Issued November 1969

SOIL SURVEY
SAN BENITO COUNTY
California

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with
UNIVERSITY OF CALIFORNIA
AGRICULTURAL EXPERIMENT STATION

Major fieldwork for this soil survey was done in the period 1955–61. Soil names and descriptions were approved in 1965. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1962. This survey was made cooperatively by the Soil Conservation Service and the University of California Agricultural Experiment Station and is part of the technical assistance furnished to the Bitterwater, San Felipe, San Juan Bautista, Elkhorn, and Bolado-Fairview Soil Conservation Districts.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY of San Benito County contains information that can be applied in managing farms and ranches; in selecting sites for roads, ponds, buildings, or other structures; and in judging tracts of land for agriculture, industry, or recreation.

Locating Soils

All of the soils of San Benito County are shown on the detailed map at the back of this survey. This map consists of many sheets that are made from aerial photographs. Each sheet is numbered to correspond with numbers shown on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbol. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and Using Information

The "Guide to Mapping Units" can be used to find information in the survey. This guide lists all of the soils of the county in alphabetic order by map symbol. It shows the page where each kind of soil is described, and also the page for the capability unit, pasture and range site, or any other group in which the soil has been placed.

Individual colored maps showing the relative suitability or limitations of soils for many specific purposes can be developed by using the soil map and information in the text. Interpretations not included in the text can be developed by grouping the soils according to their limitations for a particular use. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils in the soil descriptions and in the discussions of the capability units and pasture and range sites.

Ranchers and others interested in pasture and range can find under "Management of Pasture and Range" groupings of the soils according to their suitability for pasture and range, and also the plants that grow on each site.

Engineers and builders will find under "Engineering Uses of the Soils" tables that give engineering properties of the soils in the county and that name soil features that affect engineering practices and structures.

Scientists and others can read about how the soils were formed and how they are classified in the section "Formation and Classification of Soils."

Newcomers in San Benito County may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the section "General Nature of the County," which gives additional information about the county.

***Cover picture.*—Dryland pasture on Conejo clay loam, 2 to 9 percent slopes.**

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UNITED STATES DEPARTMENT OF AGRICULTURE AND UNIVERSITY OF CALIFORNIA AGRICULTURAL EXPERIMENT STATION

SAN BENITO COUNTY, near the coast of California (fig. 1), has a total land area of 1,396 square miles, or 893,440 acres. The county includes the southern end of the Santa Clara Valley, the eastern slopes of the Gabilan Range, and the western slopes of the Diablo Range. The county lies about 85 miles southeast of San Francisco and 25 miles inland from Monterey Bay. Hollister, in the north-central part of the county, is the largest town and the county seat.

Figure 1.—Location of San Benito County in California.

The county is in the California Coast Range section of the Pacific Border physiographic province. It has a Mediterranean climate, and an average annual rainfall that ranges from 20 inches or more in the northern part to 12 inches or less along the southwestern border. Relief is characterized by mountains and valleys. Elevations range from 120 to more than 5,000 feet above sea level. The highest point in the county, 5,248 feet, is on San Benito Mountain.

Farming is the main source of income in San Benito County. The principal crops are fruits and nuts, vegetables and other row crops, and small grains. The raising of livestock, mainly beef cattle and sheep, is also important. Lack of water is the main factor limiting production in this county. Where water is available, irrigated fields are intensively cropped. Ponds and reservoirs are used for watering livestock on range and pasture.

Most of the cropland in the county consists of well-drained to poorly drained loamy and clayey soils that are on flood plains, on fans, on terraces, and in basins. Much of the pasture and rangeland also consists of loamy and clayey soils, but these soils are on uplands and are strongly sloping to steep.

General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations in San Benito County. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in a county, who want to compare different parts of a county, or who want to know the location of large tracts that are suitable for a certain kind of farming or other land use. Such a map is not suitable for planning the management of a farm or field, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect management.

The eleven soil associations in San Benito County are described on the following pages. More detailed information about the individual soils in each association can be obtained from the detailed soil map and the section "Descriptions of the Soils."

Soils of the Terraces, Alluvial Fans, and Flood Plains

The soils of the terraces are nearly level to steep, and the soils of the alluvial fans and flood plains are nearly level to moderately sloping. These soils formed in alluvium that was derived from sedimentary rocks and basic and acid igneous rocks. The soils in most areas are used for cultivated crops. Annual grasses, forbs, and some scattered oaks grow in uncultivated areas. Elevation ranges from 130 to 2,000 feet. The annual rainfall ranges from 6 to 20 inches and increases with elevation. The soils of this group occupy about 15 percent of the county and include most of the farmland. They lie in the San Benito, Santa Clara, Dry Lake, Topo, Quien Sabe, Bitterwater, and Panoche Valleys. Five soil associations make up this group.

1. Sorrento-Yolo-Mocho association

Nearly level to sloping, well-drained, medium-textured soils on flood plains and alluvial fans

This association consists of nearly level to sloping soils that formed in very deep alluvium derived from sedimentary rocks. The main areas are in San Benito, Santa Clara, Topo, Dry Lake, and Bitterwater Valleys. The plant cover consists of annual grasses, forbs, and some scattered oaks. The annual rainfall is 12 to 20 inches, the mean annual temperature is 59° to 64° F., and elevation ranges from 140 to 1,400 feet. The frost-free season is about 260 to 275 days. This association occupies about 6 percent of the county.

The Sorrento soils make up about 45 percent of the association; Yolo soils, about 20 percent; and Mocho soils, about 15 percent. The remaining 20 percent consists of Docas and Metz soils, Riverwash, Sandy alluvial land, and Terrace escarpments.

The dominant Sorrento, Yolo, and Mocho soils are very deep and well drained. The Sorrento soils have a grayish-brown silt loam surface layer underlain by light brownish-gray, calcareous silt loam. The Yolo soils have a brown to grayish-brown loam surface layer over pale-brown loam. The Mocho soils have a surface layer of grayish-brown loam that is underlain by light brownish-gray loam to fine sandy loam.

In this association are some of the most productive soils in the county. The soils are used for irrigated fruits and nuts, row and field crops, alfalfa, and pasture. They are used for small grain and pasture when dryfarmed. Except on streambanks, the soils are subject to little or no erosion. A few pheasant and quail live on this association.

2. Clear Lake-Pacheco-Willows association

Nearly level and gently sloping, poorly drained and somewhat poorly drained, fine- and medium-textured soils on flood plains and in basins

This association consists of nearly level and gently sloping soils that formed in alluvium derived from sedimentary rocks. The main area extends southeastward from the Santa Clara County line to a point just north of Hollister. The plant cover consists of annual grasses, forbs, and salt-tolerant plants. The annual rainfall is about 20 inches, the mean annual temperature is 60° F., and elevation ranges from 130 to 400 feet. The frost-free season is about 250 to 260 days. This association occupies about 3 percent of the county.

The Clear Lake soils make up about 40 percent of the association; Pacheco soils, about 25 percent; and Willows soils, about 20 percent. The remaining 15 percent consists of Metz, Rincon, and Cropley soils and Riverwash.

The Clear Lake soils consist of poorly drained, very dark gray clays underlain by dark-gray clay over gray clay. These soils are in basins. The Pacheco soils are on flood plains and are somewhat poorly drained to poorly drained. They have a dark-gray silt loam surface layer and a grayish-brown clay loam subsoil. The Willows soils occur in basins and are poorly drained and saline-alkali. They have a grayish-brown clay surface layer underlain by light yellowish-brown clay.

The soils of this association are intensively cultivated to row and field crops, alfalfa, and small grains. Fruits and nuts are grown in areas that have been drained. Drainage is needed in most areas, and reclamation is needed in areas affected by salts and alkali. A limited number of pheasants, quail, and ducks inhabit this association.

3. Edenvale-Conejo association

Nearly level to sloping, somewhat poorly drained to well-drained, fine- and moderately fine-textured soils in basins and on their rims

This association consists of very deep, nearly level to sloping soils that formed in alluvium. The alluvium was derived from rhyolite, andesite, basalt, and serpentine of the surrounding hills. This association occurs only in a small area in Quien Sabe Valley. The plant cover is annual grasses and forbs and scattered oaks. The annual rainfall is 14 to 18 inches, the mean annual temperature is about 60° F., and elevations range from 1,200 to 2,000 feet. The frost-free season is 250 to 260 days. This association occupies about 1 percent of the county.

The Edenvale soils make up about 55 percent of the association, and the Conejo soils make up 40 percent. The remaining 5 percent consists of Cibo soils, which are on hills surrounding the Edenvale and Conejo soils.

The Edenvale soils are somewhat poorly drained and are affected by salts and alkali in some areas. These soils are very dark gray clay throughout the profile. Conejo soils are well drained and have a very dark gray clay loam surface layer underlain by dark grayish-brown clay loam.

The small supply of irrigation water limits use of the soils in this association to mainly dryland grain and pasture. Drainage is also a problem in some areas. Because the proportion of magnesium to calcium is high in the Edenvale soils, they may be less fertile than the Conejo soils. A few pheasants and ducks inhabit this association.

4. Panoche-Los Banos-Panhill association

Nearly level to steep, well-drained, medium- and moderately fine-textured soils on alluvial fans and terraces

This association consists of nearly level to sloping soils on alluvial fans and nearly level to steep soils on high

terraces. The alluvium of the fans was derived from sedimentary rock of the surrounding hilly to steep uplands. The alluvium of the terraces was derived from mixed sources and is older and more gravelly than that of the fans. The terraces are strongly dissected and have nearly level tops and undulating to steep side slopes. The vegetative cover of this association consists of annual grasses and forbs. The annual rainfall ranges from 6 to 12 inches, and elevation ranges from 1,200 to 2,000 feet. The mean annual temperature is 62° to 63° F., and the frost-free season is about 260 to 265 days. This association occupies about 3 percent of the county and occurs in Panoche Valley.

The Panoche soils make up 55 percent of this association; Los Banos soils, 25 percent; Panhill soils, 15 percent; and minor soils, the rest. The main minor soils are the Docas and Kettleman.

The Panoche soils are very deep and well drained and consist of pale-brown, calcareous loam. The Los Banos soils have a brown clay loam surface layer and a reddish-brown clay subsoil. They are moderately deep over a semiconsolidated substratum that limits the penetration of roots and water. Panhill soils have a profile consisting of very deep, light yellowish-brown loam. These soils are neutral in the surface layer but become calcareous with depth. The content of clay is slightly less in the surface layer than in the subsoil.

The soils of this association are used for annual-grass pasture and for irrigated cotton, alfalfa, safflower, wheat, and barley. Water for irrigation, however, is available only in parts of this association. Because areas in pasture have been overgrazed, the sloping soils are eroded. Los Banos soils are rilled and gullied and have other bare areas. Gullying and erosion of streambanks are a serious hazard along the drainageways and streams in this association. Some deer, quail, and pheasants live in areas where water is available.

5. Rincon-Antioch-Cropley association

Nearly level to strongly sloping, well-drained and moderately well drained, medium- to fine-textured soils on terraces and alluvial fans

This association consists of nearly level to strongly sloping soils on fans and terraces. It occupies a broad area of soils that are nearly level as they grade toward the valley floor but that are strongly sloping as they break sharply near the drainageways. The area extends from the Santa Clara County line southward along Santa Ana and Tres Pinos Creeks to Cottonwood School. The plant cover in uncultivated areas consists of annual grasses, forbs, and scattered oaks. The climate is semiarid; the annual rainfall is 12 to 16 inches. The mean annual temperature is 59° to 62° F., and the frost-free season is about 260 days. Elevation ranges from 130 to 1,500 feet. This association occupies about 2 percent of the county.

Rincon soils make up about 55 percent of this association; Antioch soils, about 25 percent; and Cropley soils, about 15 percent. The remaining 5 percent consists of Clear Lake, Pleasanton, and Sorrento soils.

The Rincon soils are very deep and well drained. They have a dark grayish-brown silty clay loam surface layer and a brown clay subsoil underlain by a light yellowish-brown clay loam substratum. The Antioch soils are moderately well drained and have a grayish-brown to gray, acid loam surface layer that extends to a depth of less than 20 inches and is underlain by a brown, slightly acid to alkaline, dense clay subsoil. The subsoil grades to a light yellowish-brown loam substratum. Permeability is very slow, and penetration of roots is limited. The Cropley soils are very deep and well drained. They have a clay texture to a depth of about 42 inches. They have a very dark gray surface layer that grades to a grayish-brown substratum. Cropley soils crack deeply as they dry out.

The soils of this association are used for fruits, nuts, alfalfa, row and field crops, and annual-grass pasture. Grain is grown both with and without irrigation. Erosion is a problem on the more sloping soils. In some places the irrigation water is of poor quality because the content of boron is high.

Soils of the Uplands

The soils of the uplands are strongly sloping to very steep. They are underlain by granitic, basic igneous, ultrabasic, and sedimentary rocks. Granitic rocks occur mainly along the Monterey County line in the southwestern part of the county; basic rocks are present throughout the eastern half; ultrabasic rocks occur in the southern part; and sedimentary rocks are in the central and eastern parts. The soils of the uplands occupy parts of the Gabilan and Diablo Ranges. These ranges have a northwestern trend parallel to the underlying bedrock. Annual rainfall ranges from about 8 to 30 inches, and elevation ranges from 200 to more than 5,000 feet. The soils of the uplands occupy about 85 percent of the county. They make up six soil associations.

6. Diablo-Soper association

Strongly sloping to very steep, well-drained, fine- and moderately coarse-textured soils formed over sandstone and shale or weakly cemented sand and gravel

This association consists of strongly sloping to very steep soils on uplands. These soils are underlain by weakly consolidated sediments of soft interbedded sandstone, conglomerate, and clay shale at a depth of 36 to 60 inches or more. This association occurs west and northeast of San Juan Bautista. Annual grasses and forbs along with scattered oaks and brush grow in most areas. Rainfall is 12 to 20 inches, and elevation ranges from 200 to 2,000 feet. The mean annual temperature is about 68° F., and the frost-free season is 250 to 260 days. This association occupies 3 percent of the county.

Diablo soils make up about 75 percent of this association, and Soper soils make up 20 percent. The Arnold and Cotati soils are minor soils and make up the remaining 5 percent. The Arnold soils are undulating to hilly and occur on old sand dunes, and the Cotati soils are on terraces along the foothills.

The Diablo and Soper soils are rolling to very steep and occur mainly on the smoothly rounded hills. Diablo soils are very deep over clay shale. They are well drained and have a very dark gray clay surface layer over a dark grayish-brown to pale-olive clay substratum. The Soper soils are deep and well drained. They have a dark grayish-brown sandy loam surface layer, a brown sandy clay

loam subsoil, and a stratified substratum over semiconsolidated sand and fine gravel.

The soils of this association are used for grain, annual-grass pasture and for range, watersheds, and some community developments. Dense stands of eucalyptus trees have been planted on some of the soils. The hazard of erosion is severe, particularly on the Arnold, Soper, and Cotati soils. Many landslides occur on the Diablo soils, which are underlain by soft sediments. A few deer live in this association.

7. *San Benito-Gazos-Linne association*

Rolling to very steep, well-drained and somewhat excessively drained, moderately fine-textured soils formed over sandstone and shale

This association consists of rolling to very steep soils on hilly to mountainous uplands. At a depth of more than 20 inches, these soils are underlain by soft sediments, sandstone, shale, conglomerate, and mudstone. This association is the largest one in the county. It takes in the foothills of the Diablo and Gabilan Ranges and the hills and low mountains in the central and southwestern parts of the county. The annual precipitation ranges from 10 to 20 inches, and elevation ranges from 400 to 3,800 feet. The mean annual temperature is 60° to 62° F., and the frost-free season is about 260 days. This association makes up 39 percent of the county.

San Benito soils make up about 65 percent of the association; Gazos soils, 20 percent; Linne soils, 10 percent; and minor soils the remaining 5 percent. The minor soils are in the Sorrento, Diablo, Pinnacles, and Gaviota series.

San Benito soils are strongly sloping to steep and lie on hills and low mountains that extend southward from the San Juan and Hollister Valleys to Bitterwater and Hernandez Valleys. These soils have a dark grayish-brown clay loam surface layer underlain by a layer of light yellowish-brown clay loam that, in turn, is underlain by calcareous sandy shale. The Gazos soils are rolling to very steep and occur in the mountains southeast of Hernandez and Bitterwater Valleys. These soils have a surface layer of grayish-brown clay loam that grades to brown shaly clay loam, which overlies sandstone. The Linne soils are rolling to steep and occupy hills along the west side of Topo Valley. They have a gray clay loam surface layer that is underlain by light brownish-gray clay loam, which overlies calcareous shale.

The soils of this association are moderately to severely eroded and are used for small grain, annual-grass pasture and range, wildlife, watersheds, and recreation. Overgrazing has depleted the vegetation, and erosion is common. Eroded materials have been deposited in the small valleys and in reservoirs. Landslides are common throughout this association.

8. *Kettleman-Nacimiento-Linne association*

Strongly sloping to very steep, well-drained, medium- to moderately fine-textured soils formed over sandstone and shale

This association is made up of strongly sloping to very steep soils on hilly to mountainous uplands in the southeastern corner of the county (fig. 2). These soils are underlain by calcareous sandstone and shale at a depth of 20 to 60 inches or more. Annual grasses, forbs, and scattered oak trees grow in most places, but some areas are covered with brush. The annual rainfall is 8 to 16 inches, and elevation ranges from 700 to 3,000 feet. This association occupies about 12 percent of the county. The mean annual temperature is 60 to 62° F., and the frost-free season is 260 to 270 days.

Kettleman soils make up 50 percent of this association; Nacimiento soils, 30 percent; and Linne soils, 15 percent. The remaining 5 percent consists of many steep areas of Sedimentary rock land, large areas of Badland along Silver Creek, and soils formed in alluvium in small valleys and along drainageways.

The Kettleman, Nacimiento, and Linne soils are well drained, moderately deep to deep, and calcareous throughout. The Kettleman soils have a pale-brown loam surface layer over light yellowish-brown loam. These soils are underlain by calcareous soft sandstone and shale. The Nacimiento soils have a brown clay loam surface layer. The next layers are pale-brown and light yellowish-brown clay loam and are underlain by calcareous sandstone and shale. The Linne soils have a gray clay loam surface layer underlain by light brownish-gray clay loam over calcareous soft sandstone and shale.

The soils of this association are used for dryland grain, pasture and range, and for watersheds. The growth of grasses is limited by the low rainfall. Stands are commonly thin and are interspersed with many bare spots. Overgrazing further depletes the cover and results in sheet, rill, and gully erosion. The hazard of erosion is severe in most areas, particularly on the steep slopes.

9. *Sheridan-Cieneba-Auberry association*

Strongly sloping to very steep, well-drained to excessively drained, moderately coarse-textured soils formed over granite

This association consists of strongly sloping to very steep soils on hilly to mountainous uplands along the western side of the county from Fremont Peak to Topo Valley. These soils are shallow to very deep over strongly weathered granitic bedrock. The plant cover consists of annual grasses, forbs, and scattered Digger pines, Coulter pines, and oaks. The soils that are shallow over bedrock are typically covered with open to thick stands of brush. The annual rainfall ranges from 14 to 30 inches, and elevation ranges from 1,000 to 3,800 feet. The mean annual temperature is 56 to 60° F., and the frost-free season is 240 to 250 days. The association occupies about 11 percent of the county.

The Sheridan soils make up about 70 percent of the association; Cieneba soils, 15 percent; and Auberry soils, 10 percent. The remaining 5 percent consists of Igneous rock land, small areas of limestone and marble, and of San Benito and Hanford soils.

The Sheridan soils have a surface layer of dark grayish-brown coarse sandy loam that is underlain by dark grayish-brown to brown coarse sandy loam. The Cieneba soils have a pale-brown gravelly sandy loam surface layer that overlies strongly weathered granite at a depth of 18 inches or less. The Auberry soils have a dark grayish-brown fine sandy loam surface layer over a strong-brown coarse sandy clay loam subsoil. Weathered granite is at a depth of 24 to more than 60 inches. This granite is strongly weathered and is slowly permeable to water. It limits the growth of roots.

Figure 2.—**The Kettleman-Nacimiento-Linne association in the Cedar Flat area in the hills to the east of Vallecitos Valley.**

This association is used for pasture, range, watersheds, wildlife, and recreation. North of McPhails Peak, forage plants grow well and there are small areas of pine. Elsewhere in this association forage plants are not well adapted. The hazard of erosion is moderate to severe on the soils of this association. Overgrazing and wildfires have resulted in sheet and gully erosion, and large amounts of sediments are deposited on the lowlands. Wildlife consists mainly of deer, rabbits, and quail, and there are some dove and wild pigeon.

10. Vallecitos-Gaviota-Cibo association

Strongly sloping to very steep, well-drained and somewhat excessively drained, medium- and fine-textured soils formed over sandstone, shale, or basic igneous rocks

This association is made up of strongly sloping to very steep soils on hilly to mountainous uplands. It lies in the northeastern part of the county and extends from the Santa Clara County line south to Panoche Valley. Many rocky mountain peaks occur in the northern part of this association around Quien Sabe Valley. The soils of this association are underlain by basic igneous rocks, metamorphosed sandstone and shale, and sandstone at a depth of 8 to 40 inches. Growing in most areas are annual grasses and forbs and scattered stands of oaks and Digger pines. Oaks grow in thick stands on a few north-facing slopes, and scattered oaks and brush grow on eroded rocky slopes and in areas of rock land. Annual rainfall is 14 to 20 inches, and elevation ranges from 1,000 to 4,000 feet. The mean annual temperature is 60 to 62° F., and the frost-free season is 240 to 280 days. This association occupies about 17 percent of the county.

Vallecitos soils make up about 50 percent of the association; Gaviota soils, 30 percent; and Cibo soils, 15 percent. Climara and Montara soils are minor soils and make up the remaining 5 percent.

In this association the soils are well drained and somewhat excessively drained. The Vallecitos soils have a brown loam surface layer over a reddish-brown gravelly clay subsoil. They are underlain by metamorphosed sandstone and shale at a depth of 12 to 36 inches. The Gaviota soils have a pale-brown granular loam surface layer underlain by sandstone at a depth of 8 to 20 inches. The Cibo soils have a surface layer of dark-brown stony or rocky clay underlain by andesite, rhyolite, and basalt at a depth of 18 to 40 inches.

The soils of this association are used for range, watersheds, wildlife, and recreation. Where the range is properly grazed, forage plants grow well. Small rills and gullies have formed in overgrazed areas where the stand

of grass is thin. The soils in most of the association are underlain by hard rock, and the damage from severe erosion is difficult to overcome. Species of wildlife include deer, rabbits, quail, and some dove and wild pigeon.

11. Igneous rock land-Henneke association

Igneous rock land and shallow, medium-textured soils formed over igneous rock

This association is made up of moderately steep to very steep soils on hilly to mountainous uplands. It occupies three areas in the southern part of the county. In these areas large intrusions of ultrabasic rock are at a depth of 9 to 20 inches. Also, basic and ultrabasic rock crop out in some areas. Most of this association is bare or is covered with brush and thin scattered stands of Digger and Coulter pines. Annual rainfall ranges from 14 to 20 inches, the mean annual temperature is about 60° F., and the frost-free season is about 250 days. Elevation ranges from 2,500 to more than 5,000 feet. San Benito Mountain, elevation 5,248 feet, is the highest point in the county. This association occupies 3 percent of the county.

Igneous rock land makes up about 55 percent of this association, and Henneke soils make up 40 percent. The remaining 5 percent consists chiefly of Montara soils.

Igneous rock land consists mostly of serpentine and some basalt. The Henneke soils are well drained to somewhat excessively drained. They have a brown fine gravelly loam surface layer and a reddish-brown very gravelly clay loam subsoil that overlies serpentine bedrock.

The soils of this association are used for watersheds and recreation. They have very low fertility, are subject to severe erosion, and require protection from grazing and wildfires. Large amounts of sediments eroded from these soils are deposited downstream.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soils are in San Benito County, where they are located, and how they can be used.

They went into the county knowing they likely would find many soils they had already seen, and perhaps some they had not. As they traveled over the county, they observed steepness, length, and shape of slopes; size and speed of streams; kinds of native plants or crops; kinds of rock; and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons in a soil; it extends from the surface down into the parent material that has not been changed much by leaching or by roots of plants.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. To use this survey, it is necessary to know the kinds of groupings most used in a local soil classification.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Cibo and San Benito, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that go with their behavior in the natural, untouched landscape. Soils of one series can differ somewhat in texture of the surface soil and in slope, stoniness, or some other characteristic that affects use of the soils by man.

Many soil series contain soils that differ in texture of their surface layer. According to such differences in texture, separations called soil types are made. Within a series, all the soils having a surface layer of the same texture belong to one soil type. Docas silt loam and Docas clay loam are two soil types in the Docas series. The difference in texture of their surface layers is apparent from their names.

Some types vary so much in slope, degree of erosion, number and size of stones, or some other feature affecting their use, that practical suggestions about their management could not be made if they were shown on the soil map as one unit. Such soil types are divided into phases. The name of a soil phase indicates a feature that affects management. For example, Diablo clay, 9 to 15 percent slopes, is one of several phases of Diablo clay, a soil type that ranges from strongly sloping to very steep.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, trees, and other details that greatly help in drawing boundaries accurately. The soil map in the back of this survey was prepared from the aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning management of farms and fields, a mapping unit is nearly equivalent to a soil type or a phase of a soil type. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some other kind that have been seen within an area that is dominantly of a recognized soil type or soil phase.

In preparing some detailed maps the soil scientists have a problem of delineating areas where different kinds of soils are so intermingled and so small in size that it is not practical to show them separately on the map. Therefore, they show this mixture of soils as one mapping unit and call it a soil complex. Ordinarily, a soil complex is named for the major kinds of soil in it, for example, Linne-Shedd complex, 15 to 30 percent slopes, eroded. Most surveys include areas where the soil material is so rocky, shallow, or so frequently worked by wind and water that it cannot be classified by soil series. These areas are shown on the map like other mapping units, but are given descriptive names, such as Igneous rock land, Landslides, or Terrace escarpments, and are called land types.

While a soil survey is in progress, samples of soils are taken, as needed, for laboratory measurements and for engineering tests. Laboratory data from the same kinds of soils in other places are assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soils. Yields under defined management are estimated for the soils.

But only part of a soil survey is done when the soils have been named, described, and delineated on the map, and the laboratory data and yield data have been assembled. The mass of detailed information then needs to be organized in a way that it is readily useful to different groups of readers, among them farmers, ranchers, managers of woodland, engineers, and homeowners. Grouping soils that are similar in suitability for each specified use is the method of organization commonly used in the soil surveys. On the basis of the yield and practice tables and other data, the soil scientists set up trial groups, and then test them by further study and by consultation with farmers, agronomists, engineers, and others. Then the scientists adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under present methods of use and management.

Descriptions of the Soils

In this section the soil series and the mapping units in each series are described. The description of a soil series mentions features that apply to all soils of that series. Differences among the soils of one series are pointed out in the descriptions of the individual soils or are indicated in the soil name. Unless otherwise stated, the profile described for the principal mapping unit, or the first after the series description, is considered representative for all the soils in the series.

Following the name of each mapping unit in the descriptions of the soils is a symbol in parentheses. This symbol identifies the mapping unit on the detailed soil map, which is at the back of the survey. Listed at the end of each description is the capability unit and the pasture and range site assigned to the mapping unit.

For more generalized information about soils in different parts of the county, the reader can refer to the section "General Soil Map." The approximate acreage and proportionate extent of the soils are given in table 1, and a list of the soils mapped, along with the capability unit and pasture and range site of each, is given in the "Guide to Mapping Units" at the back of the survey. Definitions of many terms used in describing the soils are in the Glossary, and some of them are explained in detail in the "Soil Survey Manual" (*8*).[1]

[1] Italic numbers in parentheses refer to Literature Cited, p. 109.

TABLE 1.—*Approximate acreage and proportionate extent of the soils*

Soil	Area	Extent	Soil	Area	Extent
	Acres	*Percent*		*Acres*	*Percent*
Antioch clay loam, 9 to 15 percent slopes, eroded	195	(1)	Diablo clay, 9 to 15 percent slopes	3, 360	.4
Antioch loam, 0 to 2 percent slopes	1, 815	0.2	Diablo clay, 15 to 30 percent slopes, eroded	13, 915	1.6
Antioch loam, 2 to 5 percent slopes	4, 095	.5	Diablo clay, 30 to 50 percent slopes, eroded	19, 805	2.2
Antioch loam, 5 to 9 percent slopes, eroded	430	(1)	Diablo clay, 50 to 75 percent slopes, severely eroded	1, 975	.2
Arguello loam, 2 to 9 percent slopes	220	(1)	Diablo-Linne complex, 9 to 15 percent slopes	1, 055	.1
Arguello shaly loam, 9 to 15 percent slopes	440	(1)	Diablo-Linne complex, 15 to 30 percent slopes, eroded	1, 740	.2
Arnold loamy sand, 9 to 15 percent slopes	260	(1)	Diablo-Linne complex, 30 to 50 percent slopes, eroded	700	.1
Arnold loamy sand, 15 to 30 percent slopes, eroded	1, 650	.2	Docas clay loam, 0 to 2 percent slopes	1, 405	.2
Arnold loamy sand, 30 to 50 percent slopes, severely eroded	575	.1	Docas clay loam, 2 to 9 percent slopes	1, 430	.2
Auberry fine sandy loam, 15 to 30 percent slopes	1, 405	.2	Docas silt loam, 0 to 2 percent slopes	1, 165	.1
Auberry fine sandy loam, 30 to 75 percent slopes, eroded	5, 360	.6	Docas silt loam, 2 to 9 percent slopes	1, 920	.2
Badland	33, 820	3.8	Edenvale clay, 0 to 2 percent slopes	3, 525	.4
Botella loam, 0 to 2 percent slopes	480	.1	Gaviota loam, 15 to 30 percent slopes	995	.1
Botella loam, 2 to 9 percent slopes	330	(1)	Gaviota loam, 15 to 30 percent slopes, eroded	820	.1
Cibo rocky clay, shallow, 15 to 75 percent slopes, eroded	18, 150	2.0	Gaviota loam, 30 to 50 percent slopes, eroded	8, 665	1.0
Cibo stony clay, 15 to 50 percent slopes, eroded	6, 775	2.8	Gaviota rocky loam, 15 to 50 percent slopes, eroded	30, 410	3.4
Cieneba gravelly sandy loam, 15 to 75 percent slopes, severely eroded	3, 910	.4	Gazos clay loam, 15 to 30 percent slopes, eroded	4, 035	.5
Cieneba gravelly sandy loam, 30 to 75 percent slopes, eroded	9, 005	1.0	Gazos clay loam, 30 to 50 percent slopes, eroded	14, 350	1.6
Clear Lake clay	5, 090	.6	Gazos clay loam, 50 to 75 percent slopes, severely eroded	4, 610	.5
Clear Lake clay, saline	4, 885	.5	Gazos silty clay loam, 9 to 15 percent slopes	290	(1)
Clear Lake silty clay loam	550	.1	Gullied land	350	(1)
Climara clay, 9 to 15 percent slopes	545	.1	Hanford coarse sandy loam, 0 to 2 percent slopes	1, 340	.1
Climara clay, 15 to 50 percent slopes, eroded	5, 605	.6	Hanford coarse sandy loam, 2 to 9 percent slopes	3, 005	.3
Cometa loam, 5 to 15 percent slopes, eroded	435	(1)	Hanford loam, 0 to 2 percent slopes	355	(1)
Cometa sandy loam, 5 to 15 percent slopes, eroded	225	(1)	Hanford loam, 2 to 9 percent slopes	270	(1)
Conejo clay loam, 2 to 9 percent slopes	2, 445	.3	Henneke fine gravelly loam, 15 to 50 percent slopes, eroded	5, 620	.6
Corralitos loamy sand, 2 to 9 percent slopes	375	(1)	Henneke soils, 15 to 75 percent slopes, severely eroded	14, 360	1.6
Cotati loam, 2 to 9 percent slopes	1, 095	.1	Igneous rock land	30, 650	3.4
Cotati loam, 9 to 15 percent slopes, eroded	695	.1	Kettleman loam, 5 to 15 percent slopes	4, 155	.5
Cotati loam, 15 to 30 percent slopes, eroded	565	.1	Kettleman loam, 15 to 50 percent slopes, eroded	11, 000	1.2
Cropley clay, 0 to 2 percent slopes	640	.1	Kettleman soils, 15 to 50 percent slopes, eroded	28, 110	3.1
Cropley clay, 2 to 9 percent slopes	2, 210	.2	Laniger gravelly sandy loam, 30 to 75 percent slopes, severely eroded	6, 845	.8
Cropley silty clay loam, 2 to 9 percent slopes	725	.1			

See footnote at end of table.

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TABLE 1.—*Approximate acreage and proportionate extent of the soils*—Continued

Soil	Area	Extent
	Acres	*Percent*
Landslides	7,730	.9
Linne clay loam, 9 to 15 percent slopes	995	.1
Linne clay loam, 15 to 30 percent slopes, eroded	5,800	.6
Linne clay loam, 30 to 50 percent slopes, eroded	9,350	1.0
Linne clay loam, 30 to 50 percent slopes, severely eroded	1,405	.1
Linne-Shedd complex, 15 to 30 percent slopes, eroded	355	(1)
Linne-Shedd complex, 30 to 50 percent slopes, eroded	5,240	.6
Lodo shaly loam, 50 to 75 percent slopes, eroded	1,835	.2
Los Banos clay loam, 2 to 9 percent slopes	2,535	.3
Los Banos clay loam, 9 to 15 percent slopes, eroded	660	.1
Los Banos clay loam, 15 to 50 percent slopes, severely eroded	3,480	.4
Los Gatos clay loam, 15 to 30 percent slopes	2,940	.3
Los Gatos clay loam, 30 to 50 percent slopes, eroded	3,420	.4
Los Gatos rocky clay loam, 15 to 50 percent slopes, eroded	715	.1
Metz gravelly sandy loam, 0 to 2 percent slopes	670	.1
Metz gravelly sandy loam, 2 to 9 percent slopes	340	(1)
Metz sandy loam, 0 to 2 percent slopes	1,605	.2
Metz sandy loam, wet variant, 0 to 2 percent slopes	490	.1
Mine pits and dumps	940	.1
Mocho clay loam, 2 to 9 percent slopes	305	(1)
Mocho gravelly loam, 2 to 5 percent slopes	340	(1)
Mocho loam, 0 to 2 percent slopes	1,440	.2
Mocho loam, 2 to 9 percent slopes	1,090	.1
Mocho sandy loam, 0 to 2 percent slopes	220	(1)
Mocho sandy loam, 2 to 9 percent slopes	495	.1
Montara rocky silty clay loam, 15 to 50 percent slopes, eroded	2,490	.3
Nacimiento clay loam, 9 to 15 percent slopes	205	(1)
Nacimiento clay loam, 15 to 30 percent slopes	2,295	.3
Nacimiento clay loam, 30 to 50 percent slopes, eroded	8,680	1.0
Nacimiento clay loam, 50 to 75 percent slopes, eroded	3,155	.3
Nacimiento loam, 30 to 75 percent slopes, severely eroded	12,140	1.3
Pacheco clay loam over clay	975	.1
Pacheco loam	1,050	.1
Pacheco silt loam	1,820	.2
Pacheco silty clay	4,715	.5
Panhill loam, 2 to 9 percent slopes	3,615	.4
Panoche loam, 0 to 2 percent slopes	7,030	.8
Panoche loam, 2 to 9 percent slopes	1,855	.2
Panoche sandy loam, 0 to 2 percent slopes	2,415	.3
Panoche sandy loam, 2 to 9 percent slopes	2,260	.2
Pinnacles coarse sandy loam, 15 to 30 percent slopes, eroded	1,940	.2
Pinnacles coarse sandy loam, 30 to 75 percent slopes, severely eroded	7,415	.8
Pinto sandy loam, 15 to 30 percent slopes, eroded	400	(1)
Pleasanton gravelly loam, 5 to 9 percent slopes, eroded	2,395	.3
Pleasanton loam, 2 to 5 percent slopes	3,885	.4
Reiff sandy loam, 0 to 2 percent slopes	3,495	.4
Reiff sandy loam, 2 to 9 percent slopes	2,095	.2
Rincon loam, 0 to 2 percent slopes	505	.1
Rincon loam, 2 to 9 percent slopes	2,355	.3
Rincon loam, 9 to 15 percent slopes, eroded	655	.1
Rincon silty clay loam, 0 to 2 percent slopes	3,435	.4
Rincon silty clay loam, 2 to 9 percent slopes	4,855	.5
Rincon silty clay loam, 9 to 15 percent slopes, eroded	2,475	.3
Riverwash	5,665	.6
Salinas clay loam, 0 to 2 percent slopes	1,660	.2
Salinas clay loam, 2 to 9 percent slopes	505	.1
San Benito clay loam, 9 to 15 percent slopes	4,180	.5
San Benito clay loam, 15 to 30 percent slopes, eroded	27,240	3.0
San Benito clay loam, 30 to 50 percent slopes, eroded	56,475	6.3
San Benito clay loam, 30 to 50 percent slopes, severely eroded	9,640	1.0
Sandy alluvial land	2,910	.3
Santa Lucia shaly loam, 30 to 50 percent slopes, eroded	3,045	.3
Santa Lucia shaly loam, 30 to 75 percent slopes, severely eroded	1,570	.2
Sedimentary rock land	88,125	9.9
Shedd loam, 9 to 15 percent slopes	1,100	.1
Shedd loam, 15 to 30 percent slopes, eroded	1,445	.2
Shedd loam, 30 to 50 percent slopes, eroded	4,395	.5
Shedd loam, 30 to 50 percent slopes, severely eroded	5,365	.6
Sheridan coarse sandy loam, 9 to 15 percent slopes	1,365	.1
Sheridan coarse sandy loam, 15 to 30 percent slopes	6,330	.7
Sheridan coarse sandy loam, 15 to 30 percent slopes, eroded	6,735	.8
Sheridan coarse sandy loam, 30 to 75 percent slopes, eroded	11,860	1.3
Sheridan coarse sandy loam, 30 to 75 percent slopes, severely eroded	38,450	4.3
Soper gravelly loam, 9 to 15 percent slopes	1,375	.1
Soper gravelly loam, 15 to 30 percent slopes, eroded	2,805	.3
Soper gravelly loam, 30 to 50 percent slopes, eroded	2,260	.2
Soper sandy loam, 9 to 15 percent slopes	215	(1)
Soper sandy loam, 15 to 30 percent slopes, eroded	2,745	.3
Soper sandy loam, 30 to 50 percent slopes, eroded	785	.1
Sorrento gravelly loam, 0 to 5 percent slopes	680	.1
Sorrento silt loam, 0 to 2 percent slopes	7,865	.9
Sorrento silt loam, 2 to 9 percent slopes	5,655	.6
Sorrento silty clay loam, 0 to 2 percent slopes	9,650	1.1
Sorrento silty clay loam, 2 to 9 percent slopes	2,475	.3
Sween rocky clay loam, 15 to 30 percent slopes, eroded	545	.1
Sween rocky clay loam, 30 to 50 percent slopes, eroded	365	(1)
Sween stony clay loam, 15 to 30 percent slopes, eroded	2,340	.3
Sween very stony clay loam, 15 to 50 percent slopes, eroded	3,910	.4
Terrace escarpments	4,235	.5
Vallecitos loam, 9 to 15 percent slopes	630	.1
Vallecitos loam, 15 to 30 percent slopes	6,980	.8
Vallecitos loam, 30 to 50 percent slopes	10,545	1.2
Vallecitos loam, 30 to 50 percent slopes, eroded	23,015	2.6
Vallecitos rocky loam, 9 to 30 percent slopes, eroded	575	.1
Vallecitos rocky loam, 30 to 50 percent slopes, eroded	29,535	3.3
Willows clay	6,370	.7
Willows clay, saline-alkali	520	.1
Willows sandy loam	185	(1)
Willows soils, eroded	1,330	.1
Yolo gravelly loam, 0 to 5 percent slopes	1,085	.1
Yolo loam, 0 to 2 percent slopes	1,370	.1
Yolo loam, 2 to 9 percent slopes	3,105	.3
Total	893,440	100.00

[1] Less than 0.05 percent.

Antioch Series

The Antioch series consists of moderately well drained soils that formed in alluvium derived from a wide range of sedimentary rocks. These soils have a loamy surface layer and a clayey subsoil. They occur on terraces and are nearly level to strongly sloping. The vegetation consists of annual grasses, forbs, and some scattered oaks. Elevations are less than 1,000 feet above sea level. Annual rainfall ranges from 12 to 14 inches, average annual temperature is 62° F., and the frost-free period is about 260 days. The main associated soils are the Pleasanton, Rincon, and Sorrento.

The surface layer is loam or clay loam 12 to 20 inches thick. It ranges from grayish brown to gray. The subsoil is brown clay 15 to 34 inches thick. It ranges from medium acid to moderately alkaline in reaction. The substratum is light yellowish brown loam, very gravelly loam, or silty clay loam. It is stratified with sand and gravel in some places. The substratum ranges from neutral to moderately alkaline.

Antioch soils are used for dryland pasture and grain and for irrigated apricots, grapes, and prunes.

Antioch loam, 0 to 2 percent slopes (AnA).—This nearly level soil occurs on terraces.

Representative profile: On Basarich Ranch, McMahan Road, 10 yards to rear of barn, 400 yards east of house.

Ap—0 to 10 inches, grayish-brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) when moist; moderate, fine, granular structure; hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; abundant very fine and fine roots; common, very fine and fine, interstitial pores; medium acid; clear, smooth boundary.

A2—10 to 13 inches, gray (10YR 6/1) loam, dark gray (10YR 4/1) when moist; weak, medium, subangular blocky structure; hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; abundant very fine and fine roots; many, very fine, tubular pores, common, very fine, interstitial pores; slightly acid; abrupt, smooth boundary.

B21t—13 to 25 inches, brown (10YR 5/3) clay, dark brown (10YR 3/3) when moist; strong, coarse, prismatic structure that breaks readily to moderate, fine, angular blocky structure; very hard when dry, very firm when moist, very sticky and very plastic when wet; few very fine and fine roots; common, very fine and fine, tubular pores; thin continuous clay films on surfaces of peds and pores; many fine and medium slickensides; material from the A horizon in seams and on ped surfaces; slightly acid; gradual, smooth boundary.

B22t—25 to 37 inches, brown (10YR 5/3) clay, brown (10YR 4/3) when moist; strong, medium, angular blocky structure; very hard when dry, very firm when moist, very sticky and very plastic when wet; few very fine and fine roots; few, very fine and fine, tubular pores; thin continuous clay films on surfaces of peds and pores; many fine and medium slickensides; mildly alkaline; gradual, smooth boundary.

B3—37 to 47 inches, light yellowish-brown (10YR 6/4) loam, dark yellowish brown (10YR 4/4) when moist; moderate, medium, angular blocky structure; hard when dry, friable when moist, slightly sticky and slightly plastic when wet; few very fine roots; few, very fine and fine, tubular pores; few, thin, patchy clay films on ped surfaces; moderately alkaline; slightly effervescent; clear, smooth boundary.

IIC1—47 to 54 inches, light yellowish-brown (10YR 6/4) very gravelly loam, dark yellowish brown (10YR 4/4) when moist; weak, fine, subangular blocky structure; hard when dry, friable when moist, slightly sticky and slightly plastic when wet; few very fine roots; few, very fine and fine, tubular pores; moderately alkaline, slightly effervescent; clear, smooth boundary.

IIIC2—54 to 76 inches, light yellowish-brown (10YR 6/4) silty clay loam, dark yellowish brown (10YR 4/4) when moist; strong, fine, angular blocky structure; very hard when dry, very firm when moist, sticky and plastic when wet; brittle and compact in places; moderately alkaline; gradual, smooth boundary.

Included in mapping were small areas of Pleasanton and Rincon soils and a few small areas that have a sandy loam surface layer.

This soil has a very slowly permeable subsoil that limits penetration of roots and water. The root zone is moderately deep. Runoff is very slow, and small areas are ponded occasionally during the winter. The hazard of erosion is slight. The soil has moderate to low fertility. It holds about 3.75 to 5 inches of water available for plants.

This soil is used for dryland grain and pasture and irrigated fruits. Capability unit IIIs–3 (14); pasture and range site 4.

Antioch loam, 2 to 5 percent slopes (AnB).—This soil is on long terraces and fans. Runoff is slow, and the hazard of erosion is slight.

This soil is used for dryfarmed grain and pasture and irrigated fruits. Capability units IIIe–3 (14), IVe–3 (15); pasture and range site 4.

Antioch loam, 5 to 9 percent slopes, eroded (AnC2).—This soil is steeper than Antioch loam, 0 to 2 percent slopes and has a thinner surface layer. It occurs in small areas along drainageways or as breaks in areas of less sloping soil. Slopes are dominantly 5 to 7 percent. This soil is slightly to moderately eroded, and in some areas the plow layer extends into the subsoil. Runoff is medium, and the hazard of erosion is moderate.

This soil is used for dryland grain and pasture and for irrigated fruits. Capability units IIIe–3 (14), IVe–3 (15); pasture and range site 4.

Antioch clay loam, 9 to 15 percent slopes, eroded (AoD2).—This soil has a thinner surface layer than Antioch loam, 0 to 2 percent slopes. It occurs in small rolling areas or on sharp breaks along drainageways. Slopes are dominantly 9 to 12 percent. This soil is moderately eroded, and the plow layer commonly extends into the subsoil. Fertility is low, runoff is medium to rapid, and the hazard of erosion is moderate to severe.

Included in mapping were small areas that have a loam surface layer. This soil is used for dryland grain and pasture and in small areas for irrigated grapes. Capability unit IVe–3 (15); pasture and range site 4.

Arguello Series

The Arguello series consists of well-drained loamy soils that are underlain by stratified, shaly alluvium at a depth of more than 48 inches. The soils are gently sloping to strongly sloping. They occur on terraces and toe slopes. The vegetation is annual grasses and forbs, with scattered oaks and Digger pine. Elevations are 800 to 1,600 feet above sea level. Annual rainfall is 12 to 16 inches, average annual temperature is 60° F., and the frost-free period is about 260 days. The main associated soils are the Pinnacles, Santa Lucia, and Sheridan.

The surface layer is loam or shaly loam 18 to 24 inches thick. Its color ranges from gray through dark gray to grayish brown. The subsoil is gray clay loam that is 16 to 24 inches thick. The upper part of the substratum consists of light brownish-gray clay loam 10 to 20 inches thick. It is underlain by stratified very shaly alluvium that generally extends to a depth of more than 5 feet.

Arguello soils are used for dryland grain and pasture.

Arguello loam, 2 to 9 percent slopes (ArC).—This soil occurs along drainageways on the valley floor.

Representative profile: On Jef Schmidt Ranch, 1 mile south of junction of La Gloria Road and State Route 25; in a dryfarmed grain field on a slope of 4 percent, 500 yards downstream from pond.

Ap—0 to 6 inches, gray (10YR 5/1) loam, very dark gray (10YR 3/1) when moist; weak, medium, subangular blocky structure that breaks readily to moderate, fine, granular structure; slightly hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; abundant very fine and fine roots; few, fine, tubular pores and common, very fine, interstitial pores; few angular shale fragments; slightly acid (pH 6.5); clear, smooth boundary.

A1—6 to 21 inches, gray (10YR 5/1) loam, very dark gray (10YR 3/1) when moist; weak, fine, subangular blocky structure; slightly hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; abundant very fine and fine roots; common, fine and medium, tubular and interstitial pores; few angular shale fragments; two clay bands, ¼ to ¾ inch thick, in lower part; medium acid; smooth, gradual boundary.

B2t—21 to 36 inches, gray (10YR 5/1) clay loam, very dark gray (10YR 3/1) when moist; weak, fine, subangular blocky structure; hard when dry, firm when moist, slightly sticky and slightly plastic when wet; plentiful very fine and fine roots; common, very fine and fine, tubular pores; few, angular, shale fragments; few, thin, patchy clay films on ped surfaces; strongly acid; clear, smooth boundary.

C1—36 to 50 inches, light brownish-gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) when moist; weak, medium, subangular blocky structure; hard when dry, firm when moist, slightly sticky and plastic when wet; few very fine and fine roots; few, very fine and fine, tubular pores; few, small, angular shale fragments; strongly acid (pH 5.5); gradual, smooth boundary.

IIC2—50 to 60 inches, grayish-brown (10YR 5/2) very shaly clay loam, very dark grayish brown (10YR 3/2) when moist; weak, fine, subangular blocky structure; hard when dry, firm when moist, slightly sticky and plastic when wet; few very fine and fine roots; few, very fine and fine, tubular pores; strongly acid.

Included with this soil are small areas of Rincon and Yolo soils and of Riverwash. Also included are some small areas that have a loam subsoil that is moderately permeable.

This soil has low fertility. Available water holding capacity is about 10 inches. Permeability is moderately slow, runoff is slow to medium, and the hazard of erosion is slight to moderate. The root zone extends to a depth of more than 60 inches.

This soil is used for dryland grain and incidental pasture. Capability unit IIIe–1 (15).

Arguello shaly loam, 9 to 15 percent slopes (AsD).—This shaly soil is more strongly sloping than Arguello loam, 2 to 9 percent slopes. It occurs in rolling areas or on toe slopes. Slopes are dominantly 9 to 12 percent. Some included areas are moderately eroded and others have slopes of more than 15 percent.

Runoff is medium, and the hazard of erosion is moderate. Available water holding capacity is about 6 to 8 inches.

This soil is used for dryland grain and pasture. Capability unit IVe–1 (15); pasture and range site 2.

Arnold Series

The Arnold series consists of somewhat excessively drained sandy soils that are underlain by soft or very soft, medium-grained, acid sandstone. These soils are strongly sloping to steep. They occur on hilly uplands. Elevations range from 200 to 800 feet above sea level. Annual rainfall is 16 to 20 inches, average annual temperature is about 60° F., and the frost-free period is about 260 days. The vegetation is grass, grass and oak, grass and fern, or planted eucalyptus. The main associated soils are the Corralitos, Pinto, Soper, and Diablo.

The surface layer is pale-brown loamy sand 8 to 12 inches thick. The next layer is light-brown to light yellowish-brown loamy sand 22 to 48 inches thick. Below this is very soft sandstone. Depth to sandstone ranges from 30 to more than 60 inches. The profile is generally loamy sand throughout, but loamy fine sand occurs in some places. Reaction ranges from medium acid to strongly acid.

The Arnold soils are used for dryland and irrigated apricots, dryland grain, and pasture.

Arnold loamy sand, 30 to 50 percent slopes, severely eroded (AtF3).—This soil occurs on hills or uplands.

Representative profile: Nagelmaker Ranch, 100 yards north and 30 yards west of the end of Rea Road, on hillside.

Ap—0 to 12 inches, pale-brown (10YR 6/3) loamy sand, dark brown (10YR 3/3) when moist; weak, medium, subangular blocky structure that breaks readily into moderate, fine, granular structure; slightly hard when dry, very friable when moist, nonsticky and nonplastic when wet; abundant very fine and fine roots, few coarse roots; common, very fine and fine, interstitial pores; few, small, iron-cemented concretions about ⅛ to 1 inch in diameter; strongly acid; clear, smooth boundary.

C1—12 to 22 inches, light-brown (7.5YR 6/4) loamy sand, brown (7.5YR 4/4) when moist; weak, medium, subangular blocky structure; slightly hard when dry, very friable when moist, nonsticky and nonplastic when wet; plentiful very fine and fine roots, few coarse roots; many, very fine and fine, interstitial pores; few, small, iron-cemented concretions about ½ inch to 2 inches in diameter; strongly acid; gradual, smooth boundary.

C2—22 to 46 inches, light yellowish-brown (10YR 6/4) loamy sand, dark yellowish brown (10YR 4/4) when moist; weak, medium, subangular blocky structure; slightly hard when dry, very friable when moist, nonsticky and nonplastic when wet; plentiful very fine and fine roots, few coarse roots; many, very fine and fine, interstitial pores; common small fragments of soft sandstone; strongly acid; gradual, smooth boundary.

C3—46 inches, soft, yellowish-brown, acid sandstone.

Included with this soil are small areas of Corralitos, Pinto, and Soper soils. Also included are small areas of soils that have a sandy loam surface layer and soils that are alkaline throughout.

This soil has low fertility. Available water holding capacity is about 2 to 3 inches. Permeability is rapid, runoff is medium to rapid, and the hazard of erosion is severe to very severe. The root zone is moderately deep to deep.

This soil is used mainly for range. Some areas are used for dryland apricots, but many areas have been abandoned and are reverting to range. Capability unit VIIe–4 (15); pasture and range site 3.

Arnold loamy sand, 9 to 15 percent slopes (AtD).—This soil is similar to Arnold loamy sand, 30 to 50 percent slopes, severely eroded, but it is not so steep, is very deep over sandstone, and is only slightly eroded in most places. It occurs mostly on toe slopes along drainageways in areas of moderately steep soils.

The soil has available water holding capacity of about 4 to 5 inches. Runoff is slow, and the hazard of erosion is slight. The root zone is very deep.

This soil is used for dryland pasture. Areas that were cultivated have reverted to pasture. Capability unit IIIs–4 (14); pasture and range site 3.

Arnold loamy sand, 15 to 30 percent slopes, eroded (AtE2).—This soil is similar to Arnold loamy sand, 30 to 50 percent slopes, severely eroded, but is less steep, is only moderately eroded, and is deep over sandstone. It lies on moderately steep hills or on benchlike lower slopes in areas of steep hills. Slopes are dominantly between 20 and 25 percent. A few areas are severely eroded, and a few are gullied. Eroded material has accumulated in some places and on lower slopes. Runoff is medium, and total available water holding capacity is about 3 to 4 inches.

Most of this soil is used for pasture, but some areas are used for dryland apricots. Capability unit VIe–4 (15); pasture and range site 3.

Auberry Series

The Auberry series consists of well-drained loamy soils that are underlain by weathered granite at a depth of 2 to more than 5 feet. These soils are on hilly and mountainous uplands and are moderately steep to very steep. Elevations range from 1,000 to 3,000 feet above sea level. Annual rainfall is 20 to 30 inches, average annual temperature is 60° F., and the frost-free period is about 240 days. The vegetation is annual grasses, forbs, and thin to moderately thick stands of oaks and Digger pine. Some brush grows on steep, eroded slopes and in less sloping areas that were once cultivated. The main associated soils are the Sheridan, Cieneba, and San Benito.

The surface layer is dark grayish brown in color and fine sandy loam to coarse sandy clay loam in texture. It is 10 to 20 inches thick. The subsoil is strong-brown coarse sandy clay loam 14 to 24 inches thick. In some places the subsoil is underlain by strongly weathered granite. In other places it is underlain by yellowish-brown coarse sandy loam that, in turn, is underlain by strongly weathered granite. The substratum is 20 inches or more thick. Auberry soils vary in content of clay and in reaction of their subsoil.

Auberry soils are used for pasture, range, and watersheds and for wildlife and recreational areas.

Auberry fine sandy loam, 15 to 30 percent slopes (AuE).—This soil occurs as rounded ridgetops or as small moderately steep areas in the uplands.

Representative profile: On 101 Ranch, on main ranch road, three-quarters mile southwest of ranch headquarters.

A1—0 to 7 inches, dark grayish-brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) when moist; weak, fine, subangular blocky structure that breaks readily to moderate, fine, granular structure; slightly hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; abundant very fine and fine roots; common, very fine, tubular pores and common, fine and medium, interstitial pores; medium acid; clear, smooth boundary.

A3—7 to 17 inches, dark grayish-brown (10YR 4/2) coarse sandy clay loam, very dark grayish brown (10YR 3/2) when moist; weak, medium, subangular blocky structure; slightly hard when dry, friable when moist, slightly sticky and slightly plastic when wet; abundant very fine and fine roots; few, fine and medium, tubular pores and many, very fine, fine, and medium, interstitial pores; medium acid; gradual, smooth boundary.

B2t—17 to 37 inches, strong-brown (7.5YR 5/6) coarse sandy clay loam, strong brown (7.5YR 4/6) when moist; moderate, medium, angular blocky structure; hard when dry, firm when moist, sticky and plastic when wet; plentiful very fine and fine roots; common, very fine and fine, tubular pores and few, very fine and medium, interstitial pores; thin continuous clay films on ped and pore surfaces; medium acid; gradual, irregular boundary.

C1—37 to 64 inches, yellowish-brown (10YR 5/6) coarse sandy loam, dark yellowish brown (10YR 4/6) when moist; weak, coarse, subangular blocky structure; hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; few very fine and fine roots; few, very fine and fine, tubular pores and few, fine and medium, interstitial pores; medium acid; gradual, wavy boundary.

C2—64 to 100 inches, yellowish-brown and gray, strongly weathered granite.

Strongly weathered granite is at a depth ranging from 2 to more than 5 feet, and it limits the growth of roots and, to some degree, the movement of water.

Included with this soil are small areas of Cieneba and Sheridan soils. In a few areas these included soils are near areas of calcareous sandstone and shale, and in these areas they may contain alkaline or calcareous material beneath the subsoil.

This soil has low to moderate fertility. Permeability is moderate, and runoff is medium to rapid. The hazard of erosion is moderate to severe, but the soil is generally slightly eroded. Available water holding capacity is about 6 to 8 inches.

This soil is used for dryland pasture. Capability unit VIe–1 (15); pasture and range site 3.

Auberry fine sandy loam, 30 to 75 percent slopes, eroded (AuG2).—This soil is similar to Auberry fine sandy loam, 15 to 30 percent slopes, but it is steep to very steep, is moderately eroded, and has a thinner profile. Slopes are dominantly 45 to 60 percent. The vegetation consists of grasses and forbs and a moderately thick stand of oaks and Digger pine. The more eroded areas are covered mostly with brush and some oaks and pines.

Included with this soil are some soils that have a less clayey subsoil and small areas of soils that are severely eroded.

Runoff is rapid to very rapid, and the hazard of erosion is severe to very severe. Available water holding capacity is about 4 to 7 inches.

This soil is used for range, recreation, wildlife, and watersheds. Capability unit VIIe–1 (15); pasture and range site 3.

Badland

Badland (BaG) consists of steep to very steep areas where soft geologic material has been exposed by accelerated erosion or where erosion and gullying have been very severe (fig. 3). Talus slopes at the base of the steeper slopes are also part of this land type. Except for thin low brush in a few areas, there is little or no vegetation on this land. As a result, runoff is rapid, and siltation is high.

Figure 3.—**An area of Badland. Soft geologic material has been exposed by erosion.**

Included in mapping were small areas of very thin soils and small areas of soils similar to the surrounding soils. These included areas provide limited grazing.

This land type is used for watersheds and for wildlife. Many areas are steep enough to bar the movement of livestock. Capability unit VIIIe–1 (15).

