy loam	SM	A-4	0	95-100	95-100	70-85	35-50	20-30	NP-5
	6-62	Fine sandy loam, sandy loam.	SM	A-4	0	95-100	95-100	65-85	35-50	20-30	NP-5

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification Unified	Classification AASHTO	Frag-ments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct					Pct	
205*:											
Rossmoor--------	0-6	Fine sandy loam	SM	A-4	0	95-100	95-100	70-85	35-50	20-30	NP-5
	6-62	Fine sandy loam, sandy loam.	SM	A-4	0	95-100	95-100	65-85	35-50	20-30	NP-5
Urban land.											
206, 207, 208---- Sailboat	0-16	Silt loam--------	CL-ML, ML	A-4	0	100	100	85-100	70-85	25-35	5-10
	16-28	Stratified sandy loam to silty clay loam.	CL-ML, CL	A-4, A-6	0	100	100	80-100	50-85	25-40	5-20
	28-34	Stratified sandy clay loam to silty clay loam.	CL	A-6	0	100	100	80-100	50-85	30-40	10-20
	34-62	Stratified loam to silt loam.	CL-ML, ML	A-4	0	100	100	75-100	50-80	25-35	5-10
209*:											
Sailboat--------	0-16	Silt loam--------	CL-ML, ML	A-4	0	100	100	85-100	70-85	25-35	5-10
	16-28	Stratified sandy loam to silty clay loam.	CL-ML, CL	A-4, A-6	0	100	100	80-100	50-85	25-40	5-20
	28-34	Stratified sandy clay loam to silty clay loam.	CL	A-6	0	100	100	80-100	50-85	30-40	10-20
	34-62	Stratified loam to silt loam.	CL-ML, ML	A-4	0	100	100	75-100	50-80	25-35	5-10
Urban land.											
210-------------- Sailboat Variant	0-23	Silty clay loam	ML	A-6, A-7	0	100	100	100	85-95	35-50	10-20
	23-33	Mucky silty clay loam, mucky clay loam.	OL, ML	A-8, A-5	0	100	100	100	85-95	40-50	5-10
	33-57	Mucky silty clay loam, mucky clay loam, mucky silt loam.	OL, ML	A-8, A-5	0	100	100	100	75-95	40-50	5-10
	57-64	Muck, mucky-peat	PT	A-8	0	---	---	---	---	---	---
211, 212--------- San Joaquin	0-13	Fine sandy loam	SM	A-4	0	95-100	90-100	65-85	35-50	15-25	NP-5
	13-30	Sandy clay loam, sandy loam.	SC	A-6	0	95-100	95-100	70-90	35-50	30-40	10-20
	30-35	Clay loam, clay	CL	A-7	0	95-100	95-100	80-95	55-70	40-50	25-35
	35-60	Indurated--------	---	---	---	---	---	---	---	---	---
	60-67	Stratified loamy coarse sand to loam.	SM, SM-SC	A-2, A-4	0	90-100	85-100	60-75	30-50	10-25	NP-10
213, 214, 215---- San Joaquin	0-23	Silt loam--------	CL-ML, ML	A-4	0	95-100	95-100	75-90	50-60	15-30	NP-10
	23-28	Clay loam, clay	CL	A-7	0	95-100	95-100	80-95	55-70	40-50	25-35
	28-54	Indurated--------	---	---	---	---	---	---	---	---	---
	54-60	Stratified loamy coarse sand to loam.	SM, SM-SC	A-2, A-4	0	90-100	85-100	60-75	30-50	10-25	NP-10

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
216*:											
San Joaquin-----	0-23	Silt loam--------	CL-ML, ML	A-4	0	95-100	95-100	75-90	50-60	15-30	NP-10
	23-28	Clay loam, clay	CL	A-7	0	95-100	95-100	80-95	55-70	40-50	25-35
	28-54	Indurated--------	---	---	---	---	---	---	---	---	---
	54-60	Stratified sandy loam to loam.	SM, SM-SC	A-2, A-4	0	90-100	85-100	60-75	30-50	10-25	NP-10
Durixeralfs.											
217*:											
San Joaquin-----	0-15	Silt loam--------	CL-ML, ML	A-4	0	95-100	95-100	75-90	50-60	15-30	NP-10
	15-20	Clay loam, clay	CL	A-7	0	95-100	95-100	80-95	55-70	40-50	25-35
	20-46	Indurated--------	---	---	---	---	---	---	---	---	---
	46-60	Stratified sandy loam to loam.	SM, SM-SC	A-2, A-4	0	90-100	85-100	60-75	30-50	10-25	NP-10
Galt------------	0-6	Silt loam--------	ML	A-4	0	100	100	85-95	75-85	25-35	NP-10
	6-19	Clay-------------	CL, CH	A-7	0	100	100	90-100	75-95	45-65	20-40
	19-38	Clay, silty clay	CL, CH	A-7	0	100	100	90-100	75-95	45-65	20-40
	38-60	Cemented---------	---	---	---	---	---	---	---	---	---
218*:											
San Joaquin-----	0-23	Silt loam--------	CL-ML, ML	A-4	0	95-100	95-100	75-90	50-60	15-30	NP-10
	23-28	Clay loam, clay	CL	A-7	0	95-100	95-100	80-95	55-70	40-50	25-35
	28-54	Indurated--------	---	---	---	---	---	---	---	---	---
	54-60	Stratified sandy loam to loam.	SM, SM-SC	A-2, A-4	0	90-100	85-100	60-75	30-50	10-25	NP-10
Galt------------	0-13	Clay-------------	CL, CH	A-7	0	100	100	90-100	75-95	45-65	20-40
	13-32	Clay, silty clay	CL, CH	A-7	0	100	100	90-100	75-95	45-65	20-40
	32-60	Cemented---------	---	---	---	---	---	---	---	---	---
219*:											
San Joaquin-----	0-23	Silt loam--------	CL-ML, ML	A-4	0	95-100	95-100	75-90	50-60	15-30	NP-10
	23-28	Clay loam, clay	CL	A-7	0	95-100	95-100	80-95	55-70	40-50	25-35
	28-54	Indurated--------	---	---	---	---	---	---	---	---	---
	54-60	Stratified sandy loam to loam.	SM, SM-SC	A-2, A-4	0	90-100	85-100	60-75	30-50	10-25	NP-10
Urban land.											
220*:											
San Joaquin-----	0-13	Fine sandy loam	SM	A-4	0	95-100	90-100	65-85	35-50	15-25	NP-5
	13-30	Sandy clay loam, sandy loam.	SC	A-6	0	95-100	95-100	70-90	35-50	30-40	10-20
	30-35	Clay loam, clay	CL	A-7	0	95-100	95-100	80-95	55-70	40-50	25-35
	35-60	Indurated--------	---	---	---	---	---	---	---	---	---
	60-67	Stratified loamy coarse sand to loam.	SM, SM-SC	A-2, A-4	0	90-100	85-100	60-75	30-50	10-25	NP-10
Urban land.											
221*:											
San Joaquin-----	0-23	Silt loam--------	CL-ML, ML	A-4	0	95-100	95-100	75-90	50-60	15-30	NP-10
	23-28	Clay loam, clay	CL	A-7	0	95-100	95-100	80-95	55-70	40-50	25-35
	28-54	Indurated--------	---	---	---	---	---	---	---	---	---
	54-60	Stratified sandy loam to loam.	SM, SM-SC	A-2, A-4	0	90-100	85-100	60-75	30-50	10-25	NP-10

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
221*: Xerarents.											
222 Scribner	0-12	Clay loam	CL	A-6, A-7	0	100	100	90-100	70-85	30-45	10-20
	12-39	Stratified silt loam to clay loam.	CL	A-6, A-7	0	100	100	90-100	70-85	30-45	10-20
	39-60	Stratified loam to silty clay loam.	CL	A-6, A-7	0	100	100	80-100	50-90	30-45	10-20
223*. Slickens											
224 Tehama	0-24	Loam	ML	A-4	0	90-100	85-100	80-100	60-85	25-35	NP-10
	24-67	Silty clay loam, clay loam.	CL	A-6, A-7	0	95-100	95-100	90-100	75-95	30-45	10-20
225 Tinnin	0-12	Loamy sand	SM	A-1, A-2	0	90-100	85-100	40-75	15-30	---	NP
	12-64	Loamy coarse sand, loamy sand, sand.	SM	A-1, A-2	0	90-100	80-100	40-75	10-30	---	NP
226*: Tinnin	0-12	Loamy sand	SM	A-1, A-2	0	90-100	85-100	40-75	15-30	---	NP
	12-64	Loamy coarse sand, loamy sand, sand.	SM	A-1, A-2	0	90-100	80-100	40-75	10-30	---	NP
Urban land.											
227*. Urban land											
228*: Urban land.											
Natomas	0-17	Loam	CL, CL-ML	A-4, A-6	0	100	95-100	80-90	50-65	25-35	5-15
	17-33	Loam, clay loam	CL	A-6	0	100	95-100	80-90	55-75	25-35	10-20
	33-78	Clay loam	CL	A-6	0	100	95-100	85-95	70-80	30-40	15-25
	78-84	Stratified gravelly coarse sandy loam to sandy loam.	SM-SC	A-2, A-4	0-5	65-100	60-100	45-70	25-50	25-30	5-10
229*: Urban land.											
Xerarents.											
Fiddyment	0-8	Fine sandy loam	SM	A-4	0	95-100	90-100	70-85	35-50	25-35	NP-10
	8-15	Loam	ML, CL-ML	A-4	0	95-100	90-100	70-95	50-65	25-35	5-10
	15-28	Sandy clay loam, clay loam.	CL, SC	A-6, A-7	0	95-100	90-100	80-95	40-75	35-45	15-25
	28-40	Indurated	---	---	---	---	---	---	---	---	---
	40	Weathered bedrock	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct					Pct	
230-------------- Valpac	0-10	Loam-------------	ML, CL-ML	A-4	0	100	100	85-95	60-75	25-35	5-10
	10-61	Stratified sandy loam to silty clay loam.	CL-ML, CL	A-4, A-6	0	100	100	65-95	50-80	25-40	5-15
231*:											
Valpac----------	0-10	Loam-------------	ML, CL-ML	A-4	0	100	100	85-95	60-75	25-35	5-10
	10-61	Stratified sandy loam to silty clay loam.	CL-ML, CL	A-4, A-6	0	100	100	65-95	50-80	25-40	5-15
Urban land.											
232-------------- Valpac Variant	0-16	Sandy loam--------	SM-SC, SM	A-4	0	100	100	60-70	35-50	20-30	NP-10
	16-25	Stratified sand to silt loam.	SM-SC, SM, ML, CL-ML	A-4	0	100	100	60-90	40-55	20-35	5-10
	25-60	Stratified mucky silty clay loam to mucky clay.	OL, ML	A-7, A-8	0	100	100	90-100	75-95	40-50	10-20
233-------------- Vina	0-5	Fine sandy loam	SM	A-4	0	80-100	75-100	50-75	35-50	20-30	NP-5
	5-61	Sandy loam, loam, fine sandy loam.	CL-ML, ML, SM-SC, SM	A-4	0	80-100	75-100	55-85	35-55	25-35	5-10
234-------------- Vina	0-5	Fine sandy loam	SM	A-4	0	80-100	75-100	50-75	35-50	20-30	NP-5
	5-61	Sandy loam, fine sandy loam, loam.	ML, SM	A-4	0	80-100	75-100	55-85	35-55	20-30	NP-5
235-------------- Vleck	0-13	Gravelly loam----	SM, GM	A-4	0	65-80	60-75	50-65	35-50	25-35	NP-10
	13-25	Clay-------------	CL, CH	A-7	0	100	100	95-100	75-95	40-60	20-35
	25-32	Sandy clay loam, clay loam.	SC, CL	A-6	0	100	100	80-95	40-70	30-40	10-20
	32-50	Cemented---------	---	---	---	---	---	---	---	---	---
	50-53	Weathered bedrock	---	---	---	---	---	---	---	---	---
236*:											
Vleck-----------	0-13	Loam-------------	ML	A-4	0	80-95	75-95	65-85	50-60	25-35	NP-10
	13-25	Clay-------------	CL, CH	A-7	0	100	100	95-100	75-95	40-60	20-35
	25-32	Sandy clay loam, clay loam.	SC, CL	A-6	0	100	100	80-95	40-70	30-40	10-20
	32-50	Cemented---------	---	---	---	---	---	---	---	---	---
	50-53	Weathered bedrock	---	---	---	---	---	---	---	---	---
Amador----------	0-6	Sandy loam--------	SM	A-4	0	85-100	75-100	50-75	35-50	20-30	NP-5
	6-19	Loam, sandy loam	ML, SM	A-4	0	85-100	75-100	50-85	40-60	20-35	NP-10
	19	Weathered bedrock	---	---	---	---	---	---	---	---	---
Pits.											
237-------------- Whiterock	0-8	Loam-------------	ML	A-4	0	80-95	75-95	60-85	50-70	25-35	NP-10
	8	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
238*: Xerarents.											

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
238*:											
San Joaquin-----	0-13	Fine sandy loam	SM	A-4	0	95-100	90-100	65-85	35-50	15-25	NP-5
	13-30	Sandy clay, loam, sandy loam.	SC	A-6	0	95-100	95-100	70-90	35-50	30-40	10-20
	30-35	Clay loam, clay	CL	A-7	0	95-100	95-100	80-95	55-70	40-50	25-35
	35-60	Indurated--------	---	---	---	---	---	---	---	---	---
	60-67	Stratified loamy coarse sand to loam.	SM, SM-SC	A-2, A-4	0	90-100	85-100	60-75	30-50	10-25	NP-10
239*: Xerarents.											
Redding---------	0-7	Loam-------------	CL-ML, CL	A-4, A-6	0-5	80-95	75-90	60-80	50-65	20-35	5-15
	7-20	Loam, clay loam, gravelly loam.	CL-ML, CL	A-4, A-6	0-5	65-95	60-90	55-80	50-65	25-40	5-15
	20-28	Clay loam, clay, gravelly clay.	CL, CH	A-7	0-5	65-95	60-90	55-85	50-75	40-60	15-30
	28-66	Cemented---------	---	---	---	---	---	---	---	---	---
240*: Xerarents.											
Urban land.											
San Joaquin-----	0-13	Fine sandy loam	SM	A-4	0	95-100	90-100	65-85	35-50	15-25	NP-5
	13-30	Sandy clay, loam, sandy loam.	SC	A-6	0	95-100	95-100	70-90	35-50	30-40	10-20
	30-35	Clay loam, clay	CL	A-7	0	95-100	95-100	80-95	55-70	40-50	25-35
	35-60	Indurated--------	---	---	---	---	---	---	---	---	---
	60-67	Stratified loamy coarse sand to loam.	SM, SM-SC	A-2, A-4	0	90-100	85-100	60-75	30-50	10-25	NP-10
241*: Xerarents.											
Urban land.											
Fiddyment-------	0-14	Fine sandy loam	SM	A-4	0	95-100	90-100	70-85	35-50	25-35	NP-10
	14-28	Clay loam--------	CL, SC	A-6, A-7	0	95-100	90-100	80-95	40-75	35-45	15-25
	28-34	Indurated--------	---	---	---	---	---	---	---	---	---
	34	Weathered bedrock	---	---	---	---	---	---	---	---	---
242. Xerofluvents											
243. Xerolls											
244. Xeropsamments											
245. Xerorthents											
246*: Xerorthents.											
Urban land.											