Botella Series

The Botella series consists of well-drained loamy soils that are underlain by stratified alluvium at a depth of more than 60 inches. These soils are nearly level to sloping and lie on flood plains and fans in the smaller valleys. The vegetation consists of annual grasses, forbs, and scattered oaks. Botella soils are less than 800 feet above sea level. Annual rainfall ranges from 14 to 20 inches, average annual temperature is 60° F., and the frost-free period is about 260 days. The main associated soils are the Clear Lake, Pleasanton, and Yolo.

The surface layer is gray to grayish-brown loam 12 to 16 inches thick. Color ranges from gray or dark grayish brown to grayish brown. The subsoil is dark grayish-brown to dark-gray clay loam that is about 28 inches thick. The texture of both the surface layer and subsoil ranges from loam to clay loam. As much as 30 inches of pale-brown and brown clay loam occurs in places between the subsoil and the underlying stratified alluvium.

Botella soils are used mostly for dryland grain and incidental pasture.

Botella loam, 0 to 2 percent slopes (BoA).—This soil occurs along drainageways in the smaller valleys.

Representative profile: On McCreary Ranch, in a field on bottom lands one-fourth mile east of ranchhouse.

Ap—0 to 10 inches, gray (10YR 5/1) loam, very dark gray (10YR 3/1) when moist; moderate, fine, granular structure; hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; abundant very fine and fine roots; common, fine and medium, interstitial pores; medium acid; clear, smooth boundary.

A3—10 to 16 inches, grayish-brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) when moist; weak, medium, subangular blocky structure; hard when dry, friable when moist, slightly sticky and slightly plastic when wet; few very fine and fine roots; many, very fine, fine, and medium, tubular pores; slightly acid; clear, smooth boundary.

B21t—16 to 28 inches, dark grayish-brown (10YR 4/2) clay loam, very dark brown (10YR 2/2) when moist; moderate, medium, angular blocky structure; hard when dry, firm when moist, sticky and plastic when wet; few very fine and fine roots; few, very fine and fine, tubular pores; thin patchy clay films on surface; of peds and in larger pores; few weathered fragments of fine-grained sandstone; neutral; gradual, smooth boundary.

B22t—28 to 44 inches, dark-gray (10YR 4/1) clay loam, black (10YR 2/1) when moist; weak, fine, angular blocky structure; hard when dry, firm when moist, sticky and plastic when wet; few, very fine and fine, tubular pores; few, thin, patchy clay films on the surfaces of peds and larger pores; few weathered fragments of fine-grained sandstone; neutral; gradual, smooth boundary.

C1—44 to 72 inches, pale-brown and brown (10YR 6/3, 5/3) clay loam, variegated light gray and dark gray (10YR 6/1, 4/1) when moist; weak, medium, subangular blocky structure; hard when dry, firm when moist, sticky and plastic when wet; few, very fine, tubular pores; neutral; gradual, smooth boundary.

IIC2—72 to 84 inches +, light yellowish-brown (10YR 6/4) gravelly clay loam; neutral.

Included with this soil are small areas of Yolo and Cotati soils. Also included are small areas of moderately well drained soils.

This soil is highly fertile. Available water holding capacity is 10 to 12 inches. Permeability is moderately slow, runoff is very slow, and the hazard of erosion is slight to none. The root zone is very deep.

This soil is used for dryland grain and incidental pasture. Capability units I–1 (14) and IIIc–1 (15).

Botella loam, 2 to 9 percent slopes (BoC).—This soil is similar to Botella loam, 0 to 2 percent slopes, but it is slightly steeper. It lies in narrow valleys or on fans in the larger valleys of the uplands. Runoff is slow to medium, and the hazard of erosion is slight to moderate.

This soil is used for dryland grain and incidental pasture. Capability units IIe–1 (14) and IIIe–1 (15).

Cibo Series

The Cibo series consists of well-drained clayey soils that are underlain by fine-grained basic igneous rock at a depth of 18 to 40 inches. These soils are moderately steep to very steep and lie on hilly to mountainous uplands. The vegetation consists chiefly of annual grasses and forbs and some scattered oaks and brush on the more eroded rocky slopes. Cibo soils are 1,500 to 4,000 feet above sea level. Annual rainfall ranges from 14 to 20

inches. The average annual temperature is about 62° F., and the average frost-free period is about 280 days. The main associated soils are the Vallecitos and Gaviota.

The surface layer is dark-brown stony or rocky clay 10 to 25 inches thick. The upper part of this layer ranges from clay to clay loam. The next layer is brown very stony clay 8 to 15 inches thick. This layer is dominantly brown but ranges to reddish brown. Underlying this layer is fine-grained, pinkish-gray and gray basic igneous bedrock. The depth to bedrock and the number of stones in the profile vary.

Cibo soils are used for pasture, range, watersheds, wildlife, and recreation.

Cibo stony clay, 15 to 50 percent slopes, eroded (CbF2)—This soil is on rounded hills or side slopes in areas of steep to very steep soils.

Representative profile: On Quien Sabe Ranch, on main road to feed mill, three-quarters mile northeast of ranch headquarters, on hillside above road, 400 yards west of lake.

A11—0 to 9 inches, dark-brown (7.5YR 4/2) stony clay, dark brown (7.5YR 3/2) when moist; strong, fine, granular structure in top ½ inch to 2 inches and moderate, fine, subangular blocky structure below; hard when dry, firm when moist, very sticky and very plastic when wet; abundant very fine and fine roots; few, very fine, tubular pores and common, fine, interstitial pores; slightly acid; gradual, smooth boundary.

A12—9 to 25 inches, dark-brown (7.5YR 4/2) stony clay, dark brown (7.5YR 3/2) when moist; moderate, coarse, subangular blocky structure; hard when dry, firm when moist, very sticky and very plastic when wet; few very fine and fine roots; few, very fine, tubular and interstitial pores; many fine slickensides; neutral clear, smooth boundary.

C—25 to 37 inches, brown (7.5YR 5/4) very stony clay, dark brown (7.5YR 4/4) when moist; moderate, fine, angular blocky structure; very hard when dry, very firm when moist, very sticky and very plastic when wet; few very fine roots; common, very fine, tubular pores; many fine slickensides; mildly alkaline; gradual, irregular boundary.

R—37 inches, pinkish-gray (7.5YR 7/2) and gray (N 6/0), fractured and weathered, hard, fine-grained basic igneous rock; mildly alkaline.

The soil is slightly to moderately eroded, but small areas are severely eroded. This soil is typically stony, and rocks crop out in some places.

Included with this soil are small areas of Vallecitos and Gaviota soils. This soil is low in fertility. Available water holding capacity is 4 to 6 inches. Permeability is slow, runoff is medium to rapid, and the hazard of erosion is moderate to severe. The root zone is moderately deep.

This soil is used for dryland pasture. Capability unit VIs–5 (15); pasture and range site 5.

Cibo rocky clay, shallow, 15 to 75 percent slopes, eroded (CcG2).—This soil is similar to Cibo stony clay, 15 to 50 percent slopes, eroded, but it is more shallow to bedrock and is rocky. It occupies somewhat angular hilly and mountainous areas. The depth to fractured rock ranges from 18 to 24 inches. Slopes are dominantly 45 to 60 percent. The soil is generally moderately eroded but is severely eroded on some steeper slopes.

Included with this soil in mapping are some small to moderate areas of very rocky soils, rock outcrops, very thin soils, and severely eroded soils.

Runoff is medium to very rapid, and the hazard of erosion is moderate to very severe. Available water holding capacity is 2.5 to 4 inches.

This soil is used for range, watersheds, wildlife, and recreation. Capability unit VIIs–1 (15); and pasture and range site 5.

Cieneba Series

The Cieneba series consists of somewhat excessively drained to excessively drained loamy soils that are underlain by strongly weathered granite at a depth of 18 inches or less. These soils are moderately steep to very steep and occupy mountainous uplands. The vegetation consists mainly of thin to thick stands of brush, scattered oaks and Digger pine, and a few areas of sparse grass. Elevations are 1,500 to 3,000 feet above sea level. Annual rainfall ranges from 14 to 20 inches, average annual temperature is about 60° F., and the frost-free period is about 240 days. The main associated soils are the Auberry and Sheridan.

The surface layer, 8 to 18 inches thick, is pale-brown gravelly sandy loam in most places but ranges from gravelly loam to coarse sandy loam. In some areas of dense brush, a thin layer of partly decomposed organic matter covers the surface. The underlying granite is strongly and deeply weathered. It somewhat limits the movement of water, and it limits the penetration of roots to fractures in rocks. Depth to weathered granite ranges from 8 to 18 inches.

Cieneba soils are used for range, watersheds, wildlife, and recreation.

Cieneba gravelly sandy loam, 15 to 75 percent slopes, severely eroded (CgG3).—This soil is on narrow pointed ridges.

Representative profile: On Fremont Peak Road, 9 miles from San Juan Bautista, on ridge to south of road, under brush cover.

01—½ inch to 0, grayish-brown, (10YR 5/2) intermittent, partly decomposed leaf and twig litter; loose and fluffy; abrupt, smooth boundary.

A1—0 to 10 inches, pale-brown (10YR 6/3) gravelly sandy loam, dark brown (10YR 4/3) when moist; moderate, fine, granular structure; slightly hard when dry, very friable when moist, nonsticky and nonplastic when wet; abundant fine and medium roots; many, very fine and fine, interstitial pores; medium acid; gradual, smooth boundary.

C—10 inches, reddish-yellow (7.5YR 6/6) and brown (10YR 5/3) strongly weathered, acid granitic material with relic rock structure; some loam in cracks and cleavage planes; larger roots penetrate easily and deeply; grades into hard granite at an undetermined depth.

Small to moderate amounts of relatively unweathered granite and fine-grained igneous rock crop out in most areas.

Included with this soil are small areas of Auberry and Sheridan soils. Also included are a few small areas that are reddish-yellow to yellowish-brown loam to clay.

This soil has low fertility. Available water holding capacity is about 1 to 2 inches. Permeability is rapid, runoff is medium to very rapid, and the hazard of erosion is moderate to very severe. Roots penetrate as deep as the strongly weathered granite.

This soil is used for wildlife, watersheds, and recreation. Capability unit VIIIs–1 (15).

Cieneba gravelly sandy loam, 30 to 75 percent slopes, eroded (CgG2).—This soil is similar to Cieneba gravelly sandy loam, 15 to 75 percent slopes, severely eroded, but it is only moderately eroded and is 10 to 18 inches deep to weathered granite. It occupies narrow, pointed, winding ridges or very steep side slopes in areas of Sheridan soils. Slopes are dominantly 30 to 65 percent. Included with this soil are some slightly deeper soils that have slopes of 15 to 30 percent. Also included are a few small areas of limestone or marble in the mountains to the west of Cienega Road.

Available water holding capacity is 2 to 3 inches. Runoff is rapid to very rapid, and the hazard of erosion is severe to very severe.

This soil is used mostly for watershed, wildlife and recreation, but some areas provide limited grazing. Capability unit VIIe–4 (15); pasture and range site 3.

Clear Lake Series

The Clear Lake series consists of poorly drained soils that are clayey in most places and formed in alluvium that washed from sedimentary rocks. These soils are nearly level and occupy low-lying flood plains and valley bottoms. The vegetation is annual grasses and forbs. Clear Lake soils are 130 to 1,500 feet above sea level. Annual rainfall ranges from 12 to 16 inches, average annual temperature is about 60° F., and the frost-free period is about 250 days. The main associated soils are the Cropley, Pacheco, Sorrento, and Willows.

The surface layer is very dark gray to dark-gray clay or silty clay loam 24 to 40 inches thick. The next layer is light brownish-gray clay 10 to 20 inches thick. Below this is gray clay that is underlain by stratified calcareous alluvium in some places. The alluvium extends to depths greater than 5 feet. Most areas of Clear Lake soils show some degree of stratification in the underlying material. Many areas have one or more buried horizons at depths greater than 50 inches.

Clear Lake soils are used for irrigated vegetables, sugar beets, tomatoes, apricots, prunes, walnuts, and alfalfa and for dryland grain and pasture.

Clear Lake clay (0 to 2 percent slopes) (Ch).—This soil lies on valley bottoms on slopes of 1 percent or less.

Representative profile: On Vierra Ranch, 3 miles east of the junction of San Felipe Road and State Route 156; by fence in alfalfa field.

Ap—0 to 12 inches, very dark gray (2.5Y 3/0) clay, black (2.5Y 2/0) when moist; strong, fine, granular structure; very hard when dry, very firm when moist, very sticky and very plastic when wet; abundant very fine and fine roots, few medium roots; common, very fine and fine, interstitial pores; mildly alkaline; clear, smooth boundary.

A1—12 to 30 inches, dark-gray (10YR 4/1) clay, black (10YR 2/1) when moist; strong, medium, angular blocky structure; very hard when dry, very firm when moist, very sticky and very plastic when wet; plentiful very fine and fine roots; common, very fine and fine, tubular pores; many fine and medium slickensides; common, coarse, black (2.5Y 2/0) organic stainings on ped surfaces; moderately alkaline, slightly effervescent; clear, smooth boundary.

C1—30 to 40 inches, light brownish-gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) when moist; moderate, coarse, subangular blocky structure; very hard when dry, firm when moist, very sticky and very plastic when wet; many, very fine and fine, tubular pores; common, medium, very dark gray (2.5Y 3/0) organic stains on surfaces of peds and larger pores; moderately alkaline, slightly effervescent; clear, smooth boundary.

C2g—40 to 70 inches, gray (5Y 6/1) clay, gray (5Y 5/1) when moist; many, fine, distinct, light yellowish-brown (2.5Y 6/4) mottles, light olive brown (2.5Y 5/4) when moist; moderate, coarse, subangular blocky structure; very hard when dry, firm when moist, sticky and plastic when wet; many, very fine and fine, tubular pores; few, medium, very dark gray (2.5Y 3/0) organic stains on surfaces of peds and larger pores; moderately alkaline, strongly effervescent; clear, smooth boundary.

This soil is highly fertile. Available water holding capacity is about 8 to 10 inches. Permeability is slow, runoff is ponded to very slow, and the hazard of erosion is none to slight. The root zone is deep.

Most areas of this soil have been drained and are used for irrigated row crops and apricots. Dryland barley is grown in some areas. Capability unit IIs–5 (14).

Clear Lake clay, saline (0 to 2 percent slopes) (Ck).—This soil is similar to Clear Lake clay, but it contains slight to moderate amounts of salts and alkali. This soil occurs in low-lying valley bottoms. Included with this soil are some areas that have a dark-gray to dark grayish-brown heavy clay loam surface layer.

This soil is used for irrigated sugar beets and alfalfa and for dryland grain and pasture. Capability unit IIIw–5 (14); pasture and range site 11.

Clear Lake silty clay loam (0 to 2 percent slopes) (Cl).—This soil occurs in small valleys in the uplands or in small areas in the larger valleys. It has a calcareous silty clay loam surface layer and a seasonally high or continuously high water table. Included with this soil are soils that have a clay surface layer, soils that are somewhat poorly drained, and soils that have a grayish-brown surface layer.

The soil is used for dryland barley and incidental pasture. Capability unit IIIw–5 (15).

Climara Series

The Climara series consists of well-drained clayey soils underlain by serpentine or serpentinized rocks at a depth of about 3 to 4 feet. These soils are strongly sloping to steep and are on uplands. The vegetation is chiefly annual grasses and forbs, but the steeper slopes are covered by thin to moderately thick stands of oaks and Digger pines. Many eroded areas are covered with brush. Elevations range from 500 to 3,000 feet above sea level. Annual rainfall is 10 to 16 inches, average annual temperature is about 60° F., and the frost-free period is about 250 days. The main associated soils are the Vallecitos, Gazos, Henneke, and Montara.

The surface layer is gray clay 21 to 31 inches thick. The next layer is light yellowish-brown gravelly clay 7 to 12 inches thick. In most places weathered rock occurs at a depth of 28 and 43 inches.

Climara soils are used for dryland grain and pasture.

Climara clay, 9 to 15 percent slopes (CmD).—This soil occurs on rounded ridgetops within areas of steeper soils or in other small areas.

Representative profile: On Tully Ranch, 10 yards south of ranch road, three-quarter mile east of State Route 25.

A11—0 to 12 inches, gray (5Y 5/1) clay, very dark gray (5Y 3/1) when moist; strong, very fine, granular structure; very hard when dry, very firm when moist, very sticky and very plastic when wet; abundant very fine and fine roots; few, very fine and fine, tubular pores; neutral; gradual, smooth boundary.

A12—12 to 28 inches, gray (5Y 5/1) clay, very dark gray (5Y 3/1) when moist; strong, fine, angular blocky structure; very hard when dry, very firm when moist, very sticky and very plastic when wet; plentiful very fine roots; few, very fine, tubular pores; many, small, medium and coarse slickensides; mildly alkaline, slightly effervescent; gradual, smooth boundary.

Cca—28 to 36 inches, light yellowish-brown (2.5Y 6/4)) gravelly clay, olive brown (2.5Y 4/4) when moist; moderate, fine, subangular blocky structure; very hard when dry, very firm when moist, very sticky and very plastic when wet; few very fine roots; few, very fine and fine, tubular pores; common small seams and soft masses of lime; moderately alkaline, strongly effervescent; gradual, irregular boundary.

R—36 inches, weathered, highly fractured, fine-grained, greenish-gray serpentine rock.

In places bedrock is near enough to the surface to interfere with the penetration of roots.

Included with this soil are small areas of Diablo, Henneke, and Montara soils. Also included are areas of rock outcrop.

This soil has moderate to low fertility. Available water holding capacity is 5 to 7 inches. Runoff is medium, permeability is slow, and the hazard of erosion is moderate. The root zone is moderately deep to deep.

This soil is used for dryland grain and pasture. Capability unit IIIe–5 (15); pasture and range site 1.

Climara clay, 15 to 50 percent slopes, eroded (CmF2).—This soil is similar to Climara clay, 9 to 15 percent slopes, but it is steeper and has a thinner surface layer. It is generally moderately eroded, but some steeper areas and slopes along drainageways are severely eroded. The more eroded areas have a cover of brush, oaks, and pines, but some are bare. This soil is commonly 28 to 34 inches deep over bedrock, but depth ranges from 20 to 60 inches. A small to large number of rock fragments occur throughout the profile.

Included with this soil are some areas of Landslides that have an uneven hummocky surface.

This soil has low to moderate fertility. Available water holding capacity is 3 to 5 inches, runoff is medium to rapid, and the hazard of erosion is moderate to severe.

This soil is used mainly for pasture, and some small areas are in dryland grain. Capability unit VIe–5 (15); pasture and range site 1.

Cometa Series

The Cometa series consists of well-drained soils underlain by granitic alluvium. These soils have a loamy surface layer and a clayey subsoil. They are gently sloping to strongly sloping and occupy terraces and toe slopes. The vegetation is annual grasses, forbs, and some Digger pines and oaks. Elevations are 800 to 1,600 feet above sea level. Annual rainfall is 12 to 18 inches, average annual temperature is about 62° F., and the frost-free period is about 250 days. The main associated soils are the Hanford, Auberry, and Sheridan.

The surface layer is brown sandy loam or loam about 18 inches thick. The subsoil, 24 to 36 inches thick, is reddish-brown clay that grades to coarse sandy clay loam in the lower part. The substratum is reddish-yellow coarse sandy loam that extends to depths greater than 5 feet.

Cometa soils are used for dryland pasture and grain.

Cometa sandy loam, 5 to 15 percent slopes, eroded (CoD2).—This soil is on toe slopes and on small terraces in small valleys of the uplands.

Representative profile: On Lonoak Road, 4 miles west of State Route 25, west of road.

A11—0 to 10 inches, brown (10YR 5/3) sandy loam, dark grayish brown to very dark grayish brown (10YR 4/2, 3/2) when moist; moderate, fine, granular structure; hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; abundant very fine and fine roots; common, very fine, tubular pores and common, fine, interstitial pores; medium acid; clear, smooth boundary.

A12—10 to 18 inches, brown (7.5YR 5/4) sandy loam, brown (7.5YR 4/4) when moist; weak, medium, subangular blocky structure; hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; abundant very fine and fine roots; common, very fine and fine, tubular pores; medium acid; clear, smooth boundary.

B21t—18 to 38 inches, reddish-brown (5YR 4/4) clay, reddish brown (5YR 4/4) when moist; strong, coarse, prismatic structure that breaks readily into moderate, medium, angular blocky structure; very hard when dry, firm when moist, sticky and plastic when wet; few very fine and fine roots; few, very fine and fine, tubular pores; thin continuous clay films and thick, patchy, dark reddish-brown (5YR 3/3) clay films on surfaces of peds and pores; slightly acid; gradual, smooth boundary.

B22t—38 to 50 inches, reddish-brown (5YR 5/4) coarse sandy clay loam, reddish brown (5YR 4/4) when moist; moderate, medium, subangular blocky structure; hard when dry, friable when moist, sticky and plastic when wet; few very fine and fine, tubular pores; few, thin, patchy clay films on ped surfaces; neutral; gradual, smooth boundary.

C—50 to 80 inches, reddish-yellow (5YR 6/6) coarse sandy loam, yellowish red (5YR 4/6) when moist; weak, coarse, subangular blocky structure; hard when dry, friable when moist, slightly sticky and slightly plastic when wet; few, very fine, tubular pores; mildly alkaline.

Included with this soil are soils that have a less clayey subsoil.

This Cometa soil has low fertility. Available water holding capacity is 3 to 4 inches. Permeability is very slow, runoff is medium, and the hazard of erosion is moderate. Some areas are severely eroded, and areas on the steeper slopes are gullied in some places. The root zone is shallow.

The soil is used for dryland pasture and grain. Capability unit IVe–3 (15); pasture and range site 4.

Cometa loam, 5 to 15 percent slopes, eroded (CnD2).—This soil is similar to Cometa sandy loam, 5 to 15 percent slopes, eroded, but it has a surface layer that consists of loam instead of sandy loam. It occurs on toe slopes and small terraces in small valleys and depressions in the uplands.

Included with this soil are some slightly eroded, gently sloping soils.

This soil has available water holding capacity of 4 to 6 inches. Runoff is medium, and the hazard of erosion is moderate. The root zone is shallow.

This soil is used for dryland pasture and grain. Capability unit IVe–3 (15); pasture and range site 4.

Conejo Series

The Conejo series consists of well-drained loamy soils that are underlain by basic, igneous, alluvial material at a depth of 4½ to 6 feet. These soils are gently sloping to sloping and occupy fans and toe slopes. The vegetation consists chiefly of annual grasses and forbs and scattered oaks. Elevations range from 1,200 to 2,000 feet above sea level. The annual rainfall is 14 to 18 inches, average annual temperature is about 60° F., and the frost-free period is about 250 days. The main associated soils are the Edenvale and Cibo.

The surface layer is dark-gray to very dark gray clay loam 20 to 28 inches thick. The next layer is dark grayish-brown clay loam that extends to a depth of 55 inches or more. Below this is stratified, basic, igneous, alluvial material. The Conejo soils vary somewhat in texture and in the amount of gravel in the solum.

Conejo soils are used for dryland grain and incidental pasture.

Conejo clay loam, 2 to 9 percent slopes (CpC).—This soil occurs on toe slopes and fans between the valley bottoms and the uplands.

Representative profile: On main ranch road to Quien Sabe Ranch headquarters, 300 yards west of fork in road.

A11—0 to 2 inches, dark-gray (10YR 4/1) clay loam, black (10YR 2/1) when moist; moderate, fine, granular structure; hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; abundant very fine roots; common, very fine, interstitial pores; neutral; clear, smooth boundary.

A12—2 to 7 inches, very dark gray (10YR 3/1) clay loam, black (10YR 2/1) when moist; moderate, fine, granular structure; hard when dry, friable when moist, sticky and plastic when wet; abundant very fine roots; common, very fine, interstitial pores; neutral; clear, smooth boundary.

A13—7 to 25 inches, very dark gray (10YR 3/1) clay loam, very dark gray (10YR 3/1) when moist; moderate, fine, subangular blocky structure; hard when dry, friable when moist, sticky and plastic when wet; abundant very fine roots; common, medium and coarse, tubular pores, common, very fine, interstitial and tubular pores; mildly alkaline; clear, smooth boundary.

C1—25 to 38 inches, dark grayish-brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) when moist; moderate, fine, subangular blocky structure; hard when dry, friable when moist, sticky and plastic when wet; plentiful very fine roots; few, very fine, interstitial and tubular pores, common, medium and coarse, interstitial pores; mildly alkaline; gradual, smooth boundary.

C2—38 to 55 inches, dark grayish-brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) when moist; weak subangular blocky structure; hard when dry, friable when moist, sticky and plastic when wet; few very fine roots; common, very fine, interstitial and tubular pores; mildly alkaline.

Included with this soil are small areas of the Edenvale soils.

This soil is moderately fertile. Available water holding capacity is 10 to 12 inches. Permeability is moderately slow, runoff is slow to medium, and the hazard of erosion is slight to moderate. Water from surrounding hills has cut gullies in a few included areas. The root zone is very deep.

This soil is used for dryland grain and incidental pasture. Capability unit IIIe–5 (15).

Corralitos Series

The Corralitos series consists of somewhat excessively drained sandy soils that are underlain by stratified alluvial sand at a depth of 42 to 60 inches. These soils are on fans and are gently sloping to sloping. The vegetation consists mainly of annual grasses and forbs and areas of brush, eucalyptus, and fern. Elevations range from 200 to 800 feet. Annual rainfall is 16 to 20 inches, average annual temperature is about 59° F., and the frost-free period is about 260 days. The main associated soils are the Arnold, Pinto, and Cotati.

The surface layer, about 20 inches thick, (fig. 4) is brown loamy sand in most places, but it ranges from brown to grayish brown. The next layer is pale-brown loamy sand about 22 inches thick. Below this is light yellowish-brown stratified alluvial sand.

Figure 4.—**Road cut in Corralitos loamy sand, 2 to 9 percent slopes, showing the darker surface layer and a lighter colored, coarser textured subsoil. The entrenching tool is about 20 inches long.**

The Corralitos soils are used for dryland and irrigated apricots and grapes and for dryland grain and pasture.

Corralitos loamy sand, 2 to 9 percent slopes (CuC).—This soil lies on small fans and toe slopes.

Representative profile: In apricot orchard on west side of Cole Road, one-half mile north of U.S. Highway No. 101.

Ap—0 to 8 inches, brown (10YR 5/3) loamy sand, dark brown (10YR 3/3) when moist; single grain; loose when dry, nonsticky and nonplastic when wet; plentiful very fine and fine roots; strongly acid; clear, smooth boundary.

A1—8 to 20 inches, brown (10YR 5/3) loamy sand, dark brown (10YR 3/3) when moist; single grain; loose when dry, nonsticky and nonplastic when wet; few very fine, fine, and coarse roots; strongly acid; gradual, smooth boundary.

C1—20 to 42 inches, pale-brown (10YR 6/3) loamy sand, brown (10YR 4/3) when moist; single grain; loose when dry, nonsticky and nonplastic when wet; few coarse roots; stratified; strongly acid; clear, smooth boundary.

C2—42 to 84 inches +, light yellowish-brown (10YR 6/4) stratified sand, dark yellowish brown (10YR 4/4) when moist; single grain; loose when dry, nonsticky and nonplastic when wet; strongly acid.

Included with this soil are some small areas of Arnold soils and of some soils that have a sandy loam surface layer.

This soil has low fertility. Permeability is rapid, and runoff is very slow. The hazard of erosion is slight to none, but in some included areas water from surrounding hills has cut gullies. Available water holding capacity is about 4 to 5 inches. The root zone is very deep.

This soil is used for dryland and irrigated apricots, grapes, grain, and pasture. Capability unit IIIs–4 (14).

Cotati Series

The Cotati series consists of moderately well drained soils that formed in alluvium derived from many kinds of rocks. These soils have a loamy surface layer and a clayey subsoil. They are on terraces and are gently sloping to moderately steep. The vegetation consists mostly of annual grasses and forbs and scattered oaks. Elevations range from 200 to 800 feet above sea level. Annual rainfall is 16 to 20 inches, average annual temperature is about 60° F., and the frost-free period is about 260 days. The main associated soils are the Arnold, Los Gatos, Soper, and Sween.

The surface layer is grayish-brown to gray loam 16 to 24 inches thick. The subsoil is brown clay 14 to 20 inches thick. The upper part of the substratum is light yellowish-brown coarse sandy clay loam about 4 to 10 inches thick. It overlies gravelly sandy loam alluvium that extends to an undetermined depth and is commonly brittle and compact in place. In some places a few fine pebbles are in the surface layer and moderate amounts are in the subsoil.

The Cotati soils are used for pasture.

Cotati loam, 9 to 15 percent slopes, eroded (CvD2).—This soil occurs on dissected terraces.

Representative profile: On Nyland Ranch, one-quarter mile southeast of junction of State Route 156 and U.S. Highway No. 101, 50 yards east of State Route 156.

A1—0 to 14 inches, grayish-brown (10YR 5/2) loam, dark yellowish brown (10YR 3/4) when moist; weak, fine, subangular blocky structure; hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; abundant very fine and fine roots; common, very fine and fine, tubular pores, common, fine and medium, interstitial pores; strongly acid; clear, smooth boundary.

A2—14 to 17 inches, gray (10YR 6/1) loam, gray (10YR 5/1) when moist; weak, fine, subangular blocky structure; hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; abundant very fine and fine roots; common, very fine and fine, tubular pores, common, fine and medium, interstitial pores; strongly acid; abrupt, smooth boundary.

B2t—17 to 31 inches, brown (10YR 5/3) sandy clay, brown (10YR 4/3) when moist; strong, coarse, columnar structure; very hard when dry, very firm when moist, very sticky and very plastic when wet; few very fine roots; few, very fine and fine, tubular pores; thin continuous clay films on surfaces of peds and pores; common slickensides that are fine, medium, and coarse; strongly acid; clear, smooth boundary.

C1—31 to 35 inches, light yellowish-brown (2.5Y 6/4) coarse sandy clay loam, light olive brown (2.5Y 5/4) when moist; weak, fine, subangular blocky structure; hard when dry, firm when moist, sticky and plastic when wet; few very fine roots; few, fine, interstitial pores; brown organic stains on larger ped surfaces; strongly acid; clear, smooth boundary.

IIC2—35 to 50 inches, olive-brown gravelly sandy loam, brittle and compact; strongly acid.

Figure 5 shows a profile of Cotati loam, 9 to 15 percent slopes, eroded.

Included with this soil are small areas of Antioch soils. Also included are some soils that are moderately alkaline and calcareous in the substratum.

This soil has low fertility. Available water holding capacity is 2.5 to 4.5 inches. Permeability is very slow, and runoff is medium to rapid. The hazard of erosion is moderate to severe, and small included areas are severely eroded. The root zone is shallow.

The soil is used for dryland pasture. Capability unit VIe–3 (15); pasture and range site 4.

Cotati loam, 2 to 9 percent slopes (CvC).—This soil is similar to Cotati loam, 9 to 15 percent slopes, eroded, but it has a thicker surface layer, is less sloping, and is only slightly eroded. It occurs on high terraces or along small drainageways in areas south of the Flint Hills and west of San Juan Bautista. Slopes are dominantly 2 to 6 percent.

Included with this soil are a few small areas that have a sandy loam or clay loam surface layer. Also included are some soils that have a thicker surface because they receive material from higher areas.

This soil has low to moderate fertility. Available water holding capacity is 3.0 to 4.5 inches. Runoff is slow to medium, and the hazard of erosion is slight to moderate.

The soil is used for dryland pasture. Capability unit IVe–3 (15); pasture and range site 4.

Cotati loam, 15 to 30 percent slopes, eroded (CvE2).—This soil is similar to Cotati loam, 9 to 15 percent slopes, eroded, but it is more sloping and has a thinner surface layer. Slopes are dominantly 20 to 25 percent. The surface layer is generally grayish brown but ranges to light brownish gray in a few places. In a few areas as much as 1 or 2 percent of the surface layer is fine gravel. Included with this moderately eroded soil are a few severely eroded areas.

Runoff is rapid. The hazard of erosion is severe.

This soil is used for dryland pasture. Capability unit VIe–3 (15); pasture and range site 4.

Figure 5.—**Road cut through Cotati loam, 9 to 15 percent slopes, eroded. This soil has a dark-colored surface layer, a leached layer, and a sandy clay subsoil. The sandy clay subsoil severely limits the growth of roots and the penetration of water. The entrenching tool is about 20 inches long.**

Cropley Series

The Cropley series consists of well-drained clayey soils that are underlain by coarser textured material at depths greater than 40 inches. These soils are nearly level to sloping and occupy fans and terraces. The vegetation consists of annual grasses and forbs and scattered oaks. Elevations range from 130 to 1,500 feet above sea level. Annual rainfall is 12 to 14 inches, average annual temperature is about 59° F., and the frost-free period is about 260 days. The main associated soils are the Clear Lake, Sorrento, and Willows.

The surface layer is very dark gray to dark grayish-brown clay or silty clay loam that is about 32 inches thick. The next layer is grayish-brown clay that ranges from 10 to 15 inches in thickness. Below this is grayish-brown sandy clay loam that is underlain by stratified sand, gravel, and clay in some places. These stratified materials extend to depths greater than 5 feet. The content of lime below the surface layer varies.

The Cropley soils are used for irrigated fruit and nuts, vegetables, grapes, sugar beets, tomatoes, and alfalfa and for dryland grain and incidental pasture.

Cropley clay, 2 to 9 percent slopes (CwC).—This soil is on long gently sloping fans or is in gently rolling areas.

Representative profile: On O'Connell Ranch, one-half mile northwest of house and 1 mile southwest of railroad.

Ap—0 to 6 inches, very dark gray (10YR 3/1) clay, black (10YR 2/1) when moist; strong, fine, granular structure; hard when dry, firm when moist, very sticky and very plastic when wet; abundant very fine and fine roots; few, very fine and fine, tubular pores; few, medium and coarse, interstitial pores; neutral; clear, smooth boundary.

A11—6 to 20 inches, very dark gray (10YR 3/1) clay, black (10YR 2/1) when moist; moderate, fine, angular blocky structure; very hard when dry, very firm when moist, very sticky and very plastic when wet; abundant very fine and fine roots; few, very fine and fine, tubular pores; few small pebbles; common fine and medium slickensides; moderately alkaline; gradual, smooth boundary.

A12—20 to 32 inches, dark grayish-brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) when moist; moderate, medium, angular blocky structure; very hard when dry, very firm when moist, very sticky and very plastic when wet; few very fine and fine roots; few, very fine and fine, tubular pores, few, fine and medium, interstitial pores; few small pebbles; common fine and medium slickensides; moderately alkaline, slightly effervescent; gradual, smooth boundary.

C1—32 to 42 inches, grayish-brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) when moist; weak, medium, subangular blocky structure; slightly hard when dry, firm when moist, very sticky and very plastic when wet; few very fine and fine roots; few, fine and medium, tubular pores, few, medium, interstitial pores; few small pebbles; moderately alkaline, strongly effervescent; gradual, smooth boundary.

C2—42 to 65 inches, grayish-brown (2.5Y 5/2) sandy clay loam, dark grayish brown (2.5Y 4/2) when moist; weak, medium, subangular blocky structure; slightly hard when dry, firm when moist, slightly sticky and slightly plastic when wet; few very fine and fine roots; common, fine and medium, tubular pores, common, fine and medium, interstitial pores; moderately alkaline, slightly effervescent.

Included with this soil are small areas of Clear Lake and Willows soils.

This soil is fertile. Available water holding capacity is 8 to 10 inches. Permeability is slow, runoff is slow to medium, and the hazard of erosion is slight to moderate. In a few included areas, water from surrounding hills has cut gullies. The root zone is very deep.

The soil is used for irrigated fruits, nuts, sugar beets, tomatoes, grapes, and vegetables, for dryfarmed grain, and for incidental pasture. Capability units IIe–5 (14) and IIIe–5 (15).

Cropley clay, 0 to 2 percent slopes (CwA).—This nearly level soil is similar to Cropley clay, 2 to 9 percent slopes, but the surface layer contains coarse gravel in some areas. Also, the underlying material is somewhat stratified and contains strata of fine to medium gravel in some places. Included with this soil are small areas of somewhat poorly drained soils.

Runoff is very slow and is ponded in small areas during winter. The hazard of erosion is slight to none.

This soil is used for irrigated fruits, nuts, grapes, alfalfa, sugar beets, and tomatoes and for dryland grain and incidental pasture. Capability unit IIs–5 (14).

Cropley silty clay loam, 2 to 9 percent slopes (CyC).—This soil is similar to Cropley clay, 2 to 9 percent slopes, but it has a silty clay loam surface layer. It occurs in the Bolsa Area on long slopes that are dominantly 3 to 5 percent in most places. Runoff is slow to medium, and the hazard of erosion is slight to moderate.

Included with this soil are soils that have a dark grayish-brown surface layer and soils that have a clay surface layer.

This soil is used for irrigated fruits, nuts, grapes, alfalfa, sugar beets, tomatoes, and vegetables and for incidental dryland pasture. Capability unit IIe–5 (14).

Diablo Series

The Diablo series consists of well-drained clayey soils that are underlain by calcareous soft sandstone and shale at depths greater than 30 inches. These soils are on hilly uplands and are strongly sloping to very steep. The vegetation consists of annual grasses and forbs and on the severely eroded slopes, scattered oaks and areas of brush. Elevations range from 400 to 2,000 feet. Annual rainfall is 12 to 16 inches, average annual temperature is 60° F., and the frost-free period is about 250 days. The main associated soils are the San Benito, Linne, and Soper.

In most places the surface layer is very dark gray clay 18 to 38 inches thick, but it ranges from clay to heavy clay loam (fig. 6). The next layer is dark grayish-brown to pale-olive clay 12 to 30 inches thick. Below this is stratified soft sediments or soft sandstone and shale. The depth to bedrock ranges from 30 to more than 60 inches. In some areas rock fragments, 2 to 10 inches in diameter, are interbedded between the lowest clay layer and the underlying sandstone.

These soils vary mainly in the amount of gravel and the content of lime in the profile. Because they crack deeply on drying, the upper part of the surface layer has granular structure.

The Diablo soils are used for dryland grain, chiefly barley, pasture, and range. A few small areas are irrigated and used for wine grapes.

Diablo clay, 15 to 30 percent slopes, eroded (DaE2).—This soil occurs on rounded hills and broad ridgetops.

Representative profile: On hillside to west of Cienega Road, at top of grade, 1 mile north of Bird Creek.

A11—0 to 8 inches, very dark gray (10YR 3/1) clay, black (10YR 2/1) when moist; strong, fine, granular structure; very hard when dry, very firm when moist, very sticky and very plastic when wet; abundant very fine and fine roots; many, very fine and fine, interstitial pores; moderately alkaline; gradual, smooth boundary.

A12—8 to 26 inches, very dark gray (10YR 3/1) clay, black (10YR 2/1) when moist; strong, very fine, angular blocky structure; very hard when dry, very firm when moist, very sticky and very plastic when wet; plentiful very fine and fine roots; few, very fine and fine, tubular pores; common fine slickensides; moderately alkaline, strongly effervescent; gradual, smooth boundary.

A13—26 to 38 inches, very dark gray (10YR 3/1) clay, black (10YR 2/1) when moist; common, coarse, distinct mottles of dark grayish-brown (2.5Y 4/2), very dark grayish brown (2.5Y 3/2) when moist; strong, fine, angular blocky structure; very hard when dry, very firm when moist, very sticky and very plastic when wet; plentiful very fine and fine roots; common, very fine and fine, tubular pores; roots oriented along ped surfaces; common soft masses of lime; many slickensides that are fine, medium, and coarse; moderately alkaline, strongly effervescent; gradual, smooth boundary.

C1 - 38 to 52 inches, dark grayish-brown (2.5Y 4/2) clay, very dark grayish brown (2.5Y 3/2) when moist; common, coarse, faint mottles of light olive brown (2.5Y 5/4), olive brown (2.5Y 4/4) when moist; strong, fine, angular blocky structure; very hard when dry, very firm when moist, very sticky and very plastic when wet; few very fine and fine roots; common, very fine and fine, tubular pores; common soft masses of lime; roots oriented along ped surfaces; many fine and medium slickensides; moderately alkaline, strongly effervescent; gradual, smooth boundary.

Figure 6.—**Diablo clay exposed in a road cut on Cienega Road, about 8 miles south of Hollister. A uniformly dark surface layer grades to lighter colored parent material at a depth of about 4½ feet.**

C2—52 to 68 inches, pale-olive (5Y 6/3) clay, olive (5Y 4/3) when moist; weak, fine, subangular blocky structure; hard when dry, firm when moist, very sticky and very plastic when wet; few, very fine and fine, tubular pores; common soft masses of lime and disseminated lime; moderately alkaline, strongly effervescent; gradual, smooth boundary.

R—68 inches, olive, highly weathered, calcareous, soft clay shale.

Under cultivation this soil is easily eroded and gullies form readily. Most areas are moderately eroded, but many of the steeper slopes are severely eroded, and a few areas are only slightly eroded.

Included with this soil are small areas of San Benito, Rincon, and Soper soils and of some soils that are calcareous throughout the profile. Also included are some large and many small Landslides.

This soil is highly fertile. Available water holding capacity is about 8 to 10 inches. Permeability is slow, runoff is rapid, and the hazard of erosion is severe. The root zone is deep to very deep.

The soil is used for dryland grain and pasture. Capability unit IVe–5 (15); pasture and range site 1.

Diablo clay, 9 to 15 percent slopes (DaD).—This soil is similar to Diablo clay, 15 to 30 percent slopes, eroded, but it has a thicker surface layer, is less sloping, and is only slightly eroded. It lies on low rolling hills or on toe slopes where the soil is somewhat thicker than typical. In a few areas, this soil has lime in the surface layer.

This soil has available water holding capacity of 10 to 12 inches. Runoff is medium, and the hazard of erosion is moderate. The root zone is very deep.

The soil is used for dryland grain and pastures. Capability unit IIIe–5 (15); pasture and range site 1.

Diablo clay, 30 to 50 percent slopes, eroded (DaF2).—This soil is similar to Diablo clay, 15 to 30 percent slopes, eroded, but it is steeper, has a thinner profile, and ranges from very dark gray to gray in the surface layer. This steep soil occurs in areas that are generally moderately steep and in more rugged areas that have narrow, winding ridgetops. Slopes are dominantly 45 to 50 percent. This soil is moderately eroded. Landslides are common, and the underlying material has been exposed by erosion in some areas, especially along drainageways and in areas of repeated slipping.

Included with this soil are small and large Landslides, some severely eroded areas, and Gullied land. Also included are small areas of San Benito soils.

Available water holding capacity is 6 to 8 inches. Runoff is rapid, and the hazard of erosion is severe. The root zone is moderately deep to deep.

This soil is used for dryland pasture and grain. Capability unit VIe–5 (15); pasture and range site 1.

Diablo clay, 50 to 75 percent slopes, severely eroded (DaG3).—This soil is similar to Diablo clay, 15 to 30 percent slopes, eroded, but it is steeper, has a thinner profile, and is severely eroded. Where the subsoil has been exposed by erosion, the color of the surface layer ranges from dark gray and grayish brown to yellowish brown. This soil occurs on hills where slopes are dominantly 60 percent. Rills and gullies are common.

Available water holding capacity is 4 to 6 inches. Runoff is very rapid, and the hazard of erosion is very severe. The root zone is moderately deep.

Range is the main use of this soil. Capability unit VIIe–5 (15); pasture and range site 1.

Diablo-Linne complex, 9 to 15 percent slopes (DlD).—This mapping unit is 60 percent Diablo clay, 9 to 15 percent slopes, and 40 percent Linne clay loam, 9 to 15 percent slopes. These soils occur on broad ridges that have strongly sloping side slopes. The Diablo soils generally occupy the gentle slopes, most of the north-facing slopes, and the saddles and drainageways. On these soils runoff is medium, and the hazard of erosion is moderate.

These soils are used mainly for pasture, but a few areas are in dryland grain. Capability unit IIIe–5 (15); pasture and range site 1.

Diablo-Linne complex, 15 to 30 percent slopes, eroded (DlE2).—This mapping unit generally is 50 percent Diablo clay, 15 to 30 percent slopes, eroded, and 50 percent Linne clay loam, 15 to 30 percent slopes, eroded. These soils occur on ridgetops or as areas of moderately steep soils. The Diablo soils generally occur on the more gentle slopes, the north-facing slopes, and around drainageways. Runoff is medium to rapid, and the hazard of erosion is moderate to severe.

Included in this complex are a few small Landslides and some severely eroded areas.

Pasture is the main use. Capability unit IVe–5 (15); pasture and range site 1.

Diablo-Linne complex, 30 to 50 percent slopes, eroded (DlF2).—This mapping unit is about 50 percent Diablo clay, 30 to 50 percent slopes, eroded, and 50 percent Linne clay loam, 30 to 50 percent slopes, eroded. These steep soils occur on side slopes, some of which are the side slopes of narrow, winding ridges. Dominant slopes range from 45 to 50 percent. Runoff is rapid, and the hazard of erosion is severe.

Included with this complex are small Landslides, severely eroded areas, and some outcrops of underlying material in very steep areas and on breaks. Also included are small areas of Shedd soils.

Pasture is the main use. Capability unit VIe–5 (15); pasture and range site 1.

Docas Series

The Docas series consists of well-drained, loamy soils that, at a depth of 4 to 5 feet, are underlain by stratified, calcareous silt loam alluvium. These soils are on flood plains and are nearly level to moderately sloping. Vegetation consists of annual grasses and forbs and a few oaks. Elevations range from 1,200 to 2,000 feet above sea level. Annual rainfall is 10 to 12 inches, average annual temperature is about 60° F., and the frost-free period is about 250 days. The main associated soils are the Panoche, Kettleman, Sorrento, and Shedd.

The surface layer is generally light-gray to light olive-gray silt loam or gray to dark-gray clay loam 10 to 16 inches thick. The next layer is gray to light-gray silt loam or clay loam 24 to 30 inches thick. It is underlain by light-gray silt loam that is stratified with thin lenses of sandy loam and clay loam.

Docas soils are used mostly for dryland pasture, but some small areas are used for dryland grain.

Docas silt loam, 0 to 2 percent slopes (DoA).—This soil occurs in upland valleys and along drainageways.

Representatives profile: On Ashurst Ranch in Vallecitos Valley, by a fence on south side of Ned Idria Road, 2 miles east of ranch house.

A11—0 to 5 inches, light-gray (5Y 7/2) silt loam, olive gray (5Y 5/2) when moist; moderate, thin, platy structure that breaks readily into moderate, fine, granular structure; slightly hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; abundant very fine and fine roots; common, very fine and fine, tubular pores; moderately alkaline; strongly effervescent; clear, smooth boundary.

A12—5 to 11 inches, light olive-gray (5Y 6/2) silt loam, olive gray (5Y 4/2) when moist; weak, fine, subangular blocky structure; slightly hard when dry, friable when moist, slightly sticky and slightly plastic when wet; abundant very fine and fine roots; common, very fine and fine, tubular pores; moderately alkaline; strongly effervescent; gradual, smooth boundary.

IIC1—11 to 36 inches, gray (5Y 6/1) silt loam, dark gray (5Y 4/1) when moist; weak, fine, subangular blocky structure; slightly hard when dry, friable when moist, slightly sticky and slightly plastic when wet; few very fine and fine roots; common, very fine and fine, tubular pores; stratified; moderately alkaline; strongly effervescent; gradual, smooth boundary.

IIC2—36 to 88 inches, light-gray (2.5Y 7/2) silt loam, grayish brown (2.5Y 5/2) when moist; weak, fine, subangular blocky structure; slightly hard when dry, friable when moist, slightly sticky and slightly plastic when wet; few, very fine and fine, tubular pores, thin strata of sandy loam and clay loam; moderately alkaline; strongly effervescent.

Included are small areas of Sorrento and Panoche soils. Also included are small areas of soils that lack a calcareous surface layer and some soils in which clay increases slightly in the subsoil.

This soil is moderately fertile. Available water holding capacity is about 10 to 12 inches. Permeability is moderate, runoff is very slow, and the hazard of erosion is slight to none. The rooting depth is very deep.

This soil is mostly in dryland pasture, but some small areas are used for grain. Capability unit IVc–1 (15); pasture and range site 7.

Docas silt loam, 2 to 9 percent slopes (DoC).—This soil is similar to Docas silt loam, 0 to 2 percent slopes, but is gently to moderately sloping. It occurs on flood plains and fans in upland valleys. Dominant slopes range from 3 to 6 percent. A few areas are gullied by water that runs in from the surrounding uplands. Runoff is slow to medium, and the hazard of erosion is slight to moderate.

A few areas of this soil are used for dryland grain, but pasture is the dominant use. Capability unit IVc–1 (15); pasture and range site 7.

Docas clay loam, 0 to 2 percent slopes (DsA).—This soil is similar to Docas silt loam, 0 to 2 percent slopes, but has a gray to dark-gray clay loam surface soil. It occurs along drainageways in upland valleys. In some places the drainageways are deeply cut and have nearly vertical walls. Included in mapping were small areas of soils that have a silty clay loam surface soil.

This Docas soil is used mostly for pasture, but a few areas are in dryland grain. Capability unit IVc–1 (15); pasture and range site 7.

Docas clay loam, 2 to 9 percent slopes (DsC).—This soil is similar to Docas silt loam, 0 to 2 percent slopes, but it is gently sloping to moderately sloping and has a gray to dark-gray clay loam surface layer. It occurs on fans and flood plains in upland valleys. Dominant slopes are between 3 and 6 percent. Runoff is slow to medium, and the hazard of erosion is slight to moderate.

This soil is used mostly for pasture, but a few small areas are used for dryland grain. Capability unit IVc–1 (15); pasture and range site 7.

Edenvale Series

The Edenvale series consists of somewhat poorly drained, very deep, clayey soils that formed in basic igneous alluvium. These soils are nearly level and occur on flood plains. The vegetation is annual grasses, forbs, and scattered oaks. Elevations range from 1,500 to 2,000 feet. Annual rainfall is 14 to 18 inches, average annual temperature is 60° F., and the frost-free period is about 260 days. The main associated soils are the Conejo and Cibo.

The surface layer is very dark gray clay 24 to 30 inches thick. The next layer is very dark gray clay alluvium that generally extends to depths below 5 feet.

The Edenvale soils are used for dryland and irrigated grain and pasture.

Edenvale clay, 0 to 2 percent slopes (EcA).—This soil lies on the flood plains and edges of flood plains.

Representative profile: 30 yards east of Quien Sabe Ranch.

Ap—0 to 10 inches, very dark gray (10YR 3/1) clay, black (10YR 2/1) when moist; strong, fine, granular structure; hard when dry, firm when moist, very sticky and very plastic when wet; plentiful very fine and fine roots; common, fine and medium, interstitial pores; neutral; abrupt, smooth boundary.

A1—10 to 26 inches, very dark gray (10YR 3/1) clay, black (10YR 2/1) when moist; strong, medium, angular blocky structure; very hard when dry, very firm when moist, very sticky and very plastic when wet; plentiful very fine and fine roots; common, fine and medium, tubular pores, few, fine and medium, interstitial pores; common fine and medium slickensides; mildly alkaline; gradual, smooth boundary.

C1—26 to 42 inches, very dark gray (10YR 3/1) clay, black (10YR 2/1) when moist; moderate, fine, angular blocky structure; hard when dry, firm when moist, very sticky and very plastic when wet; few very fine and fine roots; common, very fine and fine, tubular pores; common fine and medium slickensides; common, small, soft masses of lime; moderately alkaline, strongly effervescent; gradual, smooth boundary.

C2—42 to 60 inches, very dark gray (10YR 3/1) clay, black (10YR 2/1) when moist; weak, medium, subangular blocky structure; hard when dry, firm when moist, sticky and plastic when wet; few very fine and fine roots; few, very fine and fine, tubular pores; common, small, soft masses of lime; moderately alkaline, strongly effervescent.

Included with this soil are some stony soils and some soils that are affected by salts and alkali. Also included are some small areas of Conejo soils.

This soil has low to moderate fertility. Available water holding capacity is 8 to 10 inches. Runoff is very slow, permeability is slow, and the hazard of erosion is slight to none. The root zone is deep.

The soil is used for dryland and irrigated grain and pasture (fig. 7). Capability unit IIIw–5 (15).

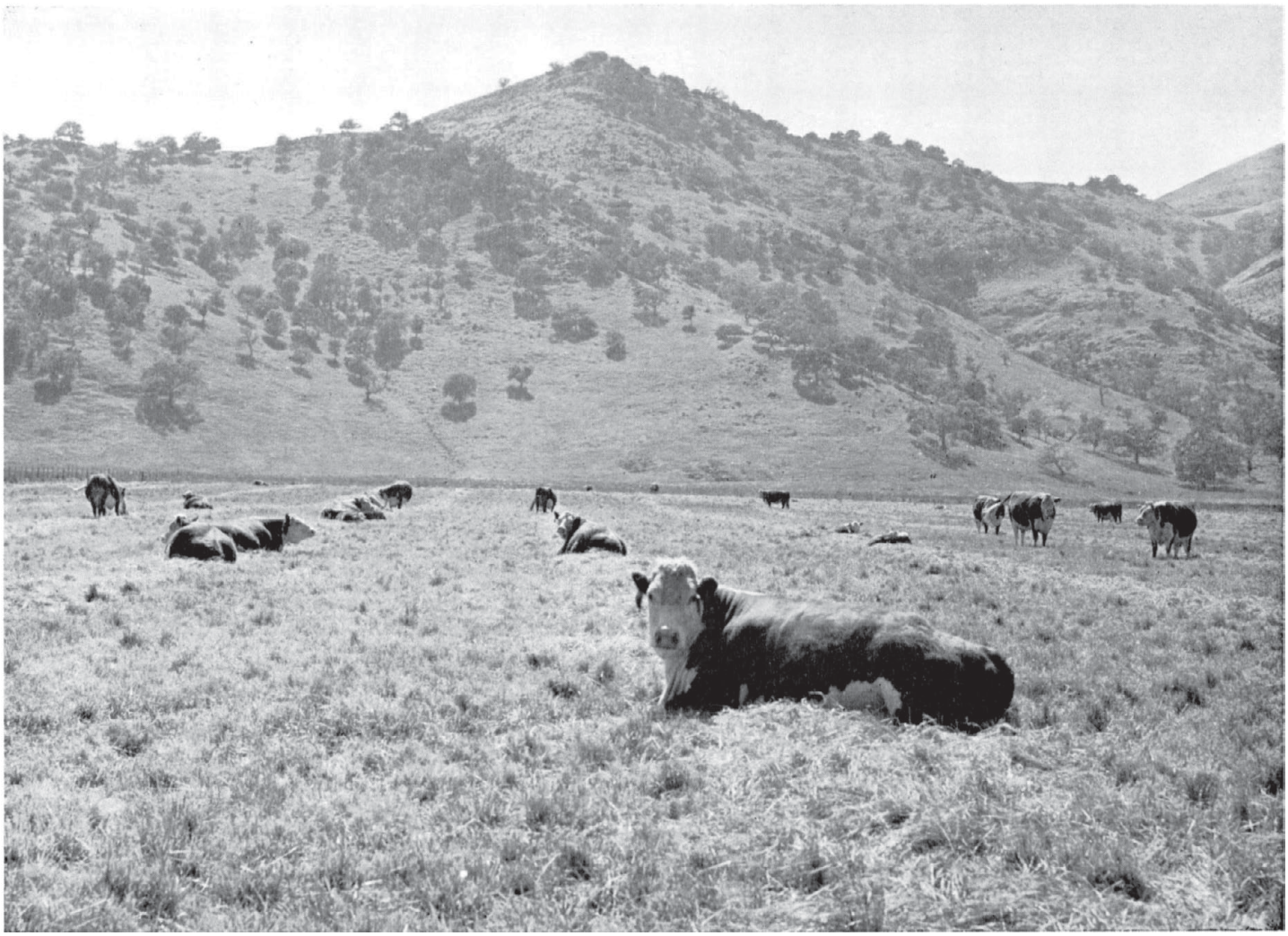

Figure 7.—**Cattle grazing irrigated pasture on Edenvale clay, 0 to 2 percent slopes, in Quien Sabe Valley. Hills in background are Cibo stony clay, 15 to 50 percent slopes, eroded.**

Gaviota Series

The Gaviota series consists of well-drained to somewhat excessively drained loamy and rocky loam soils underlain by sandstone and sandy shale. These soils are moderately steep to steep and occupy hilly mountainous uplands. The vegetation consists of annual grasses and forbs or a mixture of grasses, oaks, Digger pine, and brush. Elevations range from 1,200 to 3,800 feet above sea level. Annual rainfall is 14 to 20 inches. Average annual temperature is about 60° F., and the frost-free period is about 260 days. The main associated soils are the San Benito, Gazos, and Vallecitos.

In most places the surface layer is pale-brown loam 4 to 12 inches thick, but the color ranges to grayish brown. The next layer is pale-brown gravelly loam 4 to 12 inches thick. The underlying bedrock is chiefly moderately hard sandstone interbedded with shale. The depth to sandstone ranges from 8 to 24 inches, but is 12 to 20 inches in most places.

Gaviota soils are used for pasture, range, watersheds, wildlife, and recreation.

Gaviota loam, 30 to 50 percent slopes, eroded (GaF2).—This soil occupies steep slopes, some of which are the side slopes of narrow, winding ridges. In most areas erosion is moderate.

Representative profile: 300 yards north of Clear Creek Road, three-quarters mile from Hernandez Valley; on hillside.

A1—0 to 7 inches, pale-brown (10YR 6/3) loam, dark grayish brown (10YR 4/2) when moist; moderate, fine, granular structure; slightly hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; abundant very fine and fine roots; few, very fine, tubular pores and common, very fine and fine, interstitial pores; slightly acid; gradual, wavy boundary.

C1—7 to 19 inches, pale-brown (10YR 6/3) gravelly loam, brown (10YR 4/3) when moist; weak, medium, subangular blocky structure; slightly hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; plentiful very fine and fine roots; common, very fine and fine, tubular pores, common, very fine, interstitial pores; slightly acid; gradual, wavy boundary.

R—19 inches, yellowish-brown, highly fractured, medium-grained, moderately hard sandstone.

Included with this soil are small areas of San Benito, Gazos, and Vallecitos soils. Also included are small areas of calcareous soils, some severely eroded soils, and some areas of rock outcrops. In some areas bedrock is more than 20 inches below the surface.

This somewhat excessively drained soil has low fertility. Available water holding capacity is about 1 to 3 inches. Permeability is moderate, runoff is rapid to very rapid, and the hazard of erosion is severe to very severe. The root zone is shallow.

This soil is used for range, wildlife, watersheds, and recreation. Capability unit VIIe–1 (15); pasture and range site 6.