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

(The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated)

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	In/hr	In/in	pH	mmhos/cm					Pct
101*:											
Amador----------	0-6	12-25	0.6-2.0	0.14-0.16	5.1-6.5	---	Low--------	0.37	1	8	<2
	6-19	12-25	0.6-2.0	0.12-0.16	4.5-6.0	---	Low--------	0.37			
	19	---	---	---	---	---	-----------	----			
Gillender--------	0-4	15-25	0.6-2.0	0.13-0.16	5.6-6.5	---	Low--------	0.32	1	8	<1
	4-7	12-25	0.6-2.0	0.10-0.16	5.1-6.5	---	Low--------	0.32			
	7	---	---	---	---	---	-----------	----			
102*:											
Americanos------	0-8	12-20	0.6-2.0	0.16-0.18	6.1-7.3	---	Low--------	0.43	3	8	1-3
	8-36	18-27	0.6-2.0	0.17-0.19	6.1-7.3	---	Low--------	0.43			
	36-54	8-18	0.6-2.0	0.14-0.17	6.1-7.3	---	Low--------	0.43			
	54-62	8-18	0.6-2.0	0.08-0.10	6.1-7.3	---	Low--------	0.10			
Urban land.											
103, 104--------- Andregg	0-11	7-18	2.0-6.0	0.10-0.13	5.6-7.3	---	Low--------	0.24	2	8	1-3
	11-32	10-18	2.0-6.0	0.10-0.13	5.6-6.5	---	Low--------	0.28			
	32	---	---	---	---	---	-----------	----			
105*, 106*:											
Andregg---------	0-11	7-18	2.0-6.0	0.10-0.13	5.6-7.3	---	Low--------	0.24	2	8	1-3
	11-32	10-18	2.0-6.0	0.10-0.13	5.6-6.5	---	Low--------	0.28			
	32	---	---	---	---	---	-----------	----			
Urban land.											
107*:											
Argonaut--------	0-8	12-20	0.6-2.0	0.14-0.17	5.6-6.5	---	Low--------	0.32	2	8	1-2
	8-14	20-30	0.2-0.6	0.14-0.18	5.6-7.3	---	Moderate	0.24			
	14-29	35-50	<0.06	0.10-0.16	6.1-7.3	---	High-------	0.28			
	29	---	---	---	---	---	-----------	----			
Auburn----------	0-14	12-25	0.6-2.0	0.14-0.17	5.6-6.5	---	Low--------	0.32	1	8	1-2
	14	---	---	---	---	---	-----------	----			
108*:											
Argonaut--------	0-8	12-20	0.6-2.0	0.14-0.17	5.6-6.5	---	Low--------	0.32	2	8	1-2
	8-14	20-30	0.2-0.6	0.14-0.18	5.6-7.3	---	Moderate	0.24			
	14-29	35-50	<0.06	0.10-0.16	6.1-7.3	---	High-------	0.28			
	29	---	---	---	---	---	-----------	----			
Auburn----------	0-14	12-25	0.6-2.0	0.14-0.17	5.6-6.5	---	Low--------	0.32	1	8	1-2
	14	---	---	---	---	---	-----------	----			
Urban land.											
109-------------- Auburn	0-16	12-25	0.6-2.0	0.14-0.17	5.6-6.5	---	Low--------	0.32	1	8	1-2
	16	---	---	---	---	---	-----------	----			
110*:											
Auburn----------	0-14	12-25	0.6-2.0	0.14-0.17	5.6-6.5	---	Low--------	0.32	1	8	1-2
	14	---	---	---	---	---	-----------	----			

See footnote at end of table.

TABLE 18.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	In/hr	In/in	pH	mmhos/cm					Pct
110*:											
Argonaut--------	0-8	12-20	0.6-2.0	0.14-0.17	5.6-6.5	---	Low-------	0.32	2	8	1-2
	8-14	20-30	0.2-0.6	0.14-0.18	5.6-7.3	---	Moderate	0.24			
	14-29	35-50	<0.06	0.10-0.16	6.1-7.3	---	High------	0.28			
	29	---	---	---	---	---	----------	----			
Rock outcrop.											
111, 112--------- Bruella	0-18	12-20	2.0-6.0	0.11-0.13	6.1-7.3	---	Low-------	0.32	5	8	.5-1
	18-42	18-30	0.2-0.6	0.13-0.17	6.1-7.3	---	Moderate	0.28			
	42-61	25-35	0.2-0.6	0.15-0.18	6.1-7.3	---	Moderate	0.24			
113-------------- Capay	0-5	35-40	0.06-0.2	0.17-0.19	6.1-8.4	<2	High------	0.28	5	8	1-2
	5-28	40-60	0.06-0.2	0.14-0.16	6.1-8.4	<2	High------	0.24			
	28-67	35-40	0.06-0.2	0.17-0.19	7.4-8.4	<2	High------	0.28			
114-------------- Clear Lake	0-43	40-60	0.06-0.2	0.12-0.16	6.1-8.4	<2	High------	0.24	5	8	1-4
	43-61	20-35	0.2-0.6	0.14-0.18	7.4-8.4	<4	Moderate	0.32			
115-------------- Clear Lake	0-15	40-60	0.06-0.2	0.14-0.16	6.1-8.4	<2	High------	0.24	3	8	2-5
	15-34	40-60	0.06-0.2	0.14-0.16	7.4-8.4	<2	High------	0.24			
	34-48	27-40	0.06-0.2	0.14-0.17	7.4-8.4	<2	Moderate	0.32			
	48-64	---	---	---	---	---	----------	----			
116-------------- Columbia	0-11	8-18	2.0-6.0	0.10-0.12	6.1-7.8	---	Low-------	0.32	5	3	.5-2
	11-60	10-18	2.0-6.0	0.12-0.12	6.1-7.8	---	Low-------	0.32			
117, 118--------- Columbia	0-11	8-18	2.0-6.0	0.10-0.12	6.1-7.8	---	Low-------	0.32	5	7	.5-2
	11-60	10-18	2.0-6.0	0.08-0.11	6.1-7.8	---	Low-------	0.32			
119, 120, 121---- Columbia	0-11	8-18	2.0-6.0	0.10-0.12	6.1-7.8	---	Low-------	0.32	5	7	.5-2
	11-43	10-18	2.0-6.0	0.08-0.11	6.1-7.8	---	Low-------	0.32			
	43-64	35-60	0.06-0.2	0.14-0.16	6.6-8.4	<2	High------	0.28			
122-------------- Columbia	0-14	5-12	2.0-6.0	0.10-0.12	6.1-7.8	---	Low-------	0.32	5	2	1-2
	14-42	10-18	2.0-6.0	0.08-0.11	6.1-7.8	---	Low-------	0.32			
	42-54	20-35	0.2-0.6	0.16-0.19	7.4-8.4	<2	Moderate	0.43			
	54-67	30-40	2.0-6.0	0.20-0.22	7.4-8.4	<2	Low-------	0.28			
123-------------- Columbia	0-12	10-20	0.6-2.0	0.16-0.18	6.1-7.8	---	Low-------	0.43	5	5	<1
	12-60	10-18	2.0-6.0	0.08-0.11	6.1-7.8	---	Low-------	0.32			
124*:											
Columbia--------	0-11	8-18	2.0-6.0	0.10-0.12	6.1-7.8	---	Low-------	0.32	5	7	.5-2
	11-43	10-18	2.0-6.0	0.08-0.11	6.1-7.8	---	Low-------	0.32			
	43-64	35-60	0.06-0.2	0.14-0.16	6.6-8.4	<2	High------	0.28			
Urban land.											
125*:											
Corning, well drained--------	0-28	10-25	0.6-2.0	0.10-0.14	5.1-6.5	---	Low-------	0.20	2	8	.5-1
	28-47	35-55	<0.06	0.04-0.06	4.5-6.5	---	High------	0.28			
	47-62	10-30	0.06-0.2	0.06-0.12	5.6-8.4	---	Low-------	0.20			
Corning, moderately well drained-------	0-20	10-20	0.6-2.0	0.07-0.10	5.1-6.5	---	Low-------	0.17	2	8	.5-1
	20-32	35-55	<0.06	0.04-0.06	4.5-6.5	---	High------	0.28			
	32-60	10-30	0.06-0.2	0.06-0.12	5.6-8.4	---	Low-------	0.20			

See footnote at end of table.

TABLE 18.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	In/hr	In/in	pH	mmhos/cm					Pct
126*:											
Corning	0-28	10-25	0.6-2.0	0.10-0.14	5.1-6.5	---	Low	0.20	2	8	.5-1
	28-47	35-55	<0.06	0.04-0.06	4.5-6.5	---	High	0.28			
	47-62	10-30	0.06-0.2	0.06-0.12	5.6-8.4	---	Low	0.20			
Redding	0-7	10-25	0.6-2.0	0.10-0.14	5.1-6.5	---	Low	0.24	2	8	<2
	7-20	18-30	0.2-0.6	0.11-0.14	5.1-6.5	---	Moderate	0.24			
	20-28	35-60	<0.06	0.04-0.06	5.6-6.5	---	High	0.20			
	28-66	---	---	---	---	---	---	---			
127, 128, 129 Cosumnes	0-8	20-27	0.6-2.0	0.15-0.17	6.1-7.8	---	Low	0.43	5	8	<2
	8-21	27-55	0.06-0.2	0.15-0.19	6.1-7.8	---	High	0.32			
	21-43	35-55	0.06-0.2	0.14-0.17	6.6-8.4	<2	High	0.24			
	43-60	30-45	0.06-0.2	0.14-0.17	6.6-8.4	<2	High	0.28			
130*:											
Cosumnes	0-8	20-27	0.6-2.0	0.15-0.17	6.1-7.8	---	Low	0.43	5	8	<2
	8-21	27-55	0.06-0.2	0.15-0.19	6.1-7.8	---	High	0.32			
	21-43	35-55	0.06-0.2	0.14-0.17	6.6-8.4	<2	High	0.24			
	43-60	30-45	0.06-0.2	0.14-0.17	6.6-8.4	<2	High	0.28			
Urban land.											
131 Coyotecreek	0-15	18-27	0.6-2.0	0.18-0.20	6.1-7.3	---	Low	0.43	5	8	2-3
	15-58	18-27	0.2-0.6	0.17-0.20	6.1-7.3	---	Low	0.37			
	58-65	15-30	0.2-0.6	0.15-0.19	6.6-7.8	---	Low	0.32			
132 Creviscreek	0-21	8-15	2.0-6.0	0.10-0.12	5.6-6.5	---	Low	0.28	4	8	<2
	21-29	18-27	0.6-2.0	0.11-0.16	5.6-7.3	---	Moderate	0.20			
	29-57	10-20	0.6-2.0	0.07-0.12	6.1-8.4	---	Low	0.15			
	57	---	---	---	---	---	---	---			
133 Dierssen	0-12	12-20	0.6-2.0	0.11-0.13	6.1-7.8	---	Low	0.24	2	8	1-3
	12-19	20-30	0.2-0.6	0.15-0.17	6.6-8.4	---	Moderate	0.28			
	19-33	35-50	0.06-0.2	0.10-0.12	7.4-8.4	<2	High	0.32			
	33-60	---	---	---	---	---	---	---			
134 Dierssen	0-14	20-30	0.2-0.6	0.15-0.17	6.1-7.8	---	Moderate	0.28	2	8	1-3
	14-31	35-50	0.06-0.2	0.10-0.12	7.4-8.4	<2	High	0.32			
	31-60	---	---	---	---	---	---	---			
135 Dierssen	0-15	27-35	0.2-0.6	0.17-0.19	6.1-7.3	---	Moderate	0.32	3	8	1-3
	15-24	35-50	0.06-0.2	0.15-0.18	6.6-8.4	<2	High	0.28			
	24-41	40-55	0.06-0.2	0.14-0.16	6.6-8.4	<2	High	0.24			
	41-60	---	---	---	---	---	---	---			
136*. Dumps											
137. Durixeralfs											
138*:											
Durixeralfs.											
Galt	0-13	40-60	0.06-0.2	0.12-0.15	6.1-7.3	---	High	0.24	2	8	1-2
	13-32	40-60	0.06-0.2	0.12-0.14	6.6-8.4	<2	High	0.24			
	32-60	---	---	---	---	---	---	---			

See footnote at end of table.

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TABLE 18.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	In/hr	In/in	pH	mmhos/cm					Pct
139-------------- Egbert	0-20	40-55	0.06-0.2	0.14-0.17	6.1-7.8	<2	High------	0.24	5	4	2-10
	20-60	35-50	0.06-0.2	0.15-0.18	6.1-8.4	<2	High------	0.24			
140-------------- Egbert	0-40	40-50	0.06-0.2	0.16-0.18	6.1-7.8	<2	High------	0.24	5	4	2-10
	40-60	35-50	0.06-0.2	0.15-0.18	6.6-8.4	<2	High------	0.24			
141, 142--------- Egbert	0-18	40-55	0.06-0.2	0.14-0.17	6.1-7.8	<2	High------	0.24	5	4	2-10
	18-46	35-50	0.06-0.2	0.15-0.18	6.1-7.8	<2	High------	0.24			
	46-60	25-35	0.2-0.6	0.15-0.19	6.1-8.4	<2	Moderate	0.28			
143*:											
Egbert----------	0-18	40-55	0.06-0.2	0.14-0.17	6.1-7.8	<2	High------	0.24	5	4	2-10
	18-46	35-50	0.06-0.2	0.15-0.18	6.1-7.8	<2	High------	0.24			
	46-60	25-35	0.2-0.6	0.15-0.19	6.1-8.4	<2	Moderate	0.28			
Urban land.											
144-------------- Fiddyment	0-8	10-18	0.6-2.0	0.12-0.14	5.6-7.3	---	Low-------	0.37	2	8	1-2
	8-22	10-18	0.6-2.0	0.14-0.16	5.6-7.3	---	Low-------	0.43			
	22-30	27-35	<0.06	0.04-0.06	6.1-7.8	---	Moderate	0.32			
	30-36	---	---	---	---	---	----------	----			
	36	---	---	---	---	---	----------	----			
145-------------- Fiddyment	0-8	10-18	0.6-2.0	0.12-0.14	5.6-7.3	---	Low-------	0.37	2	8	1-2
	8-15	10-18	0.6-2.0	0.14-0.16	5.6-7.3	---	Low-------	0.43			
	15-28	27-35	<0.06	0.04-0.06	6.1-7.8	---	Moderate	0.32			
	28-40	---	---	---	---	---	----------	----			
	40	---	---	---	---	---	----------	----			
146-------------- Fiddyment	0-14	10-18	0.6-2.0	0.14-0.16	5.6-7.3	---	Low-------	0.43	2	8	1-2
	14-28	30-35	<0.06	0.04-0.06	6.1-7.8	---	High------	0.28			
	28-34	---	---	---	---	---	----------	----			
	34	---	---	---	---	---	----------	----			
147*:											
Fiddyment-------	0-8	10-18	0.6-2.0	0.12-0.14	5.6-7.3	---	Low-------	0.37	2	8	1-2
	8-15	10-18	0.6-2.0	0.14-0.16	5.6-7.3	---	Low-------	0.43			
	15-28	27-35	<0.06	0.04-0.06	6.1-7.8	---	Moderate	0.32			
	28-40	---	---	---	---	---	----------	----			
	40	---	---	---	---	---	----------	----			
Orangevale------	0-15	8-16	2.0-6.0	0.07-0.10	6.1-7.3	---	Low-------	0.24	5	8	<2
	15-20	12-25	0.6-2.0	0.08-0.11	6.1-7.3	---	Low-------	0.28			
	20-72	20-30	0.6-2.0	0.08-0.11	6.1-7.3	---	Moderate	0.28			
	72-80	15-20	2.0-6.0	0.08-0.10	6.1-7.3	---	Low-------	0.28			
148*:											
Fiddyment-------	0-8	10-18	0.6-2.0	0.12-0.14	5.6-7.3	---	Low-------	0.37	2	8	1-2
	8-15	10-18	0.6-2.0	0.14-0.16	5.6-7.3	---	Low-------	0.43			
	15-28	27-35	<0.06	0.04-0.06	6.1-7.8	---	Moderate	0.32			
	28-40	---	---	---	---	---	----------	----			
	40	---	---	---	---	---	----------	----			
Orangevale------	0-15	8-16	2.0-6.0	0.07-0.10	6.1-7.3	---	Low-------	0.24	5	8	<2
	15-20	12-25	0.6-2.0	0.08-0.11	6.1-7.3	---	Low-------	0.28			
	20-72	20-30	0.6-2.0	0.08-0.11	6.1-7.3	---	Moderate	0.28			
	72-80	15-20	2.0-6.0	0.08-0.10	6.1-7.3	---	Low-------	0.28			
Urban land.											

See footnote at end of table.

TABLE 18.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	In/hr	In/in	pH	mmhos/cm					Pct
149*:											
Fiddyment-------	0-8	10-18	0.6-2.0	0.12-0.14	5.6-7.3	---	Low-------	0.37	2	8	1-2
	8-15	10-18	0.6-2.0	0.14-0.16	5.6-7.3	---	Low-------	0.43			
	15-28	27-35	<0.06	0.04-0.06	6.1-7.8	---	Moderate	0.32			
	28-40	---	---	---	---	---	----------	----			
	40	---	---	---	---	---	----------	----			
Urban land.											
150. Fluvaquents											
151, 152, 153---- Galt	0-13	40-60	0.06-0.2	0.12-0.15	6.1-7.3	---	High------	0.24	2	8	1-2
	13-32	40-60	0.06-0.2	0.12-0.14	6.6-8.4	<2	High------	0.24			
	32-60	---	---	---	---	---	----------	----			
154*:											
Galt------------	0-13	40-60	0.06-0.2	0.12-0.15	6.1-7.3	---	High------	0.24	2	8	1-2
	13-32	40-60	0.06-0.2	0.12-0.14	6.6-8.4	<2	High------	0.24			
	32-60	---	---	---	---	---	----------	----			
Urban land.											
155-------------- Gazwell	0-30	40-60	0.6-2.0	0.18-0.20	5.1-6.5	---	Moderate	0.20	5	3	7-15
	30-36	40-60	2.0-6.0	0.20-0.23	5.6-6.5	---	Moderate	0.20			
	36-60	---	6.0-20	0.26-0.30	4.5-6.0	---	Low-------	----			
156*:											
Hadselville-----	0-7	8-18	2.0-6.0	0.11-0.13	5.1-6.5	---	Low-------	0.28	1	8	1-2
	7	---	---	---	---	---	----------	----			
Pentz-----------	0-9	8-18	2.0-6.0	0.11-0.13	5.1-6.5	---	Low-------	0.28	1	8	1-3
	9-16	10-20	2.0-6.0	0.11-0.15	5.6-7.3	---	Low-------	0.37			
	16	---	---	---	---	---	----------	----			
157-------------- Hedge	0-14	12-20	0.6-2.0	0.14-0.16	5.6-7.3	---	Low-------	0.37	2	8	<2
	14-23	10-18	0.6-2.0	0.13-0.16	6.1-7.8	---	Low-------	0.37			
	23-31	27-35	0.2-0.6	0.17-0.19	6.6-7.8	---	Moderate	0.32			
	31-38	20-27	0.6-2.0	0.14-0.16	6.6-7.8	---	Moderate	0.37			
	38-44	---	---	---	---	---	----------	----			
	44-60	5-12	0.6-2.0	0.09-0.11	7.4-8.4	<2	Low-------	0.20			
158-------------- Hicksville	0-13	18-27	0.6-2.0	0.16-0.18	5.6-6.5	---	Low-------	0.32	5	8	1-3
	13-43	27-35	0.2-0.6	0.17-0.20	6.1-7.8	---	Moderate	0.28			
	43-64	15-25	0.6-2.0	0.11-0.15	6.1-7.8	---	Low-------	0.20			
159-------------- Hicksville	0-13	18-27	0.6-2.0	0.12-0.14	5.6-6.5	---	Low-------	0.17	5	8	1-3
	13-43	27-35	0.2-0.6	0.13-0.15	6.1-7.8	---	Moderate	0.15			
	43-65	18-30	0.2-0.6	0.07-0.12	6.6-7.8	---	Low-------	0.10			
160-------------- Hicksville	0-6	20-27	0.2-0.6	0.13-0.15	5.6-6.5	---	Moderate	0.20	3	8	1-3
	6-28	27-35	0.2-0.6	0.16-0.19	6.1-7.8	---	Moderate	0.28			
	28-42	18-30	0.2-0.6	0.09-0.13	6.6-7.8	---	Low-------	0.10			
	42-48	---	---	---	---	---	----------	----			
161-------------- Jacktone	0-11	40-60	0.06-0.2	0.14-0.16	6.6-8.4	<2	High------	0.24	2	8	2-5
	11-34	35-60	0.06-0.2	0.14-0.16	7.9-8.4	<2	High------	0.24			
	34-52	---	---	---	---	---	----------	----			
	52-60	20-30	0.2-0.6	0.13-0.17	7.9-9.0	<2	Moderate	0.32			

See footnote at end of table.

TABLE 18.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	In/hr	In/in	pH	mmhos/cm					Pct
162*:											
Kaseberg----------	0-18	10-20	0.6-2.0	0.14-0.17	5.6-7.3	---	Low--------	0.43	1	8	.5-1
	18-19	---	---	---	---	---	-----------	----			
	19-22	---	---	---	---	---	-----------	----			
Fiddyment---------	0-8	10-18	0.6-2.0	0.12-0.14	5.6-7.3	---	Low--------	0.37	2	8	1-2
	8-15	10-18	0.6-2.0	0.14-0.16	5.6-7.3	---	Low--------	0.43			
	15-28	27-35	<0.06	0.04-0.06	6.1-7.8	---	Moderate	0.32			
	28-40	---	---	---	---	---	-----------	----			
	40	---	---	---	---	---	-----------	----			
Urban land.											
163---------------- Keyes	0-9	10-18	2.0-6.0	0.11-0.13	5.6-7.3	---	Low--------	0.28	1	8	<2
	9-15	20-30	0.2-0.6	0.12-0.15	6.1-7.3	---	Moderate	0.20			
	15-19	35-60	<0.06	0.04-0.06	6.1-7.3	---	High-------	0.17			
	19-25	---	---	---	---	---	-----------	----			
	25-35	---	---	---	---	---	-----------	----			
	35	---	---	---	---	---	-----------	----			
164, 165---------- Kimball	0-24	15-25	0.6-2.0	0.13-0.15	6.1-7.8	---	Low--------	0.37	2	8	1-3
	24-36	35-50	<0.06	0.04-0.06	6.1-7.8	---	High-------	0.28			
	36-60	18-30	0.2-0.6	0.12-0.15	6.6-7.8	---	Moderate	0.28			
166*:											
Kimball-----------	0-24	15-25	0.6-2.0	0.13-0.15	6.1-7.8	---	Low--------	0.37	2	8	1-3
	24-36	35-60	<0.06	0.04-0.06	6.1-7.8	---	High-------	0.28			
	36-60	20-40	0.06-0.2	0.12-0.15	6.1-7.8	---	Moderate	0.28			
Urban land.											
167---------------- Lang	0-12	8-18	2.0-6.0	0.11-0.13	6.1-7.3	---	Low--------	0.28	5	3	<1
	12-60	0-10	6.0-20	0.06-0.08	6.1-7.3	---	Low--------	0.24			
168*:											
Lang--------------	0-12	8-18	2.0-6.0	0.11-0.13	6.1-7.3	<2	Low--------	0.28	5	3	<1
	12-60	0-10	6.0-20	0.07-0.09	6.1-7.3	<2	Low--------	0.24			
Urban land.											
169---------------- Laugenour	0-16	10-20	0.6-2.0	0.14-0.16	7.4-8.4	<2	Low--------	0.37	5	5	.5-1
	16-39	10-18	2.0-6.0	0.10-0.12	7.4-8.4	<2	Low--------	0.32			
	39-60	12-25	0.6-2.0	0.12-0.16	7.4-8.4	<2	Low--------	0.37			
170*:											
Laugenour---------	0-16	10-20	0.6-2.0	0.14-0.16	7.4-8.4	<2	Low--------	0.37	5	8	.5-1
	16-39	10-18	2.0-6.0	0.10-0.12	7.4-8.4	<2	Low--------	0.32			
	39-60	12-25	0.6-2.0	0.14-0.16	7.4-8.4	<2	Low--------	0.37			
Urban land.											
171. Lithic Xerorthents											
172---------------- Liveoak	0-18	20-25	0.6-2.0	0.14-0.16	6.1-7.3	---	Low--------	0.20	5	8	1-3
	18-48	18-25	0.6-2.0	0.14-0.16	6.6-7.8	---	Low--------	0.28			
	48-60	5-15	2.0-6.0	0.06-0.11	6.6-8.4	---	Low--------	0.17			

See footnote at end of table.

TABLE 18.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	In/hr	In/in	pH	mmhos/cm					Pct
173*:											
Liveoak---------	0-18	20-25	0.6-2.0	0.14-0.16	6.1-7.3	---	Low-------	0.20	5	8	1-3
	18-48	18-25	0.6-2.0	0.14-0.16	6.6-7.8	---	Low-------	0.28			
	48-60	5-15	2.0-6.0	0.06-0.11	6.6-8.4	---	Low-------	0.17			
Urban land.											
174, 175--------- Madera	0-15	10-25	0.6-2.0	0.14-0.16	5.6-7.3	---	Low-------	0.37	2	8	<1
	15-29	35-55	<0.06	0.04-0.08	6.6-8.4	<2	High------	0.24			
	29-60	---	---	---	---	---	----------	----			
176*:											
Madera----------	0-15	10-25	0.6-2.0	0.14-0.16	5.6-7.3	---	Low-------	0.37	2	8	<1
	15-29	35-55	<0.06	0.04-0.08	6.6-8.4	<2	High------	0.24			
	29-60	---	---	---	---	---	----------	----			
Galt------------	0-13	40-60	0.06-0.2	0.12-0.15	6.1-7.3	---	High------	0.24	2	8	1-2
	13-32	40-60	0.06-0.2	0.12-0.14	6.6-8.4	<2	High------	0.24			
	32-60	---	---	---	---	---	----------	----			
177. Medisaprists											
178-------------- Mokelumne	0-10	15-25	0.6-2.0	0.11-0.13	5.1-6.5	---	Low-------	0.24	2	8	1-2
	10-39	40-70	<0.06	0.06-0.10	3.6-5.0	---	Moderate	0.24			
	39-46	---	---	---	---	---	----------	----			
179*:											
Mokelumne-------	0-10	15-25	0.6-2.0	0.11-0.13	5.1-6.5	---	Low-------	0.24	2	8	1-2
	10-39	40-70	<0.06	0.06-0.10	3.6-5.0	---	Moderate	0.24			
	39-46	---	---	---	---	---	----------	----			
Pits.											
180-------------- Mokelumne Variant	0-15	20-27	0.6-2.0	0.15-0.17	5.1-6.5	---	Low-------	0.24	4	8	1-3
	15-28	25-35	0.2-0.6	0.11-0.18	5.1-6.5	---	Moderate	0.28			
	28-35	35-45	0.2-0.6	0.09-0.16	5.1-6.0	---	Moderate	0.17			
	35-49	40-70	<0.06	0.04-0.06	3.6-5.0	---	High------	0.15			
	49-57	25-35	0.2-0.6	0.15-0.17	3.6-5.0	---	Moderate	0.20			
	57-63	---	---	---	---	---	----------	----			
181-------------- Natomas	0-17	15-25	0.6-2.0	0.14-0.17	6.1-7.3	---	Low-------	0.32	5	8	1-3
	17-33	20-30	0.6-2.0	0.15-0.18	5.6-7.3	---	Low-------	0.32			
	33-78	27-35	0.2-0.6	0.17-0.19	5.1-6.5	---	Moderate	0.28			
	78-84	15-20	0.6-2.0	0.10-0.12	6.1-7.3	---	Low-------	0.24			
182*:											
Natomas---------	0-17	15-25	0.6-2.0	0.14-0.17	6.1-7.3	---	Low-------	0.32	5	8	1-3
	17-33	20-30	0.6-2.0	0.15-0.18	5.6-7.3	---	Low-------	0.32			
	33-78	27-35	0.2-0.6	0.17-0.19	5.1-6.5	---	Moderate	0.28			
	78-84	15-20	0.6-2.0	0.10-0.12	6.1-7.3	---	Low-------	0.24			
Xerorthents.											
183-------------- Orangevale	0-15	8-16	2.0-6.0	0.07-0.10	6.1-7.3	---	Low-------	0.24	5	8	<2
	15-20	12-25	0.6-2.0	0.08-0.11	6.1-7.3	---	Low-------	0.28			
	20-72	20-30	0.6-2.0	0.08-0.11	6.1-7.3	---	Moderate	0.28			
	72-80	15-20	2.0-6.0	0.08-0.10	6.1-7.3	---	Low-------	0.28			

See footnote at end of table.