Gaviota loam, 15 to 30 percent slopes (GaE).—This soil is similar to Gaviota loam, 30 to 50 percent slopes, eroded, but it is less steep and is only slightly eroded. The depth to sandstone is as much as 24 inches. The color of the surface layer ranges from pale brown to grayish brown and is generally grayish brown on north-facing slopes. This soil occurs on rounded hills, and slopes are dominantly 20 to 25 percent. The plant cover is generally grass, scattered thin stands of oak, and a few Digger pine.

This soil is well drained. Available water holding capacity is 3 inches. Runoff is medium to rapid, and the hazard of erosion is moderate to severe.

The soil is used for pasture. Capability unit VIe–1 (15); pasture and range site 6.

Gaviota loam, 15 to 30 percent slopes, eroded (GaE2).—This soil is similar to Gaviota loam, 30 to 50 percent slopes, eroded, but it is less steep. In some places it occurs as rounded ridgetops in areas of steep soils. Slopes are dominantly about 25 percent. This soil is underlain mainly by sandstone at a depth of 16 to 20 inches. The plant cover is chiefly grass and scattered oaks, but a few areas have a thin to thick cover of brush. Included with this soil are some areas of rock outcrops and of very shallow soils. These included areas generally make up less than 2 percent of the mapped areas.

This soil is well drained. Runoff is rapid, and the hazard of erosion is severe.

Pasture is the main use. Capability unit VIe–1 (15); pasture and range site 6.

Gaviota rocky loam, 15 to 50 percent slopes, eroded (GrF2).—Loam makes up most of this mapping unit, but rock outcrops cover about 2 to 10 percent of the surface, and there are small included areas of other soils. The underlying bedrock is commonly sandstone but includes a moderate amount of interbedded shale in some places. The depth to bedrock ranges from 8 to 16 inches, which is shallower than normal for the series. Slopes are dominantly 45 to 50 percent, and relief ranges from somewhat angular hills to mountains. The vegetation consists of grasses, brush, and scattered trees. In the east-central part of the county, the plant cover is mostly grass and some brush and scattered oaks. In the southern part, it is mostly brush and wildfires are common. Most areas of this soil are moderately eroded, but some areas are severely eroded, especially in the southern part of the county.

Included with this mapping unit are small to medium-sized areas of Sedimentary rock land, small to medium-sized areas that are severely eroded, and small areas of Gazos and Vallecitos soils.

This well drained to somewhat excessively drained soil is generally low in fertility. Available water holding capacity is 2 to 3 inches. Runoff is rapid to very rapid, and the hazard of erosion is severe to very severe.

This soil is used for range, wildlife, watersheds, and recreation. Capability unit VIIs–1 (15); pasture and range site 6.

Gazos Series

The Gazos series consists of well-drained to somewhat excessively drained loamy soils. These soils are underlain by soft to moderately hard, acid, interbedded shale and sandstone at a depth of 20 to 60 inches. They are strongly sloping to very steep and occupy hilly to mountainous uplands. Vegetation consists chiefly of annual grasses and forbs, but there are thin to moderately thick stands of oaks and Digger pine and large areas of brush on the more eroded slopes. Elevations range from 1,200 to 3,800 feet above sea level. Annual rainfall is 14 to 20 inches, average annual temperature is about 60° F., and the frost-free period is about 260 days. The main associated soils are the Gaviota, Santa Lucia, San Benito, Henneke, and Linne.

The surface layer is grayish-brown or dark grayish-brown clay loam to silty clay loam 10 to 20 inches thick. The next layer is brown clay loam to shaly clay loam 10 to 40 inches thick. The underlying bedrock is largely soft clay shale and sandy clay shale with thin to moderately thick beds of soft, medium-grained sandstone. The depth to sandstone or shale ranges from 20 to 60 inches. These soils range from medium acid to slightly acid but are dominantly medium acid.

Gazos soils are used for dryland grain, pasture, and range and for watersheds, wildlife, and recreation.

Gazos clay loam, 15 to 30 percent slopes, eroded (GtE2).—This soil occurs on rounded ridges and in areas of steeper soils. In most places it is moderately eroded, but it is severely eroded in small areas.

Representative profile: On Tully Ranch, 10 yards above ranch road; 2 miles east of State Route 25.

A11—0 to 8 inches, grayish-brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) when moist; moderate, fine, granular structure; hard when dry, firm when moist, sticky and plastic when wet; abundant very fine and fine roots; common, very fine and fine, interstitial pores; slightly acid; gradual, smooth boundary.

A12—8 to 17 inches, grayish-brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) when moist; moderate, fine, angular blocky structure; hard when dry, firm when moist, sticky and plastic when wet; few very fine and fine roots; common, very fine, tubular pores; slightly acid; gradual, smooth boundary.

AC—17 to 34 inches, brown (10YR 5/3) clay loam, dark brown (10YR 3/3) when moist; weak, medium, subangular blocky structure; hard when dry, firm when moist, sticky and plastic when wet; few very fine and fine roots; few, very fine, tubular pores; few, fine slickensides; common stains of material from the A horizon on ped surfaces; medium acid; gradual, smooth boundary.

C—34 to 46 inches, brown (10YR 5/3) shaly clay loam, brown (10YR 4/3) when moist; weak, medium, subangular blocky structure; hard when dry, firm when moist, sticky and plastic when wet; few, very fine, tubular pores; some relic structure; medium acid; gradual, smooth boundary.

R—46 inches, olive-gray (5Y 5/2), highly weathered, highly fractured, moderately hard, acid shale that contains thin beds of yellowish-brown (10YR 5/4), medium-grained sandstone.

Included with this soil are some small areas of Santa Lucia, San Benito, Linne, and Henneke soils. Also included are some areas of clayey soils and small areas of rock outcrop.

This soil is moderately fertile. Available water holding capacity is about 4 to 8 inches. Permeability is moderately slow, runoff is rapid, and the hazard of erosion is severe. The root zone extends to a depth of 24 to 48 inches.

This soil is used for pasture. Capability unit IVe–5 (15); pasture and range site 5.

Gazos silty clay loam, 9 to 15 percent slopes (GsD).—This soil is similar to Gazos clay loam, 15 to 30 percent slopes, eroded, but it has a thicker profile, is less sloping, and is only slightly eroded. It occurs on toe slopes. Reaction throughout the profile is dominantly slightly acid. Included with this soil are some clayey soils.

Runoff is medium, and the hazard of erosion is moderate. Available water holding capacity is about 8 to 10 inches. The root zone is deep.

This soil is used for dryland grain and pasture. Capability unit IIIe–5 (15); pasture and range site 5.

Gazos clay loam, 30 to 50 percent slopes, eroded (GtF2).—This soil is similar to Gazos clay loam, 15 to 30 percent slopes, eroded, but it is steeper and has a slightly thinner profile. It is in areas where ridgetops are narrow and winding. Slopes are dominantly 45 to 50 percent. Depth to underlying bedrock ranges from 20 to 50 inches but is 20 to 36 inches in most places. The plant cover ranges from grass and scattered oaks and Digger pine to moderately thick stands of oaks and pines and areas of brush.

Included with this soil are small to medium-sized outcrops of shale and sandstone and small areas of very thin soils. Also included are small areas of ultrabasic intrusions and rock outcrops and small areas of San Benito and Gaviota soils.

This soil is somewhat excessively drained. Available water holding capacity is 4 to 6 inches. The root zone is moderately deep. Runoff is rapid to very rapid, and the hazard of erosion is severe to very severe.

The soil is used for pasture, watersheds, recreation, and wildlife. Capability unit VIe–5 (15); pasture and range site 5.

Gazos clay loam, 50 to 75 percent slopes, severely eroded (GtG3).—This soil is similar to Gazos clay loam, 15 to 30 percent slopes, eroded, but it is much steeper, has a thinner profile, and is severely eroded. Slopes are dominantly 55 to 60 percent. The underlying bedrock, at an average depth of about 24 inches, is mostly shale and thin layers of sandstone. This soil is covered with brush, is thinly covered with grasses, or is almost bare. Drainage is somewhat excessive. Runoff is very rapid, and the hazard of erosion is very severe. Available water holding capacity is about 2 to 4 inches.

This soil is used for range and for watersheds, wildlife, and recreation. Capability unit VIIe–5 (15); pasture and range site 5.

Gullied Land

Gullied land (GuE) consists of alluvial areas that have been very severely damaged by erosion and gullying (fig. 8). These areas occur around water seeps, in areas of salt and alkali, and where water flowing from the hills concentrates and crosses alluvial areas on its way to a larger stream. Most areas are eroded by water, but in the Bolsa Area damage has been by both water and wind. In most places Gullied land is barren, though there are small areas of thin grass. Siltation is high.

Figure 8.—**Area of Gullied land in Vallecitos Valley, southeastern San Benito County. Most of the damage is caused by runoff from the nearby hills.**

This land is useful for watershed purposes and for range where grazing is restricted. Capability unit VIIe–1 (15); pasture and range site 6.

Hanford Series

The Hanford series consists of well-drained loamy soils that formed in alluvium derived from acid igneous rock. These soils are nearly level to sloping; they occur on flood plains and fans. The vegetation consists of annual grasses and forbs and scattered oaks and Digger pine. A few small areas are in brush. Elevations range from 200 to 2,000 feet above sea level. Annual rainfall is 12 to 16 inches. Average annual temperature is about 60° F., and the frost-free period is about 260 days. The main associated soils are the Sheridan, Auberry, and Salinas.

The surface layer is grayish-brown and dark grayish-brown loam or coarse sandy loam about 20 inches thick. The next layer is grayish-brown loam about 4 inches thick. It is underlain by stratified coarse loamy sand and sandy loam that ranges from 22 to 40 inches. Below this is pale-brown coarse loamy sand.

The Hanford soils are used for irrigated walnuts, pears, sugar beets, tomatoes, and vegetables; for irrigated and dryland wine grapes; and for dryland grain and incidental pasture.

Hanford coarse sandy loam, 0 to 2 percent slopes (HaA).—This soil is nearly level and lies on flood plains along drainageways and in the larger valleys.

Representative profile: North of private road to St. Francis Retreat, 1 mile southeast of San Juan Bautista, 200 yards northeast of race track.

Ap—0 to 8 inches, grayish-brown (10YR 5/2) coarse sandy loam, very dark grayish brown (10YR 3/2) when moist; weak, fine, granular structure; hard when dry, very friable when moist, nonsticky and nonplastic when wet; plentiful very fine and fine roots; few, very fine and fine, interstitial pores; slightly acid; clear, smooth boundary.

A1— 8 to 20 inches, dark grayish-brown (10YR 4/2) coarse sandy loam, very dark grayish brown (10YR 3/2) when moist; weak, coarse, subangular blocky structure; hard when dry, very friable when moist, nonsticky and nonplastic when wet; few very fine and fine roots; few, very fine and fine, interstitial pores; slightly acid; abrupt, smooth boundary.

AC—20 to 26 inches, grayish-brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) when moist; weak, medium, subangular blocky structure; hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; few very fine and fine roots; common, very fine and fine, interstitial pores; 1-inch layer of coarse sand at top of horizon; slightly acid; clear, smooth boundary.

IIC1—26 to 48 inches, grayish-brown (10YR 5/2), stratified, loamy coarse sand and sandy loam, very dark grayish brown (10YR 3/2) when moist; single grain; loose when dry, loose when moist, nonsticky and nonplastic when wet; few very fine and fine roots; slightly acid; clear, smooth boundary.

IIC2—48 to 70 inches, pale-brown (10YR 6/3) loamy coarse sand, dark brown (10YR 3/3) when moist; weak, fine, subangular blocky structure; slightly hard when dry, very friable when moist, nonsticky and nonplastic when wet; slightly acid; clear, smooth boundary.

Included with this soil are some small areas of Salinas soils and some soils that are sandy throughout the profile.

This soil has low to moderate fertility. Available water holding capacity is about 6 to 8 inches. Permeability is rapid, runoff is very slow, and the hazard of erosion is slight to none. The root zone is very deep.

This soil is used for irrigated fruits, nuts, row and field crops and for dryland grain and incidental pasture. Capability units IIs–4 (14) and IIIs–4 (15).

Hanford coarse sandy loam, 2 to 9 percent slopes (HaC).—This soil is similar to Hanford coarse sandy loam, 0 to 2 percent slopes, but it is more sloping and, in most places, is browner. It lies in narrow valleys, on fans, and along the sides of the larger valleys. Slopes are dominantly 3 to 5 percent, but they average 8 percent on small fans and in very narrow valleys. The vegetation is grass, scattered oaks and Digger pine, and brush in some areas. Underlying this soil is stratified material that generally contains lenses of finer textured material and one or more horizons of a buried soil.

Runoff is slow to medium. The hazard of erosion is slight to moderate.

This soil is used for irrigated walnuts and for irrigated and dryland grapes, grain, and incidental pasture. Capability units IIIe–4 (14) and IIIe–1 (15).

Hanford loam, 0 to 2 percent slopes (HfA).—This soil is similar to Hanford coarse sandy loam, 0 to 2 percent slopes, but it has a loam surface layer and, in some places, slightly more water-holding capacity. Available water holding capacity is about 7.5 to 8.5 inches. This soil occurs in narrow areas along drainageways or in small areas in the larger valleys. It is generally grayish brown but ranges toward gray in some places. The underlying material is stratified with lenses of loamy coarse sand to loam.

Included with this soil are small areas of soils that have impeded drainage.

This soil is used for irrigated sugar beets, tomatoes, and vegetables; for irrigated and dryland grapes; and for dryland grain and incidental pasture. Capability units I–1 (14) and IIIc–1 (15).

Hanford loam, 2 to 9 percent slopes (HfC).—This soil is similar to Hanford coarse sandy loam, 0 to 2 percent slopes, but it has a loam surface layer, contains lenses of medium-textured material in the substratum, and is gently sloping to moderately sloping. Areas of this soil are small or medium in size, and they occur in the larger valleys where slopes that extend from the hills tend to become less steep. This soil is generally grayish brown, but it ranges to gray in some places. The underlying material is stratified and generally contains one or more buried horizons. It also contains gravel in some areas.

Included with this soil are a few small areas of soils that have impeded drainage.

Available water holding capacity is 7.5 to 8.5 inches. Runoff is slow to medium, and the hazard of erosion is slight to moderate.

This soil is used for irrigated and dryland grapes and for dryland grain and incidental pasture. Capability units IIe–1 (14) and IIIe–1 (15).

Henneke Series

The Henneke series consists of well-drained to somewhat excessively drained, very gravelly, loamy soils that are underlain by ultrabasic igneous rocks at a depth of 17 to 25 inches. These soils occur in mountainous uplands and are moderately steep to very steep. Most areas are bare or are covered with brush and with a scattered to thin stand of pine. Elevations range from 2,500 to 4,000 feet above sea level. Annual rainfall is 14 to 20 inches. Average annual temperature is about 60° F., and the frost-free period is about 250 days. The main associated soils are the Climara, Gaviota, Montara, and Gazos.

The surface layer is brown fine gravelly loam 3 to 6 inches thick. The subsoil is reddish-brown very gravelly clay loam 6 to 12 inches thick. Generally, a layer of light yellowish-brown gravelly clay loam, 8 to 14 inches thick, occurs between the subsoil and the underlying serpentine bedrock. The amount and size of gravel in the profile vary from place to place.

The Henneke soils are used for range and for watersheds, wildlife, and recreation.

Henneke fine gravelly loam, 15 to 50 percent slopes, eroded (HnF2).—This moderately steep to steep soil is sparsely covered with brush. In most places erosion is moderate, but it is severe in some areas.

Representative profile: On northwest side of road, one-half mile north of Clear Creek, on New Idria Grade; Clear Creek-New Idria Road.

A—0 to 3 inches, brown (7.5YR 5/2) fine gravelly loam, dark brown (7.5YR 3/2) when moist; moderate, fine, granular structure; slightly hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; abundant very fine and fine roots; many, very fine and fine, interstitial pores; slightly acid; clear, wavy boundary.

B2t—3 to 11 inches, reddish-brown (5YR 5/4) very gravelly clay loam, dark reddish brown (5YR 3/4) when moist; moderate, fine, subangular blocky structure; hard when dry, firm when moist, sticky and plastic when wet; abundant very fine and medium roots; many, very fine and fine, interstitial pores; thin patchy clay films on surfaces of peds and sand grains; neutral; gradual, smooth boundary.

C—11 to 25 inches, light yellowish-brown (10YR 6/4) very gravelly clay loam, dark yellowish brown (10YR 4/4) when moist; weak, medium, subangular blocky structure; hard when dry, firm when moist, sticky and plastic when wet; plentiful fine and medium roots; common, very fine, tubular pores, common, very fine and fine, interstitial pores; neutral; gradual, smooth boundary.

R—25 inches, light greenish-gray (5G 7/1), highly weathered, highly fractured, serpentine rock, greenish gray (5G 5/1) when moist.

This soil is covered with a thin layer of fine greenish-gray fragments of serpentine. A thin layer of partly decomposed leaves and twigs occurs in brushy areas.

Included with this soil are some small areas of Climara and Montara soils and of Igneous rock land. Also included are some stony areas and rock outcrops.

This soil has very low fertility. It has a low calcium-magnesium ratio and is deficient in calcium. Available water holding capacity is 2 to 3 inches. Permeability is moderately slow, runoff is rapid to very rapid, and the hazard of erosion is severe to very severe. The root zone extends to a depth of 17 to 25 inches in most places, but it is as deep as 28 inches in some small areas.

This soil is used for range, wildlife, and watersheds. Capability unit VIIe–1 (15); pasture and range site 8.

Henneke soils, 15 to 75 percent slopes, severely eroded (HsG3).—These soils are bare or are covered with brush and scattered Digger and Coulter pines. They are generally brown to reddish brown, but in many places a greenish-gray cast is imparted by the fine serpentine fragments on the surface. Texture ranges from fine gravelly loam to gravelly clay, but it is dominantly fine gravelly loam to fine gravelly clay loam. Included with these soils are rock outcrops that make up as much as 35 percent of some areas.

These soils have very low fertility. Available water holding capacity is 2 to 4 inches. Runoff is rapid to very rapid, and the hazard of erosion is very severe.

These soils are used for wildlife and watersheds. Capability unit VIIIs–1 (15).

Igneous Rock Land

Igneous rock land (IgG) consists dominantly of areas of igneous rock outcrops and of very shallow soils. The outcrops commonly cover 35 to 90 percent of the surface. The plant cover varies. In the southern part of the county, many areas are bare where the rock consists of serpentine and of silica-carbonates. Other areas have a moderately thick cover of brush and scattered Digger and Coulter pines. Areas underlain by granite in the Gabilan Range generally have a thick cover of brush and scattered Digger and Coulter pines. North of Quien Sabe Valley, areas on basic igneous rock generally have a thin cover of grass, brush, and a few scattered oaks. In some places, this land can be used for limited grazing.

This land is excessively drained. It receives low to moderate amounts of silt from other areas.

It is used for watersheds and has limited use for wildlife and recreation. Capability unit VIIIs–1 (15).

Kettleman Series

The Kettleman series consists of well-drained loamy soils that are underlain by calcareous sandstone and shale at a depth of 20 to 60 inches. These soils are strongly sloping to steep and occur in hilly to mountainous uplands. The vegetation is annual grasses and forbs and sparse low brush in some of the steeper, more eroded areas. Elevations range from 1,300 to 2,500 feet above sea level. Annual rainfall is 5 to 10 inches, average annual temperature is about 62° F., and the frost-free period is about 270 days. The main associated soils are the Linne, Nacimiento, and Shedd.

The surface layer is pale-brown loam 10 to 22 inches thick. The next layer is light yellowish-brown loam 15 to 30 inches thick. It overlies soft calcareous sandstone and shale.

The color of these soils ranges from pale brown or brown to light yellowish brown or light brownish gray. The texture ranges from sandy loam to loam, depending on whether the underlying material is sandstone or shale. Texture varies considerably within a short distance because the sandstone and shale are interbedded in many places. Depth to the underlying material ranges from 20 to 60 inches.

Kettleman soils are used for range, watersheds, wildlife, and recreation.

Kettleman loam, 15 to 50 percent slopes, eroded (KeF2).—This soil is moderately steep to steep and lies on rolling hills and side slopes in the uplands. In most areas it is moderately eroded, but a few small areas are severely eroded.

Representative profile: On Ashurst Ranch, by ranch road, 2 miles north of junction of Ashurst oil lease road and New Idria Road.

A11—0 to 10 inches, pale-brown (10YR 6/3) loam, brown (10YR 4/3) when moist; moderate, fine, granular structure; slightly hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; abundant very fine and fine roots; few, very fine and fine, tubular pores, common, very fine and fine, interstitial pores; moderately alkaline, slightly effervescent; gradual, smooth boundary.

A12—10 to 22 inches, pale-brown (10YR 6/3) loam, brown (10YR 4/3) when moist; weak, medium, subangular blocky structure; slightly hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; abundant very fine and fine roots; many, very fine, fine, and medium, tubular pores; moderately alkaline, strongly effervescent; gradual, smooth boundary.

C1—22 to 41 inches, light yellowish-brown (10YR 6/4) loam, dark yellowish brown (10YR 4/4) when moist; weak, coarse, subangular blocky structure; slightly hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; plentiful very fine and fine roots; common, very fine and fine, tubular pores; few fine flecks of lime; moderately alkaline, strongly effervescent; gradual, wavy boundary.

C2—41 to 51 inches, light yellowish-brown (10YR 6/4) loam, dark yellowish brown (10YR 4/4) when moist; weak, medium, subangular blocky structure; slightly hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; few, very fine and fine, tubular pores; few fine flecks of lime; moder-

ately alkaline, violently effervescent; gradual, irregular boundary

C3—51 inches, yellowish-brown (10YR 5/4), highly weathered sandstone that is highly fractured, soft, and calcareous.

Included with this soil are soils that are less than 20 inches deep over bedrock and some small areas of Nacimiento soils.

This soil is moderately fertile. Available water holding capacity is 6 to 8 inches. Permeability is moderate, runoff is rapid to very rapid, and the hazard of erosion is severe to very severe. The root zone extends to a depth of 36 to 48 inches.

This soil is used for range, wildlife, recreation, and watersheds. Capability unit VIIe–1 (15); pasture and range site 9.

Kettleman loam, 5 to 15 percent slopes (KeD).—This soil is similar to Kettleman loam, 15 to 50 percent slopes, eroded, but it is deeper over sandstone or shale bedrock, is less sloping, and is only slightly eroded. It occurs on low, rounded hills in rolling areas, in areas of less sloping soils at the heads of drains, or in upland valleys. In color, this soil ranges from pale brown to light brownish gray.

Included with this soil are some small areas of gravelly soils and soils that have a clay loam surface layer.

Available water holding capacity is about 6 to 10 inches. Runoff is slow to medium, and the hazard of erosion is slight to moderate. The root zone extends to a depth of 36 to 60 inches.

This soil is used for range. Capability unit VIe–1 (15); pasture and range site 9.

Kettleman soils, 15 to 50 percent slopes, eroded (KmF2).—Of this mapping unit, about 70 percent is Kettleman loam, 15 to 50 percent slopes, eroded; 20 percent is an eroded rocky Kettleman loam; and the rest is inclusions. The inclusions are gravelly soils, severely eroded soils less than 20 inches to bedrock, and small areas of Nacimiento soils.

This mapping unit is generally 20 to 30 inches deep over bedrock. It occurs in hilly to mountainous areas. Fertility is low and available water holding capacity is about 3 to 5 inches. Runoff is rapid to very rapid, and the hazard of erosion is severe to very severe.

This mapping unit is used for range, wildlife, watersheds, and recreation. Capability unit VIIe–1 (15); pasture and range site 9.

Landslides

Landslides (LdF) consists of soil that has moved downslope and of the scarred surfaces resulting from this movement (fig. 9). Areas range from a few acres to several hundred acres in size. This land has an uneven or broken surface, and the soil mantle has been so disturbed that soil characteristics are unpredictable. Runoff has increased in some places, and gullies and severe erosion are common, especially around the edges of the slides. Silt production is generally moderate to high, and further slippage is a danger. The material is generally fine textured and ranges from clay loam to clay.

This land has low to moderate fertility. Available water holding capacity ranges from 1 to 6 inches. Runoff is rapid to very rapid, and the hazard of erosion is severe to very severe.

Figure 9.—**An area of Landslides and steep broken land. This area is along the San Benito River, south of Hollister.**

Landslides are used for range and watersheds. Capability unit VIIe–5 (15); pasture and range site 1.

Laniger Series

The Laniger series consists of somewhat excessively drained gravelly loamy soils that are underlain by semiconsolidated rhyolitic conglomerate at a depth of 20 to 48 inches. These soils are steep to very steep and lie on uplands. The vegetation consists mostly of brush, but there are some scattered Digger pine and small areas of annual grasses and forbs. Elevations are from 1,500 to 2,500 feet above sea level. Annual rainfall is about 20 inches. The average annual temperature is about 60° F., and the frost-free period is about 260 days. The main associated soils are the Santa Lucia and Pinnacles.

The surface layer is grayish-brown gravelly sandy loam, 8 to 22 inches thick. The subsoil consists of 12 to 26 inches of very pale brown gravelly coarse sandy loam. Depth to bedrock is 20 to 48 inches. The amount of gravel in the profile varies from place to place.

Laniger soils are used for range, watersheds, wildlife, and recreation.

Laniger gravelly sandy loam, 30 to 75 percent slopes, severely eroded (LaG3).—This soil is steep to very steep and occupies hills with narrow, winding ridgetops. Slopes are dominantly 45 to 60 percent.

Representative profile: On hillside to the narrowest of the junction of State Route 25 and the Pinnacles Road.

A—0 to 11 inches, grayish-brown (10YR 5/2) gravelly sandy loam, very dark grayish brown (10YR 3/2) when moist; weak, fine, granular structure; soft when dry, very friable when moist, nonsticky and nonplastic when wet; plentiful very fine and fine roots; common, very fine and fine, interstitial pores; neutral; gradual, smooth boundary.

B2—11 to 29 inches, very pale-brown (10YR 7/3) gravelly coarse sandy loam, brown (10YR 5/3) when moist; weak, fine, subangular blocky structure; soft when dry, very friable when moist, nonsticky and non-

plastic when wet; few very fine and fine roots; few, fine, interstitial pores; medium acid; gradual, smooth boundary.

R—29 inches +, yellowish-brown (10YR 5/6), coarse-grained, extremely gravelly, semiconsolidated, medium acid conglomerates of the Temblor formation.

Included with this soil are small areas of Santa Lucia and Pinnacles soils and of some soils that have a loamy sand surface layer. Also included are some areas of Landslides and of soils that are less than 20 inches deep over bedrock.

This soil has low fertility. Available water holding capacity is about 1.5 to 4 inches. Permeability is rapid, runoff is rapid to very rapid, and the hazard of erosion is severe to very severe. The root zone is moderately deep to deep.

The soil is used for range, wildlife, watersheds, and recreation. Capability unit VIIe–4 (15); pasture and range site 3.

Linne Series

The Linne series consists of well-drained loamy soils that are underlain by interbedded, soft, calcareous sandstone and shale. These soils are strongly sloping to steep and lie on uplands. The vegetation consists of annual grasses and forbs and scattered oaks in some areas. A few of the more eroded areas have a cover of low brush. Elevations range from 700 to 2,200 feet above sea level. Annual rainfall is 10 to 14 inches. The average annual temperature is about 60° F., and the frost-free period is about 260 days. The main associated soils are the Gaviota, San Benito, Diablo, Kettleman, Shedd, and Nacimiento.

The surface layer is gray clay loam 12 to 24 inches thick. The next layer is light brownish-gray clay loam 12 to 24 inches thick. Olive-gray, soft, calcareous sandstone and shale is at a depth of 24 to 48 inches.

Linne soils are used for dryland grain, pasture, and range.

Linne clay loam, 15 to 30 percent slopes, eroded (LnE2).—This soil is moderately steep and occupies hills or rounded ridges in areas of steeper soil. In most places it is moderately eroded, but a few small areas are severely eroded.

Representative profile: On hillside above ranch road, 2½ miles north of State Route 25 in Bitterwater Valley.

A11—0 to 12 inches, gray (10YR 5/1) clay loam, very dark gray (10YR 3/1) when moist; weak, fine, granular structure; slightly hard when dry, very friable when moist, sticky and plastic when wet; plentiful very fine and fine roots; common, very fine and fine interstitial pores; few fine seams of lime; few fine coatings of lime on ped surfaces; moderately alkaline, violently effervescent; clear, smooth boundary.

A12—12 to 24 inches, gray (10YR 5/1) clay loam, very dark gray (10YR 3/1) when moist; weak, coarse, subangular blocky structure; slightly hard when dry, very friable when moist, sticky and plastic when wet; plentiful very fine and fine roots; common, very fine and few, medium, tubular pores; many fine and medium seams of lime, many, medium, lime coatings on ped surfaces, few, small, soft masses of lime; few small fragments of weathered sandstone; moderately alkaline, violently effervescent; gradual, smooth boundary.

Cca—24 to 38 inches, light brownish-gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) when moist; weak, coarse, subangular blocky structure; slightly hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; few very fine and fine roots; few, very fine and fine, tubular pores, few, very fine and fine, interstitial pores; many fine seams of lime, many, soft, small and medium masses of lime; few small fragments of weathered sandstone; moderately alkaline, violently effervescent; gradual, irregular boundary.

R—38 inches, soft, calcareous, olive-gray shale (5Y 5/2), with few thin beds of soft, medium-grained, calcareous sandstone.

Included with this soil are some small areas of San Benito, Shedd, Kettleman, and Diablo soils.

This soil is moderately fertile. Available water holding capacity is about 5 to 10 inches. Permeability is moderately slow, runoff is rapid, and the hazard of erosion is severe. The root zone is moderately deep to deep.

This soil is used for dryland grain and pasture. Capability unit IVe–5 (15); pasture and range site 1.

Linne clay loam, 9 to 15 percent slopes (LnD).—This soil is similar to Linne clay loam, 15 to 30 percent slopes, eroded, but it is less sloping and is only slightly eroded. It occurs on broad ridges in areas of steeper soils. Runoff is medium, and the hazard of erosion is moderate.

Included with this soil are small areas of Diablo soils in saddles and around drainageways.

This soil is used for dryland grain and pasture. Capability unit IIIe–5 (15); pasture and range site 1.

Linne clay loam, 30 to 50 percent slopes, eroded (LnF2).—This soil is similar to Linne clay loam, 15 to 30 percent slopes, eroded, but it is steeper and has a slightly thinner profile. It is steep and generally occupies hills that have narrow, rounded, winding ridges. Slopes are dominantly 40 to 50 percent.

Included with this soil are small areas of San Benito, Shedd, and Pinnacles soils. Also included are some small Landslides and a few small severely eroded areas.

Available water holding capacity is about 5 to 7 inches. Runoff is rapid to very rapid, and the hazard of erosion is severe to very severe.

The soil is used for dryland pasture. Capability unit VIe–5 (15); pasture and range site 1.

Linne clay loam, 30 to 50 percent slopes, severely eroded (LnF3).—This soil is similar to Linne clay loam, 15 to 30 percent slopes, eroded, but it is steeper, is more eroded, and has a thinner profile. Slopes are dominantly 45 to 50 percent.

Included are some areas of Shedd and Gaviota soils, of shallow soils, and of rock outcrop and Landslides.

This soil has low fertility. Available water holding capacity is about 3 to 5 inches. Runoff is rapid to very rapid, and the hazard of erosion is very severe. The root zone is moderately deep.

This soil is used for range, wildlife, watersheds, and recreation. Capability unit VIIe–5 (15); pasture and range site 1.

Linne-Shedd complex, 15 to 30 percent slopes, eroded (LsE2).—This complex consists of about 60 percent Linne clay loam, 15 to 30 percent slopes, eroded, and 40 percent Shedd loam, 15 to 30 percent slopes, eroded. These soils are severely eroded in some places. These moderately steep soils generally occur on rounded hills. The Linne soil occupies the gentler slopes, areas in saddles and along drainageways, and larger areas on north-facing slopes.

The soils of this complex are covered by grass and some scattered oaks on north-facing slopes. A few areas of Shedd soils have a cover of low brush.

Included with this mapping unit are a few small areas of Diablo soils along drainageways and a few small severely eroded areas.

These soils have moderate fertility. Runoff is rapid, and the hazard of erosion is severe.

Pasture is the main use. Capability unit IVe–5 (15); pasture and range site 7.

Linne-Shedd complex, 30 to 50 percent slopes, eroded (LsF2).—This complex consists of about equal amounts of Linne clay loam, 30 to 50 percent slopes, eroded, and Shedd loam, 30 to 50 percent slopes, eroded. These soils are steep and occur on slopes that have narrow, rounded, winding ridges. Slopes are dominantly about 45 percent but are as steep as 55 percent in a few areas. The Linne soil generally occupies saddles, less sloping drainage areas, and areas on the north-facing slopes. The Shedd soil ranges from 20 to 30 inches in depth to underlying material. It is generally moderately to severely eroded and has a sparse cover of grass and of low brush on the more eroded areas.

The Linne soil is somewhat less eroded and is generally deeper than the Shedd soil. The Linne soil is 24 to 40 inches deep. It has a dense cover of grass.

Included with this complex are a few small areas of Diablo soils and of rock outcrops.

Runoff is rapid to very rapid, and the hazard of erosion is severe to very severe.

These soils are used for pasture and watersheds. Capability unit VIe–5 (15); pasture and range site 7.

Lodo Series

The Lodo series consists of somewhat excessively drained shaly and loamy soils that are underlain by shale bedrock at a depth of 12 to 18 inches. These soils are very steep and lie on uplands. The vegetation consists of annual grasses and forbs and thin stands of oaks and Digger pine. Brush covers a few of the more eroded areas. Elevations range from 1,200 to 2,000 feet above sea level. Annual rainfall is 12 to 16 inches. The average annual temperature is about 60° F., and the frost-free period is about 250 days. The main associated soils are the Linne, Gazos, San Benito, and Shedd.

The surface layer is gray shaly loam about 12 to 18 inches thick over fractured bedrock. Grayish-brown loam is in the fractures. These soils range from slightly acid to mildly alkaline, and the shale is slightly calcareous in a few areas.

Lodo soils are used for range, watersheds, recreation, and wildlife.

Lodo shaly loam, 50 to 75 percent slopes, eroded (LtG2).—This soil is very steep and occurs on ridges that have narrow tops. It is dominantly moderately eroded but is severely eroded in some areas.

Representative profile: On ranch road, on hillside, 300 yards south of State Route 25; in lower Bitterwater Valley.

A11—0 to 4 inches, gray (10YR 5/1) shaly loam, very dark grayish brown (10YR 3/2) when moist; moderate, fine, granular structure; slightly hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; plentiful very fine and fine roots; common, very fine, tubular pores, common, fine, interstitial pores; slightly acid; clear, smooth boundary.

A12—4 to 14 inches, gray (10YR 5/1) shaly loam, very dark grayish brown (10YR 3/2) when moist; weak, medium, subangular blocky structure; slightly hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; abundant very fine and fine roots; many, very fine and fine, tubular pores, common, fine and medium, interstitial pores; slightly acid; gradual, smooth boundary.

R—14 inches, fractured, acid, moderately hard shale with grayish brown (10YR 5/2) loam in the cracks.

Included with this soil are some small areas of Gazos, Shedd, and Linne soils. Also included are some small Landslides, outcrops of shale, and severely eroded areas.

This soil has low fertility. Available water holding capacity is about 1 to 2 inches. Permeability is moderately rapid, runoff is very rapid, and the hazard of erosion is very severe.

The soil is used for range, watersheds, recreation, and wildlife. Capability unit VIIe–1 (15); pasture and range site 5.

Los Banos Series

The Los Banos series consists of well-drained clay loam soils that are underlain by gravelly semiconsolidated alluvium and lakebed clays. These soils are gently sloping to steep and occupy terraces and fans. The vegetation consists of annual grasses and forbs. Elevations range from 1,200 to 2,000 feet above sea level. Annual rainfall ranges from 5 to 8 inches. The average annual temperature is about 62° F., and the frost-free period is about 260 days. The main associated soils are the Kettleman, Panoche, and Panhill.

The surface layer is brown or reddish-brown clay loam 10 to 16 inches thick. The subsoil is reddish-brown clay that ranges from 10 to 32 inches in thickness. The underlying semiconsolidated terrace deposits occur at a depth of 20 to 48 inches. Lakebed clays underlie the terrace deposits at a depth of 4 to 30 feet. These soils are gravelly throughout the profile in some places.

Los Banos soils are used for range, watersheds, wildlife, and recreation.

Los Banos clay loam, 9 to 15 percent slopes, eroded (LuD2).—This soil occurs on high terraces or along drainageways. It is severely eroded in some areas.

Representative profile: 400 yards north of Little Panoche Road; by sheep camp.

A11—0 to 5 inches, brown (7.5YR 5/4) clay loam, dark brown (7.5YR 4/4) when moist; strong, fine, subangular blocky structure; hard when dry, firm when moist, sticky and plastic when wet; abundant very fine and fine roots; few, very fine and fine, tubular pores; mildly alkaline; gradual, smooth boundary.

A12—5 to 13 inches, brown (7.5YR 5/4) clay loam, dark brown (7.5YR 4/4) when moist; strong, medium, subangular blocky structure; hard when dry, firm when moist, sticky and plastic when wet; abundant very fine and fine roots; common, very fine and fine, tubular pores; mildly alkaline; gradual, smooth boundary.

B2t—13 to 23 inches, reddish-brown (5YR 5/4) clay, reddish brown (5YR 4/4) when moist; strong, fine, angular blocky structure; very hard when dry, very firm when moist, very sticky and very plastic when wet;

plentiful very fine and fine roots; few, very fine and fine, tubular pores; roots oriented along ped surfaces; thin patchy clay films on ped surfaces; few fine slickensides; few fine pebbles; moderately alkaline, strongly effervescent; gradual, smooth boundary.

IIC—23 inches, mixture of semiconsolidated calcareous sand, gravel, and clay; very dense and compact.

Included with this soil are soils that are less than 20 inches deep over the semiconsolidated substratum. Also included are some small areas of Panhill and Panoche soils and some soils that have a clay surface layer.

This soil has low to moderate fertility. Available water holding capacity is 4 to 6 inches. Permeability is slow, runoff is medium to rapid, and the hazard of erosion is moderate to severe. The root zone is moderately deep.

This soil is used for range. Capability unit VIIe–1 (15); pasture and range site 10.

Los Banos clay loam, 2 to 9 percent slopes (LuC).—This soil is similar to Los Banos clay loam, 9 to 15 percent slopes, eroded, but it is less sloping, is only slightly eroded, and has a slightly thicker profile. It is gently sloping to moderately sloping and occurs on long, broad, high terraces or on long, broad fans. Slopes are dominantly between 4 and 6 percent. This soil is slightly eroded, but some areas along old drainageways are moderately eroded. Depth to the semiconsolidated substratum ranges from 20 to 48 inches but averages 30 to 48 inches in most places. Threads of lime occur in many pores and cracks in the subsoil. A few areas have gravel throughout the profile.

Included with this soil are some small areas of Panhill and Panoche soils and of soils that are calcareous throughout.

Available water holding capacity is 5 to 8 inches. Runoff is slow to medium, and the hazard of erosion is slight to moderate. The root zone is moderately deep to deep.

This soil is used for range. Capability unit VIIe–1 (15); pasture and range site 10.

Los Banos clay loam, 15 to 50 percent slopes, severely eroded (LuF3).—This soil is similar to Los Banos clay loam, 9 to 15 percent slopes, eroded, but it has a thinner profile, is steeper, and is more eroded. It occurs on rounded hills or on side slopes in areas of gently sloping soils. Slopes are dominantly 35 to 45 percent. Drainage patterns are deeply incised.

Included with this soil are areas that have less clay in the subsoil, areas truncated by erosion, areas where the underlying material is exposed, and soils that are shallow.

This soil has low fertility. Available water holding capacity is about 3 to 5 inches. Runoff is rapid to very rapid, and the hazard of erosion is severe to very severe. The root zone is moderately deep.

This soil is used for range. Capability unit VIIe–1 (15); pasture and range site 9.

Los Gatos Series

The Los Gatos series consists of well-drained loamy soils that are underlain by moderately hard sandstone at a depth of 20 to 56 inches. These soils are moderately steep to steep and slightly eroded to moderately eroded. They are on uplands. The vegetation consists of annual grasses and forbs and of scattered to moderately thick stands of oaks on some north-facing slopes. Brush grows on a few of the more eroded areas. Elevations range from 300 to 1,200 feet above sea level. Annual rainfall is about 20 inches. The average annual temperature is about 57° F., and the frost-free period is about 260 days. The main associated soils are the Pinto, Soper, Sween, and San Benito.

The surface layer is brown to grayish-brown clay loam or rocky clay loam, 6 to 16 inches thick. The subsoil is brown clay loam 8 to 16 inches thick. The substratum is brownish-yellow clay loam that is 6 to 24 inches thick and is underlain by sandstone bedrock. Depth to sandstone is 20 to 56 inches in most places.

Los Gatos soils are used for dryland grain and pasture.

Los Gatos clay loam, 15 to 30 percent slopes (LvE).—This soil is moderately steep and occurs on rounded hills or on ridges and benches.

Representative profile: On hillside above pond, on Nyland Ranch, 400 yards northeast of State Route 156.

A1—0 to 13 inches, dark-brown (10YR 4/3) clay loam, dark brown (10YR 3/3) when moist; moderate, fine, granular structure; hard when dry, friable when moist, slightly sticky and slightly plastic when wet; abundant very fine and fine roots; common, very fine, tubular pores, common, fine and medium, interstitial pores; medium acid; gradual, smooth boundary.

B2t—13 to 25 inches, brown (7.5YR 5/4) clay loam, dark brown (7.5YR 4/4) when moist; weak, medium, subangular blocky structure; hard when dry, firm when moist, sticky and plastic when wet; few very fine and fine roots; common, very fine and fine, tubular pores; common stains of material from the A horizon on ped surfaces; some material from A horizon in larger pores; thin continuous clay films on surfaces of peds and larger pores; medium acid; clear, smooth boundary.

C—25 to 42 inches, brownish-yellow (10YR 6/6) clay loam, yellowish brown (10YR 5/6) when moist; moderate, fine, angular blocky structure; hard when dry, firm when moist, slightly sticky and slightly plastic when wet; few very fine and fine roots; common, very fine and fine, tubular pores; many small fragments of sandstone; slightly acid; gradual, wavy boundary.

R—42 inches, moderately hard, weathered, fine-grained, acid, yellowish-brown sandstone.

Included with this soil are some small areas of San Benito and Sween soils, of soil that have a clay surface layer, and of soils that have more or less clay in the subsoil than Los Gatos soils.

This soil is moderately fertile. Available water holding capacity is 4 to 8 inches. Permeability is moderately slow, runoff is medium to rapid, and the hazard of erosion is moderate to severe. The root zone is moderately deep to deep.

This soil is used for dryland grain and pasture. Capability unit IVe–5 (15); pasture and range site 5.

Los Gatos clay loam, 30 to 50 percent slopes, eroded (LvF2).—This soil is similar to Los Gatos clay loam, 15 to 30 percent slopes, but it is steeper and more eroded. The average slope is about 45 percent. This soil has a brown surface layer in most places but ranges to grayish brown on north-facing slopes.

Included with this soil are small severely eroded areas, small gullied areas, a few rock outcrops, and small areas of San Benito, Sween, and Cotati soils. Also included are some soils that have more clay in the subsoil than Los Gatos soils.

Runoff is rapid to very rapid, and the hazard of erosion is severe to very severe. Available water holding capacity is 5 to 7 inches. The root zone extends to a depth of about 30 to 40 inches.

This soil is used for dryland pasture. Capability unit VIe–5 (15); pasture and range site 5.

Los Gatos rocky clay loam, 15 to 50 percent slopes, eroded (LwF2).—This soil is similar to Los Gatos clay loam, 15 to 30 percent slopes, but it is steeper, is eroded, has a thinner profile, and has 2 to 10 percent rock outcrops. It is moderately deep over sandstone. In most places it is moderately eroded, but it is severely eroded in some small areas. Slopes are dominantly 45 to 50 percent.

Included with this soil are some soils that are less than 20 inches deep over bedrock and some outcrops of sandstone that make up more than 10 percent of the area. Also included are some small areas of Gaviota and San Benito soils.

The root zone of this soil extends to a depth of 20 to 30 inches. Available water holding capacity is about 3 to 5 inches. Runoff is rapid to very rapid, and the hazard of erosion is severe to very severe.

This soil is used mostly for dryland pasture but is also used for watersheds, wildlife, and recreation. Capability unit VIs–5 (15); pasture and range site 5.

Metz Series

The Metz series consists of somewhat excessively drained sandy loams that are underlain by stratified, calcareous sand and gravel at a depth of 36 to 48 inches. These soils are nearly level to moderately sloping and occur on flood plains along the major drainageways. The vegetation consists chiefly of annual grasses and forbs, brush, and willows. Elevations range from 120 to 1,000 feet above sea level. Annual rainfall is 12 to 14 inches. The average annual temperature is about 60° F., and the frost-free period is about 260 days. The main associated soils are the Mocho and Sorrento.

The surface layer is grayish-brown sandy loam or gravelly sandy loam, 10 to 16 inches thick. The next layer is light brownish-gray sand 26 to 40 inches thick. Below this is stratified sandy and gravelly alluvium that extends to a depth of more than 5 feet. The amount of gravel in the profile varies.

Metz soils are used for irrigated apricots, walnuts, tomatoes, potatoes, and other vegetables and for dryland grain and incidental pasture.

Metz sandy loam, 0 to 2 percent slopes (MeA).—This soil occurs along the major drainageways. It is occasionally flooded.

Representative profile: On San Juan Farms; in young orchard, 300 yards past end of Flint Road; on first bottom.

Ap—0 to 8 inches, grayish-brown (2.5Y 5/2) sandy loam, very dark grayish brown (2.5Y 3/2) when moist; weak, fine, granular structure; soft when dry, very friable when moist, nonsticky and nonplastic when wet; few very fine and fine roots; few, very fine and fine, tubular pores; mildly alkaline, slightly effervescent; clear, smooth boundary.

A1—8 to 14 inches, grayish-brown (2.5Y 5/2) sandy loam, very dark grayish brown (2.5Y 3/2) when moist; weak, fine, subangular blocky structure; soft when dry, very friable when moist, nonsticky and nonplastic when wet; few very fine and fine roots; few, very fine and fine, interstitial pores; moderately alkaline, slightly effervescent; clear, wavy boundary.

C1—14 to 43 inches, light brownish-gray (2.5Y 6/2) sand, grayish brown (2.5Y 5/2) when moist; single grain; loose when dry or moist, nonsticky and nonplastic when wet; mildly alkaline, slightly effervescent; abrupt, smooth boundary.

C2—43 to 60 inches, light brownish-gray (2.5Y 6/2) stratified coarse sand and gravel, grayish brown (2.5Y 5/2) when moist; single grain; loose when dry or moist, nonsticky and nonplastic when wet; contains small lenses of silt and clay; mildly alkaline, slightly effervescent.

Included with this soil are small areas of Sorrento and Mocho soils.

This soil has low fertility. Available water holding capacity is about 5 to 6 inches. Permeability is rapid, runoff is very slow, and the hazard of erosion is slight to none. The root zone is very deep.

This soil is used for irrigated fruits, nuts, vegetables, row crops, field crops, dryland grain, and incidental pasture. Capability units IIs–4 (14) and IIIs–4 (15).

Metz gravelly sandy loam, 0 to 2 percent slopes (MgA).—This soil is similar to Metz sandy loam, 0 to 2 percent slopes, but its surface layer is gravelly. It occurs on first bottoms along large drainageways, and it is occasionally flooded.

Fine to medium gravel makes up 15 percent or more of the surface layer. Layers of gravel are also in the stratified material that underlies the surface layer. Available water holding capacity of this soil is 4 to 5 inches.

Included with this soil are areas that have a surface layer ranging from gravelly coarse sandy loam to gravelly loamy sand.

This soil is used for irrigated apricots, walnuts, tomatoes, and vegetables. Capability unit IIIs–4 (14).

Metz gravelly sandy loam, 2 to 9 percent slopes (MgC).—This soil is more sloping than Metz sandy loam, 0 to 2 percent slopes, and is gravelly throughout the profile. Fine to medium gravel makes up 15 percent or more of the profile. It occupies small areas along the large drainageways, and it is occasionally flooded. Slopes average 3 to 6 percent.

Included with this soil are areas that have a surface layer ranging from gravelly coarse sandy loam to gravelly loamy sand. Available water holding capacity is 3 to 4 inches. Runoff is slow to medium. The hazard of erosion is slight to moderate.

This soil is used for dryland grain and incidental pasture. Capability unit IIIe–4 (14).

Metz Series, Wet Variant

A wet variant from the Metz series has been mapped in this county. It formed in alluvium from a wide range of rocks and is very deep and somewhat poorly drained. This soil is nearly level; it lies on fans along Pacheco Creek. Elevations range from 120 to 150 feet above sea level. Annual rainfall is 12 to 14 inches. The average annual temperature is about 60° F., and the frost-free period is about 260 days. The main associated soils are the Metz, Mocho, and Sorrento.

The surface layer is pale-brown sandy loam 10 to 18 inches thick. The next layer, 22 to 30 inches thick, is light

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brownish-gray to pale-brown loamy sand to loamy fine sand that is mottled in the lower part. This material is stratified, and it contains thin layers of fine textured material in some places. Below this is the surface horizon of a buried soil that extends to a depth of more than 60 inches. Because this variant is flooded occasionally, it is covered with a thin overwash of variable texture. Also it contains a few pebbles throughout the profile.

This soil is used for irrigated fruits, nuts, and row crops.

Metz sandy loam, wet variant, 0 to 2 percent slopes (MhA).—This nearly level soil occurs on fans along Pacheco Creek. It is flooded occasionally and receives deposits of sediment.

Representative profile: Three-quarters mile west on Lovers Lane, north of Pacheco Creek; 200 feet from the end of the levee.

Ap—0 to 9 inches, pale-brown (10YR 6/3) sandy loam, very dark grayish brown (10YR 3/2) when moist; weak, fine, granular structure; slightly hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; plentiful fine to medium roots; common, medium, interstitial pores; mildly alkaline clear, smooth boundary.

A1—9 to 18 inches, pale-brown (10YR 6/3) sandy loam, very dark grayish brown (10YR 3/2) when moist; massive; slightly hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; plentiful fine to medium roots; common, medium, interstitial pores; mildly alkaline; clear, smooth boundary.

C1—18 to 24 inches, light brownish-gray (10YR 6/2) loamy sand, dark grayish brown (10YR 4/2) when moist; single grain; loose when dry or moist, nonsticky and nonplastic when wet; plentiful fine to medium roots; moderately alkaline; clear, smooth boundary.

C2—24 to 50 inches, light brownish-gray (10YR 6/2) loamy fine sand, brown (10YR 4/3) when moist; massive; soft when dry, very friable when moist, nonsticky and nonplastic when wet; few medium roots; few, fine, prominent mottles of strong brown to reddish yellow (7.5YR 5/6 to 7/6); slightly calcareous; moderately alkaline; clear, smooth boundary.

IIAbg—50 to 60 inches, gray (10YR 5/1) loam, dark gray (10YR 4/1) when moist; weak, medium, subangular blocky structure; slightly hard when dry, friable when moist, slightly sticky and slightly plastic when wet; common, fine, prominent mottles of reddish brown to dark reddish brown (5YR 5/4 to 3/4); strongly calcareous, moderately alkaline.

This soil has low fertility. Available water holding capacity is about 5 to 6 inches. Permeability is rapid, runoff is very slow, and the hazard of erosion is slight to none. The root zone is very deep.

This soil is used for irrigated fruits, nuts, and row crops. Capability unit IIw–2 (14).

Mine Pits and Dumps

Mine pits and dumps (MnG) consists of limestone, marble, and granite quarries; sand and gravel pits; open-pit and deep shaft mines; and dumps of waste materials. The areas are generally bare, but a few of the older quarries have a thin cover of grass and forbs. Drainage is generally excessive, runoff is rapid, and silt production is high. Capability unit VIIIs–1 (15).

Mocho Series

The Mocho series consists of well-drained loamy soils that formed in stratified, calcareous alluvium washed from sedimentary rocks. These soils are nearly level to sloping and occupy flood plains along the larger drainageways. The vegetation consists of annual grasses and forbs and scattered oaks. Elevations range from 120 to 1,000 feet above sea level. Annual rainfall is 12 to 16 inches. The average annual temperature is about 60° F., and the frost-free period is about 275 days. The main associated soils are the Metz and Sorrento.

The surface layer is grayish-brown loam about 18 inches thick. It is loam, gravelly loam, sandy loam, or clay loam. The next layer, 36 to 60 inches thick, is light brownish-gray loam and fine sandy loam. Beneath this, at a depth greater than 60 inches, is stratified calcareous sand, gravel, and finer textured materials.

Mocho soils are used for irrigated fruits, nuts, row crops, and field crops and for dryland grain and incidental pasture.

Mocho loam, 0 to 2 percent slopes (MpA).—This soil occurs on fans and along major drainageways. It is subject to occasional flooding in some areas.

Representative profile: 200 yards to west of right angle bend in Cienega Road, 1 mile south of the junction of the Cienega Road and old State Route 25.

Ap—0 to 11 inches, grayish-brown (2.5Y 5/2) loam, very dark grayish brown (2.5Y 3/2) when moist; moderate, fine, granular structure; slightly hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; plentiful very fine and fine roots; common, fine and medium, interstitial pores; moderately alkaline, slightly effervescent; clear, smooth boundary.

A1—11 to 18 inches, grayish-brown (2.5Y 5/2) loam, very dark grayish brown (2.5Y 3/2) when moist; weak, medium, subangular blocky structure; slightly hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; plentiful very fine and fine roots; common, very fine and fine, tubular pores; moderately alkaline, strongly effervescent; clear, smooth boundary.

C1—18 to 29 inches, light brownish-gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) when moist; weak, medium, subangular blocky structure; slightly hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; few very fine and fine roots; many, very fine and fine, tubular pores; stratified, small, sand pockets; moderately alkaline, strongly effervescent; clear, wavy boundary.

IIC2—29 to 72 inches, light brownish-gray (2.5Y 6/2) fine sandy loam, dark grayish brown (2.5Y 4/2) when moist; weak, medium, subangular blocky structure; slightly hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; few fine roots; common, very fine and fine, tubular pores; stratified thin layers of sand and lenses of fine material with brown decayed organic material between strata; moderately alkaline, strongly effervescent; gradual, wavy boundary.

Included with this soil are some small areas of Sorrento soils and of clayey soils.

This soil is fertile. Available water holding capacity is 8 to 10 inches. Permeability is moderate, runoff is very slow, and the hazard of erosion is none to slight. The root zone is very deep.

This soil is used for irrigated apricots, prunes, walnuts, alfalfa, sugar beets, potatoes, tomatoes, and other vegetables and for dryland grain and incidental pasture. Capability units I–1 (14) and IIIc–1 (15).

Mocho loam, 2 to 9 percent slopes (MpC).—This soil is similar to Mocho loam, 0 to 2 percent slopes, but it is more sloping. Slopes dominantly are 3 to 5 percent. Areas along major drainageways are occasionally flooded. A few fine to medium pebbles occur in the profile. Gravelly layers occur in the underlying material.

Included with this soil are a few areas that have a surface layer ranging from silt loam to light clay loam. Also included are small moderately eroded areas. Runoff is slow to medium, and the hazard of erosion is slight to moderate.

This soil is used for irrigated prunes, apricots, walnuts, grapes, alfalfa, sugar beets, and vegetables and for dryland grain and incidental pasture. Capability units IIe–1 (14) and IIIe–1 (15).

Mocho gravelly loam, 2 to 5 percent slopes (MrB).—This soil is similar to Mocho loam, 0 to 2 percent slopes, but it is more sloping and is gravelly throughout the profile. The content of gravel is generally 20 percent or more by volume.

Included are areas that have a surface layer ranging from gravelly silt loam to gravelly clay loam.

Available water holding capacity is about 8 inches. Runoff is slow, permeability is moderately rapid, and the hazard of erosion is slight.

This soil is used for irrigated walnuts, apricots, and alfalfa, and for dryland grain and incidental pasture. Capability unit IIe–1 (14).

Mocho clay loam, 2 to 9 percent slopes (MsC).—This soil is similar to Mocho loam, 0 to 2 percent slopes, but it is more sloping and is finer textured throughout the profile. Slopes generally range from 3 to 6 percent. Generally the underlying material is finer textured than normal for the series and ranges from loam to silty clay loam. Most areas of this soil are not subject to flooding.

Included with this soil are small areas that have a clay or silty clay loam surface layer.

Available water holding capacity is about 10 to 12 inches. Permeability is moderately slow. Runoff is slow to medium, and the hazard of erosion is slight to moderate.

This soil is used for irrigated grapes and alfalfa and for dryland grain and incidental pasture. Capability units IIe–5 (14) and IIIe–5 (15).

Mocho sandy loam, 0 to 2 percent slopes (MoA).—This soil is similar to Mocho loam, 0 to 2 percent slopes, but it has a sandy loam surface layer. It occurs on high first bottoms and is seldom flooded. It contains a few fine to medium pebbles and has gravelly layers in the underlying material generally below a depth of 50 inches. Available water holding capacity is about 9 inches. Permeability is moderately rapid.

This soil is used for irrigated fruits, nuts, and vegetables and for dryland grain and incidental pasture. Capability units I–1 (14) and IIIc–1 (15).

Mocho sandy loam, 2 to 9 percent slopes (MoC).—This soil is similar to Mocho loam, 0 to 2 percent slopes, but it has a sandy loam surface layer and is more sloping. It occurs as small areas along major drainageways. Slopes are dominantly 3 to 6 percent. Many areas are high enough to escape flooding, but some areas are subject to occasional flooding. In some places water concentrated on the surrounding hills has cut rills and gullies through this soil. The soil contains a few fine to medium pebbles, and the underlying material contains gravelly layers in some places.

Available water holding capacity is about 9 inches. Permeability is moderately rapid, runoff is medium, and the hazard of erosion is moderate.

This soil is used for irrigated alfalfa and for dryland grains and incidental pasture. Capability units IIe–1 (14) and IIIe–1 (15).

Montara Series

The Montara series consists of somewhat excessively drained loamy soils that are underlain by serpentine or serpentinized bedrock at a depth of 4 to 20 inches. These soils occupy hilly and mountainous uplands and are moderately steep to steep. The vegetation consists of annual grasses and forbs or brush and scattered oaks and Digger pine. Elevations range from 800 to 3,000 feet above sea level. Annual rainfall is 12 to 16 inches. Average annual temperature is about 60° F., and the frost-free period is about 250 days. The main associated soils are the Cibo, Diablo, Gazos, San Benito, Vallecitos, and Climara.