TABLE 18.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	In/hr	In/in	pH	mmhos/cm					Pct
184*, 185*:											
Orangevale------	0-15	8-16	2.0-6.0	0.07-0.10	6.1-7.3	---	Low--------	0.24	5	8	<2
	15-20	12-25	0.6-2.0	0.08-0.11	6.1-7.3	---	Low--------	0.28			
	20-72	20-30	0.6-2.0	0.08-0.11	6.1-7.3	---	Moderate	0.28			
	72-80	15-20	2.0-6.0	0.08-0.10	6.1-7.3	---	Low--------	0.28			
Kaseberg--------	0-18	10-20	0.6-2.0	0.14-0.17	5.6-7.3	---	Low--------	0.43	1	8	.5-1
	18-19	---	---	---	---	---	----------	----			
	19-22	---	---	---	---	---	----------	----			
Urban land.											
186*:											
Orthents.											
Urban land.											
187*:											
Pardee----------	0-11	8-18	0.6-2.0	0.10-0.14	5.1-6.5	---	Low--------	0.20	1	8	1-2
	11-16	18-30	0.2-0.6	0.08-0.11	5.6-6.5	---	Low--------	0.10			
	16	---	---	---	---	---	----------	----			
Ranchoseco------	0-3	12-22	0.6-2.0	0.11-0.15	4.5-6.0	---	Low--------	0.17	1	8	<1
	3-7	15-25	0.6-2.0	0.06-0.11	5.1-6.5	---	Low--------	0.15			
	7	---	---	---	---	---	----------	----			
188*:											
Pentz-----------	0-9	8-18	2.0-6.0	0.11-0.13	5.1-6.5	---	Low--------	0.28	1	8	1-3
	9-16	10-20	2.0-6.0	0.11-0.15	5.6-7.3	---	Low--------	0.37			
	16	---	---	---	---	---	----------	----			
Lithic Xerorthents.											
189-------------- Peters	0-18	40-60	0.06-0.2	0.14-0.16	5.6-7.3	---	High------	0.24	1	8	1-3
	18	---	---	---	---	---	----------	----			
190*. Pits											
191-------------- Red Bluff	0-8	15-27	0.6-2.0	0.14-0.16	5.1-6.5	---	Low--------	0.32	5	8	<2
	8-25	27-35	0.2-0.6	0.15-0.19	6.1-7.3	---	Moderate	0.32			
	25-68	35-60	0.2-0.6	0.10-0.15	6.1-7.3	---	Moderate	0.24			
192-------------- Red Bluff	0-8	15-27	0.6-2.0	0.14-0.16	5.1-6.0	---	Low--------	0.32	5	8	<2
	8-25	27-35	0.2-0.6	0.12-0.18	5.1-6.5	---	Moderate	0.24			
	25-43	35-60	0.2-0.6	0.10-0.15	5.6-6.5	---	Moderate	0.24			
	43-68	30-50	0.2-0.6	0.09-0.13	5.6-6.5	---	Moderate	0.24			
193*:											
Red Bluff-------	0-8	15-27	0.6-2.0	0.14-0.16	5.1-6.0	---	Low--------	0.32	5	8	<2
	8-25	27-35	0.2-0.6	0.12-0.18	5.1-6.5	---	Moderate	0.24			
	25-43	35-60	0.2-0.6	0.10-0.15	5.6-6.5	---	Moderate	0.24			
	43-68	30-50	0.2-0.6	0.09-0.13	5.6-6.5	---	Moderate	0.24			
Redding---------	0-7	10-25	0.6-2.0	0.10-0.14	5.1-6.5	---	Low--------	0.24	2	8	<2
	7-20	18-30	0.2-0.6	0.11-0.14	5.1-6.5	---	Moderate	0.24			
	20-28	35-60	<0.06	0.04-0.06	5.6-6.5	---	High------	0.20			
	28-66	---	---	---	---	---	----------	----			

See footnote at end of table.

TABLE 18.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	In/hr	In/in	pH	mmhos/cm					Pct
194*:											
Red Bluff-------	0-8	15-27	0.6-2.0	0.14-0.16	5.1-6.0	---	Low-------	0.32	5	8	<2
	8-25	27-35	0.2-0.6	0.12-0.18	5.1-6.5	---	Moderate	0.24			
	25-43	35-60	0.2-0.6	0.10-0.15	5.6-6.5	---	Moderate	0.24			
	43-68	30-50	0.2-0.6	0.09-0.13	5.6-6.5	---	Moderate	0.24			
Urban land.											
195*:											
Red Bluff-------	0-8	15-27	0.6-2.0	0.14-0.16	5.1-6.0	---	Low-------	0.32	5	8	<2
	8-25	27-35	0.2-0.6	0.12-0.18	5.1-6.5	---	Moderate	0.24			
	25-43	35-60	0.2-0.6	0.10-0.15	5.6-6.5	---	Moderate	0.24			
	43-68	30-50	0.2-0.6	0.09-0.13	5.6-6.5	---	Moderate	0.24			
Xerarents.											
196*:											
Red Bluff-------	0-8	15-27	0.6-2.0	0.14-0.16	5.1-6.0	---	Low-------	0.32	5	8	<2
	8-25	27-35	0.2-0.6	0.12-0.18	5.1-6.5	---	Moderate	0.24			
	25-43	35-60	0.2-0.6	0.10-0.15	5.6-6.5	---	Moderate	0.24			
	43-68	30-50	0.2-0.6	0.09-0.13	5.6-6.5	---	Moderate	0.24			
Xerorthents.											
197-------------- Redding	0-7	10-25	0.6-2.0	0.14-0.16	5.1-6.5	---	Low-------	0.37	2	8	<2
	7-20	18-30	0.2-0.6	0.13-0.17	5.1-6.5	---	Moderate	0.28			
	20-28	35-60	<0.06	0.04-0.06	5.6-6.5	---	High------	0.28			
	28-66	---	---	---	---	---	----------	----			
198-------------- Redding	0-7	10-25	0.6-2.0	0.10-0.14	5.1-6.5	---	Low-------	0.24	2	8	<2
	7-20	18-30	0.2-0.6	0.11-0.14	5.1-6.5	---	Moderate	0.24			
	20-28	35-60	<0.06	0.04-0.06	5.6-6.5	---	High------	0.20			
	28-66	---	---	---	---	---	----------	----			
199-------------- Reiff	0-7	5-15	2.0-6.0	0.09-0.11	6.1-7.8	---	Low-------	0.32	5	5	1-2
	7-58	8-18	2.0-6.0	0.11-0.16	6.6-7.8	---	Low-------	0.32			
	58-65	15-25	0.6-2.0	0.16-0.19	6.6-7.8	---	Low-------	0.37			
200-------------- Rindge	0-16	---	6.0-20	0.26-0.30	4.5-6.5	2-4	Low-------	0.02	5	2	35-55
	16-60	---	6.0-20	0.26-0.30	4.5-6.5	2-4	Low-------	0.02			
201-------------- Rindge	0-13	20-27	2.0-6.0	0.20-0.22	5.6-7.3	2-4	Low-------	0.28	5	3	10-25
	13-60	---	6.0-20	0.26-0.30	4.5-6.5	2-4	Low-------	0.02			
202-------------- Rindge	0-15	27-35	2.0-6.0	0.20-0.22	5.6-7.3	2-4	Low-------	0.28	5	3	10-25
	15-60	---	6.0-20	0.26-0.30	4.5-6.5	2-4	Low-------	0.02			
203*. Riverwash											
204-------------- Rossmoor	0-6	5-15	2.0-6.0	0.13-0.15	6.6-7.8	---	Low-------	0.20	5	8	2-3
	6-62	5-15	2.0-6.0	0.12-0.14	6.6-7.8	---	Low-------	0.24			
205*:											
Rossmoor--------	0-6	5-15	2.0-6.0	0.13-0.15	6.6-7.8	---	Low-------	0.20	5	8	2-3
	6-62	5-15	2.0-6.0	0.12-0.14	6.6-7.8	---	Low-------	0.24			
Urban land.											

See footnote at end of table.

TABLE 18.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	In/hr	In/in	pH	mmhos/cm					Pct
206, 207, 208---- Sailboat	0-16	15-27	0.6-2.0	0.15-0.19	6.1-7.3	---	Low--------	0.43	5	5	<2
	16-28	18-35	0.2-0.6	0.15-0.19	6.6-7.8	---	Moderate	0.37			
	28-34	25-35	0.2-0.6	0.15-0.19	7.4-8.4	<2	Moderate	0.24			
	34-62	10-27	0.6-2.0	0.14-0.19	7.4-8.4	<2	Low--------	0.43			
209*:											
Sailboat--------	0-16	15-27	0.6-2.0	0.15-0.19	6.1-7.3	---	Low--------	0.43	5	5	<2
	16-28	18-35	0.2-0.6	0.15-0.19	6.6-7.8	---	Moderate	0.37			
	28-34	25-35	0.2-0.6	0.15-0.19	7.4-8.4	<2	Moderate	0.24			
	34-62	10-27	0.6-2.0	0.14-0.19	7.4-8.4	<2	Low--------	0.43			
Urban land.											
210-------------- Sailboat Variant	0-23	27-35	0.2-0.6	0.18-0.20	6.6-7.8	<4	Moderate	0.37	5	7	1-3
	23-33	27-35	2.0-6.0	0.20-0.22	6.1-7.3	<2	Low--------	0.28			
	33-57	20-35	2.0-6.0	0.18-0.22	6.1-7.3	<2	Low--------	0.28			
	57-64	---	6.0-20	0.26-0.30	5.6-6.5	2-4	Low--------	----			
211, 212--------- San Joaquin	0-13	10-20	0.6-2.0	0.10-0.13	5.6-6.5	---	Low--------	0.32	2	8	.5-1
	13-30	20-25	0.2-0.6	0.16-0.17	6.1-7.3	---	Low--------	0.28			
	30-35	35-50	<0.06	0.04-0.06	6.1-7.8	---	High------	0.24			
	35-60	---	---	---	---	---	----------	----			
	60-67	10-25	0.06-0.2	0.10-0.12	6.1-7.8	---	Low--------	0.32			
213, 214, 215---- San Joaquin	0-23	15-25	0.6-2.0	0.14-0.16	5.6-6.5	---	Low--------	0.37	2	8	.5-1
	23-28	35-50	<0.06	0.04-0.06	6.1-7.8	---	High------	0.24			
	28-54	---	---	---	---	---	----------	----			
	54-60	10-25	0.06-0.2	0.10-0.12	6.1-7.8	---	Low--------	0.32			
216*:											
San Joaquin-----	0-23	15-25	0.6-2.0	0.14-0.16	5.6-6.5	---	Low--------	0.37	2	8	.5-1
	23-28	35-50	<0.06	0.04-0.06	6.1-7.8	---	High------	0.24			
	28-54	---	---	---	---	---	----------	----			
	54-60	10-25	0.06-0.2	0.10-0.12	6.1-7.8	---	Low--------	0.32			
Durixeralfs.											
217*:											
San Joaquin-----	0-15	15-25	0.6-2.0	0.14-0.16	5.6-6.5	---	Low--------	0.37	2	8	.5-1
	15-20	35-50	<0.06	0.04-0.06	6.1-7.8	---	High------	0.24			
	20-46	---	---	---	---	---	----------	----			
	46-60	10-25	0.06-0.2	0.10-0.12	6.1-7.8	---	Low--------	0.32			
Galt------------	0-6	10-20	0.6-2.0	0.15-0.17	6.1-7.3	---	Low--------	0.43	2	8	<1
	6-19	40-60	0.06-0.2	0.12-0.15	6.1-7.3	---	High------	0.24			
	19-38	40-60	0.06-0.2	0.12-0.14	6.6-8.4	<2	High------	0.24			
	38-60	---	---	---	---	---	----------	----			
218*:											
San Joaquin-----	0-23	15-25	0.6-2.0	0.14-0.16	5.6-6.5	---	Low--------	0.37	2	8	.5-1
	23-28	35-50	<0.06	0.04-0.06	6.1-7.8	---	High------	0.24			
	28-54	---	---	---	---	---	----------	----			
	54-60	10-25	0.06-0.2	0.10-0.12	6.1-7.8	---	Low--------	0.32			
Galt------------	0-13	40-60	0.06-0.2	0.12-0.15	6.1-7.3	---	High------	0.24	2	8	1-2
	13-32	40-60	0.06-0.2	0.12-0.14	6.6-8.4	<2	High------	0.24			
	32-60	---	---	---	---	---	----------	----			

See footnote at end of table.

TABLE 18.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	In/hr	In/in	pH	mmhos/cm					Pct
219*:											
San Joaquin-----	0-23	15-25	0.6-2.0	0.14-0.16	5.6-6.5	---	Low-------	0.37	2	8	.5-1
	23-28	35-50	<0.06	0.04-0.06	6.1-7.8	---	High------	0.24			
	28-54	---	---	---	---	---	----------	----			
	54-60	10-25	0.06-0.2	0.10-0.12	6.1-7.8	---	Low-------	0.32			
Urban land.											
220*:											
San Joaquin-----	0-13	10-20	0.6-2.0	0.10-0.13	5.6-6.5	---	Low-------	0.32	2	8	.5-1
	13-30	15-25	0.2-0.6	0.16-0.17	6.1-7.3	---	Low-------	0.28			
	30-35	35-50	<0.06	0.04-0.06	6.1-7.8	---	High------	0.24			
	35-60	---	---	---	---	---	----------	----			
	60-67	10-25	0.06-0.2	0.10-0.12	6.1-7.8	---	Low-------	0.32			
Urban land.											
221*:											
San Joaquin-----	0-23	15-25	0.6-2.0	0.14-0.16	5.6-6.5	---	Low-------	0.37	2	8	.5-1
	23-28	35-50	<0.06	0.04-0.06	6.1-7.8	---	High------	0.24			
	28-54	---	---	---	---	---	----------	----			
	54-60	10-25	0.06-0.2	0.10-0.12	6.1-7.8	---	Low-------	0.32			
Xerarents.											
222-------------- Scribner	0-12	27-35	0.2-0.6	0.19-0.21	6.1-7.8	<2	Moderate	0.24	5	4	2-10
	12-39	25-35	0.2-0.6	0.17-0.21	6.6-8.4	<2	Moderate	0.24			
	39-60	20-35	0.2-0.6	0.15-0.19	6.6-8.4	<2	Moderate	0.32			
223*. Slickens											
224-------------- Tehama	0-24	12-20	0.6-2.0	0.14-0.17	5.6-6.5	---	Low-------	0.43	5	8	<1
	24-67	27-35	0.06-0.2	0.17-0.19	6.6-7.8	---	Moderate	0.37			
225-------------- Tinnin	0-12	0-10	6.0-20	0.06-0.08	6.1-7.8	---	Low-------	0.17	5	2	1-2
	12-64	0-10	6.0-20	0.05-0.07	6.6-8.4	<2	Low-------	0.17			
226*:											
Tinnin----------	0-12	0-10	6.0-20	0.06-0.08	6.1-7.8	---	Low-------	0.17	5	2	1-2
	12-64	0-10	6.0-20	0.05-0.07	6.6-8.4	<2	Low-------	0.17			
Urban land.											
227*. Urban land											
228*:											
Urban land.											
Natomas---------	0-17	15-25	0.6-2.0	0.14-0.17	6.1-7.3	---	Low-------	0.32	5	8	1-3
	17-33	20-30	0.6-2.0	0.15-0.18	5.6-7.3	---	Low-------	0.32			
	33-78	27-35	0.2-0.6	0.17-0.19	5.1-6.5	---	Moderate	0.28			
	78-84	15-20	0.6-2.0	0.10-0.12	6.1-7.3	---	Low-------	0.24			
229*:											
Urban land.											
Xerarents.											

See footnote at end of table.

TABLE 18.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	In/hr	In/in	pH	mmhos/cm					Pct
229*:											
Fiddyment-------	0-8	10-18	0.6-2.0	0.12-0.14	5.6-7.3	---	Low-------	0.37	2	8	1-2
	8-15	10-18	0.6-2.0	0.14-0.16	5.6-7.3	---	Low-------	0.43			
	15-28	27-35	<0.06	0.04-0.06	6.1-7.8	---	Moderate	0.32			
	28-40	---	---	---	---	---	----------	----			
	40	---	---	---	---	---	----------	----			
230-------------- Valpac	0-10	18-27	0.6-2.0	0.16-0.18	6.6-7.8	---	Low-------	0.37	5	5	1-3
	10-61	20-35	0.2-0.6	0.15-0.19	7.4-8.4	<2	Moderate	0.32			
231*:											
Valpac----------	0-10	18-27	0.6-2.0	0.16-0.18	6.6-7.8	---	Low-------	0.37	5	5	1-3
	10-61	20-35	0.2-0.6	0.15-0.19	7.4-8.4	<2	Moderate	0.32			
Urban land.											
232-------------- Valpac Variant	0-16	12-18	2.0-6.0	0.11-0.13	6.6-7.8	<2	Low-------	0.32	5	3	1-3
	16-25	18-25	0.6-2.0	0.09-0.15	6.6-8.4	<2	Low-------	0.32			
	25-60	35-55	2.0-6.0	0.20-0.23	4.5-6.0	<2	Low-------	0.24			
233-------------- Vina	0-5	12-18	2.0-6.0	0.12-0.14	6.1-7.3	---	Low-------	0.28	5	7	1-3
	5-61	12-18	0.6-2.0	0.13-0.16	6.1-7.8	---	Low-------	0.32			
234-------------- Vina	0-5	10-20	2.0-6.0	0.12-0.14	6.1-7.3	---	Low-------	0.28	5	7	1-3
	5-61	12-18	0.6-2.0	0.13-0.16	6.1-7.8	---	Low-------	0.32			
235-------------- Vleck	0-13	10-20	0.6-2.0	0.13-0.15	5.6-6.5	---	Low-------	0.32	2	8	<1
	13-25	40-60	<0.06	0.04-0.06	5.6-7.3	---	High------	0.20			
	25-32	20-30	0.2-0.6	0.13-0.18	6.1-7.8	---	Moderate	0.28			
	32-50	---	---	---	---	---	----------	----			
	50-53	---	---	---	---	---	----------	----			
236*:											
Vleck-----------	0-13	10-20	0.6-2.0	0.15-0.17	5.6-6.5	---	Low-------	0.37	2	8	<1
	13-25	40-60	<0.06	0.04-0.06	5.6-7.3	---	High------	0.20			
	25-32	20-30	0.2-0.6	0.13-0.18	6.1-7.8	---	Moderate	0.28			
	32-50	---	---	---	---	---	----------	----			
	50-53	---	---	---	---	---	----------	----			
Amador----------	0-6	10-20	0.6-2.0	0.12-0.14	5.1-6.5	---	Low-------	0.32	1	8	<2
	6-19	12-25	0.6-2.0	0.12-0.16	4.5-6.0	---	Low-------	0.37			
	19	---	---	---	---	---	----------	----			
Pits.											
237-------------- Whiterock	0-8	12-25	0.6-2.0	0.14-0.16	5.1-6.0	---	Low-------	0.37	1	8	<2
	8	---	---	---	---	---	----------	----			
238*:											
Xerarents.											
San Joaquin-----	0-13	10-20	0.6-2.0	0.10-0.13	5.6-6.5	---	Low-------	0.32	2	8	.5-1
	13-30	15-25	0.2-0.6	0.16-0.17	6.1-7.3	---	Low-------	0.28			
	30-35	35-50	<0.06	0.04-0.06	6.1-7.8	---	High------	0.24			
	35-60	---	---	---	---	---	----------	----			
	60-67	10-25	0.06-0.2	0.10-0.12	6.1-7.8	---	Low-------	0.32			

See footnote at end of table.

TABLE 18.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	In/hr	In/in	pH	mmhos/cm					Pct
239*:											
Xerarents.											
Redding---------	0-7	10-25	0.6-2.0	0.14-0.16	5.1-6.5	---	Low-------	0.37	2	8	<2
	7-20	18-30	0.2-0.6	0.13-0.17	5.1-6.5	---	Moderate	0.28			
	20-28	35-66	<0.06	0.04-0.06	5.6-6.5	---	High------	0.28			
	28-66	---	---	---	---	---	----------	----			
240*:											
Xerarents.											
Urban land.											
San Joaquin-----	0-13	10-20	0.6-2.0	0.10-0.13	5.6-6.5	---	Low-------	0.32	2	8	.5-1
	13-30	15-25	0.2-0.6	0.16-0.17	6.1-7.3	---	Low-------	0.28			
	30-35	35-50	<0.06	0.04-0.06	6.1-7.8	---	High------	0.24			
	35-60	---	---	---	---	---	----------	----			
	60-67	10-25	0.06-0.2	0.10-0.12	6.1-7.8	---	Low-------	0.32			
241*:											
Xerarents.											
Urban land.											
Fiddyment-------	0-14	10-18	0.6-2.0	0.14-0.16	5.6-7.3	---	Low-------	0.43	2	8	1-2
	14-28	30-35	<0.06	0.04-0.06	6.1-7.8	---	High------	0.28			
	28-34	---	---	---	---	---	----------	----			
	34	---	---	---	---	---	----------	----			
242.											
Xerofluvents											
243.											
Xerolls											
244.											
Xeropsamments											
245.											
Xerorthents											
246*:											
Xerorthents.											
Urban land.											

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 19.--WATER FEATURES

("Flooding," "water table," and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Soil name and map symbol	Hydrologic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months
					Ft		
101*:							
Amador	D	None	---	---	>6.0	---	---
Gillender	D	None	---	---	>6.0	---	---
102*:							
Americanos	B	None	---	---	>6.0	---	---
Urban land.							
103, 104 Andregg	B	None	---	---	>6.0	---	---
105*, 106*:							
Andregg	B	None	---	---	>6.0	---	---
Urban land.							
107*:							
Argonaut	D	None	---	---	>6.0	---	---
Auburn	D	None	---	---	>6.0	---	---
108*:							
Argonaut	D	None	---	---	>6.0	---	---
Auburn	D	None	---	---	>6.0	---	---
Urban land.							
109 Auburn	D	None	---	---	>6.0	---	---
110*:							
Auburn	D	None	---	---	>6.0	---	---
Argonaut	D	None	---	---	>6.0	---	---
Rock outcrop.							
111, 112 Bruella	B	None	---	---	>6.0	---	---
113 Capay	D	Occasional	Very brief to brief.	Dec-Apr	5.0-6.0	Apparent	Jan-Mar
114 Clear Lake	D	Frequent	Brief to long	Nov-Apr	3.0-5.0	Apparent	Dec-Apr
115 Clear Lake	D	Rare	---	---	5.0-6.0	Apparent	Dec-Apr
116 Columbia	C	Rare	---	---	3.0-5.0	Apparent	Dec-Apr

See footnote at end of table.

TABLE 19.--WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months
					Ft		
117 Columbia	B	Rare	---	---	>6.0	---	---
118 Columbia	B	Occasional	Brief to long	Dec-Apr	>6.0	---	---
119 Columbia	C	Rare	---	---	3.0-5.0	Apparent	Dec-Apr
120 Columbia	B	Rare	---	---	>6.0	---	---
121 Columbia	B	Occasional	Brief to long	Dec-Apr	>6.0	---	---
122 Columbia	B	Rare	---	---	4.0-5.0	Apparent	Dec-Apr
123 Columbia	B	Rare	---	---	5.0-6.0	Apparent	Dec-Apr
124*:							
Columbia	B	Rare	---	---	5.0-6.0	Apparent	Dec-Apr
Urban land.							
125* Corning-Corning	D	None	---	---	>6.0	---	---
126*:							
Corning	D	None	---	---	>6.0	---	---
Redding	D	None	---	---	>6.0	---	---
127 Cosumnes	C	Rare	---	---	3.0-5.0	Apparent	Dec-Apr
128 Cosumnes	C	Rare	---	---	>6.0	---	---
129 Cosumnes	C	Occasional	Brief to long	Dec-Apr	>6.0	---	---
130*:							
Cosumnes	C	Rare	---	---	3.0-5.0	Apparent	Dec-Apr
Urban land.							
131 Coyotecreek	B	Occasional	Very brief to brief.	Dec-Apr	>6.0	---	---
132 Creviscreek	C	None	---	---	3.0-5.0	Perched	Dec-Apr
133, 134 Dierssen	D	Rare	---	---	0.5-2.0	Perched	Dec-Apr

See footnote at end of table.

TABLE 19.--WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Depth	Kind	Months
					Ft		
135------ Dierssen	D	Rare------	---	---	0.5-3.0	Perched	Dec-Mar
136*. Dumps							
137. Durixeralfs							
138*: Durixeralfs.							
Galt------	D	None------	---	---	>6.0	---	---
139------ Egbert	D	Rare------	---	---	1.0-3.0	Apparent	Jan-Dec
140------ Egbert	C	Rare------	---	---	>6.0	---	---
141------ Egbert	C	Rare------	---	---	3.0-5.0	Apparent	Jan-Dec
142------ Egbert	C	Frequent------	Brief to long	Dec-Apr	3.0-5.0	Apparent	Jan-Dec
143*: Egbert------	C	Rare------	---	---	3.0-5.0	Apparent	Jan-Dec
Urban land.							
144, 145, 146------ Fiddyment	D	None------	---	---	>6.0	---	---
147*: Fiddyment------	D	None------	---	---	>6.0	---	---
Orangevale------	B	None------	---	---	>6.0	---	---
148*: Fiddyment------	D	None------	---	---	>6.0	---	---
Orangevale------	B	None------	---	---	>6.0	---	---
Urban land.							
149*: Fiddyment------	D	None------	---	---	>6.0	---	---
Urban land.							
150. Fluvaquents							
151, 152, 153------ Galt	D	None------	---	---	>6.0	---	---

See footnote at end of table.

TABLE 19.--WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Depth	Kind	Months
					Ft		
154*:							
Galt	D	None	---	---	>6.0	---	---
Urban land.							
155 Gazwell	D	Rare	---	---	1.5-3.0	Apparent	Nov-Apr
156*:							
Hadselville	D	None	---	---	>6.0	---	---
Pentz	D	None	---	---	>6.0	---	---
157 Hedge	D	Rare	---	---	1.0-2.0	Perched	Dec-Apr
158, 159 Hicksville	B	Occasional	Very brief	Dec-Apr	5.0-6.0	Apparent	Dec-Apr
160 Hicksville	C	Occasional	Very brief	Dec-Apr	3.0-4.0	Perched	Dec-Apr
161 Jacktone	D	Rare	---	---	>5.0	Apparent	Dec-Apr
162*:							
Kaseberg	D	None	---	---	>6.0	---	---
Fiddyment	D	None	---	---	>6.0	---	---
Urban land.							
163 Keyes	D	None	---	---	>6.0	---	---
164, 165 Kimball	D	None	---	---	>6.0	---	---
166*:							
Kimball	D	None	---	---	>6.0	---	---
Urban land.							
167 Lang	B	Rare	---	---	5.0-6.0	Apparent	Dec-Apr
168*:							
Lang	B	Rare	---	---	5.0-6.0	Apparent	Dec-Apr
Urban land.							
169 Laugenour	C	Rare	---	---	3.0-5.0	Apparent	Dec-Apr
170*:							
Laugenour	C	Rare	---	---	3.0-5.0	Apparent	Jan-Dec
Urban land.							