The surface layer is gray rocky silty clay loam 4 to 20 inches thick. In most places it is 10 to 18 inches thick. The underlying bedrock is weathered, fractured, serpentine and serpentinized rocks. Bedrock outcrops cover 2 to 10 percent of the area.

Montara soils are used for range and watersheds, wildlife, and recreation.

Montara rocky silty clay loam, 15 to 50 percent slopes, eroded (MtF2).—This soil is moderately steep to steep and occurs in the uplands. Rocks crop out in 2 to 10 percent of the areas.

Representative profile: North of the Panoche Valley Road, one-half mile northeast of Emmet School.

A11—0 to 7 inches, gray (5Y 5/1) rocky silty clay loam, very dark gray (5Y 3/1) when moist; strong, fine, granular structure; hard when dry, friable when moist, sticky and plastic when wet; abundant very fine and fine roots; common, fine and medium, interstitial pores; neutral; clear, smooth boundary.

A12—7 to 12 inches, gray (5Y 5/1) silty clay loam, very dark gray (5Y 3/1) when moist; weak, medium, subangular blocky structure; hard when dry, friable when moist, sticky and plastic when wet; few very fine and fine roots; few, very fine and medium, tubular pores, common, fine and medium, interstitial pores; mildly alkaline, slightly effervescent; clear, wavy boundary.

R—12 inches, highly weathered, highly fractured, greenish-gray (5G 6/1) serpentine; lime coatings on fragments.

Included with this soil are small areas of Cibo and Climara soils and of severely eroded areas.

This soil has low fertility, is deficient in calcium, and has a low calcium-magnesium ratio. Available water holding capacity is 1 to 3 inches. Permeability is moderately slow, runoff is rapid to very rapid, and the hazard of erosion is severe to very severe. The root zone is shallow over bedrock.

The soil is used for range. Capability unit VIIs–9 (15); pasture and range site 8.

Nacimiento Series

The Nacimiento series consists of well-drained loamy soils that are underlain by calcareous sandstone and shale. These soils occupy hilly and mountainous uplands and are strongly sloping to very steep. The vegetation consists of annual grasses, forbs, and scattered oaks. Brush grows on the more eroded slopes. Elevations range from 1,200 to 3,000 feet above sea level. Annual rainfall is 12 to 16 inches. Average annual temperature is about 60° F., and the frost-free period is about 260 days.

The surface layer is brown to yellowish-brown clay loam to loam 10 to 20 inches thick. The next layer is pale-brown to light yellowish-brown clay loam that averages 10 to 40 inches in thickness. Below this is weathered, yellowish-brown, calcareous, medium-grained sandstone and shale. Depth to sandstone and shale ranges from 20 to 60 inches.

Nacimiento soils are used for dryland grain and pasture and for range.

Nacimiento clay loam, 30 to 50 percent slopes, eroded (NaF2).—This steep soil occurs on hills with narrow, winding ridgetops. In most places it is moderately eroded, but it is severely eroded in a few small areas.

Representative profile: On hillside to west of State Route 25, about 2 miles south of Topo Valley.

A1—0 to 13 inches, brown (10YR 5/3) clay loam, dark brown (10YR 3/3) when moist; moderate, fine, granular structure; slightly hard when dry, very friable when moist, sticky and plastic when wet; plentiful very fine and fine roots; common, very fine and fine, interstitial pores; moderately alkaline, strongly effervescent; gradual, smooth boundary.

C1ca—13 to 24 inches, pale-brown (10YR 6/3) clay loam, brown (10YR 4/3) when moist; weak, medium, subangular blocky structure; slightly hard when dry, very friable when moist, sticky and plastic when wet; few very fine and fine roots; few, very fine, tubular pores, common, very fine and fine, interstitial pores; many, fine and medium, lime seams and coatings on ped surfaces and in larger pores; moderately alkaline, violently effervescent; gradual, smooth boundary.

C2ca—24 to 40 inches, light yellowish-brown (10YR 6/4) clay loam, dark yellowish brown (10YR 4/4) when moist; weak subangular blocky structure; slightly hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; few very fine and fine roots; common, fine and medium, interstitial pores; many, fine and medium, lime seams and coatings on ped surfaces and in larger pores, few, small, soft masses of lime; moderately alkaline, violently effervescent; gradual, wavy boundary.

C3—40 to 60 inches, highly weathered, highly calcareous, yellowish-brown (10YR 5/6), medium-grained sandstone and shale.

Included with this soil are some small areas of Kettleman and San Benito soils. Also included are some rock outcrops and Landslides.

This soil is moderately fertile. Available water holding capacity is about 5 to 8 inches. Permeability is moderately slow, runoff is rapid to very rapid, and the hazard of erosion is severe to very severe. Depth to bedrock is 20 to 48 inches.

This soil is used for dryland pasture and for watersheds and wildlife. Capability unit VIe–5 (15); pasture and range site 1.

Nacimiento clay loam, 9 to 15 percent slopes (NaD).—This soil is similar to Nacimiento clay loam, 30 to 50 percent slopes, eroded, but it is less sloping, is not eroded or is only slightly eroded, and is deeper over bedrock. Depth to bedrock is 40 to 60 inches. This soil occurs on small upland benches, on broad ridges, or on toe slopes in areas of moderately steep to very steep soils. It is generally grayish brown and is only slightly calcareous in the surface layer.

Available water holding capacity is 8 to 10 inches. Runoff is medium, and the hazard of erosion is moderate. The root zone is deep.

This soil is used for dryland grain and pasture. Capability unit IIIe–5 (15); pasture and range site 1.

Nacimiento clay loam, 15 to 30 percent slopes (NaE).—The soil is similar to Nacimiento clay loam, 30 to 50 percent slopes, eroded, but it is less sloping and is only slightly eroded. It occurs on hills or on broad rounded ridgetops in areas of steep and very steep soils. Runoff is medium to rapid, and the hazard of erosion is moderate to severe.

Included with this soil are small areas of soils that have a clay surface layer.

This soil is used mostly for dryland pasture. Capability unit IVe–5 (15); pasture and range site 1.

Nacimiento clay loam, 50 to 75 percent slopes, eroded (NaG2).—This soil is similar to Nacimiento clay loam, 30 to 50 percent slopes, eroded, but it is steeper and is shallower over bedrock. Depth to bedrock is 20 to 30 inches. This soil is very steep and occupies mountainous areas or breaks in areas of moderately steep or steep soils. Slopes are dominantly between 55 and 60 percent.

Outcrops of sandstone and shale are commonly included and make up as much as 15 percent of the surface. Also included are small Landslides, Sedimentary rock land, areas of very thin soils, and small areas of San Benito and Linne soils. Other inclusions are severely eroded areas and soils that have a surface layer ranging from sandy clay loam to loam. Available water holding capacity is about 4 to 5 inches.

Runoff is very rapid, and the hazard of erosion is very severe. The root zone is moderately deep.

This soil is used for range and for watersheds, wildlife, and recreation. Capability unit VIIe–5 (15); pasture and range site 1.

Nacimiento loam, 30 to 75 percent slopes, severely eroded (NcG3).—The surface layer of this loam ranges from grayish brown to yellowish brown but is brown to yellowish brown in areas where the underlying material has been exposed. Reaction ranges from neutral to moderately alkaline, depending on the content of lime in the underlying material, but most areas are moderately alkaline and calcareous. Slopes are dominantly 45 to 60 percent. A moderate to large amount of silt is washed from this severely eroded soil.

Included with this soil are some areas of rock outcrops and some large and small Landslides. Also included are small areas of soils deeper than this Nacimiento soil and areas of Nacimiento soils that have a surface layer as fine textured as light clay loam.

This soil has low fertility. Available water holding capacity is 2 to 3 inches. Runoff is rapid to very rapid, and the hazard of erosion is severe to very severe.

This soil is used for watersheds, wildlife, and recreation. Capability unit VIIIe–1 (15).

Pacheco Series

The Pacheco series consists of somewhat poorly drained, loamy soils that are underlain by stratified alluvium at depths greater than 50 inches. These soils are nearly level and occupy low flood plains or fans. Areas along the major drainageways are subject to occasional flooding and deposition. The vegetation consists mainly of annual grasses and forbs, but some cottonwoods and willows grow along drainageways. Elevations range from 150 to 400 feet above sea level. Annual rainfall is 12 to 14 inches. Average annual temperature is about 60° F., and the frost-free period is about 260 days. The main associated soils are the Clear Lake, Sorrento, and Willows.

The surface layer is dark-gray to grayish-brown silt loam, loam, clay loam, or silty clay 20 to 24 inches thick. The subsoil is grayish-brown to light brownish-gray clay loam that ranges from 12 to 20 inches in thickness. In places the subsoil and the substratum are mottled. The substratum is brown to yellowish-brown clay loam that is generally stratified below a depth of 50 inches. It ranges from clay loam to silt loam and contains lenses of loamy sand and gravel in some places. Most areas have a water table that is seasonally high and is within a depth of 36 to more than 60 inches. Some areas are moderately to severely affected by alkali.

Pacheco soils are used for irrigated walnuts, prunes, pears, sugar beets, tomatoes, vegetables, and alfalfa and for dryland grain and pasture.

Pacheco silt loam (0 to 2 percent slopes) (Pa).—This soil occurs on nearly level flood plains.

Representative profile: On Sabbatini Ranch, in alfalfa field, 60 yards to the rear (north) of Pacheco School, on the northwest corner of Shore Road and Lovers Lane.

Ap—0 to 9 inches, dark-gray (10YR 4/1) silt loam, very dark gray (10YR 3/1) when moist; moderate, fine, granular structure; hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; abundant very fine and fine roots; common, very fine and fine, tubular pores, common, fine, interstitial pores; moderately alkaline; clear, smooth boundary.

A1—9 to 20 inches, dark-gray (10YR 4/1) silt loam, very dark gray (10YR 3/1) when moist; moderate, medium, subangular blocky structure; hard when dry, friable when moist, slightly sticky and slightly plastic when wet; abundant very fine and fine roots; common, very fine and fine and few, medium, tubular pores, common, very fine and fine, interstitial pores; moderately alkaline; slightly effervescent; gradual, smooth boundary.

IIB2—20 to 32 inches, grayish-brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) when moist; moderate, medium, subangular blocky structure; hard when dry, firm when moist, slightly sticky and slightly plastic when wet; plentiful very fine and fine roots; many, very fine and fine, tubular pores; intermittent films of material from the A horizon on ped surfaces; ped surfaces gray and dark gray (10YR 5/1 when dry, 10YR 4/1 when moist); moderately alkaline, strongly effervescent; gradual, smooth boundary.

IIC1—32 to 64 inches, brown (10YR 5/3) clay loam, dark brown (10YR 4/3) when moist; weak, medium, subangular blocky structure; hard when dry, firm when moist, slightly sticky and slightly plastic when wet; few very fine and fine roots; many, very fine, fine, medium, tubular pores; thick gleyed layers (N 6/0 when dry, N 4/0 when moist) on ped and pore surfaces; moderately alkaline, strongly effervescent; gradual, smooth boundary.

IIC2—64 to 105 inches, yellowish-brown (10YR 5/4) clay loam, dark yellowish brown (10YR 4/4) when moist, with coarse distinct mottles of gray and dark gray (N 6/0 when dry, N 4/0 when moist); weak, medium, subangular blocky structure; hard when dry, firm when moist, slightly sticky and slightly plastic when wet; few very fine and fine roots; common, very fine, fine, and medium, tubular pores; stratified with thin layers of loamy sand; moderately alkaline, slightly effervescent.

Included with this soil are small areas that have slopes up to 4 percent and small areas of Willows and Clear Lake soils. Also included are some areas of soils that lie at higher elevations than Pacheco soils and that formed mainly in alluvium washed from soils on granite bedrock.

This soil is moderately fertile. Available water holding capacity is about 10 to 12 inches. Permeability is moderately slow, runoff is very slow to ponded, and erosion is not a hazard. Small areas are moderately to severely affected by alkali. In most places the water table has been lowered to a depth below 60 inches by pumping and artificial drainage, but in a few areas the water table is within a depth of 36 to 60 inches. The root zone is very deep.

The soil is used for irrigated alfalfa, and sugar beets, and dryland pasture. Capability unit IIw–2 (14); pasture and range site 11.

Pacheco loam (0 to 2 percent slopes) (Pc).—This soil is similar to Pacheco silt loam, but its texture is loam throughout. It has a grayish-brown to dark-gray loam surface layer and a loam subsoil. The substratum is generally stratified loam to clay loam and contains lenses of loamy sand and gravel. Some areas have fine gravel throughout the solum.

Included with this soil are small areas of soils that have a pale-brown surface layer and of some soils that have a loamy sand overwash on the surface. Also included are some small areas of soil at higher elevations than this Pacheco soil and that formed in alluvium washed mainly from soils on granitic bedrock. This included soil overlies buried soils that are at a depth of about 30 inches or more.

Available water holding capacity is about 8 to 10 inches. Permeability is moderate.

This soil is used for irrigated walnuts, apricots, sugar beets, tomatoes, and alfalfa and for dryland grain and incidental pasture. Capability unit IIw–2 (14).

Pacheco clay loam over clay (0 to 2 percent slopes) (Pd).—This soil consists of 20 to 36 inches of grayish-brown clay loam over dark gray clay. The surface layer is mildly alkaline to moderately alkaline and is slightly calcareous in a few areas. It has a few fine to medium pebbles in some areas. It occurs in San Juan and Hollister Valleys, generally to the north of Hollister.

This soil is moderately fertile. Available water holding capacity is 8 to 10 inches.

This soil is used for irrigated fruits and nuts, sugar beets, and vegetables and for dryland grain and incidental pasture. Capability unit IIw–2 (14).

Pacheco Silty clay (0 to 2 percent slopes) (Pe).—This soil is similar to Pacheco silt loam, but it has a silty clay surface layer about 15 inches thick over a clay loam subsoil. It occurs in small areas close to drainageways or in

sloping areas around and in depressions. In places this soil is stratified with lenses of silt loam to loamy sand at depths greater than 50 inches. The water table is generally below a depth of 60 inches, but in small areas it is within a depth of 36 inches.

This soil has been drained, and the water table has been lowered. Available water holding capacity is 10 to 12 inches.

This soil is used for irrigated fruit and nut trees, field and row crops, and alfalfa (fig. 10). Capability unit IIs–5 (14).

Panhill Series

The Panhill series consists of well-drained loamy soils that are underlain by stratified, gravelly, calcareous alluvium at a depth of 4 to 5 feet. These soils are gently sloping and lie in the Panoche and Vallecitos Valleys. They occupy fans and terraces below Kettleman soils, depressions in the uplands, and the floors of small valleys in the uplands. The vegetation consists of annual grasses and forbs and some desert shrubs. Elevations range from 1,200 to 2,000 feet above sea level. Annual rainfall is 5 to 10 inches. Average annual temperature is about 63° F., and the frost-free period is about 260 days The main associated soils are the Kettleman and Panoche.

The surface layer is pale-brown to light yellowish-brown loam 12 to 18 inches thick. The subsoil is light yellowish-brown loam 11 to 16 inches thick. The substratum consists of 20 to 30 inches of light yellowish-brown loam over strata of gravel and fine-textured material. The gravelly alluvium is calcareous and extends to an undetermined depth. Fine and medium gravel generally occurs throughout the profile.

Panhill soils are used for range.

Panhill loam, 2 to 9 percent slopes (PhC).—This soil occurs on fans with gilgai microrelief. Slopes are dominantly 4 to 8 percent. In some areas deep gullies or drainageways have been cut by water from surrounding hills.

Representative profile: On fan at base of hills one-third mile west of Little Panoche Road, 2 miles north of junction with Panoche Road.

Figure 10.—**Contour basin irrigation (a form of flood irrigation) in an apricot orchard on Pacheco silty clay.**

A11—0 to 1 inch, pale-brown (10YR 6/3) loam, brown (10YR 4/3) when moist; moderate, thin platy structure; slightly hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; plentiful very fine and fine roots; common, very fine and fine, tubular pores; neutral; abrupt, smooth boundary.

A12—1 to 17 inches, light yellowish-brown (10YR 6/4) loam, dark yellowish brown (10YR 4/4) when moist; weak, medium, subangular blocky structure; slightly hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; plentiful very fine and fine roots; common, very fine, fine, and medium, tubular pores; neutral; gradual, smooth boundary.

B2t—17 to 28 inches, light yellowish-brown (10YR 6/4) loam, dark yellowish brown (10YR 4/4) when moist; weak, medium, subangular blocky structure; slightly hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; few very fine and fine roots; many, very fine and medium, tubular pores; very few, thin, patchy clay films in larger pores; mildly alkaline; gradual, smooth boundary.

C1—28 to 60 inches, light yellowish-brown (10YR 6/4) loam, dark yellowish brown (10YR 4/4) when moist; weak, coarse, subangular blocky structure; slightly hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; few very fine roots; many, very fine and fine, tubular pores; few fine pebbles; soft lime in seams and small masses; moderately alkaline, strongly effervescent; gradual, smooth boundary.

Included with this soil are some small areas of Panoche soils and some soils that have a clay loam or clay surface layer. Also included are some soils that have slightly more clay in the subsoil and small areas of soils that are calcareous at the surface.

This soil is moderately fertile. Available water holding capacity is about 9 to 11 inches. Permeability is moderate, runoff is slow to medium, and the hazard of erosion is slight to moderate. The root zone is very deep.

This soil is used for range. Capability unit VIIc–1 (15); pasture and range site 10.

Panoche Series

The Panoche series consists of well-drained loamy soils that formed in alluvium derived from sedimentary rocks. These soils are on nearly level to moderately sloping flood plains and fans in the Panoche and Vallecitos Valleys in the southeastern part of the county. The vegetation consists of annual grasses and forbs and a few cottonwoods and willows along the larger drainageways. Elevations range from 1,200 to 2,000 feet above sea level. Annual rainfall is 5 to 10 inches. Average annual temperature is about 64° F., and the frost-free period is about 265 days. The main associated soils are the Docas, Panhill, and Kettleman.

The surface layer is about 12 inches thick. It is pale-brown or brown to light brownish-gray or light yellowish-brown loam or sandy loam. The next layer is pale-brown to light yellowish-brown, calcareous loam 27 to 50 inches thick. Below this is brown, calcareous loam that extends to an undetermined depth. The lower part of this layer ranges from loam to silty clay loam and is lighter colored than the upper part. It is stratified with sand and gravel in some places.

Panoche soils are used for irrigated cotton, safflower, and alfalfa and for range.

Panoche loam, 0 to 2 percent slopes (PlA).—This soil occurs along drainageways.

Representative profile: In barley field, on Recalde Ranch in Panoche Valley; 500 yards southeast of house.

Ap—0 to 8 inches, pale-brown (10YR 6/3) loam, brown (10YR 4/3) when moist; moderate, fine, granular structure; slightly hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; few very fine and fine roots; common, very fine, tubular pores, common, fine, interstitial pores; mildly alkaline, slightly effervescent; clear, smooth boundary.

A1—8 to 12 inches, pale-brown (10YR 6/3) loam, brown (10YR 4/3) when moist; weak, medium, subangular blocky structure; slightly hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; few very fine and fine roots; common, very fine, tubular pores and common, fine, interstitial pores; moderately alkaline, strongly effervescent; clear, smooth boundary.

C1—12 to 29 inches, pale-brown (10YR 6/3) loam, brown (10YR 4/3) when moist; weak, medium, subangular blocky structure; slightly hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; plentiful very fine and fine roots; many, very fine, fine, and medium, tubular pores; common, small, soft masses of lime; moderately alkaline, violently effervescent; clear, smooth boundary.

C2—29 to 39 inches, light yellowish-brown (10YR 6/4) loam, dark yellowish brown (10YR 4/4) when moist; weak, fine, subangular block structure; soft when dry, very friable when moist, slightly sticky and slightly plastic when wet; few very fine and fine roots; many, very fine and fine, tubular pores; common, small, soft masses of lime; moderately alkaline, violently effervescent; clear, smooth boundary.

C3—39 to 76 inches, brown (10YR 5/3) loam, dark brown (10YR 4/3) when moist; weak, fine, subangular blocky structure; soft when dry, very friable when moist, slightly sticky and slightly plastic when wet; few very fine and fine roots; few, very fine and fine, tubular pores; common, small, soft masses of lime, stratified; moderately alkaline, violently effervescent; clear, smooth boundary.

Included with this soil are small areas of Panhill soils and some soils that have a loamy sand or light clay surface layer.

This soil is moderately fertile. Available water holding capacity is 9 to 11 inches. Permeability is moderate, runoff is very slow, and the hazard of erosion is slight to none.

This soil is used for irrigated cotton, safflower, and alfalfa and for range. Capability units I–1 (17) and VIIc–1 (15); pasture and range site 10.

Panoche loam, 2 to 9 percent slopes (PlC).—This soil is similar to Panoche loam, 0 to 2 percent slopes, but it is more sloping. It occupies fans and bottom land along the drainageways and in valleys. Slopes are dominantly 3 to 6 percent. The soil ranges from light brownish gray to light yellowish brown, but it is generally pale brown. The lower part of the substratum is generally somewhat stratified and contains gravel in some places.

Runoff is slow to medium, and the hazard of erosion is slight to moderate.

This soil is used for irrigated safflower, cotton and alfalfa and for range. Capability units IIe–1 (17) and VIIc–1 (15); pasture and range site 10.

Panoche sandy loam, 0 to 2 percent slopes (PkA).—This soil is similar to Panoche loam, 0 to 2 percent slopes, but it has a sandy loam surface layer. It occurs along drainageways in Panoche Valley. Drainageways through areas of this soil are generally deeply cut and

have nearly vertical walls. This soil is generally pale brown but ranges to light brownish gray in some places. The lower part of the substratum is stratified sandy loam to loamy sand and contains strata of gravel in some places. Available water holding capacity is 8 to 10 inches.

This soil is used for irrigated cotton, safflower, and alfalfa and for range. Capability units I-1 (17) and VIIc–1 (15); pasture and range site 10.

Panoche sandy loam, 2 to 9 percent slopes (PkC).—This soil is similar to Panoche loam, 0 to 2 percent slopes, but it has a sandy loam surface layer and is more sloping. It generally occurs in small to medium areas within areas of nearly level soils or on small to medium fans that lead from the base of the hills to the valley floors. Slopes are generally 3 to 6 percent but range to 9 percent on a few of the fans. The soil is generally pale brown to light yellowish brown and is stratified in the lower part of the substratum.

Included with this soil are some soils that have a loamy sand surface layer.

Runoff is slow to medium, and the hazard of erosion is slight to moderate.

This soil is used for irrigated cotton, safflower, and alfalfa and for range. Capability units IIe–1 (17) and VIIc–1 (15); pasture and range site 10.

Pinnacles Series

The Pinnacles series consists of well-drained to somewhat excessively drained loamy soils that are underlain by semiconsolidated, coarse, arkosic sandstone. These soils have a loamy surface layer and a clayey subsoil. They are moderately steep to very steep. The vegetation consists of grasses and forbs, scattered oaks and Digger pine, and some areas of brush. Elevations range from 1,000 to 3,000 feet above sea level. Annual rainfall is 14 to 18 inches. Average annual temperature is about 60° F., and the frost-free period is about 250 days. The main associated soils are the Auberry, Sheridan, Santa Lucia, and Laniger.

The surface layer is 8 to 22 inches thick. It is generally brownish-gray to brown coarse sandy loam. The subsoil consists of brown coarse sandy clay and light yellowish-brown coarse sandy clay loam 12 to 20 inches thick. It is underlain by coarse, semiconsolidated, arkosic sandstone that is gravelly in most places. Depth to sandstone ranges from 20 to 42 inches.

Pinnacles soils are used for pasture, range, watersheds, wildlife, and recreation.

Pinnacles coarse sandy loam, 30 to 75 percent slopes, severely eroded (PnG3).—This steep to very steep soil occurs in areas of narrow winding ridges. Slopes are dominantly 40 to 60 percent. Landslides form deep nearly vertical escarpments in many places.

Representative profile: Jef Schmidt Ranch in Horse Valley, 2 miles east of the Pinnacles National Monument, and 3 miles west of State Route 25; in Dry Lake Valley. In the SE. corner of section 8, T. 16 S., R. 8 E., Mt. Diablo Base and Meridian.

A11—0 to 8 inches, light brownish-gray (10YR 6/2) coarse sandy loam, very dark grayish brown (10YR 3/2) when moist; moderate, fine, granular structure; hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; abundant very fine and fine roots; common, very fine and fine, interstitial pores; medium acid; clear, smooth boundary.

A12—8 to 12 inches, light brownish-gray (10YR 6/3) coarse sandy loam, dark grayish brown (10YR 4/2) when moist; weak, medium, subangular blocky structure; hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; plentiful very fine and fine roots; common, fine and medium, interstitial pores; medium acid; abrupt, smooth boundary.

B2t—12 to 22 inches, brown (7.5YR 5/4) coarse sandy clay, dark brown (7.5YR 4/4) when moist; strong, coarse, prismatic structure that breaks readily to strong, medium, angular blocky structure; very hard when dry, very firm when moist, sticky and plastic when wet; few very fine and fine roots; common, very fine and fine, tubular pores; thin continuous and moderately thick patchy clay films on ped and pore surfaces; strongly acid; clear, smooth boundary.

B3—22 to 25 inches, light yellowish-brown (10YR 6/4) sandy clay loam, dark yellowish brown (10YR 4/4) when moist; moderate, fine subangular blocky structure; very hard when dry, firm when moist, sticky and plastic when wet; strongly acid; gradual, smooth boundary.

R—25 inches, semiconsolidated, acid, coarse-grained, gravelly arkosic sandstone of the Temblor formation.

Included with this soil are small areas of Laniger, Sheridan, and Auberry soils. Also included are small areas of soils that have a gravelly surface layer and soils that have less clay in the subsoil than Pinnacles soils.

This soil has low fertility. Available water holding capacity is about 3 to 6 inches. Permeability is slow, runoff is rapid to very rapid, and the hazard of erosion is very severe. The root zone is moderately deep.

This soil is used for range, wildlife, watersheds, and recreation. Capability unit VIIe–1 (15); pasture and range site 3.

Pinnacles coarse sandy loam, 15 to 30 percent slopes, eroded (PnE2).—This soil is similar to Pinnacles coarse sandy loam, 30 to 75 percent slopes, severely eroded, but it has a slightly thicker profile, is only moderately steep, and is only moderately eroded. It occurs on moderately steep hills and ridgetops. Color ranges from brown to grayish brown. Some areas have been gullied by water from the surrounding hills.

Included with this soil are small areas of coarse sandy clay loams, of gravelly soils, and of soils that are less sloping and have a slightly thicker solum.

This soil is well drained. Runoff is rapid, and the hazard of erosion is severe. The root zone is moderately deep to deep.

This soil is covered by grass or grass and brush and is used for dryland pasture. Capability unit VIe–3 (15); pasture and range site 3.

Pinto Series

The Pinto series consists of well-drained loamy soils that are underlain by a weakly cemented hardpan at a depth of 24 to 38 inches. These soils are moderately steep and occupy uplands. The vegetation consists of grasses and forbs, plantings of eucalyptus, and areas of ferns. Elevations are 400 to 800 feet above sea level. Annual rainfall is 16 to 20 inches. Average annual temperature is about 58° F., and the frost-free period is about 250 days. The main associated soils are the Arnold and Metz.

The surface layer is brown sandy loam 6 to 12 inches thick. The subsoil is reddish-brown heavy sandy loam 18

to 26 inches thick. The hardpan consists of 24 to 38 inches of reddish-brown weakly cemented sandy loam that is underlain by brown to yellowish-brown, slightly hard, medium-grained, acid terrace material.

Pinto soils are used for dryland pasture.

Pinto sandy loam, 15 to 30 percent slopes, eroded (PsE2).—This soil occurs on moderately steep ridgetops in areas of other soils.

Representative profile: On hillside, three-quarter mile northeast of auction farm on north side of U.S. Highway No. 101.

A—0 to 8 inches, brown (7.5YR 5/2) sandy loam, dark brown (7.5YR 3/2) when moist; weak, fine, granular structure; hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; plentiful very fine and fine roots; common, very fine and fine, interstitial pores; strongly acid; clear, smooth boundary.

B21t—8 to 16 inches, reddish-brown (5YR 5/4) heavy sandy loam, dark reddish brown (5YR 3/4) when moist; weak, coarse, subangular blocky structure; hard when dry, friable when moist, slightly sticky and slightly plastic when wet; plentiful very fine and fine roots; common, very fine and fine, interstitial pores; thin patchy clay films on ped surfaces and in pores; strongly acid; gradual, smooth boundary.

B22t—16 to 29 inches, reddish-brown (5YR 5/3) heavy sandy loam, dark reddish brown (5YR 3/3) when moist; weak, medium, subangular blocky structure; hard when dry, friable when moist, slightly sticky and slightly plastic when wet; few very fine and fine roots; many, very fine, and few, fine and medium, interstitial pores; thin patchy clay films on ped surfaces and in pores; strongly acid; gradual, wavy boundary.

C1—29 to 63 inches, reddish-brown (5YR 5/4) sandy loam, weakly cemented with silica, dark reddish brown (5YR 3/4) when moist; common, medium, distinct mottles of pink (7.5YR 7/4) and brown (7.5YR 5/4) when moist; massive; few very fine and fine roots; few, fine and medium, iron and manganese concretions; strongly acid; diffuse, smooth boundary.

C2—63 inches, brown to yellowish-brown, (10YR 5/3 to 5/4) slightly hard, medium-grained, acid terrace material.

Included with this soil are some small areas of Arnold soils. This soil is low in fertility. Available water holding capacity is about 3 to 5 inches. Permeability is slow. Runoff is rapid, and the hazard of erosion is severe. Hardpan is at a moderate depth, and it limits the penetration of roots and water.

This soil is used for dryland pasture. Capability unit VIe–1 (15); pasture and range site 3.

Pleasanton Series

The Pleasanton series consists of well-drained loamy and gravelly loamy soils that are underlain by stratified alluvium at a depth of more than 48 inches. These soils are gently sloping to moderately sloping, and they occupy terraces or fans of alluvium derived from sandstone and shale. The vegetation consists of annual grasses and forbs and scattered oaks. Elevations are less than 1,000 feet above sea level. Annual rainfall is 12 to 14 inches. The average annual temperature is about 59° F., and the frost-free period is about 250 days. The main associated soils are the Antioch, Rincon, and Soper.

The surface layer is brown to grayish-brown loam or gravelly loam about 16 to 24 inches thick. The subsoil is brown clay loam 20 to 24 inches thick. It contains some gravel and generally is more gravelly as depth increases. The substratum is light yellowish-brown clay loam that is underlain by stratified alluvium below a depth of 48 inches. The stratified material consists of lenses of sand, gravel, and clay that are intermittently calcareous.

Pleasanton soils are used mainly for dryland grain and pasture. In a few areas irrigated grapes are grown.

Pleasanton loam, 2 to 5 percent slopes (PtB).—This soil is adjacent to drainageways.

Representative profile: East of Panoche Valley Road; road cut 200 yards southeast of the junction of Panoche Valley Road and Browns Valley Road.

Ap—0 to 9 inches, brown (10YR 5/3) loam, dark brown (10YR 3/3) when moist; moderate, fine, granular structure; hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; abundant very fine and fine roots; common, very fine and fine, interstitial pores; slightly acid; clear, smooth boundary.

A1—9 to 21 inches, brown (10YR 5/3) loam, dark brown (10YR 3/3) when moist; weak, medium, subangular blocky structure; hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; abundant very fine and fine roots; many, very fine and fine, tubular pores; neutral; clear, smooth boundary.

B21t—21 to 33 inches, brown (10YR 5/3) clay loam, dark brown (10YR 3/3) when moist; moderate, fine, angular blocky structure; hard when dry, firm when moist, sticky and plastic when wet; plentiful very fine and fine roots; common, very fine and fine, tubular pores; thin patchy clay films on the surfaces of peds and larger pores; neutral; clear, smooth boundary.

IIB22t—33 to 45 inches, brown (10YR 5/3) very gravelly clay loam, dark brown (10YR 3/3) when moist; weak, fine, subangular blocky structure; hard when dry, firm when moist, sticky and plastic when wet; few very fine and fine roots; common, very fine and fine, tubular pores; few, thin, patchy clay films on ped surfaces; mildly alkaline; clear, smooth boundary.

IIIC1—45 to 55 inches, light yellowish-brown (10YR 6/4) clay loam, dark yellowish brown (10YR 4/4) when moist; weak, medium, subangular blocky structure; hard when dry, friable when moist, slightly sticky and slightly plastic when wet; few, very fine and fine, tubular pores; mildly alkaline; clear, smooth boundary.

IVC2—55 inches, stratified yellowish-brown (10YR 5/6) and gray, (10YR 5/1) mildly alkaline sand, gravel, and clay.

Included with this soil are small areas of Antioch, Rincon, and Soper soils. Also included are some small areas of nearly level soils.

This well-drained soil is moderately fertile. Available water holding capacity is about 8 to 10 inches. Permeability is moderately slow, runoff is slow, and the hazard of erosion is slight. The root zone is very deep.

This soil is used for irrigated grapes and for dryland grain and incidental pasture. Capability units IIe–1 (14) and IIIe–3 (15); pasture and range site 4.

Pleasanton gravelly loam, 5 to 9 percent slopes, eroded (PvC2).—This soil is similar to Pleasanton loam, 2 to 5 percent slopes, but it is more sloping and is gravelly throughout. It occurs in small to medium-sized areas along larger drainageways. In most places it is brown, but color ranges to grayish brown.

Available water holding capacity is about 7 to 9 inches. Runoff is medium, and the hazard of erosion is moderate.

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This soil is used for dryland grain and pasture. Capability units IIIe–1 (14) and IIIe–3 (15); pasture and range site 4.

Reiff Series

The Reiff series consists of well-drained loamy soils formed in alluvium derived mainly from sedimentary uplands. These soils are nearly level to moderately sloping, and they are on flood plains and fans. The vegetation consists of annual grasses and forbs and scattered oaks. Elevations range from 120 to 1,500 feet above sea level. Annual rainfall is 12 to 16 inches. The average annual temperature is about 60° F., and the frost-free period is about 260 days. The main associated soils are the Clear Lake, Metz, Mocho, and Pacheco.

The surface layer is grayish-brown sandy loam 18 to 24 inches thick. The next layer is pale-brown to light brownish-gray sandy loam to loam that averages 30 to 36 inches in thickness. This layer is gravelly or is stratified with gravel and finer textured material. In some places the content of gravel throughout the profile is as much as 10 percent, by volume. Below this layer is a buried soil or stratified alluvium.

Reiff soils are used for irrigated fruits, nuts, alfalfa, field crops, and row crops and for dryland grain and incidental pasture.

Reiff sandy loam, 0 to 2 percent slopes (ReA).—This soil occurs on fans along the larger drainageways. Some areas are occasionally flooded.

Representative profile: 30 yards south of Fairview Road, 300 yards east of a seed company; in walnut orchard.

Ap—0 to 8 inches, grayish-brown (10YR 5/2) sandy loam, very dark grayish brown (10YR 3/2) when moist; moderate, fine, granular structure; slightly hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; plentiful very fine roots; common, very fine, interstitial pores; neutral; clear, smooth boundary.

A1—8 to 24 inches, grayish-brown (10YR 5/2) sandy loam, very dark grayish brown (10YR 3/2) when moist; weak, coarse, subangular blocky structure; slightly hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; plentiful very fine roots, few medium roots; common, very fine, tubular pores, few, fine, interstitial pores; mildly alkaline; clear, smooth boundary.

C1—24 to 42 inches, pale-brown (10YR 6/3) sandy loam, brown (10YR 4/3) when moist; weak, coarse, subangular blocky structure; slightly hard when dry, very friable when moist, slightly sticky and nonplastic when wet; few medium and coarse roots; few, very fine, tubular pores; 1 to 2 percent very fine gravel; mildly alkaline, slightly effervescent; clear, smooth boundary.

11C2—42 to 60 inches, light brownish-gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) when moist; weak, medium, subangular blocky structure; slightly hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; few coarse roots; few, very fine and medium, tubular pores; moderately alkaline, strongly effervescent; clear, smooth boundary.

Included with this soil are small areas of Mocho and Metz soils and of soils that have a gravelly or loamy sand surface layer.

This soil is moderately fertile. Available water holding capacity is about 8 inches. Permeability is moderately rapid, runoff is very slow, and the hazard of erosion is slight to none. The root zone is very deep.

This soil is used for irrigated fruits and nuts, sugar beets, tomatoes, and other vegetables and alfalfa. Dryland crops include grain and incidental pasture. Capability units I–1 (14) and IIIc–1 (15).

Reiff sandy loam, 2 to 9 percent slopes (ReC).—This soil is similar to Reiff sandy loam, 0 to 2 percent slopes, but is more sloping. It occurs on small to medium-sized fans along the major drainageways. The areas closest to the streams are occasionally flooded. Slopes dominantly range from 3 to 6 percent. In some areas as much as 10 percent, by volume, of the profile is fine to medium gravel.

Included with this soil are a few very small areas of soils that have a gravelly or loamy sand surface layer and a few small areas of Metz and Mocho soils.

Runoff is slow to medium, and the hazard of erosion is slight to moderate.

This soil is used for irrigated fruits and nuts, sugar beets, vegetables, and alfalfa and for dryland grain, and incidental pasture. Capability units IIe–1 (14) and IIIe–1 (15).

Rincon Series

The Rincon series consists of well-drained soils that formed in alluvium derived from sandstone and shale. These soils have a loamy surface layer and a clayey subsoil. They occur on benches, terraces, or fans and are nearly level to strongly sloping. They are around the edge of Hollister Valley and along the flood plains and in the valleys bordering the larger drainageways. Vegetation consists of annual grasses and forbs and scattered oaks. Rincon soils are 200 to 1,500 feet above sea level. Annual rainfall ranges from 12 to 16 inches. The average annual temperature is about 60° F., and the frost-free period is about 260 days. The main associated soils are the Antioch, Cropley, Pleasanton, and Sorrento.

The surface layer is dark-gray to grayish-brown silty clay loam or loam 20 to 24 inches thick. The subsoil is brown clay 20 to 30 inches thick. The substratum is light yellowish-brown clay loam 20 to 40 inches thick. At depths of more than 60 inches, the underlying alluvium is calcareous sand, gravel, and clay in strata that extend to an undetermined depth. Some small areas are gravelly throughout the profile. A few areas along Lone Tree Road are gravelly in the surface layer and have a very gravelly substratum.

Rincon soils are used for irrigated apricots, prunes, grapes, walnuts, alfalfa, sugar beets, tomatoes, and other vegetables, and for dryland grain, and pasture.

Rincon silty clay loam, 0 to 2 percent slopes (RsA).—This nearly level soil occurs on broad terraces.

Representative profile: On Young Ranch, 600 yards east of house and 200 yards north of stream; at edge of young prune orchard.

Ap—0 to 12 inches, dark grayish-brown (10YR 4/2) silty clay loam, very dark brown (10YR 2/2) when moist; moderate, fine, granular structure; hard when dry, firm when moist, sticky and plastic when wet; plentiful very fine and fine roots; common, very fine and fine, interstitial pores; mildly alkaline; gradual, smooth boundary.

A1—12 to 23 inches, dark grayish-brown (10YR 4/2) silty clay loam, very dark brown (10YR 2/2) when moist; moderate, medium, subangular blocky structure; hard when dry, firm when moist, sticky and plastic when wet; plentiful very fine and fine roots; common, very fine and fine, tubular pores; few, fine and medium, interstitial pores; mildly alkaline; gradual, smooth boundary.

B21t—23 to 33 inches, brown (10YR 5/3) clay, dark brown (10YR 4/3) when moist; moderate, medium, angular blocky structure; very hard when dry, very firm when moist, very sticky and very plastic when wet; few very fine and fine roots; common, very fine and fine, tubular pores; few, thin, patchy clay films; few small slickensides; material from the A horizon in fine seams and on ped surfaces; mildly alkaline; gradual, smooth boundary.

B22t—33 to 45 inches, brown (10YR 5/3) clay, dark brown (10YR 4/3) when moist; strong, medium, angular blocky structure; very hard when dry, very firm when moist, very sticky and very plastic when wet; few very fine and fine roots; common, very fine and fine, tubular pores; many fine and medium slickensides; thin, patchy clay films on ped faces and on pores; lime in seams and soft masses; moderately alkaline; slightly effervescent; gradual, smooth boundary.

Cca—45 to 80 inches, light yellowish-brown (10YR 6/4) clay loam, dark brown (10YR 4/3) when moist; strong, medium, angular blocky structure; very hard when dry, firm when moist, sticky and plastic when wet; common, very fine and fine, tubular pores; brittle and compact in place; lime in seams and soft masses; moderately alkaline; strongly effervescent; gradual, smooth boundary.

Included in mapping were small areas of Cropley, Antioch, and Pleasanton soils.

This soil is moderately fertile. The available water holding capacity is 8 to 10 inches. Permeability is slow, runoff is very slow, and the erosion hazard is slight to none. A few areas may be ponded for short periods during the winter. The rooting depth is very deep.

This soil is used for irrigated fruit and nut trees, irrigated alfalfa, grapes, and dryland grain and incidental pasture. Capability unit IIs–5 (14).

Rincon silty clay loam, 2 to 9 percent slopes (RsC).—This soil is similar to Rincon silty clay loam, 0 to 2 percent slopes, but is gently sloping to moderately sloping. It occurs in small to medium-sized areas that generally have slopes of 3 to 6 percent. In a few areas fine to medium gravel is in all parts of the profile, but it generally makes up less than 10 percent of the soil mass by volume. Runoff is slow to medium, and the hazard of erosion is slight to moderate.

This soil is used for irrigated alfalfa, apricots, grapes, walnuts, and prunes, and for dryland grain and incidental pasture. Capability units IIe–5 (14) and IIIe–5 (15).

Rincon silty clay loam, 9 to 15 percent slopes, eroded (RsD2).—This soil is similar to Rincon silty clay loam, 0 to 2 percent slopes, but has a thinner profile and is strongly sloping, and is more eroded. Areas are small to moderate in size, and slopes generally range from 12 to 15 percent. In some areas fine to medium-sized gravel is in all parts of the profile.

Included in mapping were some small areas where there is less clay than normal in the subsoil and areas where the substratum is very firm. Also included were areas where erosion is only slight.

Runoff is medium to rapid, and the hazard of erosion is moderate to high.

The soil is used for dryland pasture and grain. Capability unit IIIe–5 (15); pasture and range site 4.

Rincon loam, 0 to 2 percent slopes (RnA).—This soil is similar to Rincon silty clay loam, 0 to 2 percent slopes, but has a loam surface layer. It is nearly level and occurs in small areas on large terraces near the Comstock-Las Viboras Road and in a few other small areas. In most places the subsoil and substratum are gravelly. In some areas the surface layer contains fine gravel that generally makes up less than 5 percent of the soil mass by volume. Available water holding capacity is about 8 inches.

This soil is used for irrigated alfalfa, apricots, grapes, walnuts, and prunes, and for dryland grain and incidental pasture. Capability unit IIs–5 (14).

Rincon loam, 2 to 9 percent slopes (RnC).—This soil is similar to Rincon silty clay loam, 0 to 2 percent slopes, but is gently sloping to moderately sloping and has a loam surface layer. It occurs on small to medium-sized fans, generally along the larger drainageways. In some places fine to medium-sized gravel is in the profile. Dominant slopes are 3 to 6 percent. Available water holding capacity is about 8 inches. Runoff is slow to medium, and the erosion hazard is slight to moderate.

This soil is used for irrigated apricots, grapes, walnuts, and prunes, and for dryland grain and incidental pasture. Capability units IIIe–1 (14) and IIIe–3 (15).

Rincon loam, 9 to 15 percent slopes, eroded (RnD2).—This soil is similar to Rincon silty clay loam, 0 to 2 percent slopes, but is slightly thinner, has a loam surface layer, and is moderately eroded. It occurs throughout the survey area generally on small to medium-sized fans where slopes range from 12 to 15 percent. In some areas fine and medium-sized gravel occurs throughout the profile and makes up as much as 10 percent of the profile by volume. Available water holding capacity is about 8 inches. Runoff is medium to rapid, and the hazard of erosion is moderate to severe.

This soil is used mostly for dryland grain and pasture. Capability unit IVe–1 (15); pasture and range site 4.

Riverwash

Riverwash (Rw) consists of the coarse-textured materials—sands and gravels—that occur in the beds of the larger streams. The materials are generally covered by flowing water during the rainy season, which results in scouring and deposition. Many areas have little or no vegetation but some of the sandier, less gravelly areas are covered by grass, forbs, brush, willows, and cottonwoods. In general, these areas have little or no use for farming, though at times a few areas furnish limited grazing. A few areas on the larger streams are used for commercial production of sand and gravel. Capability unit VIIIw–4 (14).

Salinas Series

The Salinas series consists of well-drained, loamy soils that formed in alluvium derived from sandstone and shale. These nearly level to moderately sloping soils lie on flood plains and fans. The vegetation consists of annual grasses and forbs and a few scattered oaks. Elevations range from 150 to 2,000 feet above sea level. Annual rainfall is 12 to 14 inches. The average annual temperature

is about 60° F., and the frost-free period is about 260 days. The main associated soils are the Hanford and Sorrento.

The surface layer is dark-gray to dark grayish-brown clay loam 20 to 26 inches thick. The next layer is brown to light yellowish-brown clay loam 24 to 36 inches thick. Below this is light yellowish-brown clay loam that extends to undetermined depths. In some areas these soils have gravel throughout the profile.

Salinas soils are used for irrigated grapes and other fruits, nuts, vegetables, and row crops, and for dryland grain and incidental pasture.

Salinas clay loam, 0 to 2 percent slopes (SaA).—This soil occurs on fans around San Juan Bautista and in Topo and Vallecitos Valleys.

Representative profile: 20 yards west of the New Idria Road, in Vallecitos Valley, on McDonald Ranch; 1 mile southeast of ranch house.

A11—0 to 8 inches, dark-gray (10YR 4/1) clay loam, black (10YR 2/1) when moist; moderate, fine, subangular blocky structure; hard when dry, friable when moist, sticky and plastic when wet; abundant very fine and fine roots; common, very fine and fine, tubular pores; neutral; clear, smooth boundary.

A12—8 to 25 inches, dark-gray (10YR 4/1) clay loam, very dark brown (10YR 2/2) when moist; moderate, medium, subangular blocky structure; hard when dry, friable when moist, sticky and plastic when wet; abundant very fine and fine roots; common, very fine and fine, tubular pores, few, medium, interstitial pores; neutral; gradual, smooth boundary.

C1—25 to 33 inches, brown (10YR 5/3) clay loam, dark brown (10YR 3/3) when moist; weak, medium, subangular blocky structure; slightly hard when dry, very friable when moist, sticky and plastic when wet; plentiful very fine and fine roots; common, very fine and fine, tubular pores; material from A horizon in seams and as films on ped surfaces; mildly alkaline, slightly effervescent; clear, smooth boundary.

C2ca—33 to 66 inches, light yellowish-brown (10YR 6/4) clay loam, dark yellowish brown (10YR 4/4) when moist; weak, medium, subangular blocky structure; slightly hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; few very fine and fine roots; many, very fine and fine, tubular pores; many fine and medium seams of lime and many, small, soft masses of lime; moderately alkaline, violently effervescent; gradual, smooth boundary.

Included with this soil are some soils around San Juan Bautista that have a slightly thicker surface layer, less lime in the substratum and some alluvium derived from granitic rocks. Also included are small areas of Hanford and Sorrento soils and soils that have a loam surface layer.

This soil is moderately fertile. Available water holding capacity is about 10 to 12 inches. Permeability is moderately slow, runoff is very slow, and the hazard of erosion is slight to none.

This soil is used for irrigated grapes and other fruits, nuts, vegetables, row crops, and for dryfarmed grain and incidental pasture. Capability units I–1 (14) and IIIc–1 (15).

Salinas clay loam, 2 to 9 percent slopes (SaC).—This soil is similar to Salinas clay loam, 0 to 2 percent slopes, but it is more sloping. It generally occurs in small areas along the larger drainageways. Slopes are dominantly 3 to 6 percent. In some areas small amounts of fine to medium gravel occur throughout the profile, but they are not more than a few percent, by volume.

Included with this soil are some soils that have a loam surface layer.

Runoff is slow to medium. The hazard of erosion is slight to moderate.

This soil is used for dryland grain and incidental pasture. Capability units IIe–5 (14) and IIIe–5 (15).

San Benito Series

The San Benito series consists of well-drained loamy soils that are underlain by calcareous, interbedded sandstone and shale at a depth of 24 to 48 inches. These soils occupy mountainous uplands and are rolling to steep. The vegetation consists chiefly of annual grasses and forbs, but a few areas are covered with oaks or brush. Elevations range from 400 to 3,500 feet. Annual rainfall is 12 to 18 inches, average annual temperature is 60° to 62° F., and the frost-free period is about 260 days. The Linne and Gazos soils are the main associated soils.

The surface layer is dark grayish-brown clay loam 20 to 32 inches thick. The next layer is light yellowish-brown clay loam 8 to 24 inches thick. It is slightly to moderately effervescent. Texture throughout the profile ranges from clay loam to silty clay loam but is clay loam in most places. The parent rock, at a depth of 24 to 48 inches is soft, calcareous, interbedded shale and medium-grained sandstone.

San Benito soils are used for dryland grain, pasture, and range. A few small areas are irrigated and are used for fruit and nut trees.

San Benito clay loam, 15 to 30 percent slopes, eroded (SbE2).—This soil occurs on moderately steep rounded hills or on ridgetops.

Representative profile: One-half mile west of Willow Creek Road, 5 miles north of San Benito; central part of section 8, T. 15 S., R. 8 E.

A11—0 to 10 inches, dark grayish-brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) when moist; moderate, fine, subangular blocky structure that breaks readily to moderate, fine, granular structure; very hard when dry, firm when moist, sticky and plastic when wet; abundant very fine roots; common, very fine, interstitial pores; neutral; clear, smooth boundary.

A12—10 to 28 inches, dark grayish-brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) when moist; moderate, medium, subangular blocky structure; very hard when dry, firm when moist, sticky and plastic when wet; plentiful very fine roots; few, very fine, interstitial and tubular pores; few, fine, pressure faces; neutral; gradual, smooth boundary.

C1ca—28 to 48 inches, light yellowish-brown (10YR 6/4) clay loam, dark yellowish brown (10YR 4/4) when moist; weak, medium, subangular blocky structure; hard when dry, friable when moist, sticky and plastic when wet; plentiful very fine roots; common, very fine and fine, tubular pores; lime is disseminated and occurs as coatings in pores and on some ped surfaces; moderately alkaline; gradual, smooth boundary.

C2—48 to 60 inches +, yellowish-brown (10YR 5/4), soft, calcareous sandy shale.

Included with this soil are small areas of Diablo, Gaviota, and Linne soils and outcrops of sandstone. Also included are soils that are shallow over bedrock.

This soil is moderately fertile. Available water holding capacity is 6 to 8 inches. Permeability is moderately slow,

runoff is rapid, and the hazard of erosion is severe. The root zone is deep.

This soil is used for dryland pasture. Capability unit IVe–5 (15); pasture and range site 5.

San Benito clay loam, 9 to 15 percent slopes (SbD).—This soil is similar to San Benito clay loam, 15 to 30 percent slopes, eroded, but it has a thicker profile, is less sloping, and is not more than slightly eroded. This soil generally occurs on low hills and broad ridges.

Included with this soil are small areas of Diablo and Cropley soils along drainageways and in saddles.

Available water holding capacity is 8 to 10 inches. Runoff is medium, and the hazard of erosion is moderate. The root zone is deep.

This soil is used for dryland grain and pasture. A few small areas are used for irrigated fruits and nuts. Capability unit IIIe–5 (15); pasture and range site 5.

San Benito clay loam, 30 to 50 percent slopes, eroded (SbF2).—This soil is similar to San Benito clay loam, 15 to 30 percent slopes, eroded, but is more sloping. It is steep and occurs on side slopes in areas of moderately steep soils or on narrow, winding ridgetops. Slopes are dominantly between 45 and 50 percent. This soil is darker and somewhat deeper on north-facing slopes than in other areas.

Included with this soil are areas of brown, fine-textured soils, of shallow soils, and of rock outcrops.

On this soil runoff is rapid to very rapid. The hazard of erosion is severe to very severe.

This soil is used for dryland pasture. Capability unit VIe–5 (15); pasture and range site 5.

San Benito clay loam, 30 to 50 percent slopes, severely eroded (SbF3).—This soil is similar to San Benito clay loam, 15 to 30 percent slopes, eroded, but it is more eroded, is steeper, and is only 24 to 36 inches deep to weathered bedrock. It is steep and occurs along the larger drainageways, on partly slipped areas, or in areas of accelerated geologic erosion (fig. 11). Some areas are barren and actively eroding, others have a thin cover of grass or brush or are covered by moderately thick stands of oaks and brush.

Included with this soil are small to moderate areas of shallow soils, Sedimentary rock land, gullied areas, and Landslides. The gullied areas are sources of silt and debris.

Figure 11.—**San Benito clay loam, 30 to 50 percent slopes, severely eroded. Stock trails are very evident, and brush is intruding on overgrazed areas.**

Available water holding capacity is 4 to 6 inches. Run off is rapid to very rapid and the hazard of erosion is very severe. This soil has low fertility.

This soil is used for range. Capability unit VIIe–5 (15); pasture and range site 5.

Sandy Alluvial Land

Sandy alluvial land (Sc) lies along the lower courses of Pescadero, Stone, and Chalone Creeks and along a few of the small drainageways flowing from Gabilan Range. Slopes generally range from 1 to 4 percent, but a few areas are more sloping. Many of the areas are flooded occasionally and are subject to removal and deposition of material, but a few areas are above flood level.

Included with this land type, generally in the narrower heads of the valleys of the creeks, are a few gravelly and stony soils.

Fertility is low on this land. Available water holding capacity is 4 to 6 inches.

This land is used for limited grazing. Capability unit VIIw–4 (14).

Santa Lucia Series

The Santa Lucia series consists of somewhat excessively drained very shaly, loamy soils that are underlain by moderately hard, light-colored shale. These soils are moderately steep to very steep and occupy uplands underlain by shale. The vegetation consists of annual grasses and forbs and thin to moderately thick stands of oaks, Digger pine, and brush. Elevations range from 1,200 to 2,000 feet above sea level. Annual rainfall is 12 to 16 inches. Average annual temperature is about 58° F., and the frost-free period is about 250 days. The main associated soils are the Pinnacles, Laniger, Sheridan, and Gazos.

The surface layer is gray to very dark gray shaly loam 18 to 30 inches thick. The darker colored soils generally occur on north-facing slopes under moderately thick stands of oaks. The profile becomes more shaly as depth increases. Depth to shale is generally 20 to 30 inches, but it ranges from 8 to 40 inches. The underlying shale is generally moderately hard, light gray and pale brown, and highly fractured. These soils are medium acid in most places, but they are slightly acid in some places.

Santa Lucia soils are used for dryland pasture and range and for watersheds, wildlife, and recreation.

Santa Lucia shaly loam, 30 to 50 percent slopes, eroded (SdF2).—This soil occupies narrow, rounded ridges. It is 18 to 40 inches deep over shale.

Representative profile: On hillside, 30 yards west of State Route 25, on ranch road, 400 yards north of Jef Schmidt's house.

A11—0 to 4 inches, gray (10YR 5/1) shaly loam, very dark gray (10YR 3/1) when moist; moderate, fine, subangular blocky structure; slightly hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; abundant very fine and fine roots; common, very fine and fine, tubular pores, few, very fine and fine, interstitial pores; medium acid; clear, smooth boundary.

A12—4 to 22 inches, gray (10YR 5/1) very shaly loam, very dark gray (10YR 3/1) when moist; weak, medium, subangular blocky structure; slightly hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; abundant very fine and fine roots; common, very fine and fine, tubular pores, common, fine and medium, interstitial pores; medium acid; gradual, smooth boundary.

R—22 inches, pale-brown and light-gray, weathered, highly fractured, moderately hard, acid shale.

Included with this soil are some small areas of Gazos, San Benito, Laniger, and Pinnacles soils, of soils that are shallow over shale, of soils that are mildly alkaline, and of rock outcrops. Also included are small areas of Santa Lucia soils that are moderately steep and are slightly deeper over bedrock. Other included areas are severely eroded.

This soil has low fertility. Available water holding capacity is about 2 to 4 inches, permeability is moderately rapid, runoff is rapid to very rapid, and the hazard of erosion is severe to very severe. The root zone is moderately deep.

This soil is used for dryland pasture, range, wildlife, watersheds, and recreation. Capability unit VIe–1 (15); pasture and range site 2.

Santa Lucia shaly loam, 30 to 75 percent slopes, severely eroded (SdG3).—This soil is similar to Santa Lucia shaly loam, 30 to 50 percent slopes, eroded, but is more sloping, is severely eroded, and is only 8 to 18 inches deep over bedrock. It is covered with brush. Slopes are dominantly 55 to 60 percent.

Included with this soil are areas of shale rock outcrops and small areas of Laniger soils.

This soil has very low fertility. Available water holding capacity is 1 to 2 inches. Runoff is rapid to very rapid, and the hazard of erosion is very severe. The root zone is shallow.

This soil is used for watersheds, wildlife, and recreation and for range. Capability unit VIIe–1 (15); pasture and range site 2.

Sedimentary Rock Land

Sedimentary rock land (SeG) consists of outcrops of moderately hard sandstone and shale and areas of very thin soils. The rock outcrops generally make up 35 to 90 percent of the surface. The plant cover is sparse to moderately thick and consists of low brush, small areas of sparse grasses, and some scattered oaks and Digger pine. Drainage is excessive, and a moderate to large amount of silt is washed away.

Included with this land are small areas of shallow soils and surrounding soils that have a grass cover in some places.

This land is used for watersheds, wildlife, and recreation. Capability unit VIIIs–1 (15).

Shedd Series

The Shedd series consists of well-drained to somewhat excessively drained loamy soils that are underlain by soft, calcareous sandstone and shale generally at a depth of 20 to 40 inches. These soils are on uplands and are strongly sloping to steep. The vegetation consists of annual grasses and forbs, a few scattered oaks, and areas of low brush on the more eroded slopes. Elevations range from 1,000 to 2,000 feet above sea level. Annual rainfall is 12 to 14 inches. Average annual temperature is about

60° F., and the frost-free period is about 260 days. The main associated soils are the Diablo, Linne, Lodo, and Santa Lucia.

The surface layer is light-gray or gray loam 12 to 20 inches thick. The next layer is light-gray or gray stony loam 8 to 28 inches thick. The underlying material is fine- to medium-grained, interbedded sandstone and shale that is coated with lime. Depth to sandstone and shale is dominantly between 20 and 40 inches, but is 8 to 20 inches in the severely eroded, steep soils.