See footnote at end of table.

TABLE 19.--WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Depth	Kind	Months
					Ft		
171. Lithic Xerorthents							
172 Liveoak	B	Occasional	Brief to long	Dec-Apr	>6.0	---	---
173*: Liveoak	B	Rare	---	---	>6.0	---	---
Urban land.							
174, 175 Madera	D	None	---	---	>6.0	---	---
176*: Madera	D	None	---	---	>6.0	---	---
Galt	D	None	---	---	+1.0-0.5	Perched	Dec-Mar
177. Medisaprists							
178 Mokelumne	D	None	---	---	>6.0	---	---
179*: Mokelumne	D	None	---	---	>6.0	---	---
Pits.							
180 Mokelumne Variant	C	None	---	---	>6.0	---	---
181 Natomas	B	None	---	---	>6.0	---	---
182*: Natomas	B	None	---	---	>6.0	---	---
Xerorthents.							
183 Orangevale	B	None	---	---	>6.0	---	---
184*, 185*: Orangevale	B	None	---	---	>6.0	---	---
Kaseberg	D	None	---	---	>6.0	---	---
Urban land.							
186*: Orthents.							
Urban land.							
187*: Pardee	D	None	---	---	>6.0	---	---
Ranchoseco	D	None	---	---	>6.0	---	---

See footnote at end of table.

TABLE 19.--WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Depth	Kind	Months
					Ft		
188*:							
Pentz	D	None	---	---	>6.0	---	---
Lithic Xerorthents.							
189 Peters	D	None	---	---	>6.0	---	---
190*. Pits							
191, 192 Red Bluff	C	None	---	---	>6.0	---	---
193*:							
Red Bluff	C	None	---	---	>6.0	---	---
Redding	D	None	---	---	>6.0	---	---
194*:							
Red Bluff	C	None	---	---	>6.0	---	---
Urban land.							
195*:							
Red Bluff	C	None	---	---	>6.0	---	---
Xerarents.							
196*:							
Red Bluff	C	None	---	---	>6.0	---	---
Xerorthents.							
197, 198 Redding	D	None	---	---	>6.0	---	---
199 Reiff	B	Occasional	Very brief to brief.	Dec-Apr	>6.0	---	---
200, 201 Rindge	D	Rare	---	---	1.5-3.0	Apparent	Nov-Apr
202 Rindge	D	Rare	---	---	1.5-3.0	Apparent	Nov-Oct
203*. Riverwash							
204 Rossmoor	B	Rare	---	---	>6.0	---	---
205*:							
Rossmoor	B	Rare	---	---	>6.0	---	---
Urban land.							
206 Sailboat	C	Rare	---	---	3.0-5.0	Apparent	Dec-Apr

See footnote at end of table.

TABLE 19.--WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Depth	Kind	Months
					Ft		
207-------------------- Sailboat	B	Rare------------	---	---	>6.0	---	---
208-------------------- Sailboat	B	Occasional------	Very brief to brief.	Dec-Apr	>6.0	---	---
209*:							
Sailboat---------------	C	Rare------------	---	---	3.0-5.0	Apparent	Dec-Apr
Urban land.							
210-------------------- Sailboat Variant	D	Rare------------	---	---	1.5-3.0	Apparent	Nov-Apr
211, 212, 213, 214, 215- San Joaquin	D	None------------	---	---	>6.0	---	---
216*:							
San Joaquin-----------	D	None------------	---	---	>6.0	---	---
Durixeralfs.							
217*:							
San Joaquin-----------	D	None------------	---	---	>6.0	---	---
Galt------------------	D	None------------	---	---	>6.0	---	---
218*:							
San Joaquin-----------	D	None------------	---	---	>6.0	---	---
Galt------------------	D	None------------	---	---	+1-0	Perched	Dec-Mar
219*, 220*:							
San Joaquin-----------	D	None------------	---	---	>6.0	---	---
Urban land.							
221*:							
San Joaquin-----------	D	None------------	---	---	>6.0	---	---
Xerarents.							
222-------------------- Scribner	C	Rare------------	---	---	3.0-5.0	Apparent	Dec-Apr
223*. Slickens							
224-------------------- Tehama	C	None------------	---	---	>6.0	---	---
225-------------------- Tinnin	A	Rare------------	---	---	>6.0	---	---
226*:							
Tinnin-----------------	A	None------------	---	---	>6.0	---	---
Urban land.							
227*. Urban land							

See footnote at end of table.

TABLE 19.--WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Depth	Kind	Months
					Ft		
228*:							
Urban land.							
Natomas	B	None	---	---	>6.0	---	---
229*:							
Urban land.							
Xerarents.							
Fiddyment	D	None	---	---	>6.0	---	---
230 Valpac	C	Rare	---	---	3.0-5.0	Apparent	Dec-Apr
231*:							
Valpac	C	Rare	---	---	3.0-5.0	Apparent	Dec-Apr
Urban land.							
232 Valpac Variant	D	Rare	---	---	1.5-3.0	Apparent	Nov-Apr
233 Vina	B	Rare	---	---	>6.0	---	---
234 Vina	B	Occasional	Very brief to brief.	Dec-Apr	>6.0	---	---
235 Vleck	D	None	---	---	>6.0	---	---
236*:							
Vleck	D	None	---	---	>6.0	---	---
Amador	D	None	---	---	>6.0	---	---
Pits.							
237 Whiterock	D	None	---	---	>6.0	---	---
238*:							
Xerarents.							
San Joaquin	D	None	---	---	>6.0	---	---
239*:							
Xerarents.							
Redding	D	None	---	---	>6.0	---	---
240*:							
Xerarents.							
Urban land.							
San Joaquin	D	None	---	---	>6.0	---	---

See footnote at end of table.

TABLE 19.--WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Depth	Kind	Months
					Ft		
241*:							
Xerarents.							
Urban land.							
Fiddyment	D	None	---	---	>6.0	---	---
242. Xerofluvents							
243. Xerolls							
244. Xeropsamments							
245. Xerorthents							
246*:							
Xerorthents.							
Urban land.							

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 20.--SOIL FEATURES

(The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Soil name and map symbol	Bedrock		Cemented pan		Subsidence		Risk of corrosion	
	Depth	Hardness	Depth	Hardness	Initial	Total	Uncoated steel	Concrete
	In		In		In	In		
101*:								
Amador	10-20	Soft	---	---	---	---	High	High.
Gillender	4-10	Soft	---	---	---	---	Moderate	Moderate.
102*:								
Americanos	>60	---	---	---	---	---	Moderate	Low.
Urban land.								
103, 104 Andregg	20-40	Soft	---	---	---	---	Moderate	Moderate.
105*, 106*:								
Andregg	20-40	Soft	---	---	---	---	Moderate	Moderate.
Urban land.								
107*:								
Argonaut	20-40	Soft	---	---	---	---	High	Moderate.
Auburn	10-28	Hard	---	---	---	---	Moderate	Moderate.
108*:								
Argonaut	20-40	Soft	---	---	---	---	High	Moderate.
Auburn	10-28	Hard	---	---	---	---	Moderate	Moderate.
Urban land.								
109 Auburn	10-20	Hard	---	---	---	---	Moderate	Moderate.
110*:								
Auburn	10-28	Hard	---	---	---	---	Moderate	Moderate.
Argonaut	20-40	Soft	---	---	---	---	High	Moderate.
Rock outcrop.								
111, 112 Bruella	>60	---	---	---	---	---	High	Low.
113 Capay	>60	---	---	---	---	---	High	Moderate.
114 Clear Lake	>60	---	---	---	---	---	High	Moderate.
115 Clear Lake	>60	---	40-80	Thick	---	---	High	Low.
116, 117 Columbia	>60	---	---	---	---	---	Moderate	Low.

See footnotes at end of table.

TABLE 20.--SOIL FEATURES--Continued

Soil name and map symbol	Bedrock		Cemented pan		Subsidence		Risk of corrosion	
	Depth	Hardness	Depth	Hardness	Initial	Total	Uncoated steel	Concrete
	In		In		In	In		
118--------------------- Columbia	>60	---	---	---	---	---	Moderate--------	Low.
119, 120---------------- Columbia	>60	---	---	---	---	---	Moderate--------	Low.
121--------------------- Columbia	>60	---	---	---	---	---	Moderate--------	Low.
122--------------------- Columbia	>60	---	---	---	5-10	>60	High------------	Low.
123--------------------- Columbia	>60	---	---	---	2-5	>60	Moderate--------	Low.
124*:								
Columbia----------------	>60	---	---	---	---	---	Moderate--------	Low.
Urban land.								
125*-------------------- Corning-Corning	>60	---	---	---	---	---	High------------	High.
126*:								
Corning-----------------	>60	---	---	---	---	---	High------------	High.
Redding-----------------	>60	---	20-40	Thick	---	---	High------------	Moderate.
127, 128---------------- Cosumnes	>60	---	---	---	---	---	High------------	Low.
129--------------------- Cosumnes	>60	---	---	---	---	---	High------------	Low.
130*:								
Cosumnes----------------	>60	---	---	---	---	---	High------------	Low.
Urban land.								
131--------------------- Coyotecreek	>60	---	---	---	---	---	Moderate--------	Low.
132--------------------- Creviscreek	40-80	Soft	---	---	---	---	Moderate--------	Moderate.
133, 134---------------- Dierssen	>60	---	20-40	Thick	---	---	High------------	Low.
135--------------------- Dierssen	>60	---	40-60	Thick	---	---	High------------	Low.
136*. Dumps								
137. Durixeralfs								

See footnotes at end of table.

TABLE 20.--SOIL FEATURES--Continued

Soil name and map symbol	Bedrock		Cemented pan		Subsidence		Risk of corrosion	
	Depth	Hardness	Depth	Hardness	Initial	Total	Uncoated steel	Concrete
	In		In		In	In		
138*:								
Durixeralfs.								
Galt	>60	---	20-40	Thick	---	---	High	Low.
139 Egbert	>60	---	---	---	2-5	>24	High	Moderate.
140 Egbert	>60	---	---	---	2-5	>24	High	Moderate.
141 Egbert	>60	---	---	---	**	---	High	Moderate.
142 Egbert	>60	---	---	---	---	---	High	Moderate.
143*:								
Egbert	>60	---	---	---	---	---	High	Moderate.
Urban land.								
144, 145, 146 Fiddyment	21-40	Soft	20-40	Thin	---	---	High	Moderate.
147*:								
Fiddyment	21-40	Soft	20-40	Thin	---	---	High	Moderate.
Orangevale	>60	---	---	---	---	---	Moderate	Low.
148*:								
Fiddyment	21-40	Soft	20-40	Thin	---	---	High	Moderate.
Orangevale	>60	---	---	---	---	---	Moderate	Low.
Urban land.								
149*:								
Fiddyment	21-40	Soft	20-40	Thin	---	---	High	Moderate.
Urban land.								
150. Fluvaquents								
151, 152, 153 Galt	>60	---	20-40	Thick	---	---	High	Low.
154*:								
Galt	>60	---	20-40	Thick	---	---	High	Low.
Urban land.								
155 Gazwell	>60	---	---	---	6-10	>60	High	High.
156*:								
Hadselville	4-10	Soft	---	---	---	---	Moderate	Moderate.
Pentz	10-20	Soft	---	---	---	---	Moderate	Moderate.

See footnotes at end of table.

TABLE 20.--SOIL FEATURES--Continued

Soil name and map symbol	Bedrock		Cemented pan		Subsidence		Risk of corrosion	
	Depth	Hardness	Depth	Hardness	Initial	Total	Uncoated steel	Concrete
	In		In		In	In		
157: Hedge	>60	---	20-40	Thin	---	---	High	Low.
158, 159: Hicksville	>60	---	---	---	---	---	Moderate	Low.
160: Hicksville	40-60	Soft	---	---	---	---	Moderate	Low.
161: Jacktone	>60	---	20-40	Thick	---	---	High	Low.
162*:								
Kaseberg	15-21	Soft	14-20	Thin	---	---	Moderate	Moderate.
Fiddyment	21-40	Soft	20-40	Thin	---	---	High	Moderate.
Urban land.								
163: Keyes	14-40	Soft	13-20	Thick	---	---	High	Low.
164, 165: Kimball	>60	---	---	---	---	---	Moderate	Moderate.
166*:								
Kimball	>60	---	---	---	---	---	Moderate	Moderate.
Urban land.								
167: Lang	>60	---	---	---	---	---	Moderate	Moderate.
168*:								
Lang	>60	---	---	---	---	---	Moderate	Moderate.
Urban land.								
169: Laugenour	>60	---	---	---	**	---	High	Low.
170*:								
Laugenour	>60	---	---	---	---	---	High	Low.
Urban land.								
171. Lithic Xerorthents								
172: Liveoak	>60	---	---	---	---	---	High	Low.
173*:								
Liveoak	>60	---	---	---	---	---	High	Low.
Urban land.								
174, 175: Madera	>60	---	20-40	Thick	---	---	High	Low.

See footnotes at end of table.

TABLE 20.--SOIL FEATURES--Continued

Soil name and map symbol	Bedrock		Cemented pan		Subsidence		Risk of corrosion	
	Depth	Hardness	Depth	Hardness	Initial	Total	Uncoated steel	Concrete
	In		In		In	In		
176*:								
Madera	>60	---	20-40	Thick	---	---	High	Low.
Galt	>60	---	20-40	Thick	---	---	High	Low.
177. Medisaprists								
178 Mokelumne	20-40	Soft	---	---	---	---	High	High.
179*:								
Mokelumne	20-40	Soft	---	---	---	---	High	High.
Pits.								
180 Mokelumne Variant	40-60	Soft	---	---	---	---	High	High.
181 Natomas	>60	---	---	---	---	---	Moderate	Moderate.
182*:								
Natomas	>60	---	---	---	---	---	Moderate	Moderate.
Xerorthents.								
183 Orangevale	>60	---	---	---	---	---	Moderate	Low.
184*, 185*:								
Orangevale	>60	---	---	---	---	---	Moderate	Low.
Kaseberg	15-21	Soft	14-20	Thin	---	---	Moderate	Moderate.
Urban land.								
186*:								
Orthents.								
Urban land.								
187*:								
Pardee	10-20	Hard	---	---	---	---	Moderate	Moderate.
Ranchoseco	4-10	Hard	---	---	---	---	Moderate	Moderate.
188*:								
Pentz	10-20	Soft	---	---	---	---	Moderate	Moderate.
Lithic Xerorthents.								
189 Peters	10-20	Soft	---	---	---	---	Moderate	Low.
190*. Pits								
191, 192 Red Bluff	>60	---	---	---	---	---	High	High.

See footnotes at end of table.

TABLE 20.--SOIL FEATURES--Continued

Soil name and map symbol	Bedrock		Cemented pan		Subsidence		Risk of corrosion	
	Depth	Hardness	Depth	Hardness	Initial	Total	Uncoated steel	Concrete
	In		In		In	In		
193*:								
Red Bluff	>60	---	---	---	---	---	High	High.
Redding	>60	---	20-40	Thick	---	---	High	Moderate.
194*:								
Red Bluff	>60	---	---	---	---	---	High	High.
Urban land.								
195*:								
Red Bluff	>60	---	---	---	---	---	High	High.
Xerarents.								
196*:								
Red Bluff	>60	---	---	---	---	---	High	High.
Xerorthents.								
197 Redding	>60	---	23-40	Thick	---	---	High	Moderate.
198 Redding	>60	---	20-40	Thick	---	---	High	Moderate.
199 Reiff	>60	---	---	---	---	---	Moderate	Low.
200, 201, 202 Rindge	>60	---	---	---	5-10	>60	High	High.
203*. Riverwash								
204 Rossmoor	>60	---	---	---	---	---	Moderate	Low.
205*:								
Rossmoor	>60	---	---	---	---	---	Moderate	Low.
Urban land.								
206, 207 Sailboat	>60	---	---	---	**	---	High	Low.
208 Sailboat	>60	---	---	---	---	---	High	Low.
209*:								
Sailboat	>60	---	---	---	---	---	High	Low.
Urban land.								
210 Sailboat Variant	>60	---	---	---	6-10	>60	High	Moderate.
211, 212, 213, 214, 215 San Joaquin	>60	---	23-40	Thick	---	---	Moderate	Moderate.

See footnotes at end of table.

TABLE 20.--SOIL FEATURES--Continued

Soil name and map symbol	Bedrock		Cemented pan		Subsidence		Risk of corrosion	
	Depth	Hardness	Depth	Hardness	Initial	Total	Uncoated steel	Concrete
	In		In		In	In		
216*:								
San Joaquin------------	>60	---	23-40	Thick	---	---	Moderate-------	Moderate.
Durixeralfs.								
217*:								
San Joaquin------------	>60	---	20-36	Thick	---	---	Moderate-------	Moderate.
Galt-------------------	>60	---	24-40	Thick	---	---	High-----------	Low.
218*:								
San Joaquin------------	>60	---	23-40	Thick	---	---	Moderate-------	Moderate.
Galt-------------------	>60	---	20-40	Thick	---	---	High-----------	Low.
219*, 220*:								
San Joaquin------------	>60	---	23-40	Thick	---	---	Moderate-------	Moderate.
Urban land.								
221*:								
San Joaquin------------	>60	---	23-40	Thick	---	---	Moderate-------	Moderate.
Xerarents.								
222--------------------- Scribner	>60	---	---	---	2-5***	>24	High-----------	Low.
223*. Slickens								
224--------------------- Tehama	>60	---	---	---	---	---	Moderate-------	Moderate.
225--------------------- Tinnin	>60	---	---	---	---	---	High-----------	Low.
226*:								
Tinnin-----------------	>60	---	---	---	---	---	High-----------	Low.
Urban land.								
227*. Urban land								
228*:								
Urban land.								
Natomas----------------	>60	---	---	---	---	---	Moderate-------	Moderate.
229*:								
Urban land.								
Xerarents.								
Fiddyment--------------	21-40	Soft	20-40	Thin	---	---	High-----------	Moderate.
230--------------------- Valpac	>60	---	---	---	---	---	High-----------	Low.

See footnotes at end of table.

TABLE 20.--SOIL FEATURES--Continued

Soil name and map symbol	Bedrock		Cemented pan		Subsidence		Risk of corrosion	
	Depth	Hardness	Depth	Hardness	Initial	Total	Uncoated steel	Concrete
	In		In		In	In		
231*:								
Valpac	>60	---	---	---	---	---	High	Low.
Urban land.								
232 Valpac Variant	>60	---	---	---	6-10	>60	High	High.
233 Vina	>60	---	---	---	---	---	Moderate	Moderate.
234 Vina	>60	---	---	---	---	---	Moderate	Low.
235 Vleck	30-60	Soft	20-40	Thick	---	---	High	Moderate.
236*:								
Vleck	30-60	Soft	20-40	Thick	---	---	High	Moderate.
Amador	10-20	Soft	---	---	---	---	High	High.
Pits.								
237 Whiterock	4-14	Hard	---	---	---	---	High	High.
238*: Xerarents.								
San Joaquin	>60	---	23-40	Thick	---	---	Moderate	Moderate.
239*: Xerarents.								
Redding	>60	---	23-40	Thick	---	---	High	Moderate.
240*: Xerarents.								
Urban land.								
San Joaquin	>60	---	23-40	Thick	---	---	Moderate	Moderate.
241*: Xerarents.								
Urban land.								
Fiddyment	21-40	Soft	20-40	Thin	---	---	High	Moderate.
242. Xerofluvents								
243. Xerolls								
244. Xeropsamments								

See footnotes at end of table.

TABLE 20.--SOIL FEATURES--Continued

Soil name and map symbol	Bedrock		Cemented pan		Subsidence		Risk of corrosion	
	Depth	Hardness	Depth	Hardness	Initial	Total	Uncoated steel	Concrete
	In		In		In	In		
245. Xerorthents								
246*:								
Xerorthents.								
Urban land.								

* See description of the map unit for composition and behavior characteristics of the map unit.

** Most areas in MLRA 16 have initial subsidence of 2 to 5 inches and total subsidence of more than 24 inches.

*** Most areas north of Locke do not subside.

TABLE 21.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Amador	Loamy, mixed, thermic, shallow Typic Xerochrepts
Americanos	Fine-silty, mixed, thermic Mollic Haploxeralfs
Andregg	Coarse-loamy, mixed, thermic Ultic Haploxerolls
Argonaut*	Fine, mixed, thermic Mollic Haploxeralfs
Auburn**	Loamy, oxidic, thermic Ruptic-Lithic Xerochrepts
Bruella	Fine-loamy, mixed, thermic Ultic Palexeralfs
Capay	Fine, montmorillonitic, thermic Typic Chromoxererts
Clear Lake	Fine, montmorillonitic, thermic Typic Pelloxererts
Columbia	Coarse-loamy, mixed, nonacid, thermic Aquic Xerofluvents
Corning	Fine, mixed, thermic Typic Palexeralfs
Cosumnes	Fine, mixed, nonacid, thermic Aquic Xerofluvents
Coyotecreek	Fine-silty, mixed, thermic Cumulic Haploxerolls
Creviscreek	Fine-loamy, mixed, thermic Typic Haploxeralfs
Dierssen	Fine, mixed, thermic Argic Durixerolls
Durixeralfs	Durixeralfs
Egbert	Fine, mixed, thermic Cumulic Haplaquolls
Fiddyment***	Fine-loamy, mixed, thermic Typic Durixeralfs
Fluvaquents	Fluvaquents
Galt	Fine, montmorillonitic, thermic Typic Chromoxererts
Gazwell	Fine, mixed, thermic Cumulic Haplaquolls
Gillender	Loamy, mixed, nonacid, thermic, shallow Typic Xerorthents
Hadselville	Loamy, mixed, thermic, shallow Entic Ultic Haploxerolls
Hedge	Fine-loamy, mixed, thermic Haplic Durixeralfs
Hicksville	Fine-loamy, mixed, thermic Mollic Haploxeralfs
Jacktone	Fine, montmorillonitic, thermic Typic Pelloxererts
Kaseburg*	Loamy, mixed, thermic, shallow Typic Durochrepts
Keyes	Clayey, mixed, thermic, shallow Abruptic Durixeralfs
Kimball	Fine, mixed, thermic Mollic Palexeralfs
Lang*	Mixed, thermic Typic Psammaquents
Laugenour*	Coarse-loamy, mixed (calcareous), thermic Aeric Fluvaquents
Lithic Xerorthents	Lithic Xerorthents
Liveoak	Fine-loamy, mixed, thermic Typic Haploxerolls
Madera	Fine, montmorillonitic, thermic Abruptic Durixeralfs
Medisaprists	Medisaprists
Mokelumne	Clayey, kaolinitic, thermic Typic Haploxerults
Mokelumne Variant	Fine-loamy, mixed, thermic Typic Haploxerults
Natomas	Fine-loamy, mixed, thermic Ultic Palexeralfs
Orangevale	Fine-loamy, mixed, thermic Ultic Haploxeralfs
Orthents	Orthents
Pardee	Loamy-skeletal, mixed, thermic Lithic Mollic Haploxeralfs
Pentz	Loamy, mixed, thermic, shallow Ultic Haploxerolls
Peters	Clayey, montmorillonitic, thermic, shallow Typic Haploxerolls
Ranchoseco	Loamy-skeletal, mixed, nonacid, thermic Lithic Xerorthents
Red Bluff	Fine, kaolinitic, thermic Ultic Palexeralfs
Redding	Fine, mixed, thermic Abruptic Durixeralfs
Reiff	Coarse-loamy, mixed, nonacid, thermic Mollic Xerofluvents
Rindge	Euic, thermic Typic Medisaprists
Rossmoor	Coarse-loamy, mixed, thermic Fluventic Haploxerolls
Sailboat	Fine-loamy, mixed, nonacid, thermic Aquic Xerofluvents
Sailboat Variant	Fine-silty, mixed, nonacid, thermic Aquic Xerofluvents
San Joaquin	Fine, mixed, thermic Abruptic Durixeralfs
Scribner	Fine-loamy, mixed, thermic Cumulic Haplaquolls
Tehama	Fine-silty, mixed, thermic Typic Haploxeralfs
Tinnin	Sandy, mixed, thermic Entic Haploxerolls
Valpac	Fine-loamy, mixed, thermic Fluvaquentic Haploxerolls
Valpac Variant	Fine-loamy, mixed, thermic Fluvaquentic Haplaquolls
Vina	Coarse-loamy, mixed, thermic Cumulic Haploxerolls
Vleck	Fine, montmorillonitic, thermic Abruptic Haplic Durixeralfs

See footnotes at end of table.

TABLE 21.--CLASSIFICATION OF THE SOILS--Continued

Soil name	Family or higher taxonomic class
Whiterock	Loamy, mixed, nonacid, thermic Lithic Xerorthents
Xerarents	Xerarents
Xerofluvents	Xerofluvents
Xerolls	Xerolls
Xeropsamments	Xeropsamments
Xerorthents	Xerorthents

* The soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series.
** The Auburn soil in map unit 109 is a taxadjunct.
*** The Fiddyment soil in map unit 146 is a taxadjunct.

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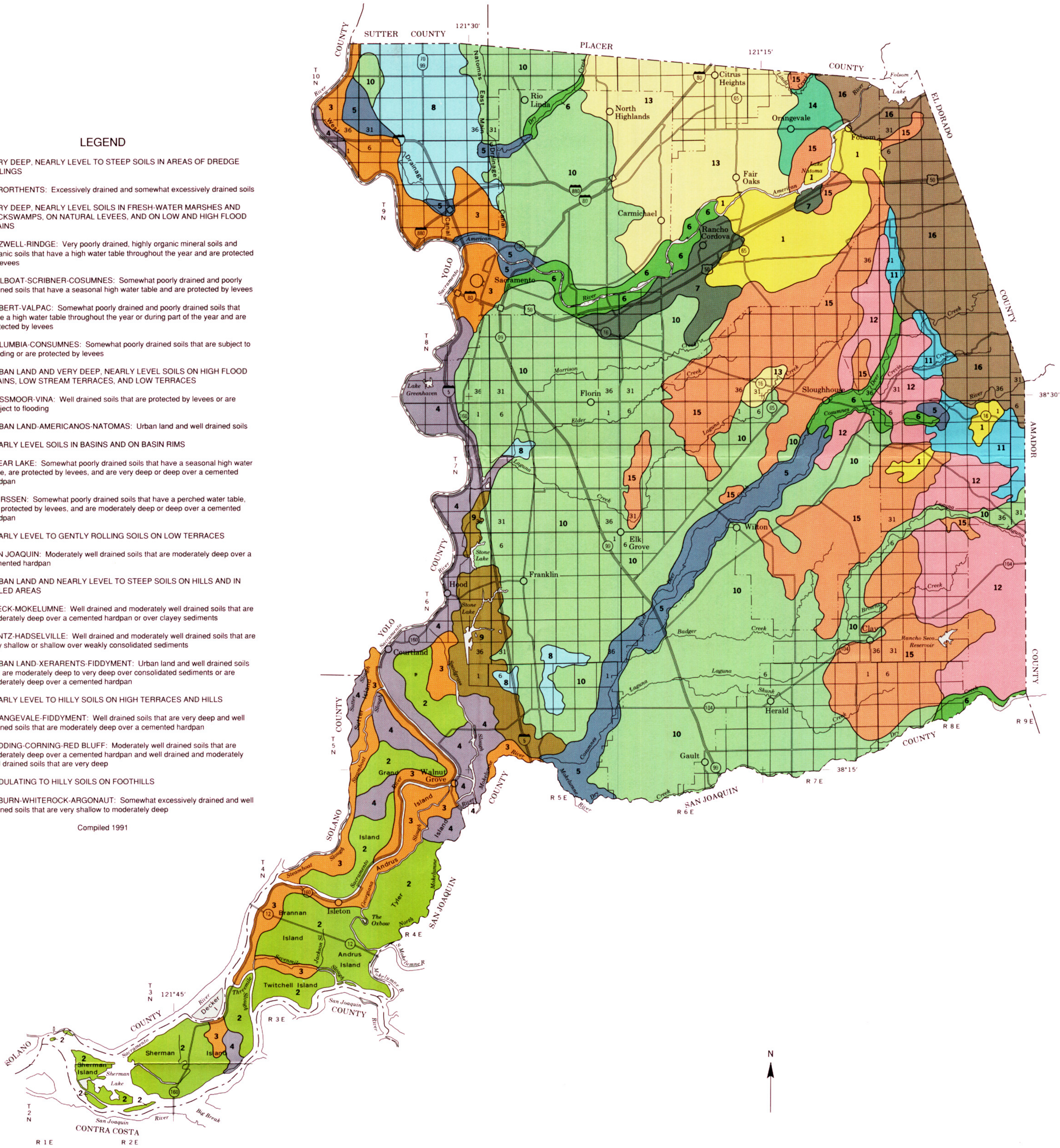