Shedd soils are used for dryland grain and pasture, range, watersheds, and wildlife.

Shedd loam, 30 to 50 percent slopes, eroded (ShF2).—This soil is steep and occurs on uplands that have narrow, winding ridgetops.

Representative profile: On hillside, 30 yards to the east of King City Road, 3 miles southwest of Bitterwater store.

A11—0 to 3 inches, light-gray (10YR 6/1) loam, dark grayish brown (2.5Y 4/2) when moist; moderate, fine, granular structure; slightly hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; abundant very fine and fine roots; common, very fine and fine, tubular pores, common, very fine and fine, interstitial pores; moderately alkaline, strongly effervescent; abrupt, smooth boundary.

A12—3 to 12 inches, light-gray (10YR 6/1) loam, dark grayish brown (2.5Y 4/2) when moist; weak, coarse, subangular blocky structure; slightly hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; plentiful very fine and fine roots; common, fine and medium, tubular pores, common, fine and medium, interstitial pores; moderately alkaline, strongly effervescent; clear, smooth boundary.

A13—12 to 20 inches, light-gray (10YR 6/1) loam, dark grayish brown (2.5Y 4/2) when moist; weak, medium, subangular blocky structure; soft when dry, very friable when moist, slightly sticky and slightly plastic when wet; plentiful very fine and fine roots; common, very fine and fine, tubular pores; moderately alkaline, violently effervescent; gradual, smooth boundary.

C1—20 to 32 inches, light-gray (10YR 6/1) stony loam, dark grayish brown (2.5Y 4/2) when moist; weak, medium, subangular blocky structure; soft when dry, very friable when moist, slightly sticky and slightly plastic when wet; plentiful very fine and fine roots; common, very fine and fine, tubular pores; moderately alkaline, violently effervescent; gradual, wavy boundary.

C2—32 to 60 inches, very light gray (10YR 7/2), calcareous, fine-grained, soft sandstone; coated with lime.

Included with this soil are some areas of Linne and Santa Lucia soils and areas of rock outcrops. Also included are severely eroded areas.

This somewhat excessively drained soil has low fertility. Available water holding capacity is about 3 to 8 inches. Permeability is moderate, runoff is rapid to very rapid, and the hazard of erosion is severe to very severe. The root zone is moderately deep.

This soil is used for range, watershed, and wildlife. Capability unit VIIe–1 (15); pasture and range site 7.

Shedd loam, 9 to 15 percent slopes (ShD).—This soil is similar to Shedd loam, 30 to 50 percent slopes, eroded, but it is less sloping, is only slightly eroded, and is somewhat deeper and more grayish. It occurs on broad ridges or on low rounded hills.

Included with this soil are small areas of Linne soils on north-facing slopes, around drainageways, and in saddles.

This well-drained soil has available water holding capacity of 5 to 6 inches. Runoff is medium, and the hazard of erosion is moderate.

This soil is used for dryland grain and pasture. Capability unit IVe–1 (15); pasture and range site 7.

Shedd loam, 15 to 30 percent slopes, eroded (ShE2).—This soil is similar to Shedd loam, 30 to 50 percent slopes, eroded, but it is less sloping. It occurs on broad ridgetops or side slopes. The underlying material is mostly calcareous sandstone and shale. The cover is generally grass, but low brush grows in some areas.

Included with this soil are small areas that are shallow over bedrock and areas that are severely eroded.

This soil is well drained. Runoff is rapid, and the hazard of erosion is severe. The root zone is moderately deep.

This soil is used mostly for dryland pasture and range. A few small tracts are used for dryland grain. Capability unit VIe–1 (15); pasture and range site 7.

Shedd loam, 30 to 50 percent slopes, severely eroded (ShF3).—This soil is similar to Shedd loam, 30 to 50 percent slopes, eroded, but it is not as deep and is severely eroded. This soil is shallow; because it has been severely eroded, average depth to sandstone and shale is 8 to 20 inches. Slopes are dominantly 45 to 50 percent.

Included with this soil are some soils that have slopes of 55 to 60 percent, areas of rock outcrops, areas of very thin soils, and some small areas of Santa Lucia and Linne soils. Also included are some moderately steep Santa Lucia soils that are moderately eroded.

This soil has very low fertility. Available water holding capacity is 1 to 3 inches. Runoff is rapid to very rapid, and the hazard of erosion is very severe. The root zone is shallow.

This soil is used for range, watersheds, and wildlife. Capability unit VIIe–1 (15); pasture and range site 7.

Sheridan Series

The Sheridan series consists of well-drained to somewhat excessively drained loamy soils that are underlain by weathered granite. These soils are strongly sloping to very steep and lie on mountainous uplands. They occur generally in an area west of Cienega Road and northwest of the Lime Kiln Road. The vegetation ranges from annual grasses and forbs to areas of Digger and Coulter pines, oaks, and brush. Elevations range from 1,200 to 3,800 feet above sea level. Annual rainfall is 20 to 25 inches. Average annual temperature is about 56° F., and the frost-free period is about 250 days. The main associated soils are the Auberry and Cieneba.

The surface layer is 14 to 36 inches thick. It is dark grayish-brown or dark-brown to brown coarse sandy loam. The next layer is dark grayish-brown coarse sandy loam 4 to 24 inches thick. The underlying granite is generally deeply weathered, but there are areas underlain by unweathered granite or by medium- to fine-grained igneous rock. In small areas the underlying rock is limestone and marble over granite. Depth to the underlying rock generally ranges from 18 to more than 60 inches but is between 30 and 55 inches in most places.

Sheridan soils are used for dryland pasture and range and for watersheds, wildlife, and recreation.

Sheridan coarse sandy loam, 15 to 30 percent slopes (SkE).—This moderately steep soil occurs on rounded ridgetops in areas of steeper soils. Slopes average about 25 percent.

Representative profile: On 101 Ranch, by ranch road, toward ridgetop, 3 miles west of ranchhouse.

A11—0 to 7 inches, dark grayish-brown (10YR 4/2) coarse sandy loam, very dark brown (10YR 2/2) when moist; moderate, fine, granular structure; slightly hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; abundant very fine and fine roots; many, very fine and fine, interstitial pores; slightly acid; clear, smooth boundary.

A12—7 to 16 inches, dark grayish-brown (10YR 4/2) coarse sandy loam, very dark brown (10YR 2/2) when moist; weak, medium, subangular blocky structure; slightly hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; plentiful very fine and fine roots; many, very fine, fine, and medium, interstitial pores; neutral; gradual, smooth boundary.

A13—16 to 28 inches, dark grayish-brown (10YR 4/2) coarse sandy loam, very dark brown (10YR 2/2) when moist; weak, medium, subangular blocky structure; slightly hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; plentiful very fine and fine roots; few, very fine and medium, tubular pores, common, very fine, fine, and medium, interstitial pores; slightly acid; gradual, smooth boundary.

C1—28 to 38 inches, dark grayish-brown (10YR 4/2) coarse sandy loam, very dark brown (10YR 2/2) when moist; weak, coarse, subangular blocky structure; slightly hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; few very fine and fine roots; common, fine and medium, tubular pores, common, medium, interstitial pores; slightly acid; gradual, smooth boundary.

C2—38 to 52 inches, brown (10YR 4/3) coarse sandy loam, dark brown (10YR 3/3) when moist; weak, coarse, subangular blocky structure; slightly hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; few very fine and fine roots; common, very fine, fine, and medium, tubular pores; medium acid; gradual, smooth boundary.

C3—52 inches, yellowish-brown (10YR 5/6), strongly weathered, highly fractured granite with relict rock structure.

Included with this soil are areas of Auberry and Cieneba soils that intergrade to Sheridan soils at lower elevations. Also included are some areas of rock outcrops, small areas of soils that are underlain by limestone or marble, and areas of moderately eroded soils.

This well-drained soil has low to moderate fertility. Available water holding capacity is 5 to 7 inches. Permeability is moderately rapid, runoff is medium to rapid, and the hazard of erosion is moderate to severe. The root zone is deep.

This soil is used for dryland pasture and for wildlife, watersheds, and recreation. Capability unit VIe–4 (15); pasture and range site 3.

Sheridan coarse sandy loam, 9 to 15 percent slopes (SkD).—This soil is similar to Sheridan coarse sandy loam, 15 to 30 percent slopes, but it is less sloping. It occurs on toe slopes or in areas around the heads of larger drainageways in the Gabilan Range. Slopes dominantly range from 9 to 12 percent. The depth to weathered granite averages 36 to 48 inches but is more than 60 inches in some places.

Included with this soil are areas of sandy loam.

On this soil runoff is medium, and the hazard of erosion is moderate. The root zone is deep.

This soil is used for dryland pasture. Capability unit IVe–1 (15); pasture and range site 3.

Sheridan coarse sandy loam, 15 to 30 percent slopes, eroded (SkE2).—This soil is similar to Sheridan coarse sandy loam, 15 to 30 percent slopes, but it is slightly shallower over bedrock and is more eroded. Depth to bedrock ranges from 24 to 36 inches. It is moderately steep and occurs on rounded hills or on rounded ridgetops in areas of steeper soils. Dominant slopes are 20 to 25 percent. Some areas have a cover of grass or grass, oaks, and Digger pine, but large areas are covered with brush.

This soil is low in fertility. Available water holding capacity is 3 to 5 inches. The root zone is 24 to 36 inches. Runoff is rapid, and the hazard of erosion is severe.

This soil is used for pasture and for watersheds, wildlife, and recreation. Capability unit VIe–4 (15); pasture and range site 3.

Sheridan coarse sandy loam, 30 to 75 percent slopes, eroded (SkG2).—This soil is similar to Sheridan coarse sandy loam, 15 to 30 percent slopes, but it is shallower to bedrock, is more sloping, and is moderately eroded. It is steep to very steep and occurs on rounded ridgetops or in mountainous areas. Slopes dominantly range from 45 to 60 percent. This soil is generally dark-brown or grayish-brown coarse sandy loam to loam. Depth to bedrock averages from 18 to 30 inches. The plant cover is generally grass and thin to moderately thick stands of oaks, Digger pine, and Coulter pine. Some eroded areas are in brush.

Included with this soil are areas as fine textured as loam. Also included are severely eroded areas, areas of thin soils, rock outcrops, and a few small areas of Auberry soils.

This somewhat excessively drained soil has low fertility. Available water holding capacity is 3 to 5 inches. Runoff is rapid to very rapid, and the hazard of erosion is severe to very severe.

This soil is used for range and for watersheds, wildlife, and recreation. Capability unit VIIe–4 (15); pasture and range site 3.

Sheridan coarse sandy loam, 30 to 75 percent slopes, severely eroded (SkG3).—This soil is similar to Sheridan coarse sandy loam, 15 to 30 percent slopes, but it is shallower over bedrock, is steeper, and is severely eroded. It is steep to very steep and occurs on rounded hills or in mountainous areas. Slopes are dominantly between 45 and 60 percent. Average depth to weathered granite is 18 to 24 inches. The plant cover is generally brush or brush and thin stands of grass, but some areas are covered by grass and some by oaks and pines.

Included with this soil are areas of sandy loam. Also included are outcrops of granite or fine-grained igneous rocks that generally make up less than 10 percent of the mapped area.

This somewhat excessively drained soil has low fertility. Available water holding capacity is 2 to 4 inches. Runoff is rapid to very rapid, and the hazard of erosion is very severe.

This soil is used for range and for watersheds, wildlife, and recreation. Capability unit VIIe–4 (15); pasture and range site 3.

Soper Series

The Soper series consists of well-drained loamy soils that are underlain by stratified, semiconsolidated sand and gravel at a depth of 30 to 48 inches. These soils lie on uplands and are strongly sloping to steep. The vegetation is chiefly annual grasses and forbs, scattered stands of oaks, and some brush on the more eroded slopes. Elevations range from 200 to 2,000 feet above sea level. Annual rainfall is 12 to 20 inches. Average annual temperature is about 60° F., and the frost-free period is about 260 days. The main associated soils are the San Benito, Los Gatos, Diablo, Pleasanton, and Vallecitos.

The surface layer is dark grayish-brown to brown sandy loam and gravelly loam about 16 to 20 inches thick. The subsoil is brown sandy clay loam that is 14 to 28 inches thick. The substratum is stratified, semiconsolidated sand and gravel. It ranges from slightly acid to mildly alkaline and in places is slightly calcareous in the lower part.

The Soper soils are used mostly for dryland pasture and range, but a few small areas are used for irrigated fruits and nuts and for dryland wine grapes, apricots, and grain.

Soper sandy loam, 30 to 50 percent slopes, eroded (SmF2).—This soil occurs on side slopes. Slopes are generally between 45 and 50 percent.

Representative profile: On hillside to north of School Road, 1 mile north of Anzar Road and 1 mile west of U.S. Highway No. 101.

A11—0 to 7 inches, dark grayish-brown (10YR 4/2) sandy loam, very dark brown (10YR 2/2) when moist; moderate, fine, granular structure; slightly hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; abundant very fine and fine roots; common, very fine and fine, interstitial pores; medium acid; clear, smooth boundary.

A12—7 to 16 inches, dark grayish-brown (10YR 4/2) loam, very dark brown (10YR 2/2) when moist; weak, medium, subangular blocky structure; slightly hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; plentiful very fine and fine roots; common, very fine, fine, and medium, interstitial pores; slightly acid; gradual, smooth boundary.

B2t—16 to 30 inches, brown (7.5YR 5/4) sandy clay loam, dark brown (7.5YR 4/4) when moist; moderate, medium, subangular blocky structure; hard when dry, firm when moist, sticky and plastic when wet; few very fine and fine roots; few, very fine and fine, tubular pores; thin patchy clay films on ped surfaces and thin continuous clay films in larger pores; seams of material from the A horizon in cracks and larger pores; common stains of material from A horizon on ped surfaces; slightly acid; gradual, smooth, boundary.

IIC1—30 to 42 inches, pale-brown (10YR 6/3) loamy sand, brown (10YR 4/3) when moist; weak, medium, subangular blocky structure; slightly hard when dry, very friable when moist, nonsticky and nonplastic when wet; few very fine and fine roots; slightly acid (pH 6.5); diffuse, smooth boundary.

IIIC2—42 to 84 inches, stratified, slightly acid (pH 6.5), yellowish-brown (10YR 6/4) and gray, (10YR 5/1) semiconsolidated sand and fine gravel.

Included with this soil are small areas of Pleasanton soils and of severely eroded Soper soils.

This soil has low fertility. Available water holding capacity is 5 to 7 inches. Permeability is moderately slow, runoff is rapid to very rapid, and the hazard of erosion is severe to very severe. The root zone is moderately deep to deep to the semiconsolidated substratum.

This soil is used for range. Capability unit VIIe–1 (15); pasture and range site 3.

Soper sandy loam, 9 to 15 percent slopes (SmD).—This soil is similar to Soper sandy loam, 30 to 50 percent slopes, eroded, but is slightly deeper to semiconsolidated material, is less sloping, and is only slightly eroded. It occurs in small areas that slope into drainageways. Slopes dominantly range from 12 to 15 percent. Average depth to semiconsolidated alluvium is 48 inches.

This soil is moderately fertile. Available water holding capacity is about 7 inches. Runoff is medium, and the hazard of erosion is moderate. The root zone is deep.

This soil is used for dryland grain and pasture. Capability unit IVe–1 (15); pasture and range site 3.

Soper sandy loam, 15 to 30 percent slopes, eroded (SmE2).—This soil is similar to Soper sandy loam, 30 to 50 percent slopes, eroded, but it is less sloping. It occurs on broad, rounded ridgetops and on rounded hills. Slopes dominantly range from 20 to 25 percent.

Included with this soil are a few areas of soil that have a grayish-brown surface layer and a few areas that have a loam surface layer. Also included are a few severely eroded areas.

On this soil runoff is rapid and the hazard of erosion is severe. The root zone is moderately deep.

This soil is used for dryland grain and pasture. Capability unit VIe–1 (15); pasture and range site 3.

Soper gravelly loam, 9 to 15 percent slopes (SlD).—This soil is similar to Soper sandy loam, 30 to 50 percent slopes, eroded, but it is less sloping, and has a gravelly loam surface texture. Also, its substratum is gravelly or very gravelly. The surface layer is dark grayish brown or grayish brown. It occurs with Pleasanton soils along the larger drainageways or on benches that have slopes of 9 to 12 percent.

Included with this soil are a few small areas of nongravelly soils and a few small areas of Pleasanton soils.

This soil is moderately fertile. Available water holding capacity is about 6 inches. Runoff is medium, and the hazard of erosion is moderate.

This soil is used for dryland grain and pasture. Capability unit IVe–1 (15); pasture and range site 3.

Soper gravelly loam, 15 to 30 percent slopes, eroded (SlE2).—This moderately eroded soil is similar to Soper sandy loam, 30 to 50 percent slopes, eroded, but it is gravelly and less sloping. It is generally dark grayish brown or grayish brown. This soil generally occurs along major drainageways where slopes are 20 to 25 percent.

Included with this soil are soils that have less clay in the subsoil and that are brown in color. Also included are slightly eroded and severely eroded areas.

This soil is moderately fertile. Available water holding capacity is 5 to 7 inches. Runoff is rapid, and the hazard of erosion is severe.

This soil is used for dryland grain and pasture. Capability unit VIe–1 (15); pasture and range site 3.

Soper gravelly loam, 30 to 50 percent slopes, eroded (SlF2).—This soil is similar to Soper sandy loam, 30 to 50 percent slopes, eroded, but it is gravelly throughout and has a dark grayish-brown gravelly loam surface layer.

It occurs along major drainageways and slopes are dominantly 35 to 45 percent. Available water holding capacity is about 5 to 7 inches.

Included with this soil are areas of brown soils that have a gravelly sandy loam surface layer and that have less clay in the subsoil. Also included are a few severely eroded areas, a few nongravelly areas, and a few small Landslides.

This soil is used for range. Capability unit VIIe–1 (15); pasture and range site 3.

Sorrento Series

The Sorrento series consists of well-drained, loamy soils that formed in alluvium derived from calcareous sandstone and shale. These soils are nearly level to moderately sloping and are on flood plains and fans. The vegetation consists of annual grasses and forbs and a few scattered oaks. Elevations range from 120 to 1,500 feet above sea level. Annual rainfall is 12 to 16 inches. Average annual temperature is about 60° F., and the frost-free period is about 260 days. The main associated soils are the Mocho, Metz, Yolo, Clear Lake, and Pacheco.

The surface layer is grayish-brown silt loam, gravelly loam, or silty clay loam 16 to 24 inches thick. This layer ranges from brown to grayish brown in color. The next layer is light brownish-gray silt loam, gravelly loam, or silty clay loam 16 to 24 inches in thickness. This layer is underlain by a similar layer that in places contains stratified sand and gravel or clay loam. It extends to a depth of more than 5 feet.

The Sorrento soils are used for irrigated apples, pears, apricots, grapes, walnuts, prunes, sugar beets, tomatoes, beans, lettuce, other vegetables, and alfalfa and for dryland grain and incidental pasture.

Sorrento silt loam, 0 to 2 percent slopes (SnA).—This soil occurs along drainageways on valley floors.

Representative profile: Gomes Ranch, 10 yards east of Flint Road, 75 yards north of State Route 156.

Ap—0 to 12 inches, grayish-brown (2.5Y 5/2) silt loam, very dark grayish brown (2.5Y 3/2) when moist; moderate, fine, granular structure; hard when dry, friable when moist, slightly sticky and slightly plastic when wet; plentiful very fine roots; common, very fine, interstitial pores; mildly alkaline; clear, smooth boundary.

A1—12 to 18 inches, grayish-brown (2.5Y 5/2) silt loam, very dark grayish brown (2.5Y 3/2) when moist; weak, medium, subangular blocky structure; hard when dry, friable when moist, slightly sticky and slightly plastic when wet; plentiful very fine and fine roots; common, very fine and fine, tubular pores; moderately alkaline; clear, smooth boundary.

C1—18 to 34 inches, light brownish-gray (2.5Y 6/2) silt loam, dark grayish brown (2.5Y 4/2) when moist; weak, coarse, subangular blocky structure; slightly hard when dry, friable when moist, slightly sticky and slightly plastic when wet; plentiful very fine roots; many, very fine, fine, and medium, tubular pores; moderately alkaline, slightly effervescent; gradual, smooth boundary.

C2—34 to 78 inches, light brownish-gray (2.5Y 6/2) silt loam, dark grayish brown (2.5Y 4/2) when moist; weak, coarse, subangular blocky structure; slightly hard when dry, friable when moist, slightly sticky and slightly plastic when wet; plentiful very fine roots; many, very fine and fine, tubular pores; few thin strata of very fine sand; moderately alkaline, strongly effervescent; clear, smooth boundary.

Included with this soil are some small areas of Mocho, Metz, and Yolo soils and some areas of a soil that has a clay surface layer.

This fertile soil has available water holding capacity of 10 to 12 inches. Permeability is moderate, runoff is very slow, and the hazard of erosion is slight to none. The root zone is very deep.

This soil is used for irrigated fruits, nuts, grapes, sugar beets, tomatoes, vegetables, and alfalfa and for dryland grain and incidental pasture (fig. 12). Capability units I–1 (14) and IIIc–1 (15).

Sorrento silt loam, 2 to 9 percent slopes (SnC).—This soil is similar to Sorrento silt loam, 0 to 2 percent slopes, but is more sloping. It occurs in small to medium-size areas along the larger drainageways. Slopes dominantly range from 3 to 5 percent. In places this soil is subject to occasional flooding. Runoff is slow to medium, and the hazard of erosion is slight to moderate.

This soil is used for irrigated fruits and nuts, grapes, sugar beets, alfalfa, and vegetables and for dryland grain and incidental pasture. Capability units IIe–1 (14) and IIIe–1 (15).

Sorrento gravelly loam, 0 to 5 percent slopes (SoB).—This soil is similar to Sorrento silt loam, 0 to 2 percent slopes, but its texture is gravelly loam throughout the profile. It occurs along the larger drainageways on valley floors at places where drainageways come together, or it is along bends where floodwaters have swept over the bottom lands. Slopes are dominantly 1 to 3 percent. This soil is grayish-brown gravelly loam. Fine to medium gravel makes up more than 15 percent of the profile. The substratum is very gravelly in places.

Included with this soil are some small areas of Metz and Mocho soils. Also included are areas of clay loam or light clay loam.

Available water holding capacity is about 7 to 9 inches. Runoff is very slow to slow, and the hazard of erosion is none to slight.

This soil is used for irrigated fruits and nuts, grapes, and alfalfa and for dryland grain and incidental pasture. Capability unit IIs–4 (14).

Sorrento silty clay loam, 0 to 2 percent slopes (SrA).—This soil is similar to Sorrento silt loam, 0 to 2 percent slopes, but it is silty clay loam throughout the profile. It occurs on flood plains and valley floors in the larger valleys and along the larger drainageways. In color, this soil ranges from grayish brown to dark grayish brown. The substratum is stratified and in places ranges from light clay loam to loamy sand. In a few areas 10 percent of the solum, by volume, is fine and medium gravel.

Included with this soil are a few small areas of loam and silt loam and a few small areas of Pacheco and Clear Lake soils.

Available water holding capacity is about 10 to 12 inches. Permeability is moderately slow.

This soil is used for irrigated fruits and nuts, grapes, sugar beets, tomatoes, vegetables, and alfalfa and for dryland grain and incidental pasture. Capability units I–1 (14) and IIIc–1 (15).

Sorrento silty clay loam, 2 to 9 percent slopes (SrC).—This soil is similar to Sorrento silt loam, 0 to 2 percent slopes, but it is more sloping and is silty clay loam

Figure 12.—Sorrento silt loam, 0 to 2 percent slopes. *Top,* young, healthy walnut trees. *Bottom,* mature walnut trees. The cover crop is barley.

throughout the profile. It occurs along the larger drainageways. Slopes are dominantly 3 to 6 percent. In some areas this soil contains a small amount of fine to medium gravel. Occasional flooding is a hazard in the lower positions along drainageways.

Permeability is moderately slow. Runoff is slow to medium, and the hazard of erosion is slight to moderate.

This soil is used for irrigated fruits, nuts, grapes, and alfalfa and for dryland grain and incidental pasture. Capability units IIe–5 (14) and IIIe–5 (15).

Sween Series

The Sween series consists of well-drained clayey soils that are underlain by fine-grained, basic igneous rocks at a depth of 20 to 50 inches. In places these soils are stony or very stony or rocks crop out. These soils are on uplands and are moderately steep to steep. The vegetation consists of annual grasses and forbs and scattered oaks. Elevations range from 200 to 2,500 feet above sea level. Annual rainfall is 14 to 20 inches. Average annual temperature is about 62° F., and the frost-free period is about 250 days. The main associated soils are the San Benito, Los Gatos, Cibo, and Henneke.

The surface layer is gray clay loam, stony clay loam, or very stony clay loam 8 to 20 inches thick. The subsoil is light brownish-gray to pale-brown clay 8 to 18 inches thick. The substratum is light yellowish-brown coarse sandy clay 4 to 12 inches thick. It is underlain by yellowish-brown and gray, weathered, basic igneous rock. Depth to bedrock ranges from 20 to 50 inches but is between 24 and 36 inches in most places. In places bedrock crops out.

Sween soils are used for dryland pasture and range.

Sween rocky clay loam, 15 to 30 percent slopes, eroded (SsE2).—This soil occurs on broad rounded ridges and moderately steep uplands. Outcrops of bedrock make up 2 to 10 percent of this soil.

Representative profile: On U.S. Highway No. 101, one-half mile northeast of its junction with State Route 156, 100 yards northwest of highway.

A11—0 to 4 inches, gray (10YR 5/1) clay loam, very dark gray (10YR 3/1) when moist; moderate, fine, granular structure; hard when dry, friable when moist, sticky and plastic when wet; abundant very fine and fine roots; common, very fine and fine, interstitial pores; medium acid; clear, smooth boundary.

A12—4 to 13 inches, gray (10YR 5/1) clay loam, very dark gray (10YR 3/1) when moist; weak, medium, subangular blocky structure; hard when dry, friable when moist, sticky and plastic when wet; abundant very fine and fine roots; many, very fine and common, fine, tubular pores; slightly acid; clear, smooth boundary.

B21t—13 to 19 inches, light brownish-gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) when moist; strong, medium, angular blocky structure; very hard when dry, very firm when moist, very sticky and very plastic when wet; plentiful very fine and fine roots; common, very fine and fine, tubular pores; thin continuous clay films on ped surfaces and in pores; many fine and medium slickensides; neutral; gradual, smooth boundary.

B22t—19 to 27 inches, pale-brown (10YR 6/3) clay, brown (10YR 4/3) when moist; strong, medium, angular blocky structure; very hard when dry, very firm when moist, very sticky and very plastic when wet; plentiful very fine roots; common, very fine, tubular pores; thin continuous clay films on ped surfaces; mildly alkaline; gradual, smooth boundary.

C—27 to 32 inches, light yellowish-brown (10YR 6/4) coarse sandy loam, dark yellowish brown (10YR 4/4) when moist; weak, medium, subangular blocky structure; very hard when dry, very firm when moist, sticky and plastic when wet; few very fine roots; few, very fine, tubular pores; mildly alkaline; gradual, irregular boundary.

R—32 inches, yellowish-brown (10YR 5/4) and gray (10YR 5/1), weathered, basic igneous rock.

Included with this soil are some small areas of Cibo soils and some soils that have a subsoil only 2 to 10 inches thick over bedrock. Also included are a few areas that are severely eroded.

This soil has moderate to low fertility; the calcium-magnesium ratio is low. Available water holding capacity is 4 to 6 inches. Permeability is slow, runoff is rapid to very rapid, and the hazard of erosion is severe to very severe. The root zone is moderately deep.

This soil is used for dryland pasture. Capability unit VIs–5 (15); pasture and range site 5.

Sween rocky clay loam, 30 to 50 percent slopes, eroded (SsF2).—This soil is similar to Sween rocky clay loam, 15 to 30 percent slopes, eroded, but is shallower to bedrock and is more sloping. It occurs on side slopes in the hills to the west of San Juan Bautista. Slopes are dominantly 35 to 40 percent. The cover is mostly grass, but some north-facing slopes have thin to moderately thick stands of oaks.

This soil has moderate to low fertility; the calcium-magnesium ratio is low. Available water holding capacity is 3 to 5 inches. The root zone extends to a depth of 24 to 30 inches.

This soil is used for dryland pasture. Capability unit VIs–5 (15); pasture and range site 5.

Sween stony clay loam, 15 to 30 percent slopes, eroded (StE2).—This soil has rounded pebbles and stones on the surface and in the profile. It is on ridgetops and in moderately steep areas along Lone Tree Road. Slopes are dominantly 20 to 25 percent. A few areas of rock outcrops are included.

This soil is moderately fertile. Available water holding capacity is 3 to 6 inches. The root zone is moderately deep. Runoff is rapid, and the hazard of erosion is severe.

This soil is used for dryland pasture. Capability unit VIs–5 (15); pasture and range site 5.

Sween very stony clay loam, 15 to 50 percent slopes, eroded (SwF2).—This soil is similar to Sween stony clay loam, 15 to 30 percent slopes, eroded, but it is very stony rather than stony, is shallower to bedrock, and is more sloping. Bedrock is at a depth of 20 to 30 inches. This soil occurs along Lone Tree Road where slopes are dominantly 45 to 50 percent.

Included with this soil are small areas of rock outcrops, small areas of severely eroded soils and shallow soils, and some areas of nonstony soils. Also included are areas of soils that have a surface layer ranging from loam to clay loam.

This soil has low fertility. Available water holding capacity is 2 to 5 inches. Runoff is rapid to very rapid, and the hazard of erosion is severe to very severe.

This soil is used for range. Capability unit VIIs–1 (15); pasture and range site 5.

Terrace Escarpments

Terrace escarpments (TeF) consists of even fronts of terraces and long narrow streambanks that have slopes of 20 to 50 percent. These areas range from gravelly loam to clay loam in texture. They are generally slightly to moderately eroded but are severely eroded in some areas. Most areas are covered by annual grasses and forbs and scattered oaks, but severely eroded areas support little or no vegetation.

Included with this mapping unit are nearly vertical streambanks and small areas that have slopes of as much as 75 percent. Also included are some areas where the streambanks slough into streams.

Terrace escarpments have low to moderate fertility. Runoff is rapid to very rapid, and the hazard of erosion is severe to very severe.

This land is used for pasture. Capability unit VIe–1 (15) ; pasture and range site 4.

Vallecitos Series

The Vallecitos series consists of well-drained loamy soils that are underlain by metamorphosed sandstone and shale. These soils have a loamy surface layer and a clayey subsoil. They are strongly sloping to steep and lie on mountainous uplands. The vegetation consists of annual grasses and forbs and some scattered oaks, Digger pine, and brush. Elevations range from 1,000 to 3,800 feet above sea level. Annual rainfall is 14 to 20 inches. Average annual temperature is about 60° F., and the frost-free period is about 240 days. The main associated soils are the Climara, Gaviota, and Montara.

The surface layer is brown loam 6 to 10 inches thick. The subsoil is reddish-brown to yellowish-red gravelly clay 6 to 26 inches thick. The underlying bedrock is interbedded, metamorphosed sandstone and shale. Depth to bedrock ranges from 12 to 36 inches.

Vallecitos soils are used for dryland pasture and for range, watersheds, wildlife, and recreation.

Vallecitos loam, 30 to 50 percent slopes, eroded (VaF2).—This soil is steep and occurs on side slopes or in areas that have rounded ridgetops.

Representative profile: In NE¼SW¼ section 26, T. 11 S., R. 3 E., about 20 yards up the hillside north of ranch road, one-half mile north of ranch house, 2 miles past the end of Comstock Road.

A—0 to 8 inches, brown (10YR 5/3) loam, dark brown (10YR 4/3) when moist; massive; hard when dry, friable when moist, slightly sticky and slightly plastic when wet; abundant very fine roots; many, very fine, and, few, medium, tubular pores; slightly acid; clear, smooth boundary.

B21t—8 to 14 inches, reddish-brown (5YR 4/3) gravelly clay, dark reddish brown (5YR 3/3) when moist; moderate, medium, subangular blocky structure; very hard when dry, firm when moist, sticky and plastic when wet; many, very fine, interstitial pores, few, medium, tubular pores; moderately thick continuous clay films lining pores and on ped surfaces; slightly acid; clear, smooth boundary.

B22t—14 to 18 inches, yellowish-red (5YR 5/6) gravelly clay, yellowish red (5YR 4/6) when moist; moderate, medium, subangular blocky structure; very hard when dry, firm when moist, plastic and sticky when wet; many, very fine, interstitial and tubular pores; moderately thick continuous clay films lining pores and on ped surfaces; slightly acid; abrupt, broken boundary.

R—18 inches, metamorphosed, yellowish-brown (10YR 5/6) fine-grained sandstone; clay films along cleavage planes.

Included with this soil are common outcrops of metamorphosed and ultrabasic rocks and areas of Climara and Montara soils. Also included are small areas of Gaviota soils, and a few small severely eroded areas that have a clay surface layer. Generally, the soils are darker and deeper on the north-facing slopes and have more trees and brush in the cover.

This soil has low fertility. Available water holding capacity is 2 to 5 inches. Permeability is slow, runoff is rapid to very rapid, and the hazard of erosion is severe to very severe. The root zone is shallow to moderately deep.

This soil is used for range and for watersheds, wildlife, and recreation. Capability unit VIIe–1 (15) ; pasture and range site 6.

Vallecitos loam, 9 to 15 percent slopes (VaD).—This soil is similar to Vallecitos loam, 30 to 50 percent slopes, eroded, but it has a thicker profile, is less sloping, and is only slightly eroded. It occurs on toe slopes in areas of steeper soils. Slopes dominantly range from 12 to 15 percent. The surface layer ranges in color from brown to dark brown. The subsoil ranges from reddish brown to yellowish brown. Included with this soil are a few small areas of Climara and Gaviota soils and areas that have a dark-brown surface layer.

This soil has low fertility. Available water holding capacity is about 3 to 5 inches. Runoff is medium, and the hazard of erosion is moderate.

This soil is used for dryland pasture. Capability unit IVe–1 (15) ; pasture and range site 6.

Vallecitos loam, 15 to 30 percent slopes (VaE).—This soil is similar to Vallecitos loam, 30 to 50 percent slopes, eroded, but it is less steep. It occurs on rounded hills or on rounded ridgetops in areas of steeper soils. Slopes dominantly range from 20 to 30 percent. Included with this soil are rock outcrops and moderately eroded areas.

On this soil runoff is medium to rapid, and the hazard of erosion is moderate to severe.

This soil is used mostly for dryland pasture, but a few areas are used for dryland grain. Capability unit VIe–1 (15) ; pasture and range site 6.

Vallecitos loam, 30 to 50 percent slopes (VaF).—This soil is similar to Vallecitos loam, 30 to 50 percent slopes, eroded, but it has a slightly thicker profile. It occurs in large areas in the uplands on somewhat rounded ridgetops.

Included with this soil are small to medium areas of Climara and Montara soils that formed on ultrabasic intrusions. Also included are some small Landslides, small severely eroded areas, soils that have slopes up to 60 percent, and some rock outcrops. Other included areas have a clay loam surface layer.

This soil has low to moderate fertility. Runoff is rapid, and the hazard of erosion is severe. The root zone is shallow to moderately deep.

This soil is used for dryland pasture and for watersheds, wildlife, and recreation. Capability unit VIe–1 (15) ; pasture and range site 6.

Vallecitos rocky loam, 9 to 30 percent slopes, eroded (VrE2).—This soil is similiar to Vallecitos loam, 30 to 50 percent slopes, eroded, but it is rocky and somewhat less steep. It occurs on low rounded hills or on ridgetops. Outcrops of rock cover from 2 to 10 percent of the surface. Erosion is slight to moderate and occurs mostly around the rock outcrops. The average slope is about 20 percent.

Included with this soil are some small areas of Climara and Montara soils on intrusions of ultrabasic rock. Also included are small areas of soils that have a clay, clay loam, or gravelly surface layer.

This soil has low fertility. Available water holding capacity is about 3 inches. Runoff is medium to rapid, and the hazard of erosion is moderate to severe.

This soil is used for dryland pasture and for watersheds, wildlife, and recreation. Capability unit VIs–5 (15) ; pasture and range site 6.

Vallecitos rocky loam, 30 to 50 percent slopes, eroded (VrF2).—This soil is similar to Vallecitos loam, 30 to 50 percent slopes, eroded, but it has a thinner profile. It is moderately eroded and occurs on narrow, somewhat angular to rounded, winding ridgetops and on mountainous areas. Slopes dominantly range from 45 to 50 percent. In places this soil is gravelly. Rock outcrops cover 2 to 10 percent of the surface.

Included with this soil are small to medium areas of Montara and Climara soils that formed on ultrabasic intrusions. Also included are soils that have slopes as steep as 60 percent, soils that have a loam or clay surface layer, small Landslides, small severely eroded areas, and small to medium areas of thin soils.

This soil has low fertility. Available water holding capacity is 1 to 3 inches. The root zone is shallow to moderately deep. Runoff is rapid to very rapid, and the hazard of erosion is severe to very severe.

This soil is used for range and for wildlife, watersheds, and recreation. Capability unit VIIs–1 (15) ; pasture and range site 6.

Willows Series

The Willows series consists of poorly drained, generally clayey, nearly level soils that formed on flood plains in alluvium derived from sandstone and shale. The vegetation is annual grasses and salt-tolerant plants. Elevations are less than 400 feet above sea level, and annual rainfall is less than 14 inches. The average annual temperature is about 60° F., and the frost-free period is about 260 days. The main associated soils are the Clear Lake, Cropley, and Sorrento.

Typically the surface layer is grayish-brown clay that ranges from 24 to 33 inches in thickness. The next layer is yellowish-brown clay that is mottled in the lower part and extends to a depth of about 84 inches.

These soils are slightly saline-alkali in most places, but some areas are moderately to severely saline-alkali.

Willows soils are used for irrigated sugar beets and for dryland grain and pasture.

Willows clay (0 to 2 percent slopes) (Wc).—This soil occurs in the basin of the Bolsa-Soap Lake area and on the floor of a few larger upland valleys. The soil is slightly saline-alkali.

Representative profile: On Turner Ranch, 60 yards north of Bolsa Road and one-quarter mile west of Shore Road intersection; in a field of barley along fence.

Ap—0 to 12 inches, grayish-brown (2.5Y 5/2) clay, very dark grayish brown (2.5Y 3/2) when moist; moderate, fine, granular structure; very hard when dry, very firm when moist, very sticky and very plastic when wet; abundant, very fine and fine roots; common, very fine and fine, interstitial pores; mildly alkaline; clear, smooth boundary.

A11—12 to 19 inches, grayish-brown (2.5Y 5/2) clay, very dark grayish brown (2.5Y 3/2) when moist; strong, very fine, angular blocky structure; very hard when dry, very firm when moist, very sticky and very plastic when wet; few very fine and fine roots; few, very fine and fine, interstitial pores; moderately alkaline; gradual, smooth boundary.

A12—19 to 33 inches, grayish-brown (2.5Y 5/2) clay, very dark grayish brown (2.5Y 3/2) when moist; strong, fine, angular blocky structure; very hard when dry, very firm when moist, very sticky and very plastic when wet; common, very fine and fine, tubular pores; common fine and medium slickensides; moderately alkaline; gradual, smooth boundary.

C1—33 to 57 inches, light yellowish-brown (2.5Y 6/4) clay, olive brown (2.5Y 4/4) when moist; moderate, medium, subangular blocky structure; very hard when dry, very firm when moist, very sticky and very plastic when wet; common, very fine and fine, tubular pores; pale-yellow horizontal layers (2 to 3 inches thick) of lime in soft masses; few coatings of material from the A horizon on surfaces of peds and in pores; moderately alkaline; gradual, smooth boundary.

C2g—57 to 84 inches, light yellowish-brown (2.5Y 6/4) clay, olive brown (2.5Y 4/4) when moist; weak, medium, subangular blocky structure; very hard when dry, very firm when moist, sticky and plastic when wet; common, very fine, fine and medium, tubular pores; mottled with gray on ped and pore surfaces; common soft masses and hard nodules of pale-yellow lime; salt crystals in large pores; moderately alkaline, slightly effervescent; gradual, smooth boundary.

In some places the C horizon overlies the surface of a buried soil.

Included in mapping were small areas of Pacheco and Clear Lake soils and areas in which there are buried soils high in organic-matter content.

This soil has low fertility. Available water holding capacity is 7 to 9 inches. Permeability is very slow, runoff is very slow to ponded, and there is no erosion hazard. Plant roots penetrate deeply except where the water table is moderately high.

This soil is used for irrigated sugar beets and dryland grain and incidental pasture. Capability units IIIw–5 (14) and IIIw–5 (15).

Willows clay, saline-alkali (0 to 2 percent slopes) (Wk).—This soil is similar to Willows clay but is moderately to severely affected by salts and alkali. The surface layer is fluffy in most places and ranges from silty clay to clay in texture. Salts and alkali increase with increasing depth. In some places this soil is in small areas surrounded by large areas of other soils. Fertility of the soil is very low.

This soil is used for dryland pasture, but it can be cultivated with the larger areas of surrounding soils. Capability unit IVw–6 (14) ; pasture and range site 11.

Willows sandy loam (0 to 2 percent slopes) (Ws).—This soil is similar to Willows clay, but its surface layer

is 8 to 10 inches of overwash. The overwash ranges from loam to sandy loam in texture but is grayish-brown sandy loam in most places. All of this soil is along medium-sized drainageways. Areas in the Bolsa area have an uneven surface that seems to be a few feet above the surrounding landscape. This soil is slightly saline-alkali. Available water holding capacity is 6 to 8 inches.

Included with this soil in mapping were small areas of Clear Lake soils. In one area of the soil southward from the San Juan-Hollister Road, texture and depth to clay are quite variable and there are minor inclusions of other soils.

Willows sandy loam is used for irrigated sugar beets and for dryland grain and incidental pasture. Capability unit IIIw–5 (14).

Willows soils, eroded (0 to 2 percent slopes) (Ww2).—These soils occur in the Bolsa area on low flats that generally do not have well-defined drainage channels. These soils are moderately affected by salts and alkali in most places, but strongly affected in spots and small areas. Erosion, caused by water running in from surrounding areas, ranges from slight to severe but is moderate to severe in most places. Texture varies from place to place. It is clay in slightly eroded areas, silty clay loam in moderately eroded areas, and clay loam to sandy loam in severely eroded areas. The slightly eroded to moderately eroded areas are characterized by small elongated potholes that have vertical walls and are generally 1 to 2 feet deep. In many places the surface layer of these soils has weak prismatic structure. In severely eroded areas, these soils are rough and gullied and have many small moderately eroded areas rising a foot or more above the general surface. Soil blowing occurs in spots and small areas where the concentration of alkali is severe.

These soils are used for dryland pasture. Capability unit IVw–6 (14); pasture and range site 11.

Yolo Series

The Yolo series consists of well-drained loamy soils that formed in alluvium derived from sandstone and shale. These soils are nearly level to moderately sloping and occupy flood plains and fans. The vegetation consists of annual grasses and forbs and scattered oaks. Elevations range from 400 to 600 feet above sea level. Annual rainfall is 12 to 18 inches. Average annual temperature is about 60° F., and the frost-free period is about 260 days. The main associated soils are the Botella, Gazos, Pleasanton, and Sorrento.

The surface layer is brown to grayish-brown loam and gravelly loam that ranges from 12 to 24 inches in thickness and from medium acid to neutral in reaction. The next layer is pale-brown loam 28 to 40 inches thick. Below this is pale-brown gravelly loam.

Yolo soils are used for dryland grain and incidental pasture.

Yolo loam, 2 to 9 percent slopes (YoC).—This soil occurs on fans, sloping valley floors, and flood plains. Slopes are dominantly between 3 to 6 percent.

Representative profile: On McCreary Ranch in bottom field, one-half mile east of ranchhouse.

Ap—0 to 8 inches, brown (10YR 5/3) loam, dark brown (10YR 3/3) when moist; moderate, fine, granular structure; hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; abundant very fine and fine roots; common, very fine and fine, interstitial pores; some fine gravel; medium acid; clear, smooth boundary.

A1—8 to 20 inches, grayish-brown (10YR 5/2) loam, very dark brown (10YR 3/2) when moist; weak, coarse, subangular blocky structure; hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; abundant very fine and fine roots; few, very fine and fine, tubular pores, common, fine and medium, interstitial pores; some fine gravel; slightly acid; gradual, smooth boundary.

C1—20 to 48 inches, pale-brown (10YR 6/3) loam, brown (10YR 4/3) when moist; weak, medium, subangular blocky structure; hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; plentiful very fine and fine roots; common, very fine and fine, tubular pores; some fine gravel; neutral; gradual, smooth boundary.

IIC2—48 to 60 inches, pale-brown (10YR 6/3) gravelly loam, brown (10YR 4/3) when moist; weak, medium, subangular blocky structure; hard when dry, very friable when moist, slightly sticky and slightly plastic when wet; few very fine and fine roots; common, very fine, tubular pores; mildly alkaline; gradual, smooth boundary.

Included with this soil are some small areas of Botella, Cropley, Pleasanton, and Sorrento soils.

This soil is moderately fertile. Available water holding capacity is 9 to 11 inches. Permeability is moderate, runoff is slow to medium, and the hazard of erosion is slight to moderate. The root zone is very deep.

This soil is used for dryland grain and incidental pasture. Capability unit IIIe–1 (15).

Yolo loam, 0 to 2 percent slopes (YoA).—This soil is similar to Yolo loam, 2 to 9 percent slopes, but it is less sloping. It occurs along the larger drainageways and is subject to occasional flooding in some places. The substratum is stratified and is gravelly or has strata of gravel. Runoff is very slow, and the hazard of erosion is slight to none.

Included with this soil are Botella and Cropley soils and soils that have a sandy loam to light clay loam surface layer.

This soil is used for dryland grain and incidental pasture. Capability unit IIIc–1 (15).

Yolo gravelly loam, 0 to 5 percent slopes (YvB).—This soil is similar to Yolo loam, 2 to 9 percent slopes, but it is less sloping and is gravelly throughout the profile. The surface layer contains 15 percent or more angular gravel, and the substratum is very gravelly and stratified. In some places gullies have been cut by water from the adjacent hills.

Included with this soil are soils on a few toe slopes that have gradients of as much as 5 percent.

Available water holding capacity is about 6 to 8 inches. Permeability is moderately rapid, runoff is very slow to slow, and the hazard of erosion is slight to none.

This soil is used for dryland grain and incidental pasture. Capability unit IIIe–1 (15).

Use and Management of the Soils

The soils in San Benito County are used mainly for range and improved pasture and for growing field crops and irrigated tree fruits, nuts, grapes, and vegetables.

This section tells how the soils can be used for these purposes and also for building highways and other engineering structures.

First described is the system of capability classification commonly used by the Soil Conservation Service but with modifications that are necessary because of climatic differences in the three land resource areas in the county. Capability groups of soils in San Benito County are described, and management of these groups is suggested. Following this is a table that gives estimated yield of crops on important soils for which management is specified. Another table gives the Storie index rating for each soil. Then soils grouped in pasture and range sites are described, and yields of air-dry herbage for each site is estimated. Most of the data on engineering is presented in tables in which properties that affect engineering are estimated and the soils are interpreted according to their suitability for engineering uses.

Capability Groups of Soils

Capability classification is the grouping of soils to show, in a general way, their suitability for most kinds of farming. It is a practical classification based on limitations of the soils, the risk of damage when they are used, and the way they respond to treatment. The classification does not apply to rice and other crops having special requirements. The soils are classified according to degree and kind of permanent limitation, but without consideration of major and generally expensive landforming that would change the slope, depth, or other characteristics of the soils; and without consideration of possible but unlikely major reclamation projects.

In the capability system, all kinds of soils are grouped at three levels, the capability class, subclass, and unit. These are discussed in the following paragraphs.

Capability Classes, the broadest grouping, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. Classes are defined as follows:

Class I. Soils have few limitations that restrict their use.

Class II. Soils have some limitations that reduce the choice of plants or require moderate conservation practices.

Class III. Soils have severe limitations that reduce the choice of plants or require special conservation practices, or both.

Class IV. Soils have very severe limitations that restrict the choice of plants or require very careful management, or both.

Class V. Soils subject to little or no erosion but have other limitations, impractical to remove, that limit their use largely to pasture, range, woodland, or wildlife food and cover. (None in San Benito County)

Class VI. Soils have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture or range, woodland, or wildlife food and cover.

Class VII. Soils have very severe limitations that make them unsuited to cultivation and that restrict their use largely to grazing, woodland, or wildlife.

Class VIII. Soils and landforms have limitations that preclude their use for commercial plant production and restrict their use to recreation, wildlife, or water supply, or to esthetic purposes.

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, IIe. The letter *e* shows that the main limitation is 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 San Benito County but not in all parts of the United States, shows that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses, because the soils of this class have few limitations. Class V can contain, at the most, only subclasses indicated by *w*, *s*, and *c*, because the soils in it are subject to little or no erosion, though they have other limitations that restrict their use largely to pasture, range, woodland, wildlife, or recreation.

Capability Units are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils.

Capability units in California are given Arabic numbers that suggest the chief kind of limitation responsible for placement of the soil in the capability class and subclass. For this reason, some of the units within the subclasses are not numbered consecutively, and their symbols are a partial key to some of the soil features. The numeral used to designate units within the classes and subclasses are these:

0. A problem or limitation caused by sand and gravel in the substratum (not used in the county).
1. An erosion hazard, actual or potential.
2. A problem or limitation of wetness caused by poor drainage or flooding.
3. A problem or limitation caused by slow or very slow permeability of the subsoil or substratum.
4. A problem or limitation caused by coarse soil texture or excessive gravel.
5. A problem or limitation caused by a fine or moderately fine textured surface soil.
6. A problem or limitation caused by salt or alkali.
7. A problem or limitation caused by cobbles, stones, or rock outcrop (not used in this county).
8. A problem or limitation caused by shallow depth of soil over bedrock (not used in this county).
9. A problem or limitation caused by low fertility or by toxicity.

Land resource areas

In San Benito County, capability classification is further refined by designating the land resource area in which the soils in a unit occur. A land resource area is a broad geographic area that has a distinct combination of climate, soils, management needs, and cropping systems.

The 48 conterminous states in the nation have been divided into 156 land resource areas. Parts of three of these areas are in San Benito County and are shown in figure 13. These areas and their numbers are Central California Coastal Valleys (14); Central California Coast Range (15); and Sacramento and San Joaquin Valleys (17). The number of the resource area is added, in parentheses, to the class, subclass, and unit designation for complete identification of the capability unit.

To place soils consistently into capability units, it is necessary to make assumptions that affect management in a land resource area. In the following paragraphs the land resource areas of which parts occur in San Benito County are described so that local farming can be related to the larger areas. Following the description of each area is a listing of the assumptions made to guide placement of soils into capability classes and units.

Land Resource Area 14 is called Central California Coastal Valleys. This area occurs in the coastal range, except in the northernmost and southernmost parts of California. Temperatures in the area are influenced by nearness to the ocean. Summers are cool near the coast. Daytime temperatures are higher inland, but at night in summer temperatures are lowered by ocean breezes. The frost-free season ranges from a low of about 210 days to slightly more than 300 days near the coast. Annual precipitation ranges from about 14 to 30 inches. The soils in this area developed in alluvium. They range from

Figure 13.—Land resource areas in San Benito County; Central California Coastal Valleys (14); Central California Coast Range (15); Sacramento and San Joaquin Valleys (17).

poorly drained in basins through well drained in recent alluvium along streams. The soils on terraces have slight to large increases in clay content in the subsoil. They are generally nearly level to gently sloping, though small areas on short slopes are moderately sloping or steep. The principal crops in this resource area are truck crops, fruits, nuts, wine grapes, small grains, and forage. Dairying is important.

The soils in Land Resource Area 14 are placed in capability units on the assumption that—

1. Irrigation water is available for all soils that are suitable for cultivation.
2. Length of growing season or lack of heat does not decrease choice of crops to the extent that the capability class is changed to a less suitable class.
3. Wet soils can be drained, but continuing limitations result from permeability of the soil, difficulty in maintaining drainage facilities, and possible restriction in selection of crops because of other water problems.
4. Damage by flooding has been reduced by structures and channel work, but flooding is a limitation in some places.
5. The level of management is moderately high.

Land Resource Area 15 is called Central California Coast Range. It occupies the foothills of the coastal range of California. The hills and mountains of the northern and southernmost parts of the State are excluded. Also excluded are most areas where elevations are more than 2,500 feet, areas of conifer forests, and areas having more than 30 to 40 inches of precipitation. Within the resource area, precipitation may be as little as 6 inches. The frost-free period is approximately 200 to 300 days. In most places the soils overlie sedimentary rocks, but in San Benito County extensive areas of soils are on granite and basic igneous rocks. The soils range from rolling to very steep. Raising livestock is the main agricultural activity. Only about 6 percent of the soil area is cultivated. About 47 percent is in grass or grass and oak, and 47 percent is in brush that varies in density and is of low grazing value.

The soils in Land Resource Area 15 are placed in capability units on the assumption that—

1. Irrigation water is not available. Limitations in crop selection caused by lack of precipitation affect placement of soils in a capability class. An isolated irrigated soil requires management practices similar to those used in area 14.
2. Soils more than 20 inches deep and soils having more than 3 inches of available moisture capacity are suitable for annual forage plants and may be managed for these plants.
3. Assuming that available moisture capacity is 4 inches in the soil, additional assumptions are as follows:
   a. Soils having less than 7 inches of precipitation available for evapotranspiration are not suitable for cropping.
   b. Soils having 7 to 10 inches of water are suitable for small grains.
   c. Soils having 10 to 12 inches of water have higher yields of grain than the soils with 7 to 10 inches, and in addition can produce low to moderate yields of sudangrass, beans, and grapes.
   d. Soils with 12 to 16 inches of water produce somewhat higher yields than those with 10 to 12 inches, and in addition can produce some tree fruits and nuts and several kinds of row crops.
4. Other than lack of precipitation and length of frost-free period, the climate does not restrict crop selection enough to affect capability class.
5. The level of management is moderately high.

Land Resource Area 17 is called Sacramento and San Joaquin Valleys. This area occupies all of the central valley in California plus a few small partly isolated valleys, such as Panoche Valley in San Benito County. Only the valley floors and terraces are included in this area. Rainfall ranges from 6 to 22 inches and is about 6 inches in Panoche Valley. Summers are hot and dry, and winters are cool. The frost-free period ranges from 220 to 320 days. More than half of the area is cropland, and many kinds of crops can be grown.

The soils in Land Resource Area 17 are placed in capability units on the assumption that—

1. Irrigation water is available for all soils suitable for cultivation.
2. Climate does not limit crop selection to the extent that the soils should be placed in capability class of less suitability.
3. Many kinds of crops can be grown under irrigation.
4. Overflow and drainage are not problems in the San Benito County part of the area.
5. The level of management is moderately high.

Management by capability units

In the following pages, the capability units of San Benito County are described and management for the soils in these units is suggested. The mention of the soil series in these descriptions does not mean that all the soils in a series are in the capability unit. To determine the soils in each unit, refer to the "Guide to Mapping Units" at the back of this survey. Because the placement of the soils into capability units in San Benito County partly depends on land resource areas, each soil that occurs in two of these areas is in two capability units. There are many soils in the county of this kind.

In the following descriptions of the capability units, available water holding capacity applies to the effective root zone, or to the depth that plant roots generally penetrate.

CAPABILITY UNIT I–1 (14)

Soil in this unit are very deep, well drained, moderately coarse textured to moderately fine textured, and nearly level. These soils are in the Botella, Hanford, Mocho, Salinas, Sorrento, and Reiff series. The surface layer and underlying layers range from sandy loam to silty clay loam. Some soils in this unit have relatively uniform texture throughout the profile, but others have strata of different texture. Roots readily penetrate these soils to a depth of 60 inches or more. Permeability of the subsoil ranges from moderately rapid to moderately slow.

Available water holding capacity ranges from about 7.5 to 12.0 inches.

The surface layer ranges from medium acid to moderately alkaline. Lower layers tend to be more alkaline than the surface layer and, in large areas, are calcareous. Problems related to reaction or to lime are rare or minor. Slopes are less than 2 percent, and the erosion hazard is none to slight. The soils in this unit occupy the valley bottoms in the San Juan-Hollister area, the lower reaches of the San Benito River, and the bottoms along Tres Pinos Creek and a few small side creeks.

Many kinds of crops are grown on these soils. Among those grown are apricots, apples, prunes, pears, walnuts, wine grapes, sugar beets, tomatoes, potatoes, beans, peppers, garlic, onions, lettuce, cabbage, squash, flower and vegetable seeds, small grains, alfalfa, and pasture. Small grains are dryfarmed, but the other crops are usually irrigated. Field crops other than small grains and some orchard crops can be dryfarmed, though plant growth is not so good as in irrigated areas.

Land leveling is needed if irrigation water is applied by furrows or borders. By timing and regulating the irrigations, the water can be applied uniformly so that it does not pond or cause erosion. Application needs to be timed so that the crop receives enough water, but not too much. For most crops sprinkler irrigation is as suitable as the furrow or border method.

All soils in this unit need green manure, crop residues, and other organic matter that helps to maintain favorable soil structure, tilth, and infiltration rates. Except for soils in orchards, crop rotation should be used to offset the buildup of pests and disease, as well as the loss of plant nutrients. If tillage is kept to a minimum, structure and infiltration are improved. Tillage pans are common in many areas, where they adversely affect all except the most shallow-rooted crops such as lettuce. Compaction is greater for moist soils than for dry ones. Excessive travel and tillage between tree rows are particularly harmful in orchards. Deep tillage breaks up tillage pans, but it should not be used in orchards where too many roots will be cut.

Nitrogen fertilizer is needed for all crops except alfalfa and, at times, beans. Alfalfa generally responds to phosphorus fertilizer. A number of truck and field crops grow better if both phosphorus and potassium are added.

CAPABILITY UNIT I–1 (17)

The soils in this unit are very deep, are well drained, have a moderately coarse textured to medium-textured surface layer, and are nearly level. These soils are in the Panoche series. They are similar to the soils in capability unit I–1 (14), but they are in the San Joaquin-Sacramento Valley resource area where summer temperatures are high and crop selection and management are somewhat different.

In these soils roots penetrate to a depth of 60 inches or more. Except for stratification in some areas, the soils are, from the surface downward, nearly uniform in texture, reaction, color, permeability, and content of lime and of organic matter. Available water holding capacity ranges from about 8.0 to 11.0 inches. These soils are calcareous, but the lime does not cause chlorosis in the crops commonly grown. Noticeable tillage pans have not developed. The hazard of erosion is none to slight. The soils in this unit occupy the Panoche and Vallecitos Valleys.

These soils are used for cotton, alfalfa hay, alfalfa seed, safflower, wheat, and barley. They are also used for irrigated pasture, wine, table, and raisin grapes, melons, tomatoes, sugar beets, beans, and many kinds of tree fruits and nuts. In local areas the hazard of winter and spring frosts affects the choice of fruit and nut crops.

Because the supply of irrigation water is limited, extra care is needed in use of water. If the border or furrow method is used, these soils need to be smoothed. The rate of water application, direction of run, and timing need to be controlled so that plant growth is uniform and there is no ponding, excessive losses of runoff, or deep percolation.

Sprinklers may be used in place of furrows and borders or in conjunction with them. Careful land leveling is not needed where sprinklers are used, but the sprinklers should be designed and used in a way that accomplishes the same objectives as land leveling.

Crop rotation helps to offset the buildup of pests and disease and to improve the seedbed. Crop residues, green manure, barnyard manure, or other organic material improves or helps maintain favorable soil structure and infiltration.

All crops except legumes need nitrogen fertilizer; alfalfa needs phosphorus. Application of potassium and of minor elements commonly is not needed.

CAPABILITY UNIT IIe–1 (14)

Soils in this unit are very deep, well drained, moderately coarse textured to medium textured, and gently sloping to moderately sloping. These soils are in the Botella, Hanford, Mocho, Pleasanton, Reiff, and Sorrento series. The surface layer ranges from sandy loam to silt loam. Many of the soils are slightly stratified and have texture as fine as clay loam in the lower layers. Permeability is generally moderate and moderately rapid throughout the profile, but some soils have moderately slow permeability in the lower horizons. In most places roots penetrate to a depth of 60 inches or more, but there is some restriction to penetration of roots, particularly in the Pleasanton soil. This restriction affects the growth of orchard trees, particularly nut trees. Available water holding capacity is about 7.0 to 11.0 inches.

The surface layer and lower horizons generally range from slightly acid to moderately alkaline, but a number of soils are more alkaline in the lower horizons. Many of the soils are calcareous. Slopes range from 2 to 9 percent, and the hazard of erosion is slight to moderate. These soils are in the northern third of the county. They occupy small valleys and fans on the edge of the main valleys.

These soils are used for apricots, apples, prunes, pears, walnuts, wine grapes, alfalfa hay, pasture, and field and truck crops. Small grain is grown without irrigation. Nonirrigated field crops and fruit and nut crops are not produced if irrigation water can be obtained at a reasonable cost.

Sprinkler irrigation has advantages over surface methods because irrigation water and its application can be better controlled. In only a few places can the border method be used. If furrows are used, they should be laid out on a grade of about 0.5 percent so that the soils can

be uniformly moistened and erosion or the breaking of the furrows prevented. Some leveling and smoothing normally is needed to avoid awkward pieces, point rows, and dry spots. This leveling lowers the content of organic matter, and temporarily the level of plant nutrients, but only in the Pleasanton soil does it expose unfavorable subsoil material. If cuts of more than 2 feet are to be made, the soils should be examined carefully so as to insure that gravel or sand is not exposed. Regardless of the irrigation method used, the water should be applied at times and at rates that favor crop growth but do not cause erosion or loss of water.

Particularly during rainy periods, organic material is needed on the surface of these soils for protection. Close-growing plants, plant residues, and mulches are needed to slow runoff and to increase infiltration. Where slopes are long, diversions are needed to convey water safely to nonerosive channels or streambeds. Where tillage is performed across the slope or on the contour, the small ridges created will slow runoff, increase infiltration, and help to convey the excess water from the field. Crop rotations can be used to improve soil structure and minimize disease and pests on soils in orchards.

Nitrogen fertilizer benefits all crops except alfalfa. Alfalfa responds to phosphorus.

CAPABILITY UNIT IIe-1 (17)

Soils in this unit are very deep, moderately coarse textured and medium textured, and gently sloping to moderately sloping. These soils are in the Panoche series. They are readily penetrated by roots to a depth of 60 inches or more. Texture ranges from sandy loam to loam. The lower layers have about the same texture as the surface layer, though there is some stratification. Soil permeability is moderate to moderately rapid. Available water holding capacity ranges from about 8.0 to 11.0 inches.

These soils are moderately alkaline. They are calcareous throughout the profile, but lime-induced chlorosis is not likely. Slopes range from 2 to 9 percent, and susceptibility to erosion is moderate unless these soils are properly managed. The irrigation of sloping soils presents some problems. The soils in this unit occur in Panoche and Vallecitos Valleys but are not extensive.

These soils are used for alfalfa hay, alfalfa seed, safflower, wheat, and barley. Many other irrigated crops can be grown.

Irrigation water is not plentiful. The timing of irrigations and the amount of water applied should be regulated so that drought is prevented but water is not lost through deep percolation and runoff. Water applied in furrows on a grade of about 0.5 percent is evenly distributed and does not cause erosion or break the furrows. Some soil leveling is generally needed so as to avoid awkward pieces and point rows. In this leveling, the subsoil material exposed is favorable for crop growth, though yields in areas where material has been removed may be temporarily reduced.

Use of sprinkler irrigation is advantageous because little or no leveling is needed, awkward furrow layouts can be avoided, and the time, amount, and rates of application can be readily adjusted. Some protection from erosion by runoff is provided by crop residues left on the surface or sticking out of the soil. A crop rotation helps to improve soil structure and infiltration if many fine roots and plentiful crop residues are mixed into the soil. Crop rotations also minimize the buildup of pests and disease. Damaging runoff is slowed by tilling on the contour. Nitrogen fertilizer benefits all crops except alfalfa. Alfalfa responds to phosphorus.

CAPABILITY UNIT IIe-5 (14)

Soils in this unit are very deep, well drained, moderately fine textured to fine textured, and gently sloping to moderately sloping. These soils are in the Cropley, Mocho, Rincon, Salinas, and Sorrento series. The surface layer and lower horizons range from clay loam to clay. Permeability is moderately slow to slow. Most slopes are between 2 and 9 percent.

These soils generally are penetrated by roots to a depth of 60 inches or more, but penetration is restricted by fine texture and dense horizons in the subsoil. Available water holding capacity ranges from about 8.0 to 12.0 inches. In the upper horizons, some of these soils are slightly acid to neutral and others are alkaline and calcareous. All of the soils are calcareous in the lower horizons. Some tree fruits are slightly susceptible to chlorosis caused by lime. Rill and gully erosion is a slight to moderate hazard unless these soils are protected. The more clayey soils are somewhat difficult to till. The soils in this unit occur around the side of the main valley and in sloping small valleys.

Many crops are grown, among them irrigated apricots, prunes, walnuts, sugar beets, tomatoes, beans, alfalfa, and pasture. Small grains are grown without irrigation, but other crops do not grow well unless they are irrigated.

The protection of organic material on the surface is needed to reduce soil erosion during the rainy season. Close-growing plants, crop residues, or mulches slow runoff water and improve infiltration. If the tillage before the rainy period is on the contour or across the slope, the small ridges created will slow runoff and aid infiltration. On longer slopes, or where water comes from the hills above, diversions are needed to convey the water to stabilized channels or streambeds. By using crop rotations that reduce tillage and increase fine roots and residues, erosion is reduced because soil structure is improved. Rotations also lessen the buildup of pests and disease.

Because of slope, the border method of irrigation is suitable only in a few small areas. If furrows are used for irrigation, the grade should be from 0.3 to 0.7 percent so that water infiltrates without undue runoff at the end of the furrows and without soil loss through erosion. The amount of water should be controlled so as to avoid breaking the furrows. Some leveling and smoothing may be needed to improve layout and to avoid point rows, dry spots, and awkward pieces. If cuts are deeper than 18 inches, growth of plants may be temporarily lowered. Seedbed preparation, particularly on the Rincon soils, is difficult where the subsoil is exposed.

Sprinklers can be used on these soils, provided water is applied at rates adjusted to the infiltration rate of the clayey soils. Whatever method is used, irrigation should be at times and rates that favor crop growth but do not waste water or promote erosion. Tillage requirements of tractor power tend to be high, particularly as the soils become dry. If these soils are worked when wet, large clods form and tilth is worsened. Distinct tillage pans, however, do not develop in these soils.

Nitrogen fertilizer benefits all crops except alfalfa. Alfalfa responds to phosphorus. Potassium probably is not needed for common crops.

CAPABILITY UNIT IIw-2 (14)

Soils in this unit are very deep, somewhat poorly drained, moderately coarse textured to moderately fine textured, and nearly level. These soils are in the Metz and Pacheco series. The surface layer ranges from sandy loam to clay loam. In some places the lower layers are considerably stratified with loamy sand and sand. Permeability ranges from rapid to moderately slow. Originally, these soils had a water table that generally fluctuated between depths of 36 and 60 inches. In places it was temporarily nearer to the surface than 36 inches. By pumping and improving drainage, the water table was lowered in many areas, and it rises only a little above 60 inches.

Roots penetrate these soils to a depth of 60 inches, except in those areas where wetness limits penetration. Available water holding capacity generally ranges from 5.0 to 12.0 inches. The soils in this unit are mildly alkaline to moderately alkaline. Generally, they are not calcareous in the surface layer but are moderately alkaline and calcareous in the lower layers. Slopes are generally less than 1 percent, and erosion is not a hazard. Some areas are flooded, but flooding is infrequent and occurs in winter when crops are not growing on these soils. Only small areas are affected by salt. The soils in this unit occur mostly north and west of Hollister, though there is a small area south and east of San Juan Bautista.

Irrigated crops commonly grown on these soils are sugar beets, tomatoes, alfalfa, truck crops, walnuts, and wine grapes. These crops do not grow well unless they are irrigated. Small grains, however, are grown without irrigation. Because these soils occur in low positions, frosts late in spring discourage the planting of apricots and other sensitive crops.

For these soils the widest selection of crops can be made if excess water is removed by drainage ditches and pumping. In some places tile drains are also needed. Drainage is particularly needed for the deeper rooted, long-lived plants such as orchard trees and alfalfa. Crop rotations that provide many fine roots and large amounts of organic residues aid in the maintenance of favorable soil structure and infiltration. Tillage should be kept at a minimum so that tilth is maintained.

All crops grown except alfalfa respond to nitrogen fertilizer. Phosphorus is beneficial to alfalfa and other legumes. Potassium improves the quality of some truck crops.

CAPABILITY UNIT IIs–4 (14)

Soils in this unit are very deep, well drained and somewhat excessively drained, moderately coarse textured, and nearly level. These soils are in the Hanford, Metz, and Sorrento series. They have a coarse sandy loam, sandy loam, or gravelly loam surface layer. Their lower layers are of the same or coarser texture. Plant roots can penetrate to a depth of 60 inches or more. Permeability of the lower horizons ranges from moderately rapid to rapid. Available water holding capacity is about 5.0 to 9.0 inches. Stratification, however, causes considerable variation in some places.

These soils range from slightly acid to moderately alkaline. Slopes are generally less than 2 percent but are as much as 5 percent in some places. The hazard of erosion is none to slight. These soils occur with and are similar to the soils in capability unit I–1 (14), though they are more droughty and less fertile. In many places the soils are along major streams where flooding is infrequent.

These soils are used for irrigated apricots, walnuts, grapes, tomatoes, potatoes, other truck crops, beans, alfalfa, and pasture. Without irrigation, trees in orchards do not grow well and truck crops and most row crops are not grown. Small grains, however, are grown without irrigation.

If management is intensive, crops grow about as well on these soils as they do on the soils in capability unit I–1 (14), but irrigation water and fertilizers have to be applied more frequently and with more care so as to prevent losses through leaching. Also, shorter furrows and borders are needed. By soil leveling and controlling the rate of applying water, these soils can be evenly moistened without erosion and the loss of runoff. Sprinkler irrigation allows better control of the time and amounts of the applications. Where deep cuts or extensive earthmoving are planned, the areas should be thoroughly investigated. Because these soils are stratified with sand and gravel, it may be difficult to prepare them for irrigation and to irrigate them. These soils benefit if crop rotations that add roots and other organic matter are used, or if organic matter from any source is added.

Additions of nitrogen improve the growth of most crops, but their benefits to alfalfa are marginal. Legumes respond to additions of phosphorus, and some truck crops respond to additions of potassium.

CAPABILITY UNIT IIs–5 (14)

Soils in this unit are very deep, well drained to moderately well drained, moderately fine textured to fine textured, and nearly level. These soils are in the Clear Lake, Cropley, Pacheco, and Rincon series. Their surface layer is clay, silty clay, silty clay loam, or loam, and the subsoil ranges from clay to clay loam. Permeability is generally slow but is moderately slow to very slow in some places. Available water holding capacity is about 8.0 to 12.0 inches.

Reaction in the surface layer ranges from neutral to moderately alkaline, but the surface layer is noncalcareous. The subsoil is moderately alkaline and calcareous. Slopes are less than 2 percent and, in some places, are less than 1 percent. Erosion is not a hazard.

Because of the clay in these soils, requirements of tractor power for plowing and other tilling are high and preparation of the seedbed is difficult. Many of the areas were poorly drained, but they have been artificially drained and the water table has been lowered. These soils are fertile.

Crops commonly grown under irrigation on these soils are apricots, walnuts, pears, prunes, sugar beets, tomatoes, beans, many truck crops, alfalfa, and pasture. A number of these crops can be grown without irrigation, though they do not grow so well. Small grains are grown without irrigation.

Leveling and irrigation layout should be planned so as to provide even distribution of moisture without ponding

at the end of fields. Sprinklers can be used in place of other methods. The time of irrigations and the amount of water applied depend on the needs of the crops grown. Crop rotations that add many fine roots add substantially to the organic matter. By decreasing tillage, structure and infiltration are improved. Manure and other organic material mixed into the soil are also beneficial. If cuts deeper than 18 inches are planned, particularly on Rincon soils, soil structure is worsened and soil fertility is lowered.

All crops except legumes respond favorably to nitrogen fertilizer. Additions of phosphorus benefit legumes, and additions of potassium benefit some special truck crops.

CAPABILITY UNIT IIIe–1 (14)

Soils in this unit are deep, well drained, medium textured, and gently sloping to moderately sloping. These soils are in the Pleasanton and Rincon series. The surface layer is loam or gravelly loam that permits easy penetration by roots. At a depth of 18 to 24 inches, the subsoil is clay loam, gravelly clay loam, or heavy clay loam and is moderately slow to slow in permeability. It restricts development of roots. Below a depth of 40 inches, and soils are very gravelly in some places, but few roots extend below 60 inches. Available water holding capacity is about 5.0 to 9.0 inches.

The surface layer ranges from medium acid to neutral, but the subsoil is generally more alkaline. The Rincon soils are calcareous in the lower part. Slopes range from 2 to 9 percent but are mostly between 5 and 9 percent. The hazard of erosion is slight to moderate. These soils occur on benches along the main valley and extend from Paicines northwestward to Santa Clara County.

These soils are used for irrigated prunes, apricots, wine grapes, and pasture. Small grains, hay, and pasture plants are grown without irrigation. Because air drainage is slightly better than in most areas, fruit trees have an advantage in avoiding damage by frost in spring. Row crops could be grown on these soils, but the difficulties of irrigation and the cost of pumping tend to discourage such use.

The timing of irrigations should be adjusted to the needs of the crop. Surface applications should be used only with contour furrows. Sprinklers have an advantage on the steeper more uneven slopes. The water should be applied slowly enough to avoid loss in runoff, as well as loss of soils through erosion. In leveling these soils, cuts of more than 12 to 18 inches are undesirable because deep cuts expose subsoil material that has slow infiltration rates and unfavorable soil structure.

During the rainy periods, these soils need the protection of organic mulches and of crop residues in and on the surface layer. Crop rotations that provide fine roots and other organic material improve soil structure and decrease runoff, particularly if these rotations allow reduced tillage. In orchards cover crops are needed in winter. Tilling on the contour leaves ridges that slow runoff. Orchards and vineyards should be planted on the contour. On fields that do not have a good cover of vegetation, diversions and terraces are needed and water from them should be carried safely to outlets through grassed waterways.

Nitrogen fertilizer benefits all crops commonly grown on these soils, but it is uncertain whether response to phosphorus and potassium fertilizers will be favorable.

CAPABILITY UNIT IIIe–1 (15)

Soils in this unit are very deep, well drained, moderately coarse textured to medium textured, and gently sloping to moderately sloping. These soils are in the Arguello, Botella, Hanford, Mocho, Reiff, Sorrento, and Yolo series. They are the same kinds of soil or are similar to the soils that are in capability unit IIe–1 (14), but they occur in small valleys in the foothills where irrigation water is not available.

These soils have a surface layer and subsoil of silt loam, loam, sandy loam, coarse sandy loam, or gravelly loam, except for a few less permeable soils that have a clay loam subsoil. Permeability of the subsoil ranges from moderately rapid to moderately slow. Available water holding capacity ranges from 6.0 to 12.0 inches.

The surface layer and lower horizons range from strongly acid to moderately alkaline in reaction. Slopes range from 2 to 9 percent, and the hazard of erosion ranges from slight to moderate.

The choice of crops is limited by lack of precipitation and available irrigation water. These soils are used for dryland small grains, beans, sudangrass, wine grapes, and a few tree fruits. Many areas are used for pasture and range, along with soils of adjacent hills.

During rainy periods, erosion is controlled by crop residues or stubble left on and near the surface or by close-growing crops. In vineyards and orchards volunteer or seeded cover crops help control erosion. If the crops are allowed to grow vigorously in spring, they seriously deplete the stored moisture. Runoff is slowed where these soils are tilled on or near the contour before the rainy season. Orchards and vineyards should be planted on the contour. A crop rotation that provides fine roots and crop residues improves infiltration and the growth of crops. Where runoff from the hills crosses fields or where slopes are long, diversions are needed to convey water to controlled outlets.

Applications of nitrogen and phosphorus fertilizers generally benefit most crops, except in years when rainfall is below average.

CAPABILITY UNIT IIIe–3 (14)

Soils in this unit have a claypan and are moderately deep, medium textured, and gently sloping to moderately sloping. These soils are in the Antioch series. The surface layer is loam that is moderately permeable and favorable to the growth of roots. The subsoil occurs at a depth of 12 to 20 inches and consists of dense clay that is very slowly permeable and unfavorable to the growth of roots. The part of these soils occupied by roots can hold about 3.75 to 5.0 inches of water. These soils are moderately well drained and well drained, but the zone just above the claypan may be saturated for a week or more following a rainy period or an irrigation.

Reaction is about medium acid in the surface soil but is moderately alkaline deep in the subsoil. Slopes range from 2 to 9 percent, and the hazard of erosion is moderate unless these soils are protected. Other limitations to

use are the restricted root zone and permeability in the subsoil. These soils occur on benches and terraces along the east side of the main valley. They extend from a point about 12 miles south of Hollister to 8 miles north of it.

These soils are used for irrigated prunes, apricots, tomatoes, and a few row crops and pasture. Air drainage and availability of water favor fruit trees more than soil quality does. Walnuts and a few other crops may be grown in parts of fields consisting mainly of other soils. Small grains and pasture plants are grown without irrigation.

Irrigation can be by contour furrows, though the layout and water control may be difficult. Close attention to the amount and timing of the irrigation is required for preventing drought or temporary waterlogging. Sprinklers may have some advantages because the time and amount of application can be regulated more closely. Spur rows and complicated layouts should be avoided. Because the subsoil is unfavorable for the growth of plants, soil leveling and smoothing are practical in only a few areas. Plants grow poorly where the subsoil is exposed or where the surface soil is thinned.

During rainy periods a close-growing crop, organic residues, and stubble are needed for protection against erosion. In orchards a cover crop is needed. Areas in field and row crops benefit from a crop rotation that improves soil structure, reduces tillage, and adds organic matter. Tillage should be on the contour so that the small ridges created will slow runoff and increase infiltration. In some locations diversions and terraces are needed where there is not enough vegetation for protection. Terraces should be designed so as to prevent channel erosion, silting, or breakovers.

CAPABILITY UNIT IIIe–3 (15)

This unit consists of deep, well-drained, gently sloping to moderately sloping soils that have a medium-textured surface layer and a subsoil with moderately slow to slow permeability. These soils are in the Pleasanton and Rincon series. They are the same kinds of soils as are in unit IIIe–1 (14) or are similar to them. Management requirements differ, however, because the soils in unit IIIe–3 (15) occur in the foothills where irrigation water is not available.

The soils in this unit have a loam or gravelly loam surface layer that is favorable to the growth of roots. At a depth of about 20 inches, the soil material is less permeable for it consists of clay loam, heavy clay loam, or gravelly clay loam. Some soils are very gravelly below a depth of about 40 inches. Few roots extend below 60 inches. The soils in this unit hold about 7.0 to 10.0 inches of available water.

The surface layer ranges from medium acid to about neutral in reaction, but the subsoil is more alkaline. Some soils are calcareous in the lower part. Slopes range from 2 to 9 percent, and the hazard of erosion is moderate to high unless these soils are protected. The soils in this unit occur on benches on the sides of parts of the main valley in the northern half of the county.

These soils are used for dryland small grains, a few row crops, sudangrass, wine grapes, apricots, and prunes. Some areas next to more extensive areas of rangeland are used for pasture. Except for grain and pasture plants, crops do not grow as well on these soils as they do on similar soils in unit IIIe–1 (14) when they are irrigated.

Close-growing plants, crop residues, stubble, and other organic matter on or near the surface reduce the hazard of erosion. Crop rotations should be those that protect the surface during the rainy periods. In these rotations grass is used, tillage is reduced, and crop residues are not removed. Tillage should be on or near the contour so that runoff is slowed and infiltration is increased. In a few places diversions and terraces may be needed. For these, outlets should be protected, the waterways grassed, and channels protected so that they convey the water without eroding. A winter cover crop is needed in orchards and vineyards. In spring growth of the cover crop should be checked so that a reasonable amount of moisture remains for the trees or vines.

Crops generally respond favorably to nitrogen and phosphorus fertilizers, if the supply of moisture is good.

CAPABILITY UNIT IIIe–4 (14)

Soils in this unit are very deep, well drained and somewhat excessively drained, moderately coarse textured, and gently sloping to moderately sloping. These soils are in the Metz and Hanford series. They have a surface layer of coarse sandy loam or gravelly sandy loam. Texture is the same in the lower horizons, or there are thick layers of loamy sand to sand. Generally these soils are stratified. The lower horizons have moderately rapid to rapid permeability; roots readily penetrate to a depth of 60 inches or more. Available water holding capacity is about 4.0 to 8.0 inches.

Reaction in these soils ranges from slightly acid to moderately alkaline and generally is a little more alkaline in the lower part than at the surface. Slopes range from 2 to 9 percent, and in unprotected areas the hazard of erosion is generally moderate but is slight in some places. These soils occur along the small narrow valleys in the northern half of the county. In small areas there are infrequent flooding, bank cutting, and channel changes. Rainfall is about average.

These soils are used for irrigated grapes, walnuts, and alfalfa. Some areas are used for dryland grain and pasture. In many areas adjacent to hilly soils used for range, these soils are used for range and pasture.

Irrigation water needs to be applied frequently on these soils because the capacity for storing moisture is below average. Surface methods of irrigation can be used. Contour furrows and short runs are needed for avoiding excessive loss of water through deep percolation and to provide uniform distribution of moisture without soil erosion. Sprinklers have some advantages, for the rate and amount of water can be closely controlled if they are used. Some smoothing and leveling of land may help irrigation, particularly if surface methods are used. Before any deep cuts are made, however, the area should be investigated. Advantages of leveling may be offset if it exposes excessively sandy gravelly layers.

These soils have low fertility, and they benefit from crop rotations that provide large amounts of crop residues and roots. Crop residues and stubble left on and near the surface during the rainy periods help control erosion, but vigorous close-growing plants are more effective. A cover crop is needed in orchards and vineyards.

Additions of fertilizer are required for good crop growth. All crops except alfalfa respond to nitrogen and phosphorus fertilizers. Additions of potassium may not be economically feasible. In dryland areas the benefits from fertilizers are uncertain.

CAPABILITY UNIT IIIe–5 (15)

This unit consists of moderately deep to very deep, well-drained, moderately fine textured to fine textured soils that are gently sloping to strongly sloping. These soils are in the Climara, Conejo, Cropley, Diablo, Gazos, Linne, Mocho, Nacimiento, Rincon, Salinas, San Benito, and Sorrento series. All of the soils are more than 36 inches deep to soft or hard rock, and some are more than 60 inches. Roots penetrate all of the soil, but in some areas penetration is restricted by the fine texture.

The surface layer ranges from clay loam to clay, and generally the surface layer and lower horizons are similar in texture. Permeability is moderately slow to slow. Many of the soils less than 60 inches deep have slopes of 9 to 15 percent. Available water holding capacity is about 5.0 to 12.0 inches.

The surface layer generally ranges from slightly acid to moderately alkaline. It is calcareous in some places. Most of the lower layers of these soils are moderately alkaline and calcareous. The content of organic matter ranges from about 1.5 to 2.5 percent. Some of the soils in the unit are the same as those in unit IIe–5 (14), which have irrigation water available. Others are more varied and are not so favorable for farming because they are more sloping and the hazard of erosion is slight to high. Tillage, particularly in the clay soils, is somewhat difficult.

These soils are used for dryland small grain, sudangrass, beans, and a few other field crops. Other dryland crops can be grown, but unless irrigated, they do not grow well. These soils are used for grazing in many areas where they are next to extensive areas used for grazing. One soil, Rincon silty clay loam, 9 to 15 percent slopes, eroded, is irrigated in a few small areas.

The soils in this unit need the protection of close-growing plants during rainy periods. Crop residues, stubble, and other organic mulches also help control erosion. A crop rotation that provides a large amount of grass roots is beneficial. Soils not covered with close-growing plants need the protection of crop residues during rainy periods. If these soils are tilled on or near the contour before rainy periods, the small ridges created will slow runoff. Some farmers plow deeply on the contour so as to open up the subsoil and allow faster infiltration and percolation. If these soils are used for orchards and vineyards, winter cover crops or organic mulches should be used for protection.

When rainfall is normal or above normal, crops respond favorably to additions of nitrogen fertilizer.

CAPABILITY UNIT IIIw–5 (14)

Soils in this unit occur in basins and are poorly drained, fine textured to moderately fine textured, and nearly level. These soils are in the Clear Lake and the Willows series. The surface layer is generally clay, though a soil with a sandy overwash occurs in a small acreage. The lower layers are clay or silty clay in most places, but some strata have a coarser texture. The subsoil is slowly to very slowly permeable. Originally, these soils were poorly drained and very poorly drained, but in most areas the water table has been lowered by pumping or by other means. In most places the seasonal water table is within 36 to 60 inches of the surface.

Because of wetness and the finer textured subsoil, few roots penetrate below a depth of 36 inches. Available water holding capacity ranges from about 6.0 to 10.0 inches. The surface layer is generally alkaline; it is not calcareous. Lower layers are calcareous and moderately alkaline, and in places spots of alkali slow plant growth and damage soil structure. Slight to moderate quantities of salt are generally present. The stronger concentrations are in a spotted pattern. After a period of irrigation, the surface layer may be relatively free of salt. Slopes are less than 1 percent, and erosion is not a hazard. Local areas have been flooded, but flooding generally occurs during periods when crops are not grown on these soils. Other management problems are related to texture, drainage, and salt. The soils of this unit occur in the Bolsa area, north and west of Hollister.

These soils are used for irrigated sugar beets, alfalfa, and pasture. Tomatoes, other truck crops, and field crops are grown in small areas. Small grains are dryfarmed, and some areas are used for dryland pasture.

Drainage ditches are needed to hold the water table down and to remove tail water. In some places protection from flooding is also needed. Tile drains generally are not economical; close spacing of tile is necessary because of fine texture and slow permeability. Salts need to be washed out of the upper layers of these soils, but wetness is increased if too much water is applied. Soil leveling is needed so that water can be applied uniformly to promote even crop growth and to avoid the enlargement of salt spots. Irrigation by borders and furrows is generally favored because most areas have a smooth surface. Sprinklers also can be used. Infiltration rates and tilth are improved if crop rotations are used and the crops grown provide large amounts of crop residues and grass roots. Crop rotations also help to reduce pests. Additions of manure or other organic material are also beneficial.

All crops except alfalfa respond to nitrogen fertilizer. Alfalfa responds to phosphorus. Potassium is generally in adequate supply.

CAPABILITY UNIT IIIw–5 (15)

Soils in this unit are deep, poorly drained or somewhat poorly drained, fine textured or moderately fine textured, and nearly level. These soils are in the Clear Lake, Edenvale, and Willows series. They occur in areas where irrigation water is not available, but some of them also occur in units IIs–5 (14) and IIIw–5 (14), where irrigation water is available. In most places permeability is slow in the surface layer and subsoil, but in some places it is very slow in the subsoil. Roots, however, penetrate to a depth of 60 inches or more except in a few areas that have a seasonally high water table. Edenvale clay, 0 to 2 percent slopes, is generally somewhat poorly drained, and the other soils are poorly drained, but in most places the water table has been lowered. Available water holding capacity is about 7.0 to 10.0 inches.

The surface layer is neutral to moderately alkaline. It is calcareous in places. Lower layers are strongly alkaline and contain salt and alkali. Slopes are less than 2 percent. Erosion is not a hazard, but there is a slight hazard of flooding in some areas. Use of these soils is limited mainly by lack of moisture in summer, difficulty in preparing a seedbed, slow permeability, and the presence of salt. These soils occur in basins in the northern part of the county.

These soils are used for small grain, sudangrass, and pasture. Beans, apricots, and other crops could also be grown without irrigation, but crop growth is not good, and these soils are not farmed extensively. Requirements for tractor power are high when these soils are dry, and working them when wet makes them cloddy and their seedbed poor. A crop rotation that produces many fine roots aids soil structure. Crop residues returned to the soil, and any organic matter added, help to maintain soil structure and fertility.

In years of average or above average rainfall, all crops respond well to nitrogen fertilizer.

CAPABILITY UNIT IIIs-3 (14)

Antioch loam, 0 to 2 percent slopes, is the only soil in this capability unit. This soil is moderately deep and medium textured. Its loam surface layer favors the growth of roots, but the very slowly permeable clay subsoil restricts the growth of roots. Depth to the claypan ranges from 12 to 22 inches. About 3.75 to 5.0 inches of water is held in the surface layer and the part of the subsoil occupied by roots. The soil above the claypan may be saturated with water for a week or more following a rainy period or an irrigation.

Reaction in this soil is about medium acid in the surface layer but is moderately alkaline deep in the subsoil. Slopes are generally less than 2 percent, and the hazard of erosion is slight. Use of this soil is limited mainly by the very slowly permeable root zone that restricts the growth of roots and the movement of water. Where irrigation water is of poor quality, salt and toxic elements tend to accumulate in the lower subsoil. This soil extends along the east side of the main valley from Tres Pinos northward to the county line.

This soil is used mostly for irrigated apricots, prunes, pasture, and alfalfa. Irrigated truck and row crops could also be grown. Small grain and pasture are produced without irrigation. Fruit trees are grown more because of the availability of irrigation water and better air drainage than because of soil qualities. Irrigation water, however, is not available in all areas of this soil.

This soil has unstable structure, and it tends to puddle and to turn into powder when it is cultivated. Crop residues, organic matter from any source, grass roots, and infrequent tillage are needed to improve soil structure and infiltration. Although this soil is nearly level, mulches, residues, or close-growing plants are needed for protection against erosion.

In areas not used for orchard, crop rotations are needed for improving soil structure and for avoiding the pests and diseases that are common in a single-crop system. Runoff water from benches can be safely lowered by using overpour structures or diversions. Borders and furrows can be used for irrigation. Sprinklers may be better, however, because they provide better control of water and lessen the danger of temporary waterlogging in this soil with limited storage capacity. Soil leveling that exposes the subsoil or thins the surface layer should be avoided.

Most crops respond favorably to additions of nitrogen and phosphorus fertilizers.

CAPABILITY UNIT IIIs-4 (14)

Soils in this unit are very deep, somewhat excessively drained to well drained, coarse textured to moderately coarse textured, and generally nearly level to moderately sloping. These soils are in the Arnold, Corralitos, and Metz series. The sloping soils are loamy sands, and the nearly level soils are gravelly. In most places these soils are somewhat stratified. Permeability is rapid, and roots readily penetrate to a depth of 60 inches or more. Available water holding capacity is about 4.0 to 5.0 inches.

Reaction range from strongly acid to moderately alkaline. The soils in this unit are similar to those in unit IIs-4 (14) but hold less moisture and in some places are more sloping. Slopes generally range from 0 to 9 percent, and the hazard of erosion is slight to moderate. A small acreage of Arnold loamy sand, 9 to 15 percent slopes, is more sloping than the other soils in this unit, is more limited in use, and needs more intensive management. The soils in this unit occur in the northern half of the county on first bottoms along the main streams in small valleys in the Aromas area.

These soils are used for irrigated walnuts, apricots, and alfalfa. Irrigated truck and row crops are grown on the nearly level soils. Grapes, a few apricots, small grain, and pasture are grown without irrigation. In some areas irrigation water is not available.

Frequent applications of irrigation water are needed on these soils. Surface methods of irrigation can be used if the runs are short so as to avoid loss of water through deep percolation. Contour furrows laid out carefully can be used in sloping areas. Sprinklers, particularly on the more sloping soils, have advantages in reducing percolation losses because the irrigations are easily controlled. Cuts made in soil leveling and smoothing do not expose soil that varies greatly from the original surface layer, though stringers of very gravelly material are exposed in some areas.

Because fertility is low, these soils benefit from crop rotations that provide large amounts of residues and roots. Organic material from any source is also beneficial. The sloping areas need close-growing vegetation, stubble, and other residues during the rainy periods. In orchards and vineyards a cover crop is needed, but under dryland farming growth of this crop needs to be checked in the spring before too much moisture has been used.

For good crop growth under irrigation, careful use of fertilizers is required. All crops except alfalfa respond to nitrogen, all crops including alfalfa respond to phosphorus. Potassium fertilizer may be helpful, particularly on truck crops.

CAPABILITY UNIT IIIs-4 (15)

Soils in this unit are very deep, well-drained and somewhat excessively drained, moderately coarse textured, and nearly level. These soils are in the Hanford and Metz series. Sandy material that is stratified and rapidly

permeable is at a variable depth. Roots penetrate to a depth of 60 inches. Available water holding capacity is 5.0 to 8.0 inches.

The Hanford soil is slightly acid and the Metz soil is moderately alkaline and generally calcareous throughout. These soils are similar to the soils in unit IIIc–1 (15). Slopes are 0 to 2 percent, and the hazard of erosion is none to slight.

These soils are used for dryland small grain.

Because fertility and content of organic matter are low, these soils benefit from crop rotations that provide large amounts of residues and roots. Lack of moisture limits the production of crops on these soils, especially in years of unfavorable rainfall. It also limits crop response to additions of fertilizer.

CAPABILITY UNIT IIIc–1 (15)

Soils of this unit are very deep, well drained, moderately coarse textured to moderately fine textured, and commonly nearly level. These soils are in the Botella, Hanford, Mocho, Reiff, Salinas, Sorrento, and Yolo series. Some of the soils in this unit also occur in unit I–1 (14), where irrigation water is available, but some occur only in unit IIIc–1 (15), where irrigation water is not available. In most places permeability ranges from moderately rapid to moderately slow in the subsoil. Roots penetrate to a depth of 60 inches or more. The texture of the surface layer and subsoil generally ranges from sandy loam to clay loam. Available water holding capacity is about 7.5 to 12.0 inches.

The surface layer ranges from medium acid to moderately alkaline. In places the surface layer is calcareous. Lower horizons tend to be more alkaline than the surface layer and in many places are calcareous. Nearly all slopes are less than 2 percent, and the hazard of erosion is none to slight. These soils are limited mainly by lack of moisture in summer and the narrow selection of suitable crops. These soils occur in small valleys throughout the county.

The soils in this unit are used for dryland small grain, sudangrass, pasture, and small areas of beans and dryland apricots. Additional crops can be grown, but they do not grow well and extension of farming is not advisable.

Maintaining soil structure and fertility is important. Crop rotations that provide large amounts of grass roots and other crop residues are needed. Infiltration is increased during the rainy periods by leaving stubble or other organic material on or near the surface. A close-growing crop is useful in protecting the surface. Tillage pans tend to form in some soils of this unit, but they can be partly erased by subsoiling. Compaction is decreased by avoiding working these soils when they are wet. In some places diversions and other control structures may be needed for protection against runoff from adjacent hills. Along some small streams it may be necessary to protect the banks and stabilize the channels.

If rainfall is average or above, crops respond well to nitrogen fertilizer.

CAPABILITY UNIT IVe–1 (15)

Soils of this unit are deep, well drained, moderately coarse textured to medium textured, and strongly sloping. These soils are in the Arguello, Rincon, Shedd, Sheridan, Soper and Vallecitos series. A few small areas have as little as 20 inches of soil above the bedrock; other areas have 48 inches; and some are 60 inches deep over clay. Many of the deep soils have moderately slow to slow permeability in the subsoil. The penetration of roots is restricted to a depth ranging from 20 to 60 inches by a combination of bedrock, subsoil permeability, and lack of deep moisture.

The texture of the surface layer ranges from sandy loam to loam, and some soils are shaly or gravelly. The subsoil of some soils is finer textured than the surface layer and ranges from sandy loam to heavy clay loam. Available water holding capacity ranges from 3.0 to 10.0 inches.

The surface layer is commonly medium acid, but it is slightly acid in some places. It is slightly more acid than the subsoil. One soil is strongly acid, and another has lime throughout the profile. Slopes range from 9 to 15 percent, and erosion is a moderate to severe hazard in unprotected cultivated areas. Lack of moisture in summer is also a hazard. The soils in this unit occur throughout the county on foothills and ridgetops. They are inextensive.

Most of the acreage of these soils is used for dryland pasture along with more extensive areas of range. Small areas are used for small grain and sudangrass.

Pasture plants or other close-growing vegetation is needed in most years so that the content of organic matter is maintained, infiltration is increased, and erosion is controlled. If needed the soils can be tilled 1 year out of 4 to 8, but stubble or a mulch is needed in the tilled areas. Also, tillage should be on the contour. In a few places diversions may be needed to divert runoff from adjacent hills.

In years when rainfall is average or above, crops respond to nitrogen, phosphorus, and sulfur fertilizers.

CAPABILITY UNIT IVe–3 (15)

Soils in this unit have a claypan and are well drained to moderately well drained, moderately coarse textured to moderately fine textured, and gently sloping to strongly sloping. These soils are in the Antioch, Cometa, and Cotati series. Some of them are in unit IIIe–3 (14), where irrigation water is available.

The surface layer of the soils in unit IVe–3 (15) is loam, sandy loam, or clay loam and is favorable for the growth of roots. Very slowly permeable clay occurs at a depth of 10 to 24 inches and severely restricts the development of roots. Available water holding capacity is about 3.0 to 6.0 inches in the root zone. The soil directly above the claypan may be saturated for a week or more following a rainy period.

The surface layer ranges from medium acid to strongly acid. Many of the soils are moderately alkaline deep in the subsoil. Fertility is low to moderate. Slopes range from 2 to 15 percent, and the hazard of erosion is moderate to severe in unprotected cultivated areas. Use of these soils is also limited by lack of rainfall in summer and low water-holding capacity. These soils occur in the northern third of the county.

These soils are used for dryland small grain and pasture.

In most years close-growing plants and crop residues are needed. Tillage can be performed only once in 4 to

8 years without risk of severe loss of soil. If tillage is performed, it should be on the contour. Plant residues should be left on the surface during the rainy periods.

These soils, except in dry years, generally respond to nitrogen, phosphorus, and sulfur fertilizers.

CAPABILITY UNIT IVe-5 (15)

Soils in this unit are moderately deep to deep, well drained to somewhat excessively drained, moderately fine textured to fine textured, and moderately steep. The soils are in the Diablo, Gazos, Linne, Los Gatos, Nacimiento, and San Benito series. Texture ranges from clay loam to clay and in each kind of soil is almost uniform from the surface downward. These soils have moderately slow to slow permeability, but roots penetrate them easily. Available water holding capacity ranges from 4.0 to 10.0 inches for the whole profile.

The surface layer ranges from medium acid to moderately alkaline but is mildly alkaline to moderately alkaline in many of the soils. Some of the soils have a calcareous surface layer. Lower horizons have a range in reaction similar to that of the surface layer. Many of the soils in this unit are moderately alkaline and calcareous in some or all parts of the subsoil. Slopes are between 15 and 30 percent, and the hazard of erosion is severe where the soils are tilled and not protected. Fertility is moderate, but cultivating the clayey soils on moderately steep slopes is difficult. These soils are scattered throughout most of the county, where they occur on foothills and broad ridges.

Many of the soils are used for dryland pasture, along with adjacent extensive areas of rangeland. Small grain and sudangrass are grown in some areas. Other crops are grown in small areas that are parts of larger fields consisting of less sloping soils.

These soils need the protection of close-growing vegetation and plant residues most of the time. If crop residues are used and soil structure is maintained, tilled crops can be grown about 1 year out of 4 to 8. Also, these soils can be kept in continuous cover such as pasture. Tillage should be on the contour, and part of the plant remains should be left on the surface for protection against erosion.

Plants respond favorably to nitrogen fertilizer in years of average or above average rainfall. The response to phosphorus and sulfur fertilizers depends on local variations of the soil and the amount of rainfall.

CAPABILITY UNIT IVw-6 (14)

Soils in this unit occur in basins and are poorly drained, fine textured, and nearly level. They are in the Willows series. Although these soils are deep, roots of most crops generally do not extend below a depth of 24 to 36 inches. The surface layer is clay in most places, though it is clay loam in sizable areas that have an uneven, scoured surface. Lower horizons are clay loam to clay in which the amount of clay increases with increasing depth. Permeability ranges from moderately slow to slow. During most winters a water table commonly occurs about 30 inches below the surface. Available water holding capacity is about 7.0 to 9.0 inches for the entire root zone.

The surface layer is mildly alkaline to strongly alkaline. The surface layer is calcareous in some places, but the lower horizons are calcareous in almost all places. In addition, these soils are moderately saline to strongly saline, though concentration of salt is somewhat spotty. The hazard of erosion is none to slight, and there is a small risk of flooding and scouring. These soils occur in the Bolsa area.

Most of the acreage of these soils is used for pasture and range, but a few areas are used for alfalfa hay and row crops, primarily sugar beets. Some of the cropped areas are parts of larger fields consisting of better soils. These soils are suitable for irrigated pasture, alfalfa, and a few salt-tolerant crops, such as sugar beets or barley.

Where soils are to be used for pasture or for irrigated crops, drainage and the reduction of salt and alkali are needed. Reclamation may not be practical, however, because permeability is slow, drainage outlets are not readily available, and irrigation water is not abundant. For substantial improvements, these soils should be drained by a well laid out system and then leached of salt. Unless these soils are drained, the applications of irrigation water must be small so that the water table does not rise and cause accumulation of salt at or near the surface. Leaching of salt from the surface layer is essential. Drains that are at least shallow are needed for removal of tail water. In some areas dikes or enlarged channels are needed to prevent flooding and scouring. Where there are no flood control structures, a strong turf helps to control the loss of soil.

Benefits from fertilizer are low unless salt has been removed and other improvements made. Organic material spread on or mixed into the soil aids reclamation and helps to improve tilth and permeability. On improved soils, most field crops respond to nitrogen and alfalfa responds to phosphorus.

CAPABILITY UNIT IVc-1 (15)

Soils in this unit are moderately deep to very deep, well drained, medium textured to moderately fine textured, and nearly level to moderately sloping. These soils are in the Docas series. They have a silt loam or clay loam surface layer and a subsoil of about the same texture as the surface layer. They contain fairly large amounts of silt. Depth of these soils is more than 60 inches. Roots readily penetrate all of the soil, though lack of moisture deep in the profile makes the total soil depth unimportant. Permeability is moderate. Available water holding capacity is about 10.0 to 12.0 inches.

These soils are moderately alkaline and calcareous throughout. They are not saline. Slopes range from 0 to 9 percent, and the hazard of erosion is generally none to slight, though infrequently an intense storm may damage tilled soils that are bare. Average rainfall is only about 10 to 14 inches, and irrigation water is not available. These soils occur near the southeastern edge of the county.

These soils are used for dryland small grains and pasture. Lack of precipitation limits the choice of crops. A common practice is to alternate a year of fallow with a year of small grain. Soils used for grain should be tilled on the contour. Part of the stubble should be left on this soil so as to protect it against erosion. The use of fertilizer is not practical, because sufficient moisture is lacking.

CAPABILITY UNIT VIe–1 (15)

Soils in this unit are shallow to moderately deep, well drained to somewhat excessively drained, moderately coarse textured to moderately fine textured, and moderately steep to steep. The soils are in the Auberry, Gaviota, Kettleman, Pinto, Santa Lucia, Shedd, Soper, and Vallecitos series. Terrace escarpments, a land type, is also in this unit. These soils have a sandy loam to clay loam surface layer. They are shaly or gravelly in places. The subsoil is similar to the surface layer or is clay loam. A large proportion of the soils are 20 to 30 inches deep over bedrock or a hardpan. A few are less than 20 inches deep, and others are deeper than 36 inches. The subsoil generally is moderate to slow in permeability. Available water holding capacity is 2.0 to 10.0 inches.

Nearly all of the soils in this unit are medium acid to moderately alkaline throughout, although two soils are calcareous throughout. Most soils receive an average annual precipitation of 12 inches. The more shallow and erodible soils are on slopes of 15 to 30 percent, but slopes are as much as 30 to 50 percent in some places and as little as 2 to 15 percent in other places. The hazard of erosion is severe. Many of the soils in this unit occur in the northern part of the county, but some are scattered in hilly areas in other parts.

These soils are used mostly for dryland pasture. Close-growing crops and plant residue are needed for protection against erosion. Tillage needed for seeding and brush control can be carried out in many small areas, though operation of farm equipment is difficult. Pasture plants respond favorably to nitrogen, phosphorus, and sulfur fertilizers.

CAPABILITY UNIT VIe–3 (15)

Soils in this unit have a very slowly permeable claypan and are moderately well drained to well drained, moderately coarse textured or medium textured, and strongly sloping to moderately steep. These soils are in the Cotati and Pinnacles series. Their surface layer is coarse sandy loam or loam that is easily penetrated by water. The subsoil is at a depth of 16 to 48 inches and consists of clay or sandy clay. The growth of roots is severely restricted by the clay in the subsoil. Total available water holding capacity is 2.5 to 6.0 inches of water.

Reaction generally ranges from medium acid to strongly acid in both the surface layer and the subsoil. Fertility is low. Most slopes are 15 to 30 percent, and a few are 9 to 15 percent. The hazard of erosion is moderate or severe. In these soils small amounts of runoff cut deep gullies that discourage tillage. Also, working these soils on the moderately steep slopes is difficult. These soils are inextensive in this county. They occur in the northwestern and southwestern parts in areas of fairly low hills.

These soils are used for pasture. They need protection of continuous vegetation and are not suited to tilled crops. If plant residues are left near the surface, the tillage needed for seeding and for brush control can be carried out. Plants respond to nitrogen, phosphorus, and sulfur fertilizers, but it is uncertain whether fertilization is economically feasible.

CAPABILITY UNIT VIe–4 (15)

Soils in this unit are moderately deep to deep, well drained to somewhat excessively drained, coarse textured to moderately coarse textured, and moderately steep. These soils are in the Arnold and Sheridan series. They have a coarse sandy loam or loamy sand surface layer, and there is little difference in texture between the surface layer and subsoil. Roots easily penetrate these soils, but their growth is severely limited by the decomposed granite or soft sandstone, which is at a depth ranging from 30 to 48 inches. Permeability is moderately rapid to rapid. Available water holding capacity is about 3.0 to 7.0 inches.

These soils are generally about medium acid, but they range from slightly acid to strongly acid. Slopes range from 15 to 30 percent, and the hazard of erosion is moderate to severe. These soils occur along the northwestern boundary of the county.

Pasture is the main use of these soils. Small areas were cultivated, but tillage is limited by the steep slopes. Trees and brush grow in small areas and limit grazing. If care is used, enough tillage can be carried out for seeding forage plants or controlling brush, but these soils need the protection of continuous vegetation and a moderate amount of plant residues.

Favorable response to nitrogen fertilizer is obtained in years when rainfall is above average. Response to fertilizers, however, is not so favorable as for soils in unit VIe–1 (15) and is not nearly so favorable as for the soils in unit VIe–5 (15).

CAPABILITY UNIT VIe–5 (15)

Soils in this unit are moderately deep to deep, well drained, fine textured to moderately fine textured, and moderately steep to steep. These soils are in the Climara, Diablo, Gazos, Linne, Los Gatos, Nacimiento, and San Benito series. Texture is commonly clay loam, but it is clay in some areas. Bedrock is at a depth of 24 to 48 inches, and it limits the penetration of roots. Available water holding capacity is about 3.0 to 8.0 inches.

The surface layer ranges from medium acid to moderately alkaline but is neutral or alkaline in more than half of the acreage. Many of the soils are alkaline and calcareous in the lower part of the profile. Fertility is fairly high. Average annual rainfall is more than 10 inches. Most soils have slopes ranging from 30 to 50 percent, but a few have slopes of 15 to 50 percent. The hazard of erosion is moderate to high. The soils in this unit are extensive in this county and are scattered throughout the hilly areas.

These soils are used for pasture. They require the protection of close-growing plants. The best protection is provided by pasture grasses, forbs, and fairly large amounts of residues. If cultivation is practiced for forage improvement, large amounts of plant residues should be left on and near the surface. Tillage should be performed on the contour and in a way that disturbs these soils very little. Crop response to nitrogen, phosphorus, and sulfur fertilizers is favorable.

CAPABILITY UNIT VIs–5 (15)

Soils in this unit are moderately deep, well drained, stony and rocky, fine textured to medium textured, and moderately steep to steep. These soils are in the Cibo, Los Gatos, Sween, and Vallecitos series. They have a clay, clay loam, or loam surface layer and a similar or fine-textured subsoil. Bedrock is at a depth of 50 inches, and

it limits the penetration of roots. Available water holding capacity is about 3.0 to 6.0 inches.

Reaction ranges from medium acid to neutral in the surface layer and from neutral to mildly alkaline in the lower part. Except for the material in a few rock joints, these soils are not calcareous. Fertility is moderate. Average annual rainfall is about 14 to 20 inches. Slopes range from 9 to 50 percent, and the hazard of erosion is moderate to severe. These soils occur mainly in the northeastern part of the county, but small areas are in the northwestern and central parts.

These soils are not suited to cultivated crops, and they are used for pasture. They need the protection of close-growing plants. Pasture grasses, forbs, and a fairly large amount of plant residue provide the best protection. Rocks are not numerous enough to prevent limited tillage in most places. If cultivation is a part of forage improvement, large amounts of plant residues should be left on and near the surface. Such tillage should be on the contour and should be done in a manner in which the soils are disturbed or compacted very little. Favorable response to nitrogen, phosphorus, and sulfur fertilizers can be anticipated.

CAPABILITY UNIT VIIe–1 (15)

Soils in this unit are shallow to moderately deep, well drained to somewhat excessively drained, moderately fine textured to moderately coarse textured, and steep to very steep. These soils are in the Auberry, Gaviota, Henneke, Kettleman, Lodo, Los Banos, Pinnacles, Santa Lucia, Shedd, Soper, and Vallecitos series. Gullied land, a land type, is also in this unit. The surface layer of these soils is loam in most places, but there are small areas that have a sandy loam or fine sandy loam surface layer and a clay loam or sandy clay subsoil. Some soils are eroded, and the subsoil material is exposed. These soils are generally 15 to 40 inches deep, but in places they are as shallow as 10 inches or as deep as 60 inches. Available water holding capacity is 1.0 to 8.0 inches for the whole soil profile.

These soils are medium acid to moderately alkaline in both the surface layer and subsoil, but the range in reaction is not so wide in any one kind of soil. Average annual rainfall is generally more than 10 inches but may be as low as 6 inches. Slopes generally range from 30 to 50 percent, but some are as much as 75 percent or as little as 5 percent. The erosion hazard is severe. The soils in this unit are extensive and occur throughout the county.

These soils are unsuitable for cultivation. They are used as range. In some areas the amount of usable forage is limited by brush. It is essential that these soils are protected at all times by a good cover of plants and plant residues. Seeding and fertilizing are so difficult that their expense cannot be justified.

CAPABILITY UNIT VIIe–4 (15)

Soils in this unit are shallow to deep, well drained to excessively drained, coarse textured to moderately coarse textured, and steep to very steep. These soils are in the Arnold, Cieneba, Laniger, and Sheridan series. Most of the soils have a coarse sandy loam or gravelly sandy loam surface layer. The subsoil has the same texture as the surface layer. Extensive areas are 18 to 30 inches deep over granite. Some soils on sediments are deeper, but few roots can penetrate the dense subsoil. Arnold loamy sand, 30 to 50 percent slopes, severely eroded, is loamy sand throughout and is 30 inches or more deep, but it is not extensive. Most of the soils have rapid to moderately rapid permeability. Total available water holding capacity is about 1.5 to 5.0 inches.

Reaction is medium to strongly acid. Average annual precipitation is 14 to 25 inches. Slopes range from 30 to 75 percent, and the hazard of erosion is severe. The soils of this unit occur along the western boundary of the county. They are moderately extensive.

Range is the main use, but brush covers extensive areas and reduces the forage available. The protection of vegetation and plant residues is needed at all times. Seeding and fertilization are so difficult, and they improve the range so little, that they are not practiced except after fires, and then for the purpose of protecting soils downslope.

CAPABILITY UNIT VIIe–5 (15)

Soils in this unit are shallow to moderately deep, well drained, fine textured to moderately fine textured, and steep to very steep. These soils are in the Diablo, Gazos, Linne, Nacimiento, and San Benito series. Landslides, a land type, is also in this unit. These soils have a clay loam or clay surface layer and a subsoil of about the same texture as the surface layer. They are only 20 to 36 inches deep. Available water holding capacity is about 3.0 to 6.0 inches.

Most soils in this unit are neutral to moderately alkaline, but one is slightly acid to medium acid. Average annual rainfall is more than 10 inches. Many slopes are between 50 and 75 percent, though some severely eroded areas are not so steep. The hazard of erosion is severe to very severe. These soils are scattered throughout the county.

These soils are used as range. A vegetative cover is needed at all times. Plant growth is fair, but most of the vegetation should be left so as to protect the soils and encourage new plant growth. Heavy stands of brush are not common. Slopes are too steep or the surface is too rough for seeding and fertilizing.

CAPABILITY UNIT VIIw–4 (14)

Only Sandy alluvial land is in this capability unit. It occurs on flood plains and is very deep, coarse textured, and nearly level. The soil material ranges from coarse sand to sandy loam and is gravelly and stratified in most places. Roots normally penetrate deeply, except in some areas where the strata are too coarse and too droughty for root development. Generally, the soil material is very rapidly permeable and excessively drained. During winter and spring some part of the soil profile may be saturated. Flooding, scouring, and deposition of fresh material is likely. Available water holding capacity is about 4.0 to 6.0 inches. Most slopes are less than 2 percent, but a few are not so nearly level.

Reaction is slightly acid to mildly alkaline. This land is scattered along the main streams throughout the county.

Sandy alluvial land is used for limited grazing, but the amount of forage is limited. The land is covered with brush, willows, and annuals in many places, and many areas have bare streaks. Seeding, fertilizing, or clearing brush for the purpose of improving the forage is not

profitable. It may be necessary, however, to straighten channels, clear brush, or stabilize streambanks so as to protect more valuable adjacent land.

CAPABILITY UNIT VIIs–1 (15)

Soils in this unit are rocky and stony, well drained to somewhat excessively drained, medium textured to fine textured, and moderately steep to very steep. These soils are in the Cibo, Gaviota, Sween, and Vallecitos series. The surface layer is loam, clay loam, and clay, and the subsoil of the loam and clay loam soils is finer textured than the surface layer. Most soils are 10 to 20 inches deep over bedrock, but some are more than 30 inches. Total available water holding capacity is 2 to 4 inches of water.

Reaction ranges from neutral to medium acid. Slopes range from 15 to 75 percent, but they are between 30 and 50 percent in extensive areas. The hazard of erosion is moderate to very severe. The soils in this unit occur throughout the county, particularly in the eastern part. They are extensive.

These soils are used for range. A good cover of plants and plant residues is needed at all times for protection against erosion. Because of the rocks, steep slopes, or other unfavorable soil features, seeding and the clearing of brush are not practical.

CAPABILITY UNIT VIIs–9 (15)

Soils in this unit are very shallow or are rocky. They are well drained to somewhat excessively drained, medium textured to moderately fine textured, and moderately steep to very steep. These soils are in the Montara series. Their surface layer and subsoil are silty clay loam. Depth of these soils ranges from 4 to 20 inches. Rock outcrops or stones cover from 2 to 10 percent of the surface. These soils developed on serpentine rocks and generally are deficient in calcium. Permeability is moderately slow. Available water holding capacity for the profile is about 1.0 to 3.0 inches.

Reaction is generally slightly acid to mildly alkaline, but in a few places it is moderately alkaline, particularly in the lower part of the profile. Slopes range from 15 to 50 percent, and the hazard of erosion is generally severe. These soils are in scattered areas in the northeastern and southeastern parts of the county. They are more extensive in the southeastern part.

Use of these soils is limited by steep slopes, shallowness, rockiness, low fertility, and erosion. The main use is limited grazing. A large part of the forage produced on the soils of this unit should be left to protect the soil and to encourage the regrowth of plants.

CAPABILITY UNIT VIIc–1 (15)

Soils in this unit are very deep, well drained, moderately coarse textured to medium textured, and nearly level to moderately sloping. These soils are in the Panhill and Panoche series. They have a loam or sandy loam surface layer. In most places roots readily penetrate to a depth of 60 inches or more, though moisture is not available so deep in the profile. Permeability is moderate to moderately rapid. Average annual rainfall is 5 to 10 inches. Available water holding capacity is 8.0 to 11.0 inches. The low annual rainfall limits use of these soils more than does the available water holding capacity.

Most of the soils are moderately alkaline and calcareous throughout. The soils are not saline. Slopes range from 0 to 9 percent, and the hazard of erosion is none to slight. The soils in this unit occur in or near Panoche Valley, near the eastern boundary of the county.

These soils are used for range. Some plant residues should be left on the surface to encourage plant growth the following year. Cost of improving the growth and quality of the forage plants through reseeding and fertilization is not justified at this time.

CAPABILITY UNIT VIIIe–1 (15)

This unit consists of shallow, steep and very steep, severely eroded soils. These soils are in the Nacimiento series. Badland, a land type, is also in this unit. The soils in the unit are less than 20 inches deep. Little water penetrates the soil material, because the surface seals and crusts. Nearly all of the rainfall runs off, and it takes much soil material with it. Hard bedrock does not occur. Slopes are 45 to 60 percent or more. Many areas are bare, and only thin, brushy stands cover other areas.