LEGEND

VERY DEEP, NEARLY LEVEL TO STEEP SOILS IN AREAS OF DREDGE TAILINGS

1 XERORTHENTS: Excessively drained and somewhat excessively drained soils

VERY DEEP, NEARLY LEVEL SOILS IN FRESH-WATER MARSHES AND BACKSWAMPS, ON NATURAL LEVEES, AND ON LOW AND HIGH FLOOD PLAINS

2 GAZWELL-RINDGE: Very poorly drained, highly organic mineral soils and organic soils that have a high water table throughout the year and are protected by levees

3 SAILBOAT-SCRIBNER-COSUMNES: Somewhat poorly drained and poorly drained soils that have a seasonal high water table and are protected by levees

4 EGBERT-VALPAC: Somewhat poorly drained and poorly drained soils that have a high water table throughout the year or during part of the year and are protected by levees

5 COLUMBIA-CONSUMNES: Somewhat poorly drained soils that are subject to flooding or are protected by levees

URBAN LAND AND VERY DEEP, NEARLY LEVEL SOILS ON HIGH FLOOD PLAINS, LOW STREAM TERRACES, AND LOW TERRACES

6 ROSSMOOR-VINA: Well drained soils that are protected by levees or are subject to flooding

7 URBAN LAND-AMERICANOS-NATOMAS: Urban land and well drained soils

NEARLY LEVEL SOILS IN BASINS AND ON BASIN RIMS

8 CLEAR LAKE: Somewhat poorly drained soils that have a seasonal high water table, are protected by levees, and are very deep or deep over a cemented hardpan

9 DIERSSEN: Somewhat poorly drained soils that have a perched water table, are protected by levees, and are moderately deep or deep over a cemented hardpan

NEARLY LEVEL TO GENTLY ROLLING SOILS ON LOW TERRACES

10 SAN JOAQUIN: Moderately well drained soils that are moderately deep over a cemented hardpan

URBAN LAND AND NEARLY LEVEL TO STEEP SOILS ON HILLS AND IN FILLED AREAS

11 VLECK-MOKELUMNE: Well drained and moderately well drained soils that are moderately deep over a cemented hardpan or over clayey sediments

12 PENTZ-HADSELVILLE: Well drained and moderately well drained soils that are very shallow or shallow over weakly consolidated sediments

13 URBAN LAND-XERARENTS-FIDDYMENT: Urban land and well drained soils that are moderately deep to very deep over consolidated sediments or are moderately deep over a cemented hardpan

NEARLY LEVEL TO HILLY SOILS ON HIGH TERRACES AND HILLS

14 ORANGEVALE-FIDDYMENT: Well drained soils that are very deep and well drained soils that are moderately deep over a cemented hardpan

15 REDDING-CORNING-RED BLUFF: Moderately well drained soils that are moderately deep over a cemented hardpan and well drained and moderately well drained soils that are very deep

UNDULATING TO HILLY SOILS ON FOOTHILLS

16 AUBURN-WHITEROCK-ARGONAUT: Somewhat excessively drained and well drained soils that are very shallow to moderately deep

Compiled 1991

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
REGENTS OF THE UNIVERSITY OF CALIFORNIA
(AGRICULTURAL EXPERIMENT STATION)

GENERAL SOIL MAP

SACRAMENTO COUNTY, CALIFORNIA

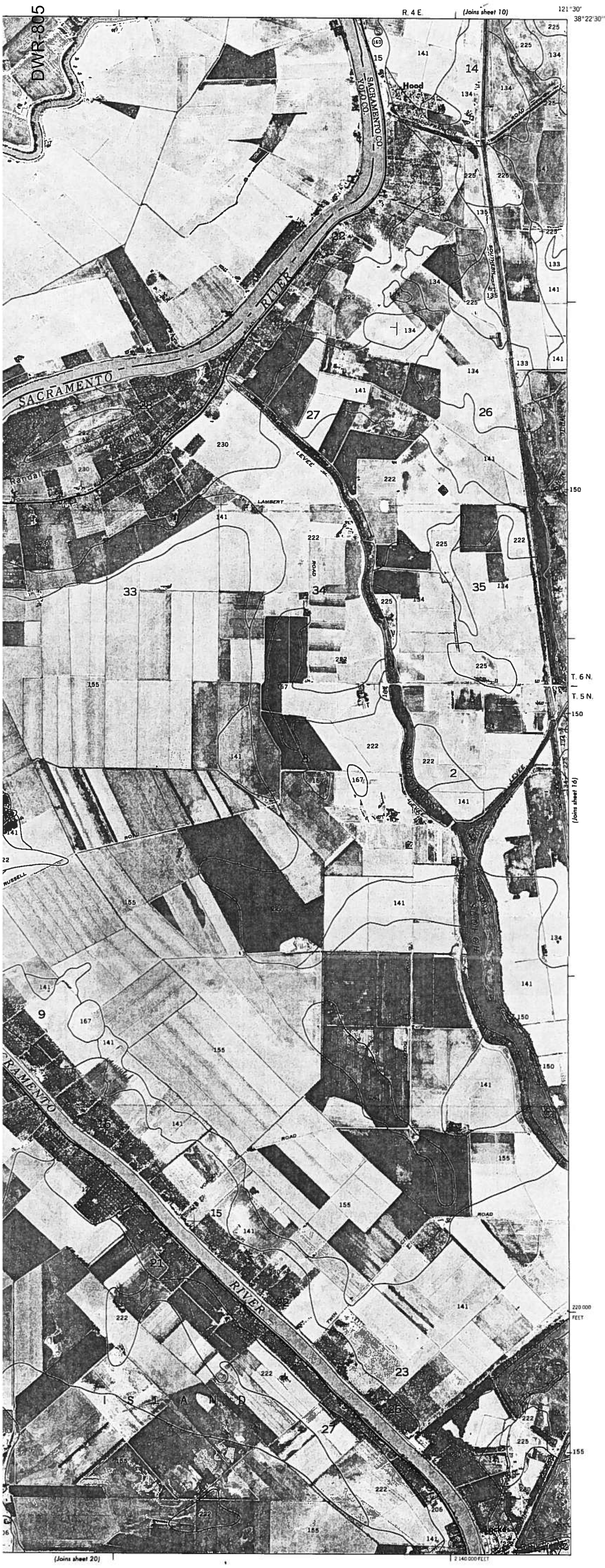
Scale 1:190,080

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

SOIL SURVEY OF SACRAMENTO COUNTY, CALIFORNIA
(COURTLAND QUADRANGLE)



1
2 MILES
2 KILOMETERS

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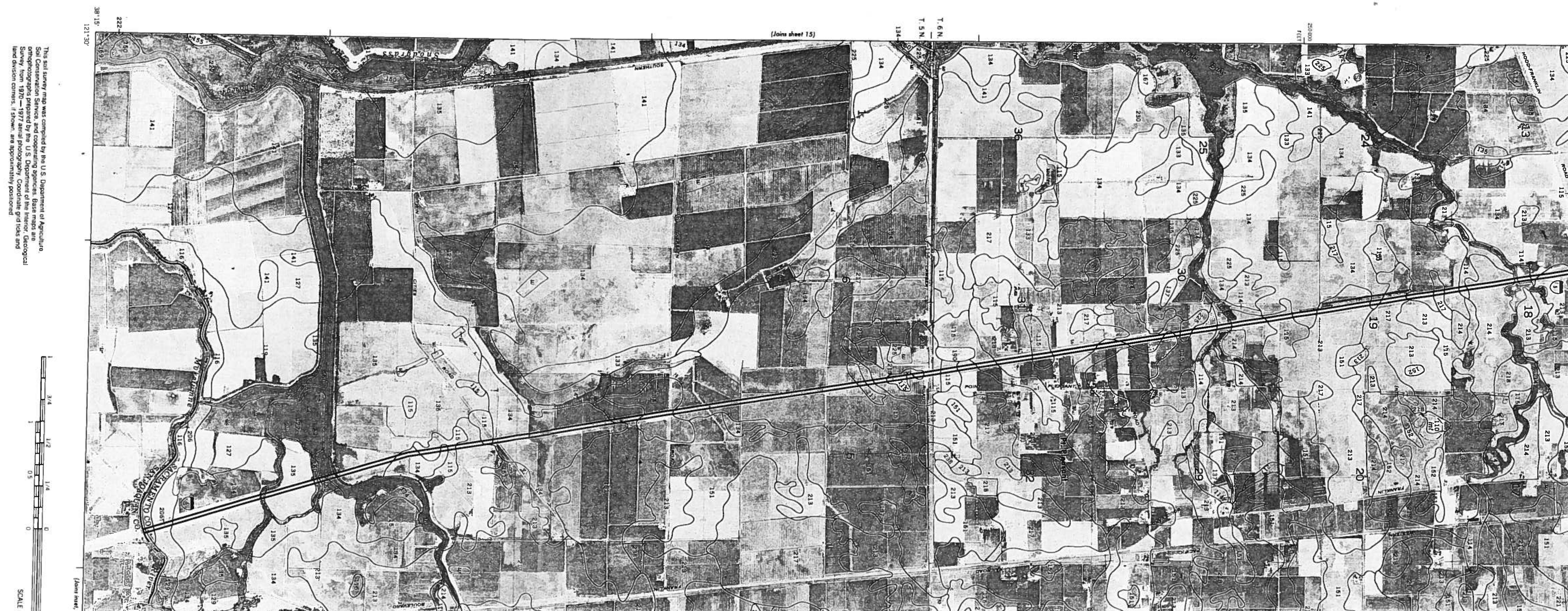

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1970—1977 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.
(Joins sheet 15)
T.6 N.
T.5 N.
R.4 E. | R.5 E.
38°15'
121°30'
SCALE
SACRAMENTO COUN

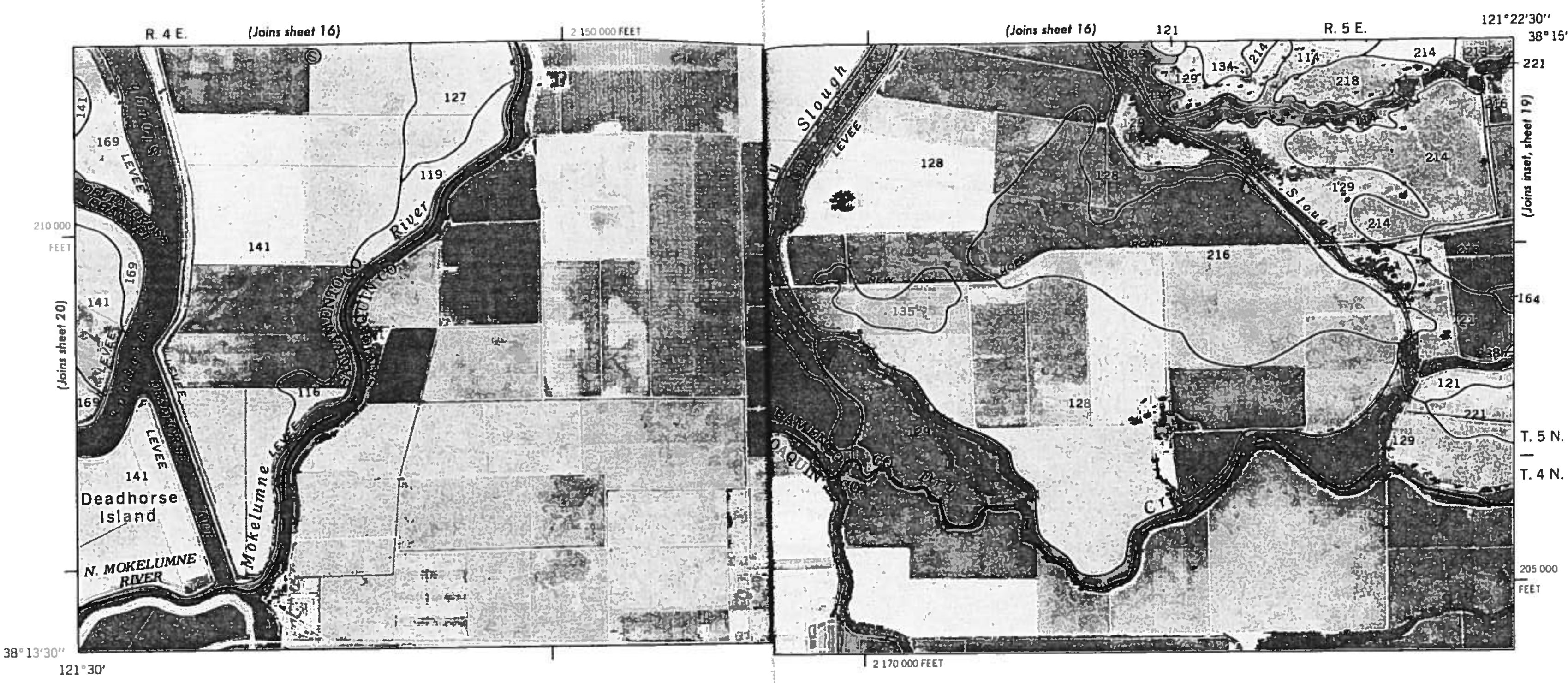
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 21

SOIL SURVEY OF SACRAMENTO COUNTY, CALIFORNIA

(ANTIOCH NORTH AND PART OF NEW HOPE QUADRANGLES)

DWR-805



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SHEET NO. 20
SOIL SURVEY OF SACRAMENTO COUNTY, CALIFORNIA
(ISLETON QUADRANGLE)