These soils have no use for farming. Reclamation is not feasible, but structures and planting may be needed for protection against gullying and sloughing and to prevent soil material from being deposited on lower areas. Much soil material is washed away and deposited. The plant cover on these soils should be protected and encouraged.

CAPABILITY UNIT VIIIw–4 (14)

Only Riverwash is in this unit. It consists of sand and gravel in channels of the larger streams. The soil material is excessively drained, though this land is commonly flooded part of the year. Sorting, scouring, and redeposition of soil material are likely. The surface is free of vegetation or is sparsely covered by annuals, brush, and willows that may be removed when the flow of the streams is heavy.

This land has essentially no value for vegetation, but it is valuable as infiltration beds and for storing underground water. Also, Riverwash is used for commercial sand and gravel. Adjacent land would benefit if channels were alined and the streambanks protected.

CAPABILITY UNIT VIIIs–1 (15)

The soils and land types in this unit are very shallow to shallow, rocky, and moderately steep to steep. The soils are in the Cieneba and Henneke series, and the land types are Igneous rock land, Sedimentary rock land, and Mine pits and dumps. The soil material normally is less than 10 inches deep. Rock outcrops generally cover from 35 to 90 percent of the surface. Texture is variable but normally ranges from coarse sandy loam to loam. Many rock fragments are in the soil material. Available water holding capacity totals 1.0 to 4.0 inches. Slopes range from 15 to 75 percent, and many areas are eroded. The hazard of further erosion is very severe. Runoff is medium to very rapid. The vegetation varies. In some places there is a brushy cover that ranges from dense and high to sparse and low. Other areas have a thin cover of grass, and some areas are bare.

These soils and land types have no value for farming. They are used mainly as wildlife habitat, and their vegetation should be protected. Special measures may be needed on the watershed above to protect low areas. The main management needed is protection from fires.

Estimated Yields and Soil Management Practices

This section presents estimated yields of the principal crops grown in the county and some of the management practices used to obtain those yields. Yields are listed in table 2 for alfalfa, apricots, grapes, prunes, sugar beets, tomatoes, walnuts, and barley. These estimates are based on observations made by the soil scientists who surveyed the county, on information furnished by farmers, and on data from the Agricultural Extension Service, Soil Conservation Service, California Agricultural Experiment Station, and the San Benito County Agricultural Commissioner. For crops on some soils detailed information was available. If little information was available about the yield on a particular kind of soil, estimates were made by comparing that soil with similar soils. Only those soils that are widely used for crops are listed in table 2.

The yields in table 2 are averages, and in any one year actual yields may be higher or lower than those listed. Also, the yields do not apply to individual parcels of land, and in San Benito County the weather has a great effect on yields.

Estimates of yields are of most use when the management practices under which yields can be produced are specified. The combination of practices needed for producing the yields given in table 2 are for the best known management, or the level of management that experience, field trials, and research findings indicate give the highest returns at the present time.

This information on yields and management practices will be most useful immediately after the release of this survey. New developments in crop breeding, in control of insects and diseases, and in use of fertilizer, tillage, irrigation, and drainage may replace much of the information in this section. The latest information can be obtained from State and Federal publications or agricultural agencies.

The management commonly practiced for most crops grown in San Benito County includes proper preparation of the seedbed and control of insects and weeds. Under an optimum level of management, the best adapted and most desirable known varieties of crops are grown and planting, harvesting, pruning, tillage, irrigation, and other management are performed at the proper time or season. Management by capability units is discussed in the section "Capability Groups of Soils."

Given in the following paragraphs are the cropping sequence, rates of planting and fertilization, and amounts of irrigation water that were assumed when the yields for the crops specified in table 2 were estimated.

Alfalfa.—A typical cropping sequence consists of 4 years of alfalfa followed by 2 to 3 years of selected row or field crops. The alfalfa seed is inoculated prior to seeding and is drilled at a rate of 5 to 7 pounds per acre. In the summer or in fall following planting, 40 pounds of phosphorus is applied. Alfalfa requires 3 acre-feet of irrigation water per acre annually on loamy and clayey soils and as much as 4.5 acre-feet per acre annually on the sandy soils.

TABLE 2.—*Estimated average yields per acre of principal irrigated and dryland crops*

[Absence of yield figure indicates that the soil is not suited to the crop specified or that the crop is not commonly grown]

Soil	Irrigated crops							Dryland crop
	Alfalfa	Apricots	Grapes	Prunes	Sugar beets	Tomatoes	Walnuts	Barley
	Tons	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*100 lbs.*
Antioch clay loam, 9 to 15 percent slopes, eroded			1. 5					16
Antioch loam, 0 to 2 percent slopes		4	2	1				20
Antioch loam, 2 to 5 percent slopes		4	2	1				18
Antioch loam, 5 to 9 percent slopes, eroded		3. 5	2	1				16
Arguello loam, 2 to 9 percent slopes								26
Arguello shaly loam, 9 to 15 percent slopes								22
Botella loam, 0 to 2 percent slopes								35
Botella loam, 2 to 9 percent slopes								35
Clear Lake clay	7	6		1. 5	30	35	1. 1	22
Clear Lake clay, saline	5				25	20		18
Clear Lake silty clay loam								25
Cometa loam, 5 to 15 percent slopes, eroded								18
Cometa sandy loam, 5 to 15 percent slopes, eroded								18
Conejo clay loam, 2 to 9 percent slopes								35
Corralitos loamy sand, 2 to 9 percent slopes		6	4					16
Cropley clay, 0 to 2 percent slopes	7	5	4		30	35	1. 2	30
Cropley clay, 2 to 9 percent slopes	7	5	4		30	30	1. 2	24
Cropley silty clay loam, 2 to 9 percent slopes	7	5	4		30	30	1. 3	24
Diablo clay, 9 to 15 percent slopes								26
Diablo clay, 15 to 30 percent slopes, eroded								20
Diablo-Linne complex, 9 to 15 percent slopes								18
Diablo-Linne complex, 15 to 30 percent slopes, eroded								16
Edenvale clay, 0 to 2 percent slopes								26
Gazos silty clay loam, 9 to 15 percent slopes								16

TABLE 2.—*Estimated average yields per acre of principal irrigated and dryland crops*—Continued

Soil	Irrigated crops							Dryland crop
	Alfalfa	Apricots	Grapes	Prunes	Sugar beets	Tomatoes	Walnuts	Barley
	Tons	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*100 lbs.*
Hanford coarse sandy loam, 0 to 2 percent slopes	6		5		24	25	1. 1	20
Hanford coarse sandy loam, 2 to 9 percent slopes	6		5		22	20	1. 1	20
Hanford loam, 0 to 2 percent slopes	7		5		28	30	1. 4	28
Hanford loam, 2 to 9 percent slopes	7		5		28	30	1. 4	26
Linne clay loam, 9 to 15 percent slopes								24
Linne clay loam, 15 to 30 percent slopes, eroded								22
Los Gatos clay loam, 15 to 30 percent slopes								20
Metz gravelly sandy loam, 0 to 2 percent slopes	6	5	4	1. 5	24	30	1. 1	16
Metz gravelly sandy loam, 2 to 9 percent slopes	6	5	4		24	30	1. 1	16
Metz sandy loam, 0 to 2 percent slopes	6	6	5	1. 5	28	30	1. 2	18
Metz sandy loam, wet variant, 0 to 2 percent slopes	6		4		28	30	. 9	
Mocho clay loam, 2 to 9 percent slopes	7	7	5	2. 5	25	32	1. 9	35
Mocho gravelly loam, 2 to 5 percent slopes	7	7	5	2. 2	33	30	1. 9	30
Mocho loam, 0 to 2 percent slopes	7	8	5	2. 5	33	35	2. 0	30
Mocho loam, 2 to 9 percent slopes	7	8	5	2. 5	33	32	1. 9	30
Mocho sandy loam, 0 to 2 percent slopes	7	8	5	2	30	32	1. 9	24
Mocho sandy loam, 2 to 9 percent slopes	7	8	5	2	30	30	1. 9	22
Nacimiento clay loam, 9 to 15 percent slopes								24
Pacheco clay loam over clay	6	5		1. 7	25	20	1. 2	18
Pacheco loam	7	6	4		33	35	1. 5	24
Pacheco silt loam	7	6	4		33	35	1. 5	24
Pacheco silty clay	7	7	5	2	33	35	1. 5	35
Panoche loam, 0 to 2 percent slopes	7							[1] 35
Panoche loam, 2 to 9 percent slopes	7							[1] 35
Panoche sandy loam, 0 to 2 percent slopes	7							[1] 30
Panoche sandy loam, 2 to 9 percent slopes	7							[1] 30
Pleasanton gravelly loam, 5 to 9 percent slopes, eroded								18
Pleasanton loam, 2 to 5 percent slopes			3					20
Reiff sandy loam, 0 to 2 percent slopes	7	7	5	1. 8	28	30	1. 7	22
Reiff sandy loam, 2 to 9 percent slopes	7	7	5	1. 8	28	28	1. 7	20
Rincon loam, 0 to 2 percent slopes	5	5	4	1. 4	25	20	1. 3	27
Rincon loam, 2 to 9 percent slopes	5	5	4	1. 4			1. 3	22
Rincon loam, 9 to 15 percent slopes, eroded								18
Rincon silty clay loam, 0 to 2 percent slopes	6	6	4	1. 7	30	30	1. 3	27
Rincon silty clay loam, 2 to 9 percent slopes	5	5	4	1. 5			1. 3	22
Rincon silty clay loam, 9 to 15 percent slopes, eroded							1. 2	21
Salinas clay loam, 0 to 2 percent slopes	7	9	5		33	35	2. 0	36
Salinas clay loam, 2 to 9 percent slopes	7	8	5		33	35	2. 0	36
San Benito clay loam, 9 to 15 percent slopes								22
Shedd loam, 9 to 15 percent slopes								18
Soper gravelly loam, 9 to 15 percent slopes								16
Soper gravelly loam, 15 to 30 percent slopes, eroded								14
Soper sandy loam, 9 to 15 percent slopes								14
Soper sandy loam, 15 to 30 percent slopes, eroded								14
Sorrento gravelly loam, 0 to 5 percent slopes	7	7	5	2. 5	30	32	2	32
Sorrento silt loam, 0 to 2 percent slopes	7	8	5	2. 5	33	35	2	35
Sorrento silt loam, 2 to 9 percent slopes	7	8	5	2. 5	33	32	2	35
Sorrento silty clay loam, 0 to 2 percent slopes	7	9	5	2. 5	33	35	2	36
Sorrento silty clay loam, 2 to 9 percent slopes	7	8	5	2. 5	33	32	2	36
Willows clay					25			20
Willows sandy loam					25			20
Yolo gravelly loam, 0 to 5 percent slopes								20
Yolo loam, 0 to 2 percent slopes								32
Yolo loam, 2 to 9 percent slopes								30

[1] Grown under irrigation.

Apricots.—These trees (fig. 14) require 40 pounds of nitrogen and 40 pounds of phosphorus per acre annually. For a cover crop on sloping soils, 30 pounds of barley seed and 20 pounds of purple vetch seed or 80 pounds of horsebeans should be planted. Apricots require from 25 to 30 acre-inches of irrigation water per acre applied in two to four applications prior to harvest and one or two applications after harvest.

Wine grapes.—These grapes require 40 to 60 pounds of nitrogen per acre annually. For a cover crop that reduces soil blowing and water erosion, adapted bromegrass is drilled in the middle of rows at a rate of 8 pounds per acre. Grapes need 6 to 12 acre-inches of irrigation water per acre annually. Prunings from grape vines annually are shredded and disked into the soil in alternate rows.

Prunes.—Prune trees require 60 to 100 pounds of nitrogen per acre annually and, on some soils, as much as 60 pounds of potassium. For winter cover, 20 pounds of purple vetch, 80 pounds of horsebeans, or 30 to 60 pounds of barley is planted on the sloping soils. Prunes need 24 to 36 acre-inches of irrigation water per acre annually. Irrigation water is applied three to four times before harvest and one to two times after harvest to help establish the cover crop.

Sugar beets.—A typical cropping sequence on the loamy and sandy soils consists of sugar beets for 1 year, truck or field crops for 1 year, and alfalfa for 3 years. On clayey soils, sugar beets, tomatoes, and small grain each are grown for 1 year. Sometimes corn is grown for silage for 1 year. Sugar beets require 120 to 150 pounds of nitrogen per acre per year. In addition, 30 to 40 pounds of phosphorus per acre is needed on sandy soils. For improving structure and tilth on clayey soils, 5 to 10 tons of barnyard manure is needed annually. Sugar beets seasonally require 2 to 3 acre-feet of irrigation water per acre. Crop residues are returned to the soil.

Tomatoes.—A typical cropping sequence consists of tomatoes grown for 2 years and alfalfa grown for 4 years. Another suitable sequence is tomatoes, some other truck crop, and a green-manure crop each grown for 1 year. Coated and treated seed is planted direct. Tomatoes should be fertilized according to the individual needs of the soil and plants as indicated by chemical analyses. In San Benito County, however, tomatoes generally need 40 to 80 pounds of nitrogen and 40 pounds of phosphorus per acre per year. Potassium may also be needed on some soils. Tomatoes need 2 to 3 acre-feet of irrigation water per acre annually. Crop residues are returned to the soil.

Walnuts.—These trees require 100 to 150 pounds of nitrogen per acre annually, applied in two separate applications. For winter cover crop, 20 pounds of purple vetch, 80 pounds of horsebeans, or 40 pounds of barley per acre is needed on sloping soils. Walnuts require 30 to 40 acre-inches of irrigation water per acre annually. At least one application is after harvest.

Barley (dryland).—A cropping sequence consists of barley planted and harvested 1 year, and the volunteer growth grazed for 1 or 2 years, and fallow for 1 year. Seeding is at a rate of 60 to 100 pounds per acre using seed that has been treated with a fungicide. About 30 to 50 pounds of nitrogen is required, but this may not be effective in years of low rainfall. Crop residues are returned to the soil, and a stubble mulch is left at or near the surface.

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Barley (irrigated).—A typical sequence consists of barley grown for 1 year, alfalfa for 4 years, and cotton or safflower grown for 1 or 2 years. Another common cropping sequence is barley grown for 1 year and cotton for 1 year. After treatment with a fungicide, the seed is planted at a rate of 60 to 100 pounds per acre. About 60 to 80 pounds of nitrogen per acre is required per year. The soil should be irrigated to a depth of 3 feet just before planting. During the growing season 12 to 18 acre-inches of irrigation water per acre are needed. Crop residues are returned to the soil, and a mulch of stubble is left at or near the surface.

Storie Index Rating [2]

In table 3 the soils of the county are listed in alphabetic order of the soil name and are rated according to the Storie index (*6*). This index expresses numerically the relative degree of suitability, or value, of a soil for general intensive agriculture. The rating is based on soil characteristics only. It does not take into account other factors, such as availability of water for irrigation, climate, and distance from markets, which might determine the desirability of growing specific crops in a given locality. For these reasons, the index, in itself, cannot be considered an index for land valuation.

Four factors that represent the inherent characteristics and qualities of the soils are considered in the index rating. Each factor is rated or evaluated separately in terms of percentage of the ideal, or 100 percent. The factors are—

Factor A, Profile characteristics.—Factor A expresses relative suitability of a soil profile for the growth of plant roots. Soils that have deep permeable profiles are rated 100 percent. Those that have a dense clay layer or a hardpan or are shallow over bedrock are rated less than 100 percent. The rating depends on the extent to which root penetration is limited.

Factor B, Texture of the surface soil.—Factor B is rated according to the texture of the surface soil, which affects the ease of tillage and the capacity of the soil to hold water. The moderately coarse and medium textures—fine sandy loam, loam, and silt loam—are the most desirable and are rated as 100 percent. The coarser and finer textures, such as sand and clay, are rated less than 100 percent.

Factor C, Slope.—Factor C is particularly important if the soil is irrigated. The amount of water that runs off a soil and its susceptibility to erosion are influenced by the slope of the soil. Smooth, nearly level or very gently sloping soils are rated 100 percent. The rating decreases as the slope increases.

Factor X, Other conditions.—Factor X is used to evaluate any other limitations to use of the soil, such as poor drainage or a high water table, erosion, salts or alkali, low fertility, acidity, or unfavorable microrelief. If more than one limitation exists, the values of each are multiplied together to get the X factor. The index rating of a soil is obtained by multiplying the four factors A, B, C, and X; thus, any one factor may dominate or control the final rating. For example, a soil may have an excellent

[2] Ratings by EUGENE L. BEGG, soil specialist, University of California.

Figure 14.—Mature apricot trees. *Top*, trees on Antioch loam, 0 to 2 percent slopes, are small thinly branched, and only moderately productive (Auger is about 5 feet long). *Bottom*, even, healthy, well-branched trees on Sorrento silt loam, 0 to 2 percent slopes. They produce an above average amount of high-quality fruit.

TABLE 3.—*Storie index rating for soils of San Benito County*

[Limitations used in computing the X factor for some of the soils are indicated by figures in parentheses after the factor as follows: (1) erosion; (2) fertility, erosion; (3) fertility; (4) salinity; (5) drainage; (6) fertility, drainage; (7) drainage, alkalinity; (8) fertility, overflow

Soil	Rating factors				Index rating	Soil grade
	A (Profile)	B (Texture)	C (Slope)	X (Other conditions)		
Antioch clay loam, 9 to 15 percent slopes, eroded	50	85	90	90(1)	34	4
Antioch loam, 0 to 2 percent slopes	60	100	100	100	60	2
Antioch loam, 2 to 5 percent slopes	60	100	100	100	60	2
Antioch loam, 5 to 9 percent slopes, eroded	55	100	95	95(1)	50	3
Arguello loam, 2 to 9 percent slopes	75	100	95	80(2)	57	3
Arguello shaly loam, 9 to 15 percent slopes	75	85	90	80(2)	46	3
Arnold loamy sand, 9 to 15 percent slopes	85	80	90	85(3)	52	3
Arnold loamy sand, 15 to 30 percent slopes, eroded	80	80	80	65(2)	33	4
Arnold loamy sand, 30 to 50 percent slopes, severely eroded	80	80	45	55(2)	16	5
Auberry fine sandy loam, 15 to 30 percent slopes	70	100	80	80(3)	45	3
Auberry fine sandy loam, 30 to 75 percent slopes, eroded	70	100	40	70(2)	20	4
Badland					[1] <5	6
Botella loam, 0 to 2 percent slopes	95	100	100	100	95	1
Botella loam, 2 to 9 percent slopes	95	100	95	100	90	1
Cibo rocky clay, shallow, 15 to 75 percent slopes, eroded	50	60	40	70(2)	9	6
Cibo stony clay, 15 to 50 percent slopes, eroded	70	60	60	70(2)	18	5
Cieneba gravelly sandy loam, 30 to 75 percent slopes, eroded	30	80	40	70(2)	7	6
Cieneba gravelly sandy loam, 15 to 75 percent slopes, severely eroded	30	80	50	50(2)	6	6
Clear Lake clay	95	60	100	100	57	3
Clear Lake clay, saline	95	60	100	75(4)	43	3
Clear Lake silty clay loam	95	85	100	70(5)	57	3
Climara clay, 9 to 15 percent slopes	70	60	90	100	38	4
Climara clay, 15 to 50 percent slopes, eroded	65	60	60	60(2)	13	5
Cometa loam, 5 to 15 percent slopes, eroded	70	100	90	70(2)	44	3
Cometa sandy loam, 5 to 15 percent slopes, eroded	70	95	90	70(2)	42	3
Conejo clay loam, 2 to 9 percent slopes	95	85	95	100	77	2
Corralitos loamy sand, 2 to 9 percent slopes	95	80	95	95(3)	69	2
Cotati loam, 2 to 9 percent slopes	60	100	95	90(3)	51	3
Cotati loam, 9 to 15 percent slopes, eroded	60	100	90	70(2)	38	4
Cotati loam, 15 to 30 percent slopes, eroded	60	100	80	60(2)	29	4
Cropley clay, 0 to 2 percent slopes	95	60	100	90(5)	51	3
Cropley clay, 2 to 9 percent slopes	95	60	95	100	54	3
Cropley silty clay loam, 2 to 9 percent slopes	95	85	95	100	77	2
Diablo clay, 9 to 15 percent slopes	80	60	90	100	43	3
Diablo clay, 15 to 30 percent slopes, eroded	80	60	80	80(1)	31	4
Diablo clay, 30 to 50 percent slopes, eroded	75	60	45	75(1)	15	5
Diablo clay, 50 to 75 percent slopes, severely eroded	60	60	30	50(2)	5	6
Diablo-Linne complex, 9 to 15 percent slopes	80	75	90	100	54	3
Diablo-Linne complex, 15 to 30 percent slopes, eroded	80	75	80	80(1)	38	4
Diablo-Linne complex, 30 to 50 percent slopes, eroded	75	75	45	80(1)	20	4
Docas clay loam, 0 to 2 percent slopes	95	85	100	100	81	1
Docas clay loam, 2 to 9 percent slopes	95	85	95	100	77	2
Docas silt loam, 0 to 2 percent slopes	95	100	100	100	95	1
Docas silt loam, 2 to 9 percent slopes	95	100	95	100	90	1
Edenvale clay, 0 to 2 percent slopes	90	60	100	100	54	3
Gaviota loam, 15 to 30 percent slopes	60	100	80	106	48	3
Gaviota loam, 15 to 30 percent slopes, eroded	45	100	80	80(1)	29	4
Gaviota loam, 30 to 50 percent slopes, eroded	40	100	45	70(1)	13	5
Gaviota rocky loam, 15 to 50 percent slopes, eroded	40	70	60	60(1)	10	5
Gazos clay loam, 15 to 30 percent slopes, eroded	60	85	80	80(1)	33	4
Gazos clay loam, 30 to 50 percent slopes, eroded	60	85	45	80(1)	18	5
Gazos clay loam, 50 to 75 percent slopes, severely eroded	50	85	30	60	8	6
Gazos silty clay loam, 9 to 15 percent slopes	70	85	90		54	3
Gullied land					[1] <5	6
Hanford coarse sandy loam, 0 to 2 percent slopes	90	80	100	85(6)	61	2
Hanford coarse sandy loam, 2 to 9 percent sopes	90	80	95	85(6)	58	3
Hanford loam, 0 to 2 percent slopes	90	100	100	85(6)	77	2
Hanford loam, 2 to 9 percent slopes	90	100	95	85(6)	73	2
Henneke fine gravelly loam, 15 to 50 percent slopes, eroded	50	70	60	50(2)	11	5
Henneke soils, 15 to 75 percent slopes, severely eroded	40	60	50	40(2)	5	6
Igneous rock land					[1] <5	6
Kettleman loam, 5 to 15 percent slopes	90	100	90	100	81	1
Kettleman loam, 15 to 50 percent slopes, eroded	85	100	60	80(1)	41	3
Kettleman soils, 15 to 50 percent slopes, eroded	70	100	60	80(1)	34	4
Landslides					[1] <5	6

See footnote at end of table.

TABLE 3.—*Storie index rating for soils of San Benito County*—Continued

Soil	Rating factors				Index rating	Soil grade
	A (Profile)	B (Texture)	C (Slope)	X (Other conditions)		
Laniger gravelly sandy loam, 30 to 75 percent slopes, severely eroded	60	60	40	40(2)	6	6
Linne clay loam, 9 to 15 percent slopes	80	85	90	100	61	2
Linne clay loam, 15 to 30 percent slopes, eroded	80	85	80	80(1)	44	3
Linne clay loam, 30 to 50 percent slopes, eroded	60	85	45	70(1)	16	5
Linne clay loam, 30 to 50 percent slopes, severely eroded	50	85	45	70(1)	13	5
Linne-Shedd complex, 15 to 30 percent slopes, eroded	80	90	80	80(1)	46	3
Linne-Shedd complex, 30 to 50 percent slopes, eroded	60	90	45	70(1)	17	5
Lodo shaly loam, 50 to 75 percent slopes, eroded	50	80	40	70(1)	11	5
Los Banos clay loam, 2 to 9 percent slopes	80	85	95	85(3)	55	3
Los Banos clay loam, 9 to 15 percent slopes, eroded	80	85	90	70(2)	43	3
Los Banos clay loam, 15 to 50 percent slopes, severely eroded	80	85	60	50	20	4
Los Gatos clay loam, 15 to 30 percent slopes	80	85	80	100	55	3
Los Gatos clay loam, 30 to 50 percent slopes, eroded	65	85	45	70(1)	17	5
Los Gatos rocky clay loam, 15 to 50 percent slopes, eroded	65	70	60	70(1)	19	5
Metz gravelly sandy loam, 0 to 2 percent slopes	90	70	100	85(3)	54	3
Metz sandy loam, 0 to 2 percent slopes	95	95	100	100	90	1
Metz gravelly sandy loam, 2 to 9 percent slopes	90	70	95	85(3)	51	3
Metz sandy loam, wet variant, 0 to 2 percent slopes	90	95	100	70(7)	60	2
Mine pits and dumps					[1] <5	6
Mocho clay loam, 2 to 9 percent slopes	100	85	95	100	81	1
Mocho gravelly loam, 2 to 5 percent slopes	100	70	95	100	62	2
Mocho loam, 0 to 2 percent slopes	100	100	100	100	100	1
Mocho loam, 2 to 9 percent slopes	100	100	95	100	95	1
Mocho sandy loam, 0 to 2 percent slopes	100	95	100	100	95	1
Mocho sandy loam, 2 to 9 percent slopes	100	95	95	100	90	1
Montara rocky silty clay loam, 15 to 50 percent slopes, eroded	20	50	60	50(2)	3	6
Nacimiento clay loam, 9 to 15 percent slopes	90	85	90	100	69	2
Nacimiento clay loam, 15 to 30 percent slopes	80	85	80	90(1)	49	3
Nacimiento clay loam, 30 to 50 percent slopes, eroded	80	85	45	80(1)	25	4
Nacimiento clay loam, 50 to 75 percent slopes, eroded	65	85	30	70(1)	12	5
Nacimiento loam, 30 to 75 percent slopes, severely eroded	65	100	40	50(1)	13	5
Pacheco clay loam over clay	90	85	100	70(7)	54	3
Pacheco loam	90	100	100	70(7)	63	2
Pacheco silty clay	90	70	100	70(7)	44	3
Pacheco silt loam	90	100	100	70(7)	63	2
Panhill loam, 2 to 9 percent slopes	100	100	95	100	95	1
Panoche loam, 0 to 2 percent slopes	100	100	100	100	100	1
Panoche loam, 2 to 9 percent slopes	100	100	95	100	95	1
Panoche sandy loam, 0 to 2 percent slopes	100	95	100	100	95	1
Panoche sandy loam, 2 to 9 percent slopes	100	95	95	100	90	1
Pinnacles coarse sandy loam, 15 to 30 percent slopes, eroded	60	80	80	80(2)	31	4
Pinnacles coarse sandy loam, 30 to 75 percent slopes, severely eroded	60	80	40	40(2)	8	6
Pinto sandy loam, 15 to 30 percent slopes, eroded	70	95	80	70(2)	37	4
Pleasanton gravelly loam, 5 to 9 percent slopes, eroded	90	80	95	90(1)	62	2
Pleasanton loam, 2 to 5 percent slopes	90	100	95	100	85	1
Reiff sandy loam, 0 to 2 percent slopes	95	95	100	100	90	1
Reiff sandy loam, 2 to 9 percent slopes	95	95	95	100	85	1
Rincon loam, 0 to 2 percent slopes	85	100	100	100	85	1
Rincon loam, 2 to 9 percent slopes	85	100	95	100	81	1
Rincon loam, 9 to 15 percent slopes, eroded	85	100	90	90(1)	69	2
Rincon silty clay loam, 0 to 2 percent slopes	85	90	100	100	77	2
Rincon silty clay loam, 2 to 9 percent slopes	85	90	95	100	73	2
Rincon silty clay loam, 9 to 15 percent slopes, eroded	85	90	90	90(1)	62	2
Riverwash					[1] <5	6
Salinas clay loam, 0 to 2 percent slopes	95	85	100	100	81	1
Salinas clay loam, 2 to 9 percent slopes	95	85	95	100	77	2
San Benito clay loam, 9 to 15 percent slopes	80	85	90	100	61	2
San Benito clay loam, 15 to 30 percent slopes, eroded	75	85	80	90(1)	46	3
San Benito clay loam, 30 to 50 percent slopes, eroded	70	85	45	85(1)	23	4
San Benito clay loam, 30 to 50 percent slopes, severely eroded	70	85	45	80(1)	21	4
Sandy alluvial land	90	75	100	60 8	41	3
Santa Lucia shaly loam, 30 to 50 percent slopes, eroded	45	80	45	70(2)	11	5
Santa Lucia shaly loam, 30 to 75 percent slopes, severely eroded	40	80	40	50(2)	6	6
Sedimentary rock land					[1] <5	6
Shedd loam, 9 to 15 percent slopes	65	100	90	100	58	3
Shedd loam, 15 to 30 percent slopes, eroded	60	100	80	80(1)	38	4
Shedd loam, 30 to 50 percent slopes, eroded	45	100	45	70(1)	14	5
Shedd loam, 30 to 50 percent slopes, severely eroded	45	100	45	50(2)	10	5

See footnote at end of table.

TABLE 3.—*Storie index rating for soils of San Benito County*—Continued

Soil	Rating factors				Index rating	Soil grade
	A (Profile)	B (Texture)	C (Slope)	X (Other conditions)		
Sheridan coarse sandy loam, 9 to 15 percent slopes	75	90	90	90 (3)	55	3
Sheridan coarse sandy loam, 15 to 30 percent slopes	70	90	80	90 (3)	45	3
Sheridan coarse sandy loam, 15 to 30 percent slopes, eroded	65	90	80	80 (2)	37	4
Sheridan coarse sandy loam, 30 to 75 percent slopes, eroded	45	90	40	40 (2)	7	6
Sheridan coarse sandy loam, 30 to 75 percent slopes, severely eroded	35	90	40	30 (2)	4	6
Soper gravelly loam, 9 to 15 percent slopes	85	80	90	100	61	2
Soper gravelly loam, 15 to 30 percent slopes, eroded	85	80	80	80 (1)	44	3
Soper gravelly loam, 30 to 50 percent slopes, eroded	80	80	70	70 (1)	31	4
Soper sandy loam, 9 to 15 percent slopes	90	95	90	100	77	2
Soper sandy loam, 15 to 30 percent slopes, eroded	85	95	80	80 (1)	52	3
Soper sandy loam, 30 to 50 percent slopes, eroded	80	95	70	70 (1)	37	4
Sorrento gravelly loam, 0 to 5 percent slopes	85	80	95	100	65	2
Sorrento silt loam, 0 to 2 percent slopes	100	100	100	100	100	1
Sorrento silt loam, 2 to 9 percent slopes	100	100	95	100	95	1
Sorrento silty clay loam, 0 to 2 percent slopes	100	85	100	100	85	1
Sorrento silty clay loam, 2 to 9 percent slopes	100	85	95	100	81	1
Sween rocky clay loam, 15 to 30 percent slopes, eroded	65	70	80	80 (1)	29	4
Sween rocky clay loam, 30 to 50 percent slopes, eroded	65	70	45	70 (1)	14	5
Sween stony clay loam, 15 to 30 percent slopes, eroded	65	60	80	80 (2)	25	4
Sween very stony clay loam, 15 to 50 percent slopes, eroded	40	55	60	70 (2)	9	6
Terrace escarpments					[1] <5	6
Vallecitos loam, 9 to 15 percent slopes	75	100	90	100	68	2
Vallecitos loam, 15 to 30 percent slopes	70	100	80	100	56	3
Vallecitos loam, 30 to 50 percent slopes	65	100	45	80 (2)	22	4
Vallecitos loam, 30 to 50 percent slopes, eroded	60	100	45	70 (2)	19	5
Vallecitos rocky loam, 9 to 30 percent slopes, eroded	50	70	90	60 (2)	19	5
Vallecitos rocky loam, 30 to 50 percent slopes, eroded	45	70	45	50 (2)	7	6
Willows clay	80	65	100	50 (7)	26	4
Willows clay, saline-alkali	80	65	100	40 (7	21	4
Willows sandy loam	90	95	95	80 (3)	65	2
Willows soils, eroded	80	70	100	50 (7)	28	4
Yolo gravelly loam, 0 to 5 percent slopes	90	80	95	100	69	2
Yolo loam, 0 to 2 percent slopes	95	95	100	100	90	1
Yolo loam, 2 to 9 percent slopes	95	100	95	100	69	2

[1] Index rating was estimated; rating factors were not determined.

profile justifying a rating of 100 percent for factor A, excellent texture of the surface soil justifying 100 percent for factor B, a smooth, nearly level surface justifying 100 percent for factor C, but a high accumulation of salts or alkali that would give a rating of 20 percent for factor X. Multiplying these four ratings gives an index rating of 20 for this soil. The high accumulation of salts or alkali dominates, makes the soil unproductive for crops, and justifies the low index rating of 20.

Soils are placed in grades according to their suitability for farming as shown by their Storie index ratings. The six grades and their range in index ratings are—

	Index rating
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

Soils of grade 1 have few or no limitations that restrict their use for crops. Soils of grade 2 are suitable for most crops, but they have minor limitations that narrow the choice of crops and have few special management needs. Grade 3 soils are suited to a few crops or to special crops and require special management. Grade 4 soils are severely limited for crops. If used for crops, they require careful management. Grade 5 soils generally are not suited to cultivated crops but can be used for pasture and range. Grade 6 consists of soils and land types that generally are not suited to farming.

Management of Pasture and Range

About 500,000 acres in San Benito County is used for grazing livestock. Cattle is the main livestock, though the number of sheep is considerable.

The forage consists of various mixtures of desirable and undesirable annual plants. The kinds of plants and the condition of the range partly depend on the kinds of soils and practices of management. Desirable plants include soft chess, ryegrass, filaree, annual clover, burclover, wild oats, and remnants of perennial grasses. Among the less desirable plants are ripgut brome, wild barley, annual fescues, red brome, wild carrot, and annual lupine. The undesirable plants include nitgrass, dogtail, tarweed, fiddleneck, popcornflower, vinegar weed, turkey mullein, thistles, and mustard.

Where an area of range is producing at or near its potential, a mixture of desirable plants makes up 70 percent or more of the vegetative cover. Less desirable plants and undesirable plants make up the remaining cover. The undesirable plants do not amount to more than 10 percent of the total cover.

The amount of forage produced, like the kinds of plants, depends on the kinds of soils and past management, and especially on the temperature and the amount and distribution of rainfall. In years when rainfall and temperature are favorable, production may be as high as 2,500 pounds per acre on a good site, but production may fall as low as 1,000 pounds on the same site when the weather is adverse. When there is enough rainfall that is well distributed through winter and spring and temperatures are moderate, the green feed period may run from December through spring and into June. The green feed period is the period when forage plants grow vigorously, are nutritious, and are at peak production. In years of low temperatures and rainfall, this period is from February into May.

In conducting a good program of management, variation of production and the length of the green feed period are considered. The program must be flexible enough to make full use of the available feed when it is most nutritious. The number of livestock on a site should be varied according to the forage available, or supplemental feed should be provided during periods when there is not enough green feed.

Pasture and range sites

The soils used for grazing in San Benito County have been grouped into pasture and range sites. Each site differs from other pasture and range sites in its ability to produce significantly different kinds and amounts of vegetation and in the management needed to keep the site in good condition. For this management it is necessary to have knowledge about the soils that make up each site and about the kinds and amounts of plants the site can produce. Then it is possible to use management, including regulation of grazing, that favors production of the most desirable forage plants.

The pasture and range sites in San Benito County are described in the following pages.

Annual air-dry production is estimated for each site. These estimates are based on a limited number of clippings, and on knowledge of the soils in sites.

SITE 1: CLAYEY

This site extends across the entire county from north to south and has an average annual rainfall of 10 to 18 inches. It consists of calcareous clays, clay loams, and silty clay loams that are more than 20 inches deep. Slopes are between 9 and 75 percent but are dominantly less than 50 percent. This site occupies about 124,000 acres.

The soils in this site have moderate to high available water holding capacity and are moderately fertile. Permeability is moderately slow to slow, and runoff is rapid.

Large acreages of these soils are arable but are used for grazing. They should be considered first if improvements are planned.

During years when moisture is favorable, the soils in this site produce heavy stands of wild oats. Stands of burclover are abundant in some years. If cows graze heavily on this burclover when it is young and lush, they may become bloated. The soils of this site are well suited to seeding of adapted annual grasses and legumes. Hardinggrass can be established in areas that receive 16 inches of rainfall. Forage plants respond well to applications of ammonium-phosphate-sulfate fertilizer.

Where the soils on this site are not fertilized and management is not improved, annual air-dry production ranges from 3,000 pounds per acre in years of favorable moisture to 1,200 pounds in years of unfavorable moisture. Except for the severely eroded soils (DaG3, LnF3, SbF3) and for an eroded soil on slopes of more than 50 percent (NaG2), total annual yields can be increased 2 to 4 times by adding fertilizer and improving management.

SITE 2: LOAMY

This site consists of strongly acid to neutral shaly loams that are 18 to 60 inches deep. The average annual precipitation on this site is 12 to 16 inches. This site occupies only about 6,000 acres. Some spots are calcareous. Slopes range from 9 to 75 percent.

The soils in this site have low to high available water holding capacity. Permeability is moderate to moderately slow, runoff is medium to rapid, and fertility is low to moderate.

Some areas of these soils are arable but are used for grazing. These soils should be considered first if improvements are planned.

Only moderately good stands of burclover grow on this site. The forage is mostly soft chess, wildoats, and filaree. The production of grasses can be improved by removing trees and brush that grow in some places. The soils of this site are well suited to seeding of adapted annual grasses and legumes. Forage plants respond well to applications of nitrogen, phosphorus, and sulfur fertilizers.

Where the soils on this site are not fertilized and management is not improved, annual air-dry production ranges from 2,400 pounds per acre in years of favorable moisture to 1,200 pounds in years of unfavorable moisture. Except for a severely eroded soil (SdG3), total annual yields can be increased 3 to 4 times by adding fertilizer and improving management.

SITE 3: GRANITIC

This site consists of soils that occur largely in the Gabilan Range in the western part of the county where average annual rainfall is 12 to 30 inches. These soils are loamy sands, gravelly loams, and fine, coarse, and gravelly sandy loams. They are more than 20 inches deep over sandstone, granite, or granitic material (fig. 15). These soils are strongly acid to slightly acid. Slopes range from 9 to 75 percent and are dominantly more than 30 percent. Some areas are severely eroded. This site occupies about 104,000 acres.

These soils have low fertility and low available water holding capacity. They are rapidly permeable and droughty. If they are not adequately protected these soils erode easily.

Small acreages of these soils are arable but are used for grazing and are included in this site.

Only a small amount of burclover grows on this site. Some open areas are covered with grass, but in most of

Figure 15.—**Pinnacles coarse sandy loam, 15 to 30 percent slopes, eroded, in site 3.**

the acreage blue oak, live oak, and Digger pine are scattered or grow in heavy stands. Some areas are covered with brush. The production of forage in the areas covered by brush and trees is far below potential, but care must be used if the brush is cleared because the hazard of erosion is high.

Where the soils on this site are not fertilized and management is not improved, annual air-dry production ranges from 1,600 pounds per acre in years of favorable moisture to 800 pounds in years of unfavorable moisture. Except for the soils on slopes of more than 30 percent (AtF3, AuG2, CgG2, LaG3, PnG3, SkG2, SkG3, SlF2, SmF2,), total annual yields can be increased 3 to 4 times by adding fertilizer and improving management.

SITE 4: CLAYPAN

This site consists of soils around the edges of valleys along most of the major drainageways throughout the county where average annual rainfall is 12 to 20 inches. Exceptions are the valleys in the drier areas in the southeastern part of the county. The soils in this site are loams, gravelly loams, and sandy loams. At a depth of 12 to 20 inches, these soils have an accumulation of clay that restricts the movement of roots and water. Reaction generally ranges from strongly acid to neutral but is mildly alkaline in a few areas. Slopes range from 0 to 30 percent but are dominantly between 2 and 15 percent. This site occupies about 10,000 acres.

The soils in this site have moderate to high available water holding capacity. Permeability is moderately slow to very slow, runoff is slow to medium, and fertility is low to moderate.

Much of the acreage of these soils is arable and has been farmed to dryland grain but has been allowed to revert to range. Because they have been tilled for crops, the steeper soils are eroded, fertility is reduced, and the plant cover is poor. Little or no brush grows on this site. The soils of this site are well suited to seeding of adapted annual grasses and legumes. Forage plants respond well to applications of nitrogen, phosphorus, and sulfur fertilizers.

Where the soils on this site are not fertilized and management is not improved, annual air-dry production ranges from 2,000 pounds per acre in years of favorable moisture to 1,200 pounds in years of unfavorable moisture. Total annual yields can be increased 3 to 4 times by adding fertilizer and improving management.

SITE 5: FINE LOAMY

This site consists mainly of clayey and loamy soils, some of which are shaly, rocky, stony, or very stony. The rocky and stony clays are 20 to 60 inches deep over sandstone, shale, or basic igneous rock. The soils in this site are medium acid to slightly acid. Slopes range from 9 to 75 percent but are dominantly between 30 and 50 percent. This site occupies 62,000 acres and has an average annual rainfall of 12 to 20 inches.

These soils have low to moderate available water holding capacity and moderate fertility. Permeability is moderate to slow, and runoff is medium to very rapid.

Some areas of these soils are arable but are used for grazing. During years when moisture is favorable, the soils of this site produce thick stands of wild oats with moderate to large amounts of burclover. Moderately dense and dense stands of blue oak and live oak grow in some areas. Brush is not generally abundant.

The soils in this site are well suited to seeding of adapted annual grasses and legumes. Hardinggrass can be established in areas that receive 16 inches of rainfall. Forage plants respond well to applications of ammonium-phosphate-sulfate fertilizer.

Where the soils on this site are not fertilized and management is not improved, annual air-dry production ranges from 2,500 pounds per acre in years of favorable moisture to 1,200 pounds per acre in years of unfavorable moisture. Except for a shallow soil (CcG2), a very stony soil (SwF2), and soils on slopes of more than 50 percent (GtG3, LtG2), total annual yields can be increased 2 to 4 times by adding fertilizer and improving management.

SITE 6: SHALLOW LOAMY

This site occurs mainly in the Diablo Range along the southern and eastern boundaries of the county, where the average annual rainfall is 14 to 20 inches. It consists of gullied areas and of medium acid to neutral loams and rocky loams that are 10 to 24 inches deep over sandstone and shale. Slopes range from 9 to 50 percent but are dominantly between 30 and 50 percent. This site occupies 111,000 acres.

The soils in this site have low available water holding capacity and low to moderate fertility. Permeability is moderate, and runoff is rapid to very rapid.

Small areas of these soils are arable but are used for grazing. Only moderately good stands of burclover grow on this site. Most of the forage is soft chess, wild oats, ripgut brome, and filaree. Large acreages are covered with brush or have open to dense stands of blue oak, live oak, and some Digger pine. The production of forage on this site can be increased by removing trees and brush and seeding adapted annual grasses and legumes.

Where the soils on this site are not fertilized and management is not improved, annual air-dry production ranges from 2,000 pounds per acre in years of favorable moisture to 1,000 pounds in years of unfavorable moisture. Except for eroded soils on slopes of more than 30 percent (GaF2, VaF2), rocky eroded soils on slopes of 15 to 50 percent (GrF2, VrF2), and Gullied land (GuE), total yields can be increased 2 to 3 times by adding fertilizer and improving management.

SITE 7: DRY LOAMY

This site occurs in the southern part of the county in the drier areas west of Bitterwater Valley and on the western side of Vallecitos Valley. It has an average annual rainfall of 12 to 14 inches. It consists of calcareous loams and clay loams that are 20 to 48 inches deep over calcareous shale and sandstone. Slopes range from 9 to 50 percent. This site occupies 16,000 acres.

The soils in this site have low to moderate available water holding capacity and moderate to low fertility. Runoff is medium to rapid.

Large areas of these soils, particularly on ridgetops, have been dryfarmed to grain and are now eroded or severely eroded. Before these areas were cultivated, the native plants included wild oats, soft chess, filaree, burclover, red brome and annual fescues. The wild oats and soft chess have been replaced by red brome and annual fescues. In years of favorable moisture, stands of burclover are abundant. If cows graze heavily on this site when it is young and lush, they may become bloated. The more severely eroded areas are bare or support thin stands of California sagebrush and wild buckwheat mixed with thin stands of grasses and forbs.

The production of forage can be increased on some of the soils of this site by seeding to adapted annual grasses and legumes and by fertilizing when equipment can be operated without damage to the soils. Response to improved management is poor during years of low or poorly distributed rainfall.

The yield of forage varies greatly on this site; in years of favorable moisture grasses are abundant, but during droughty years the growth of grasses is very poor.

Where the soils on this site are not fertilized and management is not improved, annual air-dry production ranges from 2,000 pounds per acre in years of favorable moisture to 800 pounds in years of unfavorable moisture. Except for a severely eroded soil (ShF3) and an eroded soil on slopes of more than 30 percent (ShF2), total annual yields can be increased 2 to 4 times by adding fertilizer and improving management.

SITE 8: SERPENTINE LAND

The soils in this site are fine gravelly loams and rocky silty clay loams derived from serpentine. These soils are intermingled with Igneous rock land. They are 10 to 25 inches deep over bedrock. Slopes range from 15 to 50 percent. This site occupies 8,000 acres and has an average annual rainfall of 12 to 20 inches.

These soils have very low fertility. Available water holding capacity is low, and runoff is rapid.

Most of this site is covered with brush, but there are small open areas of grasses. Less desirable annual fescues are dominant in most areas. Burclover generally does not grow on this site. Much of this site is inaccessible, because it is intermingled with Igneous rock land and watershed areas. Generally it is not feasible to reseed or fertilize the soil of this site.

On this site total annual air-dry production is 1,200 pounds per acre in years of favorable moisture and 500 pounds in years of unfavorable moisture.

SITE 9: ARID LOAMY HILLS

This site consists of soils in the southeastern corner of the county along the Fresno County line where the average annual rainfall is 6 to 12 inches. These soils are calcareous loams, rocky loams, and clay loams that are 18 to 40 inches deep over soft calcareous sandstone and shale. Slopes range from 5 to 50 percent. Many areas have been overgrazed in the past and are severely eroded, especially on south-facing slopes. This site occupies 47,000 acres.

These soils have low to moderate available water holding capacity. Permeability is moderate to moderately rapid, and runoff is medium to rapid.

Red brome and filaree are the dominant vegetation on this site. Only in years of above average rainfall does burclover grow well on this site. Because rainfall is low, the production of forage varies. Grazing should be permitted only during years of adequate production. The site is more suitable for grazing by sheep than cattle; it is easier to herd the sheep and keep them off the bare south-facing slopes. It is not feasible to reseed or fertilize the site.

On this site total annual air-dry production ranges from 1,500 pounds per acre in years of favorable moisture to 500 pounds per acre in years of unfavorable moisture.

SITE 10: ARID FANS

This site consists of soils on fans, terraces, and flood plains in Panoche and Vallecitos Valleys (fig. 16) where the average annual rainfall is 6 to 12 inches. These soils are calcareous loams, sandy loams, and clay loams that are more than 20 inches deep over stratified calcareous gravel, sand, and clay. Slopes range from 0 to 15 percent. The site occupies about 12,000 acres.

The soils in this site have moderate to high available water holding capacity and moderate to slow permeability. Runoff is very slow to medium. The hazard of erosion is slight to moderate and has been increased by overgrazing and compaction of the soils.

***Figure 16.*—Sheep grazing on Panoche loam, 2 to 9 percent slopes, in site 10. This long gently sloping fan in the Panoche Valley is used extensively for grazing in winter and spring. The hills in the background are Los Banos clay loam, 15 to 50 percent slopes, severely eroded, in site 9.**

This site is easily accessible and has been so heavily grazed that vinegar weed, turkey mullein, and tarweed have invaded and are the dominant plants. Red brome and filaree provide most of the forage in spring. Burclover grows well only in years when rainfall is above average. It is not feasible to reseed or fertilize these soils.

On this site total annual air-dry production ranges from 1,800 pounds per acre in years of favorable moisture to 600 pounds per acre in years of unfavorable moisture.

SITE 11: POORLY DRAINED BOTTOMS

This site consists of soils in low lying valley bottoms in the northern portion of the county. These soils are deep, somewhat poorly drained and poorly drained loams and clays that are moderately to severely affected by salts and alkali. Slopes are less than 2 percent.

The soils in this site have moderately slow to very slow permeability. This site occupies about 7,200 acres. Available water holding capacity is high, and there is no runoff. These soils remain moist late in the year.

The forage of this site is mostly soft chess, wild oats, and ryegrass. Production is better in years of lower rainfall because excess moisture does not collect and retard growth of the higher producing plants. The forage on this site remains green and palatable somewhat longer than that on other sites because of the extra moisture. The growth of grasses is reduced in areas severely affected by salts and alkali. Hardinggrass is adapted and can be established on this site in years when the proper seedbed can be prepared. Forage plants respond well to applications of nitrogen, phosphorus, and sulfur.

Where the soils on this site are not fertilized and managed, annual air-dry production ranges from 3,500 pounds per acre in years of favorable moisture to 2,000 pounds per acre in years of unfavorable moisture. Total annual yields can be increased 2 to 3 times by adding fertilizer and improving management.

Engineering Uses of the Soils

The properties of soils are important to engineers because soils support dams, highways, reservoirs, buildings, and other structures and are used as materials for constructing roads, dams, foundations for houses, and other uses. These properties include strength, permeability, compaction, shrink-swell potential, water-holding capacity, grain size, and plasticity.

With the use of the soil map for identification, the engineering interpretations in this section can be useful for many purposes. It should be emphasized that they may not eliminate the need for sampling and testing at the site of specific engineering works involving heavy loads and where the excavations are deeper than the depths of layers here reported. Even in these situations, the soil map is useful for planning more detailed field investigations and for suggesting the kinds of problems that may be expected.

The information in this survey can be used to—

1. Make soil and land use studies that will aid in selecting and developing sites for industries, businesses, residences, and recreational areas.

2. Make preliminary estimates of the engineering properties of soils in the planning of agricultural drainage systems, farm ponds, irrigation systems, and diversion terraces.
3. Make preliminary evaluations of soil and ground conditions that will aid in selecting locations for highways, airports, pipelines, and cables and in planning detailed investigations at the selected locations.
4. Locate probable sources of gravel and other materials suitable for construction.
5. Correlate performance of engineering structures with soil mapping units to develop information for overall planning that will be useful in designing and maintaining certain engineering practices and structures.
6. Determine the suitability of soil mapping units for cross-country movement of vehicles and construction equipment.
7. Supplement the information obtained from other published maps and reports and aerial photo-

TABLE 4.—*Estimated engineering*

[Absence of data indicates

Soil series and map symbols [1]	Hydraulic soil group	Depth to bedrock or hardpan	Depth from surface in typical profile	Classification		
				Dominant USDA texture	Unified	AASHO
		Feet	*Inches*			
Antioch: AnA, AnB, AnC2, AoD2	D	5+	0 to 13	Loam or clay loam	CL	A–4, A–6
			13 to 37	Clay	CH	A–7
			37 to 76	Loam to silty clay loam	CL	A–6
Arguello: ArC, AsD	C	5+	0 to 21	Loam or shaly loam	CL	A–4
			21 to 50	Clay loam or shaly clay loam.	CL	A–6
			50 to 60	Very shaly clay loam	GP or GC	A–2
Arnold: AtD, AtE2, AtF3	B	2 to 5	0 to 46	Loamy sand	SM	A–2
			46 to 90	Soft sandstone.		
Auberry: AuE, AuG2	C	2 to 5	0 to 37	Fine sandy loam to coarse sandy clay loam.	SC	A–4
			37 to 64	Coarse sandy loam	SM	A–2
			64 to 100	Weathered granite.		
Botella: BoA, BoC	C	5+	0 to 16	Loam	ML	A–4
			16 to 72	Clay loam	CL	A–6
Cibo: CbF2, CcG2	D	1½ to 3½	0 to 37	Stony clay	CH	A–7
			37	Fractured, weathered basic igneous rock.		
Cieneba: CgG2, CgG3	B	½ to 1½	0 to 10	Gravelly sandy loam	SM	A–2
			10	Weathered granite.		
Clear Lake: Ch, Ck, Cl	D	5+	0 to 70	Clay	CH	A–7
Climara: CmD, CmF2	D	2 to 5	0 to 36	Clay	CH	A–7
			36	Serpentine.		
Cometa: CoD2, CnD2	C	5+	0 to 18	Sandy loam to loam	SM	A–2 or A–4
			18 to 38	Clay	CH	A–7
			38 to 50	Coarse sandy clay loam.	SC	A–4
Conejo: CpC	C	5+	0 to 55	Clay loam	CL	A–6
Corralitos: CuC	A	5+	0 to 42	Loamy sand	SM	A–2
			42 to 84	Stratified sands	SP	A–1
Cotati: CvC, CvD2, CvE2	D	5+	0 to 17	Loam	ML	A–4
			17 to 35	Sandy clay	CH	A–7
			34 to 50	Gravelly sandy loam	SM	A–2

See footnote at end of table.

graphs to make maps and reports that can be used readily by engineers.

8. Develop other preliminary estimates for construction purposes pertinent to the particular area.

Much of the information in this section is given in tables 4, 5, and 6. In table 4 properties of the soils that are important to engineering are estimated. Table 5 indicates the suitability of the soils for various engineering uses. Table 6 contains test data for series in the county.

Additional information useful for engineering can be obtained from the soil map and from other parts of the survey, particularly the section "Descriptions of the Soils" and "Formation and Classification of Soils." By using the information in this soil survey, the engineer can concentrate on the most suitable soils for engineering purposes. Then a minimum number of soil samples will be needed for laboratory testing and an adequate investigation can be made at minimum cost.

Some of the terms used by the soil scientist may be unfamiliar to the engineer, and some words may have a special meaning in soil science. These and other special terms used in this survey are defined in the Glossary.

properties of soils

estimate was not made]

Percentage passing sieve—					Permeability	Available water capacity	Reaction	Shrink-swell potential	Potential corrosion of uncoated steel
3 inches	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)					
					Inches per hour	*Inches per inch of soil*	*pH value*		
100	100	95–100	85–95	60–80	0. 2 to 2. 5	0. 14 to 0. 18	5. 6 to 6. 5	Moderate	Moderate.
100	100	100	90–100	75–85	Less than 0. 05	0. 14 to 0. 16	5. 6 to 8. 4	High	High.
100	100	100	85–95	70–80	0. 8 to 2. 5	0. 14 to 0. 18	7. 4 to 8. 4	Moderate	Moderate.
95–100	90–100	70–100	65–90	50–70	0. 8 to 2. 5	0. 10 to 0. 14	5. 6 to 6. 5	Low to moderate	Low to moderate
95–100	90–100	70–100	65–90	55–75	0. 2 to 0. 8	0. 14 to 0. 18	5. 1 to 6. 0	Moderate	Low to moderate
50–75	40–55	25–40	20–35	15–30	0. 8 to 2. 5	0. 06 to 0. 08	5. 1 to 6. 0	Low	Low.
100	100	95–100	70–85	25–35	5. 0 to 10. 0	0. 06 to 0. 08	5. 1 to 6. 0	Low	Low.
100	100	100	80–90	35–50	0. 8 to 2. 5	0. 14 to 0. 16	5. 6 to 6. 0	Moderate	Moderate.
100	100	100	60–70	25–35	5. 0 to 10. 0	0. 10 to 0. 12	5. 6 to 6. 0	Low	Low.
100	100	100	85–95	65–75	0. 8 to 2. 5	0. 14 to 0. 16	5. 6 to 6. 5	Moderate	Low.
100	100	100	90–100	70–80	0. 2 to 0. 8	0. 18 to 0. 20	6. 1 to 7. 3	Moderate	Moderate.
70–90	65–90	60–90	50–80	40–60	0. 05 to 0. 2	0. 10 to 0. 12	6. 1 to 9. 3	High	High.
95–100	70–85	70–85	45–55	15–25	5. 0 to 10. 0	0. 08 to 0. 10	5. 6 to 6. 0	Low	Low.
100	100	100	90–100	90–100	0. 05 to 0. 2	0. 14 to 0. 16	7. 4 to 8. 4	High	High.
100	90–100	90–100	80–90	75–85	0. 05 to 0. 2	0. 14 to 0. 16	6. 6 to 8. 4	High	High.
100	100	100	60–70	30–50	2. 5 to 5. 0	0. 10 to 0. 14	5. 6 to 6. 0	Low	Low.
100	100	100	90–100	70–80	<0. 05	0. 14 to 0. 16	6. 1 to 6. 5	High	High.
100	100	100	80–90	35–45	0. 8 to 2. 5	0. 10 to 0. 12	6. 6 to 7. 8	Low	Low.
100	100	100	90–100	70–80	0. 2 to 0. 8	0. 18 to 0. 20	6. 6 to 7. 8	Moderate	Moderate.
100	100	90–100	50–75	15–25	5. 0 to 10. 0	0. 07 to 0. 09	5. 1 to 6. 0	Low	Low.
100	100	90–100	50–70	5–15	More than 10. 0	0. 04 to 0. 06	5. 1 to 6. 0	Low	Low.
100	100	100	90–100	60–70	0. 8 to 2. 5	0. 14 to 0. 16	5. 1 to 6. 0	Moderate	Moderate.
100	100	100	90–100	75–85	Less than 0. 05	0. 14 to 0. 16	5. 1 to 6. 0	High	High.
95–100	70–85	50–80	45–55	25–35	2. 5 to 5. 0	0. 09 to 0. 11	5. 1 to 6. 5	Low	Low.

TABLE 4.—*Estimated engineering*

Soil series and map symbols [1]	Hydraulic soil group	Depth to bedrock or hardpan	Depth from surface in typical profile	Classification		
				Dominant USDA texture	Unified	AASHO
		Feet	*Inches*			
Cropley: CwA, CwC, CyC	D	5+	0 to 42	Clay	CH	A–7
			42 to 65	Sandy clay loam	SC	A–4
Diablo: DaD, DaE2, DaF2, DaG3, DID, DIE2, DIF2. (For properties of the Linne soils in mapping units DID, DIE2, and DIF2, refer to the Linne series.)	D	2½ to 6	0 to 68	Clay	CH	A–7
			68 to 90	Calcareous shale.		
Docas: DoA, DoC, DsA, DsC	B	5+	0 to 88	Silt loam or clay loam	ML or CL	A–4
Edenvale: EcA	D	5+	0 to 60	Clay	CH	A–7
Gaviota: GaE, GaE2, GaF2, GrE2	C	½ to 2	0 to 19	Loam over gravelly loam.	SM–SC	A–4
			19	Sandstone.		
Gazos: GtE2, GtF2, GtG3, GsD	C	2 to 5	0 to 46	Clay loam	CL	A–6
			46	Shale.		
Hanford: HaA, HaC, HfA, HfC	B	5+	0 to 26	Coarse sandy loam to loam.	SM	A–2
			26 to 70	Stratified loamy coarse sand and coarse sandy loam.	SM	A–2
Henneke: HnF2, HsG3	D	1½ to 2	0 to 25	Very gravelly clay loam	GC or GM	A–2
			25	Serpentine.		
Kettleman: KeD, KeF2, KmF2	C	2 to 5	0 to 51	Loam	ML	A–4
			51	Calcareous sandstone.		
Laniger: LaG3	B	1½ to 4	0 to 29	Gravelly sandy loam	SM	A–2
			29	Conglomerate.		
Linne: LnD, LnE2, LnF2, LnF3, LsE2, LsF2. (For properties of Shedd soils in mapping units LsE2, and LsF2, refer to the Shedd series.)	C	2 to 4	0 to 38	Clay loam	CL	A–6
			38	Calcareous shale.		
Lodo: LtG2	C	1 to 1½	0 to 14	Shaly loam	SM–SC	A–4
			14	Shale.		
Los Banos: LuC, LuD2, LuF3	C	5+	0 to 13	Clay loam	CL	A–6
			13 to 23	Clay	CH	A–7
			23	Semiconsolidated sand, gravel, and clay.		
Los Gatos: LvE, LvF2, LwF2	C	1½ to 5	0 to 42	Clay loam	CL	A–6
			42	Hard sandstone.		
Metz:						
MeA	A	5+	0 to 14	Sandy loam	SM	A–2 or A–4
			14 to 43	Sand	SP	A–3
			43 to 60	Sand and gravel	SP and GP	A–1
MgA, MgC	A	5+	0 to 14	Gravelly sandy loam	SM	A–2
			14 to 60	Gravelly sand	SP and GP	A–1
MhA	A	5+	0 to 18	Sandy loam	SM	A–2 or A–4
			18 to 50	Loamy fine sand	SM	A–2
			50 to 60	Loam	ML	A–4

See footnote at end of table.

properties of soils—Continued

Percentage passing sieve—					Permeability	Available water capacity	Reaction	Shrink-swell potential	Potential corrosion of uncoated steel
3 inches	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)					
					Inches per hour	*Inches per inch of soil*	*pH value*		
100	100	100	90–100	75–85	0. 05 to 0. 2	0. 14 to 0. 16	6. 6 to 8. 4	High	High.
100	100	100	80–90	40–50	0. 2 to 0. 8	0. 14 to 0. 16	7. 9 to 8. 4	Moderate	Moderate.
100	100	100	90–100	85–95	0. 05 to 0. 2	0. 14 to 0. 16	7. 4 to 8. 4	High	High.
100	100	100	90–100	80–90	0. 8 to 2. 5	0. 18 to 0. 20	7. 4 to 8. 4	Moderate	Low to moderate.
100	100	100	90–100	85–95	0. 05 to 0. 2	0. 14 to 0. 16	6. 6 to 8. 4	High	High.
100	60–90	50–80	45–75	35–50	0. 8 to 2. 5	0. 10 to 0. 12	5. 6 to 6. 5	Low	Low.
100	100	100	90–100	70–80	0. 2 to 0. 8	0. 16 to 0. 17	5. 6 to 6. 5	Moderate	Moderate.
100	100	100	60–70	25–35	5. 0 to 10. 0	0. 12 to 0. 14	6. 1 to 6. 5	Low	Low.
100	100	100	60–70	10–20	5. 0 to 10. 0	0. 09 to 0. 11	6. 1 to 6. 5	Low	Low.
95–100	30–60	20–50	15–40	10–25	0. 2 to 0. 8	0. 06 to 0. 08	6. 1 to 7. 3	Low	Low.
100	100	95–100	85–95	55–65	0. 8 to 2. 5	0. 14 to 0. 16	7. 4 to 8. 4	Low	Low.
95–100	70–85	50–80	45–55	15–25	5. 0 to 10. 1	0. 07 to 0. 09	5. 6 to 7. 3	Low	Low.
100	100	100	95–100	85–95	0. 2 to 0. 8	0. 18 to 0. 20	7. 9 to 8. 4	Moderate	Moderate.
100	80–90	60–80	55–75	35–50	2. 5 to 5. 0	0. 10 to 0. 12	6. 1 to 6. 5	Low	Low.
100	100	100	90–100	70–80	0. 2 to 0. 8	0. 18 to 0. 20	7. 4 to 7. 8	Moderate	Moderate.
100	100	100	90–100	85–95	0. 05 to 0. 2	0. 14 to 0. 16	7. 9 to 8. 4	High	High.
100	95–100	90–100	90–100	70–80	0. 2 to 0. 8	0. 18 to 0. 20	5. 6 to 6. 5	Moderate	Moderate.
100	95–100	95–100	60–70	30–40	2. 5 to 5. 0	0. 12 to 0. 14	7. 4 to 8. 4	Low	Low.
100	90–100	90–100	45–60	5–10	5. 0 to 10. 0	0. 05 to 0. 07	7. 4 to 8. 4	Low	Low.
100	50–80	40–70	30–60	0–5	More than 10. 0	0. 04 to 0. 05	7. 4 to 8. 4	Low	Low.
100	65–85	60–75	50–65	15–25	2. 5 to 5. 0	0. 07 to 0. 09	7. 4 to 8. 4	Low	Low.
100	50–80	40–70	30–60	0–5	More than 10. 0	0. 04 to 0. 05	7. 4 to 8. 4	Low	Low.
100	95–100	95–100	60–70	30–40	2. 5 to 5. 0	0. 12 to 0. 14	7. 4 to 8. 4	Low	Moderate.
100	95–100	95–100	50–60	15–25	5. 0 to 10. 0	0. 08 to 0. 10	7. 9 to 8. 4	Low	Moderate.
100	100	100	85–95	60–70	0. 8 to 2. 5	0. 14 to 0. 16	7. 9 to 8. 4	Moderate	Moderate.

TABLE 4.—*Estimated engineering*

Soil series and map symbols [1]	Hydraulic soil group	Depth to bedrock or hardpan	Depth from surface in typical profile	Classification		
				Dominant USDA texture	Unified	AASHO
		Feet	*Inches*			
Mocho:						
MoA, MoC	B	5+	0 to 60	Sandy loam	SM	A–2 or A–4
MpA, MpC	B	5+	0 to 60	Loam and fine sandy loam.	ML	A–4
MrB	B	5+	0 to 60	Gravelly loam	SM or SC	A–4
MsC	C	5+	0 to 60	Clay loam to silty clay loam.	CL	A–6
Montara: MtF2	D	½ to 1½	0 to 12	Silty clay loam	CL	A–6
			12	Serpentine.		
Nacimiento: NaD, NaE, NaF2, NaG2, NcG3.	C	2 to 5	0 to 40	Clay loam	CL	A–6
			40	Weathered clacareous shale and sandstone.		
Pacheco:						
Pa, Pc	D	5+	0 to 20	Silt loam and loam	ML	A–4
			20 to 105	Clay loam	ML or CL	A–6
Pd	D	5+	0 to 30	Clay loam	CL	A–6
			30 to 60	Clay	CH	A–7
Pe	D	5+	0 to 15	Silty clay	CH	A–7
			15 to 60	Clay loam	CL	A–6
Panhill: PhC	B	5+	0 to 60	Loam	ML	A–4
Panoche: PlA, PlC, PkA, PkC	B	5+	0 to 76	Loam [2]	ML or CL	A–4 or A–6
Pinnacles: PnE2, PnG3	C	2 to 4	0 to 12	Coarse sandy loam	SM	A–2
			12 to 25	Coarse sandy clay	CH	A–7
			25	Semiconsolidated arkosic sandstone.		
Pinto: PsE2	B	2 to 3	0 to 29	Heavy sandy loam	SM or SC	A–2 or A–4
			29 to 63	Weakly cemented hardpan.		
Pleasanton:						
PtB	C	5+	0 to 21	Loam	ML	A–4
			21 to 55	Clay loam	CL	A–6
			55 to 90	Stratified sand, gravel, and clay.	GC or GM	A–2
PvC2	C	5+	0 to 20	Gravelly loam	SM–SC	A–4
			20 to 36	Gravelly clay loam	CL	A–4
			36 to 60	Stratified sand, gravel, and clay loam.	GC or GM	A–2
Reiff: ReA, ReC	B	5+	0 to 42	Sandy loam	SM	A–2 or A–4
			42 to 60	Loam	ML	A–4
Rincon: RnA, RnC, RnD2, RsA, RsC, RsD2.	C	5+	0 to 23	Silty clay loam [3]	CL	A–7
			23 to 45	Clay	CH	A–7
			45 to 80	Clay loam	ML	A–4
Salinas: SaA, SaC	C	5+	0 to 66	Clay loam	CL	A–6

See footnotes at end of table.

properties of soils—Continued

Percentage passing sieve—					Permeability	Available water capacity	Reaction	Shrink-swell potential	Potential corrosion of uncoated steel
3 inches	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)					
					Inches per hour	*Inches per inch of soil*	*pH value*		
100	95–100	95–100	60–70	30–40	2. 5 to 5. 0	0. 11 to 0. 13	7. 9 to 8. 4	Low	Low.
100	95–100	95–100	85–95	60–70	0. 8 to 2. 5	0. 14 to 0. 16	7. 9 to 8. 4	Moderate	Low.
95–100	75–90	70–85	60–70	35–45	2. 5 to 5. 0	0. 10 to 0. 12	7. 9 to 8. 4	Low	Low.
100	100	100	90–100	70–80	0. 2 to 0. 8	0. 18 to 0. 20	7. 9 to 8. 4	Moderate	Moderate.
100	100	100	95–100	85–95	0. 2 to 0. 8	0. 18 to 0. 20	6. 6 to 7. 8	Moderate	Moderate.
100	100	95–100	90–95	70–80	0. 2 to 0. 8	0. 18 to 0. 20	7. 9 to 8. 4	Moderate	Moderate.
100	100	95–100	90–100	85–95	0. 8 to 2. 5	0. 18 to 0. 20	7. 9 to 8. 4	Moderate	High.
100	100	95–100	90–100	85–95	0. 2 to 0. 8	0. 18 to 0. 20	7. 9 to 8. 4	Moderate	High.
100	100	95–100	90–100	85–95	0. 2 to 0. 8	0. 18 to 0. 20	7. 9 to 8. 4	Moderate	High.
100	100	95–100	90–100	75–95	0. 05 to 0. 2	0. 14 to 0. 16	7. 9 to 8. 4	High	High.
100	100	95–100	90–100	75–95	0. 05 to 0. 2	0. 14 to 0. 16	7. 9 to 8. 4	High	High.
100	100	100	90–100	85–95	0. 2 to 0. 8	0. 18 to 0. 20	7. 9 to 8. 4	Moderate	High.
100	100	95–100	75–95	50–70	0. 8 to 2. 5	0. 14 to 0. 16	6. 6 to 8. 4	Moderate	Low.
100	100	100	90–100	75–85	0. 8 to 2. 5	0. 14 to 0. 16	7. 4 to 8. 4	Moderate	Low.
100	90–100	85–95	50–60	25–35	2. 5 to 5. 0	0. 12 to 0. 14	5. 6 to 6. 0	Low	Low.
100	90–100	90–100	70–80	50–60	0. 05 to 0. 2	0. 14 to 0. 16	5. 1 to 5. 5	High	High.
100	100	100	60–70	30–40	0. 8 to 2. 5 0. 05 to 0. 20	0. 12 to 0. 14	5. 1 to 5. 5	Low	Low.
100	100	100	85–95	60–70	0. 8 to 2. 5	0. 14 to 0. 16	6. 1 to 7. 3	Moderate	Low.
100	100	100	95–100	70–80	0. 2 to 0. 8	0. 16 to 0. 18	6. 6 to 7. 3	Moderate	Moderate.
100	60–90	50–80	30–40	10–20	0. 08 to 2. 5	0. 08 to 0. 10	7. 4 to 7. 8	Low	Low.
100	75–95	70–90	55–70	35–50	0. 5 to 2. 5	0. 10 to 0. 12	6. 1 to 7. 3	Low	Low.
100	75–95	70–90	70–85	50–60	0. 2 to 0. 8	0. 12 to 0. 14	6. 6 to 7. 3	Moderate	Moderate.
100	60–90	30–50 50–80	20–35 30–40	5–15 10–20	0. 08 to 2. 5	0. 08 to 0. 10	7. 4 to 7. 8	Low	Low.
100	95–100	90–100	60–70	30–40	2. 5 to 5. 0	0. 12 to 0. 14	6. 6 to 7. 8	Low	Low.
100	95–100	90–100	85–95	60–70	0. 8 to 2. 5	0. 14 to 0. 16	7. 9 to 8. 4	Moderate	Low.
100	100	100	95–100	85–95	0. 2 to 0. 8	0. 18 to 0. 20	7. 4 to 7. 8	Moderate to high	Moderate.
100	100	100	95–100	85–95	0. 05 to 0. 2	0. 14 to 0. 16	7. 4 to 8. 4	High	High.
100	100	95–100	90–100	70–80	0. 2 to 0. 8	0. 18 to 0. 20	7. 9 to 8. 4	Moderate	Moderate.
100	100	95–100	90–100	70–80	0. 2 to 0. 8	0. 18 to 0. 20	6. 6 to 8. 4	Moderate	Moderate.

TABLE 4.—*Estimated engineering*

Soil series and map symbols [1]	Hydraulic soil group	Depth to bedrock or hardpan	Depth from surface in typical profile	Classification		
				Dominant USDA texture	Unified	AASHO
		Feet	*Inches*			
San Benito: SbD, SbE2, SbF2, SbF3--	C	2 to 4	0 to 42	Clay loam	CL	A–6
			42	Shale.		
Santa Lucia: SdF2, SdG3----------	B	1½ to 3½	0 to 22	Very shaly loam	GM	A–1
			22	Shale.		
Shedd: ShD, ShE2, ShF2, ShF3------	C	1½ to 3½	0 to 20	Loam	ML	A–4
			20 to 32	Stony loam	SM	A–4
			32 to 60	Soft calcareous sandstone.		
Sheridan: SkD, SkE, SkE2, SkG2, SkG3	B	1½ to 5	0 to 52	Coarse sandy loam	SM	A–2
			52	Granite.		
Soper: SlD, SlE2, SlF2, SmD, SmE2, SmF2.	C	2½ to 4	0 to 16	Fine sandy loam and gravelly loam.	SM	A–2, A–4
			16 to 30	Sandy clay loam	SC	A–4
			30 to 42	Loamy sand	SM	A–2
			42	Conglomerate.		
Sorrento:						
SnA, SnC----------	B	5+	0 to 78	Silt loam	ML	A–4
SoB----------	B	5+	0 to 60	Gravelly loam	SM	A–4
SrA, SrC----------	C	5+	0 to 60	Silty clay loam	CL	A–6 or A–7
Sween:						
SsE2, SsF2----------	D	1½ to 4½	0 to 13	Rocky clay loam	CL	A–6
			13 to 27	Clay	CH	A–7
			27 to 32	Coarse sandy loam	SM	A–2
			32	Basic igneous rock.		
StE2, SwF2----------	D	1½ to 2½	0 to 12	Stony and very stony clay loam.	CL	A–6
			12 to 24	Stony and very stony clay.	CH	A–7
			24	Basic igneous rock.		
Vallecitos: VaD, VaE, VaF, VaF2, VrE2, VrF2.	C	1 to 3	0 to 8	Loam	SM or SC	A–4
			8 to 18	Gravelly clay	CL	A–4
			18	Sandstone.		
Willows: Wc, Wk, Ws, Ww2---------	D	5+	0 to 84	Clay [4]	CH	A–7
Yolo:						
YoA, YoC----------	B	5+	0 to 48	Loam	ML	A–4
			48 to 60	Gravelly loam	SM to ML	A–4
YvB----------	B	5+	0 to 60	Gravelly loam	SM	A–4

[1] Because they vary, properties were not estimated for Badland (BaG), Gullied land (GuE), Igneous rock land (IgG), Landslides (LdF) Mine pits and dumps (MnG), Riverwash (Rw), Sandy alluvial land (Sc), Sedimentary rock land (SeG), and Terrace escarpments (TeF)

properties of soils—Continued

Percentage passing sieve—					Permeability	Available water capacity	Reaction	Shrink-swell potential	Potential corrosion of uncoated steel
3 inches	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)					
					Inches per hour	*Inches per inch of soil*	*pH value*		
100	100	95–100	90–100	70–80	0. 2 to 0. 8	0. 18 to 0. 20	6. 6 to 8. 4	Moderate	Moderate.
80–100	60–70	30–50	20–40	10–20	2. 5 to 5. 0	0. 06 to 0. 08	5. 6 to 6. 5	Low	Low.
100	100	95–100	85–95	50–65	0. 8 to 2. 5	0. 16 to 0. 18	7. 9 to 8. 4	Moderate	Low.
70–90	65–85	60–80	50–70	40–50	0. 8 to 2. 5	0. 10 to 0. 12	7. 9 to 8. 4	Low	Low.
100	95–100	90–100	50–60	25–35	2. 5 to 5. 0	0. 10 to 0. 12	5. 6 to 6. 5	Low	Low.
100	75–100	70–100	65–75	30–50	0. 8 to 5. 0	0. 14 to 0. 16	5. 6 to 6. 0	Low	Moderate.
100	100	100	80–90	35–45	0. 2 to 0. 8	0. 14 to 0. 16	6. 1 to 6. 5	Moderate	Moderate.
100	100	100	50–75	15–30	5. 0 to 10. 0	0. 06 to 0. 08	6. 1 to 6. 5	Low	Low.
100	100	95–100	90–100	70–90	0. 8 to 2. 5	0. 18 to 0. 20	7. 4 to 8. 4	Moderate	Low.
100	75–90	70–85	60–70	40–50	0. 8 to 2. 5	0. 10 to 0. 12	7. 4 to 8. 4	Low	Low.
100	95–100	90–100	95–100	85–95	0. 2 to 0. 8	0. 18 to 0. 20	7. 4 to 8. 4	Moderate	Moderate.
100	100	100	90–100	70–80	0. 2 to 0. 8	0. 18 to 0. 20	5. 6 to 6. 5	Moderate	Moderate.
100	100	100	90–100	75–95	0. 05 to 0. 2	0. 14 to 0. 16	6. 6 to 7. 3	High	High.
100	100	100	60–70	25–35	5. 0 to 10. 1	0. 10 to 0. 12	7. 4 to 7. 8	Low	Low.
45–70	30–60	30–60	20–45	15–35	0. 8 to 2. 5	0. 06 to 0. 10	5. 6 to 6. 5	Low	Low.
90–100	90–100	90–100	85–95	70–90	0. 05 to 0. 2	0. 06 to 0. 08	6. 6 to 7. 3	Low to moderate	High.
95–100	90–100	80–90	60–70	40–50	0. 8 to 2. 5	0. 14 to 0. 16	6. 1 to 6. 5	Moderate	Moderate.
100	80–95	75–85	65–75	50–60	0. 05 to 0. 2	0. 12 to 0. 14	6. 1 to 6. 5	Moderate	High.
100	100	100	90–100	90–100	Less than 0. 05	0. 14 to 0. 16	7. 4 to 8. 4	High	High.
100	100	100	90–100	70–90	0. 8 to 2. 5	0. 14 to 0. 16	5. 6 to 7. 3	Moderate	Low.
95–100	70–85	70–85	55–70	45–65	0. 8 to 2. 5	0. 14 to 0. 16	7. 4 to 7. 8	Moderate	Low.
100	75–90	70–85	55–70	40–50	0. 8 to 2. 5	0. 10 to 0. 12	5. 6 to 7. 8	Low	Low.

[2] Sandy loam surface layer in places.
[3] Loam surface layer in places.
[4] Sandy loam overwash in places.

TABLE 5.—*Engineering*

Soil series and map symbols[1]	Suitability as source of—		
	Topsoil	Sand and gravel	Road fill
Antioch: AnA, AnB, AnC2, AoD2	Fair in surface layer; poor in subsoil and substratum.	Unsuitable	Fair in surface layer; poor in subsoil; fair in substratum.
Arguello: ArC, AsD	Fair in surface layer and subsoil; poor in substratum.	Unsuitable in surface layer and subsoil; fair in substratum.	Fair in surface layer and subsoil; good in substratum.
Arnold: AtD, AtE2, AtF3	Poor	Fair	Good
Auberry: AuE, AuG2	Fair	Unsuitable	Good in surface layer and subsoil.
Botella: BoA, BoC	Fair in surface layer and subsoil.	Unsuitable	Fair in surface layer and subsoil.
Cibo: CbF2, CcG2	Poor	Unsuitable	Poor
Cieneba: CgG2, CgG3	Poor	Poor	Good
Clear Lake: Ch, Ck, Cl	Poor	Unsuitable	Poor
Climara: CmD, CmF2	Poor	Unsuitable	Poor
Cometa: CoD2, CnD2	Poor	Unsuitable	Good in surface layer; poor in subsoil; fair in substratum.
Conejo: CpC	Fair	Unsuitable	Fair
Corralitos: CuC	Poor	Fair in surface layer; good in substratum.	Good
Cotati: CvC, CvD2, CvE2	Poor	Unsuitable in surface layer and subsoil; poor in substratum.	Poor in surface layer and subsoil; good in substratum.
Cropley: CwA, CwC, CyC	Poor	Unsuitable	Poor

See footnote at end of table.

interpretations of soils

Soil features affecting—				Soil limitations for use as septic tank filter field
Road location	Water-retention structures		Irrigation	
	Embankments	Reservoir area		
Very slow permeability in clay subsoil; moderate to high shrink-swell potential.	Low strength; cracks when dry; moderate to high shrink-swell potential.	Very slow permeability	Shallow over claypan; low water-holding capacity; moderate intake rate.	Severe: Very slow permeability in subsoil; slopes of as much as 9 percent.
Clay loam subsoil; low to moderate shrink-swell potential.	Moderate strength; subject to piping and cracking; low to moderate shrink-swell potential.	Moderately slow permeability.	Most features favorable	Severe: Moderately slow permeability in subsoil; slopes of as much as 9 percent.
Slopes of more than 15 percent; bedrock at depth of 2 to 5 feet.	Moderate strength; subject to piping; bedrock at a depth of 3 to 5 feet.	Rapid permeability; steep slopes; rock at a depth of 2 to 5 feet.	Moderately deep to deep soils; moderate water-holding capacity; rapid intake rate; steep slopes.	Severe: Slopes of more than 15 percent; bedrock at a depth of 2 to 5 feet.
Moderate permeability in subsoil; moderate shrink-swell potential; slopes of more than 15 percent; bedrock at a depth of 2 to 5 feet.	Moderate strength; subject to piping and cracking; moderate shrink-swell potential; bedrock at a depth of 2 to 5 feet or more.	Moderate permeability; granite at a depth of 2 to 5 feet or more; steep slopes.	Moderately deep to deep soils; steep slopes; other features favorable.	Severe: Moderate permeability in subsoil; slopes of more than 15 percent; bedrock at a depth of 2 to 5 feet or more.
Moderate shrink-swell potential.	Moderate strength; subject to piping and cracking; moderate shrink-swell potential.	Moderately slow permeability.	Most features favorable	Severe: Moderately slow permeability in subsoil; slopes of 9 percent.
High shrink-swell potential; slopes of more than 15 percent; bedrock at a depth of 1½ to 3½ feet.	Very low strength; cracks when dry; high shrink-swell potential; bedrock at a depth of 1½ to 3½ feet; stones throughout.	Slow permeability; stones throughout profile; bedrock at a depth of 1½ to 3½ feet; steep slopes.	Moderately deep soil; very slow intake rate; steep slopes.	Severe: Slow permeability; slopes of more than 15 percent; bedrock at a depth of 1½ to 3½ feet.
Slopes of more than 15 percent bedrock at a depth of ½ to 1½ feet.	Moderate strength; subject to piping and cracking; bedrock at a depth of ½ to 1½ feet.	Rapid permeability; bedrock at a depth of ½ to 1½ feet; steep slopes.	Shallow soils; moderate water-holding capacity; steep slopes.	Severe: Slopes of more than 15 percent; bedrock at a depth of ½ to 1½ feet.
High shrink-swell potential; water table at a depth of 3 to 4 feet.	Very low strength; cracks when dry; high shrink-swell potential.	Slow permeability; water table at a depth of 3 to 4 feet.	Slow intake rate; drainage required.	Severe: Slow permeability; water table at a depth of 3 to 4 feet.
High shrink-swell potential; slopes of more than 9 percent; bedrock at a depth of 2 to 5 feet.	Very low strength; cracks when dry; high shrink-swell potential; bedrock at a depth of 2 to 5 feet.	Slow permeability; rock at a depth of 2 to 5 feet; steep slopes.	Moderately deep soils; slow intake rate; steep slopes.	Severe: Slow permeability; slopes of more than 9 percent; bedrock at a depth of 2 to 5 feet.
Very slow permeability in clay subsoil; high shrink-swell potential; slopes of 5 to 15 percent.	Moderate to low strength; subject to piping and cracking; high shrink-swell potential.	Very slow permeability; slopes of 5 to 15 percent.	Very slow permeability in subsoil; slopes of 5 to 15 percent.	Severe: Very slow permeability in subsoil; slopes of 5 to 15 percent or more.
Moderate shrink-swell potential.	Low strength; cracks when dry; moderate shrink-swell potential.	Moderately slow permeability.	Most features favorable	Severe: Moderately slow permeability; slopes of 2 to 9 percent.
Sand subsoil	High strength; subject to piping and cracking.	Rapid permeability	Low water-holding capacity; rapid intake rate.	Slight to moderate: Slopes as great as 9 percent.
Very slow permeability in clay subsoil; high shrink-swell potential.	Low strength; subject to piping and cracking; high shrink-swell potential.	Very slow permeability; slopes of 2 to 30 percent.	Shallow over claypan; low water-holding capacity; moderately steep slopes in some places.	Severe: Very slow permeability in subsoil.
High shrink-swell potential.	Very low strength; cracks when dry; high shrink-swell potential.	Slow permeability	Slow intake rate	Severe: Slow permeability.

TABLE 5.—*Engineering interpretations*

Soil series and map symbols[1]	Suitability as source of—		
	Topsoil	Sand and gravel	Road fill
Diablo: DaD, DaE2, DaF2, DaG3, DlD, DlE2, DlF2. (For interpretations of Linne soils in mapping units DlD, DlE2, and DlF2, refer to the Linne series.)	Poor	Unsuitable	Poor
Docas: DoA, DoC, DsA, DsC	Poor	Unsuitable	Fair
Edenvale: EcA	Poor	Unsuitable	Poor
Gaviota: GaE, GaE2, GaF2, GrF2	Poor	Poor	Good
Gazos: GtE2, GtF2, GtG3, GsD	Fair	Unsuitable	Fair
Hanford: HaA, HaC, HfA, HfC	Good	Unsuitable	Good to fair
Henneke: HnF2, HsG3	Poor	Poor	Poor
Kettleman: KeD, KeF2, KmF2	Poor	Unsuitable	Fair
Laniger: LaG3	Fair	Fair	Good
Linne: LnD, LnE2, LnF2, LnF3, LsE2, LsF2. (For interpretations of Shedd soils in mapping units LsE2 and LsF2, refer to the Shedd series.)	Poor	Unsuitable	Fair
Lodo: LtG2	Poor	Unsuitable	Poor
Los Banos: LuC, LuD2, LuF3	Poor	Unsuitable in surface layer and subsoil; unsuitable in substratum.	Poor
Los Gatos: LvE, LvF2, LwF2	Fair	Unsuitable	Fair

See footnote at end of table.

of soils—Continued

Soil features affecting—				
Road location	Water-retention structures		Irrigation	Soil limitations for use as septic tank filter field
	Embankments	Reservoir area		
High shrink-swell potential; slopes of more than 9 percent; bedrock at a depth of 2½ to 6 feet or more.	Very low strength; cracks when dry; high shrink-swell potential; bedrock at a depth of 2½ to 6 feet or more.	Slow permeability; bedrock at a depth of 2½ to 6 feet or more; steep slopes.	Deep soils; slow intake rate; steep slopes.	Severe: Slow permeability; slopes of more than 9 percent; bedrock at a depth of 2½ to 6 feet.
Moderate shrink-swell potential.	Moderate strength; subject to piping and cracking; moderate shrink-swell potential.	Moderate permeability	Highly calcareous soils; other features favorable.	Moderate: Moderate permeability; slopes of as much as 9 percent.
High shrink-swell potential.	Very low strength; cracks when dry; high shrink-swell potential.	Slow permeability	Slow intake rate	Severe: Slow permeability.
Slopes of more than 15 percent; bedrock at a depth of ½ to 2 feet.	Moderate strength; subject to piping; bedrock at a depth of ½ to 2 feet.	Moderate permeability; bedrock at a depth of ½ to 2 feet; steep slopes.	Shallow soils; low water-holding capacity; steep slopes.	Severe: Slopes of more than 9 percent; bedrock at a depth of ½ to 2 feet.
Moderate shrink-swell potential; slopes of more than 15 percent; bedrock at a depth of 2 to 5 feet.	Moderate strength; moderate shrink-swell potential; bedrock at a depth of 2 to 5 feet.	Moderately slow permeability; bedrock at a depth of 2 to 5 feet; steep slopes.	Moderately deep to to deep soils; slow intake rate; steep slopes.	Severe: Moderately slow permeability; slopes of more than 9 percent; bedrock at a depth of 2 to 5 feet.
Most features favorable.	Moderate strength; subject to piping and cracking; low shrink-swell potential.	Rapid permeability	Most features favorable	Slight on slopes of 0 to 5 percent; moderate on slopes of 5 to 9 percent: Rapid permeability.
Low shrink-swell potential; slopes of more than 15 percent; bedrock at a depth of 1½ to 2 feet.	High to moderate strength; subject to piping; low shrink-swell potential; rock at a depth of 1½ to 2 feet.	Moderately slow permeability; bedrock at a depth of 1½ to 2 feet; steep slopes.	Shallow soils; low water-holding capacity; steep slopes.	Severe: Moderately slow permeability; slopes of more than 9 percent; bedrock at a depth of 1½ to 2 feet.
Low shrink-swell potential; slopes of more than 15 percent; bedrock at a depth of 2½ to 5 feet.	Moderate strength; subject to piping and cracking; low shrink-swell potential; bedrock at a depth of 2½ to 5 feet.	Moderate permeability; bedrock at a depth of 2½ to 5 feet; steep slopes.	Moderately deep to deep soils; steep slopes.	Moderate on slopes of 5 to 10 percent; severe on slopes of more than 10 percent: Moderate permeability; bedrock at a depth of 2½ to 5 feet.
Gravelly soils; slopes of more than 30 percent; bedrock at a depth of 1½ to 4 feet.	High strength; subject to piping and cracking; bedrock at a depth of 1½ to 4 feet.	Rapid permeability; bedrock at a depth of 1½ to 4 feet; steep slopes.	Moderately deep soils; rapid intake rate; low water-holding capacity; steep slopes.	Severe: Slopes of more than 30 percent; bedrock at a depth of 1½ to 4 feet.
Moderate shrink-swell potential; slopes of more than 9 percent; bedrock at a depth of 2 to 5 feet.	Low strength; moderate shrink-swell potential; bedrock at a depth of 2 to 5 feet.	Moderately slow permeability; bedrock at a depth of 2 to 5 feet; steep slopes.	Moderately deep soils; steep slopes.	Severe: Moderately slow permeability; slopes of more than 9 percent; bedrock at a depth of 2 to 5 feet.
Shaly soils; slopes of more than 50 percent; bedrock at a depth of 1 to 1½ feet.	Moderate strength; subject to piping and cracking; bedrock at a depth of 1 to 1½ feet.	Moderately rapid permeability; bedrock at a depth of 1 to 1½ feet; steep slopes.	Shallow soils; low water-holding capacity; steep slopes.	Severe: Moderately rapid permeability; slopes of more than 50 percent; bedrock at a depth of 1 to 1½ feet.
Slow permeability in subsoil; high shrink-swell potential; slopes of more than 15 percent in some places.	Low strength; cracks when dry; high shrink-swell potential.	Slow permeability; steep slopes in some places.	Slow permeability in subsoil; steep slopes in some places.	Severe: Slow permeability in subsoil.
Moderate shrink-swell potential; slopes of more than 15 percent; bedrock at a depth of 1½ to 5 feet.	Low strength; cracks when dry; moderate shrink-swell potential; bedrock at a depth of 1½ to 5 feet.	Moderately slow permeability; bedrock at a depth of 1½ to 5 feet.	Moderately deep soils; steep slopes.	Severe: Moderately slow permeability; slopes of more than 15 percent; bedrock at a depth of 1½ to 5 feet.

TABLE 5.—*Engineering interpretations*

Soil series and map symbols [1]	Suitability as source of—		
	Topsoil	Sand and gravel	Road fill
Metz:			
MeA	Poor	Poor in surface layer; good in substratum.	Good
MgA, MgC	Poor	Good	Good
MhA	Poor	Fair in surface layer and subsoil; unsuitable below a depth of about 50 inches.	Good
Mocho:			
MoA, MoC, MrB	Poor	Fair to poor	Good
MpA, MpC	Poor	Unsuitable	Good
MsC	Poor	Unsuitable	Fair
Montara: MtF2	Poor	Unsuitable	Poor
Nacimiento: NaD, NaE, NaF2, NaG2, NcG3	Poor	Unsuitable	Fair
Pacheco:			
Pa, Pc	Poor	Unsuitable	Fair
Pd	Poor	Unsuitable	Fair in surface layer; poor below.
Pe	Poor	Unsuitable	Poor in surface layer; fair below.
Panhill: PhC	Fair to poor	Unsuitable in surface layer; good in substratum.	Fair in surface layer and subsoil; good in substratum.
Panoche: PlA, PlC, PkA, PkC	Poor	Unsuitable	Fair
Pinnacles: PnE2, PnG3	Poor	Unsuitable	Good in surface layer; poor in subsoil.
Pinto: PsE2	Fair	Poor	Good

See footnote at end of table.

of soils—Continued

Soil features affecting				Soil limitations for use as septic tank filter field
Road location	Water-retention structures		Irrigation	
	Embankments	Reservoir area		
Sand substratum	High strength; subject to piping and cracking.	Rapid permeability	Rapid intake rate low water-holding capacity.	Slight: Most features favorable.
Gravelly soils; sandy substratum.	High strength; subject to piping and cracking.	Rapid permeability	Rapid intake rate; low water-holding capacity.	Moderate: Slopes of as much as 9 percent; flooding hazard.
Water table at a depth of 2 to 5 feet or more.	Moderate strength; subject to piping and cracking.	Moderately rapid to rapid permeability; water table at a depth of 2 to 5 feet or more.	Rapid intake rate; low water-holding capacity; drainage required.	Moderate: Water table at a depth of 2 to 5 feet or more.
Most features favorable; MrB gravelly throughout.	Moderate strength; subject to piping and cracking.	Moderately rapid permeability.	Most features favorable	Moderate: Slopes as great as 9 percent; flooding hazard.
Moderate shrink-swell potential.	Moderate strength; subject to piping and cracking; moderate shrink-swell potential.	Moderate permeability	Most features favorable	Moderate: Moderate permeability; slopes as of much as 9 percent.
Moderate shrink-swell potential.	Low strength; cracks when dry; moderate shrink-swell potential.	Moderately slow permeability.	Most features favorable	Severe: Moderately slow permeability; slopes of more than 9 percent.
Moderate shrink-swell potential; slopes of more than 9 percent; bedrock at a depth of ½ to 1½ feet.	Low strength; cracks when dry; moderate shrink-swell potential; bedrock at a depth of ½ to 1½ feet.	Moderately slow permeability; rock at a depth of ½ to 1½ feet; steep slopes.	Shallow soils; low water-holding capacity; steep slopes.	Severe: Moderately slow permeability; slopes of more than 15 percent; bedrock at a depth of ½ to 1½ feet.
Moderate shrink-swell potential; slopes of more than 15 percent; bedrock at a depth of 2 to 5 feet.	Low strength; cracks when dry; moderate shrink-swell potential; bedrock at a depth of 2 to 5 feet.	Moderately slow permeability; bedrock at a depth of 2 to 5 feet; steep slopes.	Moderately deep to deep soils; steep slopes.	Severe: Moderately slow permeability; slopes of more than 9 percent; bedrock at a depth of 2 to 5 feet.
Moderate shrink-swell potential; water table at a depth of 3 to 5 feet.	Moderate strength; subject to piping; moderate shrink-swell potential.	Moderately slow permeability; water table at a depth of 3 to 5 feet.	Drainage required; slightly to highly saline.	Severe: Moderately slow permeability; water table at a depth of 3 to 5 feet.
Moderate to high shrink-swell potential; water table at depth of 3 to 5 feet.	Low strength; cracks when dry; moderate to high shrink-swell potential.	Slow permeability; water table at a depth of 3 to 5 feet.	Slow permeability in subsoil; drainage required; slightly to highly saline.	Severe: Slow permeability; water table at a depth of 3 to 5 feet.
Moderate to high shrink-swell potential; water table at a depth of 3 to 5 feet.	Low strength; cracks when dry; moderate to high shrink-swell potential.	Slow permeability; water table at a depth of 3 to 5 feet.	Slow intake rate; drainage required; slightly to highly saline.	Severe: Slow permeability; water table at a depth of 3 to 5 feet.
Moderate shrink-swell potential; gravel below a depth of 60 inches.	Moderate strength; subject to piping and cracking; moderate shrink-swell potential.	Moderate permeability	Most features favorable	Moderate: Moderate permeability; slopes of as much as 9 percent.
Moderate shrink-swell potential.	Moderate strength; subject to piping and cracking; moderate. shrink-swell potential.	Moderate permeability	Most features favorable	Moderate: Moderate permeability; slopes of as much as 9 percent.
Slopes of more than 15 percent; bedrock at a depth of 2 to 4 feet.	Moderate to low strength; subject to piping and cracking; bedrock at a depth of 2 to 4 feet.	Slow permeability; bedrock at a depth of 2 to 4 feet; steep slopes.	Moderately deep to deep soils; steep slopes.	Severe: Slow permeability in subsoil; slopes of more than 15 percent; bedrock at a depth of 2 to 4 feet.
Slopes of more than 15 percent hardpan at a depth of 2 to 3 feet.	Moderate strength; subject to piping and cracking.	Hardpan at a depth of 2 to 3 feet; steep slopes.	Moderately deep soils; moderate water-holding capacity; steep slopes.	Severe: Slopes of more than 15 percent; hardpan at a depth of 2 to 3 feet.

TABLE 5.—*Engineering interpretations*

Soil series and map symbols [1]	Suitability as source of—		
	Topsoil	Sand and gravel	Road fill
Pleasanton: PtB	Fair in surface layer and subsoil; poor in substratum.	Unsuitable in surface layer and subsoil; fair in substratum.	Fair in surface layer and subsoil; good in substratum.
PvC2	Fair in surface layer and subsoil; poor in substratum.	Poor in surface layer and subsoil; fair in substratum.	Fair in surface layer and subsoil; good in substratum.
Reiff: ReA, ReC	Fair in surface layer; poor in substratum.	Poor in surface layer; unsuitable in substratum.	Good in surface layer; fair in substratum.
Rincon: RsA, RsC, RsD2, RnA, RnC, RnD2	Fair in surface layer: poor in subsoil and substratum.	Unsuitable	Fair in surface layer and substratum; poor in subsoil.
Salinas: SaA, SaC	Fair to poor	Unsuitable	Fair
San Benito: SbD, SbE2, SbF2, SbF3	Fair to poor	Unsuitable	Fair
Santa Lucia: SdF2, SdG3	Poor	Fair to poor	Good
Shedd: ShD, ShE2, ShF2, ShF3	Poor	Unsuitable	Fair
Sheridan: SkD, SkE, SkE2, SkG2, SkG3	Fair	Poor	Good
Soper: SmD, SmE2, SmF2, SID, SIE2, SIF2	Fair in surface layer and subsoil; poor in substratum.	Unsuitable in surface layer and subsoil; fair to poor in substratum.	Fair
Sorrento: SnA, Snc	Fair to poor	Unsuitabe	Fair
SoB	Fair to poor	Poor	Fair
SrA, SrC	Poor	Unsuitable	Fair

See footnote at end of table.

of soils—Continued

Soil features affecting				Soil limitations for use as septic tank filter field
Road location	Water-retention structures		Irrigation	
	Embankments	Reservoir area		
Moderate shrink-swell potential.	Low strength; subject to piping and cracking; moderate shrink-swell potential.	Moderately slow permeability.	Most features favorable	Severe: Moderately slow permeability in subsoil.
Gravelly soils; moderate to low shrink-swell potential.	Low strength; subject to piping and cracking; moderate to low shrink-swell potential.	Moderately slow permeability.	Most features favorable	Severe: Moderately slow permeability in subsoil.
Low to moderate shrink-swell potential.	Moderate strength; subject to piping and cracking.	Moderately rapid permeability.	Most features favorable	Moderate: Moderate permeability in substratum; slopes of more than 9 percent.
Slowly permeable; clay subsoil; high shrink-swell potential.	Very low strength; cracks when dry; high shrink-swell potential.	Slow permeability; strongly sloping in some places.	Slowly permeable subsoil; steep slopes in some places.	Severe: Slowly permeable in subsoil; slopes of more than 9 percent in some places.
Moderate shrink-swell potential.	Low strength; cracks when dry; moderate shrink-swell potential.	Moderately slow permeability.	Most features favorable	Severe: Moderately slow permeability; slopes of as much as 9 percent.
Moderate shrink-swell potential; slopes of more than 9 percent; bedrock at a depth of 2 to 4 feet.	Low strength; cracks when dry; moderate shrink-swell potential; bedrock at a depth of 2 to 4 feet.	Moderately slow permeability; bedrock at a depth of 2 to 4 feet; steep slopes.	Moderately deep soils; steep slopes.	Severe: Moderately slow permeability; slopes of more than 9 percent.
Low shrink-swell potential; slopes of more than 30 percent; bedrock at a depth of 1½ to 3½ feet.	High to moderate strength; subject to piping and cracking; low shrink-swell potential; bedrock at a depth of 1½ to 3½ feet.	Moderately rapid permeability; bedrock at a depth of 1½ to 3½ feet; steep slopes.	Moderately deep soils; rapid intake rate; low water-holding capacity; steep slopes.	Severe: Slopes of more than 30 percent; bedrock at a depth of 1½ to 3½ feet.
Moderate shrink-swell potential; slopes of more than 9 percent; bedrock at a depth of 1½ to 3½ feet.	Moderate strength; subject to piping and cracking; moderate shrink-swell potential; bedrock at a depth of 1½ to 3½ feet.	Moderate permeability; stones in substratum; bedrock at a depth of 1½ to 3½ feet; steep slopes.	Moderately deep soils; steep slopes.	Severe: Moderate permeability; slopes of more than 9 percent; bedrock at a depth of 1½ to 3½ feet.
Slopes of more than 15 percent; bedrock at a depth of 1½ to 5 feet.	Moderate strength; subject to piping and cracking; bedrock at a depth of 1½ to 5 feet or more.	Moderately rapid permeability; bedrock at a depth of 1½ to 5 feet or more; steep slopes.	Moderately deep to deep soils; moderate water-holding capacity; steep slopes.	Severe: Slopes of more than 9 percent; bedrock at a depth of 1½ to 5 feet or more.
Low shrink-swell potential; slopes of more than 9 percent; bedrock at a depth of 2½ to 4 feet.	Low strength; subject to piping and cracking; low shrink-swell potential; bedrock at a depth of 2½ to 4 feet.	Moderately slow permeability; bedrock at a depth of 2½ to 4 feet; steep slopes.	Moderately steep slopes	Severe: Moderately slow permeability in subsoil; slopes of more than 9 percent; bedrock at a depth of 2½ to 4 feet.
Moderate shrink-swell potential.	Moderate strength; subject to piping and cracking; moderate shrink-swell potential.	Moderate permeability	Most features favorable	Moderate: Moderate permeability; slopes of as much as 9 percent.
Gravelly soils; low shrink-swell potential.	Moderate strength; subject to piping and cracking; low shrink-swell potential.	Moderate permeability	Most features favorable	Moderate: Moderate permeability.
Moderate shrink-swell potential.	Low strength; cracks when dry; moderate shrink-swell potential.	Moderately slow permeability.	Most features favorable	Severe: Moderately slow permeability; slopes of as much as 9 percent.

TABLE 5.—*Engineering interpretations*

Soil series and map symbols [1]	Suitability as source of—		
	Topsoil	Sand and gravel	Road fill
Sween:			
SsE2, SsF2	Poor	Unsuitable	Fair in surface layer; poor in subsoil.
StE2, SwF2	Poor	Unsuitable	Poor
Vallecitos: VaD, VaE, VaF, VaF2, VrE2, VrF2	Poor	Unsuitable in surface layer and subsoil.	Fair to poor
Willows: Wc, Wk, Ws, Ww2	Poor	Unsuitable	Poor
Yolo:			
YoA, YoC	Fair to good	Unsuitable in surface layer and substratum.	Fair
YvB	Fair to good	Poor	Fair to good

[1] Because their properties vary, interpretations were not made for Badland (BaG), Gullied land (GuE), Igneous rock land (IgG), Landslides (LdF), Mine pits and dumps (MnG), Riverwash (Rw), Sandy alluvial land (Sc), Sedimentary rock land (SeG), Terrace escarpments (TeF).

TABLE 6.—*Engineering*

Soil name and location	Parent material	California report No.	Depth	Horizon	Moisture-density [2]		Mechanical analysis [3]		
					Maximum dry density	Optimum moisture	Percentage passing sieve—		
							3 in.	¾ in.	⅜ in.
		V62	*Inches*		*Lb. per cu. ft.*	*Percent*			
Antioch loam:									
400 yards E. of Basarich ranchhouse on McMahan Road.	Stratified sand, silt, and clay; gravelly in some places.	5005	0–10	Ap	123	11	------	------	------
		5006	13–25	B21t	106	15	------	------	------
		5007	54–76	IIIC2	115	16	------	------	------
Arnold loamy sand:									
100 yards N. and 30 yards W. of the end of Rea Road.	Sandstone.	5019	0–12	Ap	126	9	------	------	------
		5020	12–22	C1	131	9	------	------	------
		5021	22–46	C2	130	10	------	------	------
		5022	46–90	C3	129	10	------	------	------

See footnotes at end of table.

of soils—Continued

Soil features affecting—				Soil limitations for use as septic tank filter field
Road location	Water-retention structures		Irrigation	
	Embankments	Reservoir area		
Slow permeability in clay subsoil; moderate to high shrink-swell potential; slopes of more than 15 percent; bedrock at a depth of 1½ to 4 feet.	Low strength; cracks when dry; moderate to high shrink-swell potential; bedrock at a depth of 1½ to 4 feet.	Slow permeability; bedrock at a depth of 1½ to 4 feet; steep slopes.	Moderately deep soils; slow intake rate; steep slopes.	Severe: Slow permeability in clay subsoil; slopes of more than 15 percent; bedrock at a depth of 1½ to 4 feet.
Slow permeability in clay subsoil; low shrink-swell potential; slopes of more than 15 percent; bedrock at a depth of 1½ to 2½ feet.	Very slow strength; cracks when dry; low shrink-swell potential; bedrock at a depth of 1½ to 2½ feet.	Slow permeability; bedrock at 1½ to 2½ feet; stones and rocks; steep slopes.	Shallow soils; slow intake rate; steep slopes.	Severe: Slow permeability in subsoil; slopes of more than 15 percent; bedrock at a depth of 1½ to 2½ feet.
Slow permeability in clay subsoil; moderate shrink-swell potential; slopes of more than 9 percent; bedrock at a depth of 1 to 3 feet.	Moderate to low strength; subject to piping and cracking; moderate shrink-swell potential; bedrock at a depth of 1 to 3 feet.	Slow permeability; bedrock at 1 to 3 feet; steep slopes; rock outcrops.	Shallow soils; slowly permeable subsoil; steep slopes.	Severe: Slow permeability in clay subsoil; slopes of more than 9 percent; bedrock at a depth of 1 to 3 feet.
High shrink-swell potential; water table at a depth of 1½ to 3 feet.	Very low strength; cracks when dry; high shrink-swell potential.	Very slow permeability; water table at a depth of 1½ to 3 feet.	Slow intake rate; drainage required; slightly to highly saline.	Severe: Very slow permeability; water table at a depth of 1½ to 3 feet.
Moderate shrink-swell potential; gravelly below a depth of 40 inches.	Moderate strength; subject to piping and cracking; moderate shrink-swell potential.	Moderate permeability---	Most features favorable--	Moderate: Moderate permeability; slopes of as much as 9 percent.
Low shrink-swell potential; gravelly soils.	Moderate strength; subject to piping and cracking; low shrink-swell potential.	Moderate permeability---	Most features favorable--	Slight to moderate: Moderate permeability.

test data [1]

Mechanical analysis [3]—Continued								Liquid limit	Plasticity index	Classification	
Percentage passing sieve—Continued				Percentage smaller than—							
No.4 (4.7 mm.)	No.10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.			AASHO [4]	Unified [5]
100	99	94	73	68	45	24	19	23	8	A–4(8)	CL
-------	100	97	83	81	64	51	45	53	29	A–7–6(18)	CH
-------	100	96	75	71	48	29	20	40	20	A–6(12)	CL
-------	100	80	27	26	20	10	6	[6] NP	[6] NP	A–2–4(0)	SM
-------	100	85	33	31	23	12	8	NP	NP	A–2–4(0)	SM
100	99	80	24	23	19	13	9	NP	NP	A–2–4(0)	SM
-------	100	80	24	23	19	13	11	NP	NP	A–2–4(0)	SM

TABLE 6.—*Engineering*

Soil name and location	Parent material	California report No.	Depth	Horizon	Moisture-density [2]		Mechanical analysis [3]		
					Maximum dry density	Optimum moisture	Percentage passing sieve—		
							3 in.	¾ in.	⅜ in.
		V62	*Inches*		*Lb. per cu. ft.*	*Percent*			
Clear Lake clay:									
30 yards E., of intersection of San Felipe Road and State Route 156.	Stratified alluvium.	5008	0–12	Ap	101	19	------	------	------
		5009	12–30	A1	106	13	------	------	------
		5010	40–70	C2	105	19	------	------	------
Gaviota loam:									
300 yards N. of Clear Creek Road and 0.75 mile from Hernandez valley.	Sandstone and sandy shale.	5011	0–7	A1	111	16	------	------	------
		5012	7–19	C1	118	14	100	98	90
Henneke fine gravelly loam:									
1 mile N. of Clear Creek by Clear Creek and New Idria Road.	Serpentine.	5013	0–3	A	97	23	100	97	95
		5014	3–11	B2t	103	21	100	99	95
		5015	11–25	C	108	19	------	100	95
Kettleman loam:									
2 miles N. of Ashurst oil lease road on New Idria Road and 0.25 mile W. of Cedar Flats.	Sandstone.	5017	10–22	A12	105	19	------	------	------
		5018	22–41	C1	106	19	------	------	------
Pacheco silt loam:									
50 yards N. of Pacheco School on the NW. corner of Shore Road and Lovers Lane.	Stratified alluvium.	5023	9–20	A12	116	14	------	------	------
		5024	32–64	C2g	116	14	------	------	------
Panoche loam:									
400 yards SE. of Recalde ranchhouse.	Stratified alluvium.	5025	0–8	Ap	118	14	------	------	------
		5026	12–29	C1	110	15	------	------	------
		5027	39–76	C3	110	14	------	------	------
Pinnacles coarse sandy loam:									
0.5 mile E. of Jef Schmidt ranchhouse and 300 yards W. of main ranch road.	Arkosic sandstone.	5028	0–8	A11	128	9	100	98	97
		5029	12–22	B2t	116	14	------	100	99
		5030	25–60	C	127	10	------	100	99
Rincon silty clay loam:									
600 yards E. of house on Young Ranch and 200 yards N. of stream.	Stratified alluvium.	5031	0–12	Ap	111	15	------	------	------
		5032	33–45	B22t	107	18	------	------	------
		5033	45–80	Cca	100	20	------	------	------
San Benito clay loam:									
40 yards N. of Willow Creek Road and 0.5 mile S. of Morelini ranchhouse	Sandstone and shale.	5001	8–20	A12	112	15	------	------	------
		5002	20–35	C1	112	15	------	------	------
		5003	35–45	Cca	114	15	------	------	------
Shedd loam:									
30 yards E. of King City Road and 4 miles SW. of Bitterwater store.	Sandstone.	5034	3–12	A12	98	22	------	------	------
		5035	20–32	IIC1	92	26	------	------	------
Vallecitos loam:									
20 yards N. of ranch road and 0.5 mile N. of ranchhouse.	Metamorphosed sandstone.	5041	0–6	A1	127	10	------	100	97
		5042	17–32	B2t	117	13	100	99	98
Willows clay:									
60 yards N. of Bolsa Road and 0.25 mile W. of Shore Road.	Stratified alluvium.	5038	0–12	Ap	100	17	------	------	------
		5039	19–33	A12	109	16	------	------	------
		5040	33–57	C1	109	16	------	------	------

[1] Tests performed by District V, California Division of Highways, in accordance with procedures given in "California Materials Manual for Testing and Control Procedures" (*3*).

[2] Based on method of test for relative compaction of untreated and treated soils and aggregates, test method No. Calif. 216E (*3*).

[3] Mechanical analyses by the procedure of California Division of Highways. Results by this procedure frequently may differ somewhat from results obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the California procedure, the fine material is analyzed by the hydrometer method and the various grain-sized fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method and the

test data [1]—Continued

Mechanical analysis[3]—Continued								Liquid limit	Plasticity index	Classification	
Percentage passing sieve—Continued				Percentage smaller than—							
No.4 (4.7 mm.)	No.10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.			AASHO [4]	Unified [5]
-------	100	99	95	94	82	56	45	58	30	A–7–6(20)	CH
-------	100	99	96	94	79	55	46	70	44	A–7–6(20)	CH–MH
-------	100	99	97	97	94	61	45	57	31	A–7–6(19)	CH
100	99	94	82	78	58	33	23	37	8	A–4(8)	ML
75	65	86	48	46	35	20	13	36	10	A–4(3)	SM–SC
92	83	55	32	30	21	12	9	NP	NP	A–2–4(0)	SM
89	79	52	32	31	25	18	16	51	19	A–2–7(2)	SM
89	78	53	28	25	20	13	12	43	9	A–2–5(0)	SM
100	99	94	57	50	30	14	11	33	4	A–4(4)	ML
100	98	92	57	49	29	17	11	32	5	A–4(4)	ML
-------	100	98	90	86	56	32	25	36	7	A–4(8)	ML
100	99	98	92	90	66	40	29	35	13	A–6(9)	ML–CL
-------	100	99	74	68	44	26	21	29	8	A–4(8)	ML–CL
100	93	60	35	32	25	16	11	34	13	A–2–6(1)	SC
-------	100	97	80	75	56	35	24	35	24	A–6(10)	CL
94	87	54	27	25	17	8	6	NP	NP	A–2–4(0)	SM
98	92	71	55	53	49	42	38	52	30	A–7–6(13)	CH
96	87	51	20	19	15	10	8	27	6	A–2–4(0)	SM–SC
-------	-------	100	88	86	65	47	39	45	26	A–7–6(15)	CL
-------	-------	100	89	85	66	46	42	51	30	A–7–6(18)	CH
100	98	92	73	62	31	13	8	36	8	A–4(8)	ML
100	99	95	71	68	52	35	30	41	21	A–7–6(12)	CL
100	99	95	71	67	52	37	27	40	19	A–6(11)	CL
100	99	92	65	62	48	31	24	37	17	A–6(9)	CL
100	98	92	53	50	35	22	15	31	4	A–4(4)	ML
100	93	83	46	43	31	18	12	35	7	A–4(2)	SM
91	83	65	48	46	38	25	16	33	10	A–4(3)	SM–SC
94	88	72	59	58	52	40	32	53	28	A–7–6(14)	CH
-------	-------	100	98	98	83	63	52	64	36	A–7–6(20)	CH
-------	100	98	94	92	82	81	81	63	39	A–7–6(20)	CH
-------	100	99	98	97	84	52	41	44	23	A–7–6(14)	CL

material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analyses used in this table are not suitable in naming textural classes for soil.

[4] Based on Standard Specifications for Highway Materials and Methods of Sampling and Testing (Pt. 1, Ed. 8). The classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes, AASHO Designation M 145–49 (*1*).

[5] Based on the Unified Soil Classification System, Tech. Memo. No. 3–357, v. 1, Waterways Experiment Station. Corps of Engineers, March 1953 (*10*). Soils that have a plasticity index within 2 points of A-line are to be given a borderline classification. Examples of borderline classification thus obtained are ML–CL, SM–SC, and CH–MH.

[6] NP=Nonplastic.

Engineering classification systems

Two systems of classifying soils are in general use among engineers. One is the system approved by the American Association of State Highway Officials (AASHO) (*1*), and the other is the Unified system adopted by the Corps of Engineers, U.S. Army (*10*). Both systems are used in this survey and are explained in the following paragraphs. The explanations are taken largely from the PCA Soil Primer (*4*).

AASHO classification system.—Most highway engineers classify soil material according to the AASHO system. In this system soil material is classified in seven principal groups. These groups range from A–1 (gravelly soils of high bearing capacity, the best soils for subgrade) to A–7 (clay soils having low strength when wet, the poorest for subgrade). Within each group, the relative engineering value of the soil material is indicated by a group index number. Group index numbers range from 0 for the best material to 20 for the poorest. For the soils tested, the group index numbers are shown in table 6 in parentheses following the soil group symbol. The estimated AASHO classification of the soils in the county, without group index numbers, is given in table 4.

Unified classification system.—The Unified system identified materials as coarse grained, eight classes; fine grained, six classes; and highly organic. The tested soils are classified according to the Unified system in table 6, and the classification for the soils that were not tested is estimated in table 5.

Estimated engineering properties of soils

Table 4 provides estimates of important properties of soils that affect engineering. The estimates in this table are based on the results of laboratory tests given in table 6, on experience with similar soils in other areas, and on information in other parts of this survey.

Depth to the seasonally high water table is not given in table 4, because the water table is below a depth of 5 feet for most soils in the county. In a few soils, however, the depth is less than 5 feet. The water table is at a depth of 1½ to 3 feet in the Willows soils, 2 to 5 feet in Metz sandy loam, wet variant, 3 to 4 feet in Clear Lake soils, 3 to 5 feet in Pacheco soils, and 5 feet in Edenvale soils.

Salinity is also not listed in table 4, because the soils of only three series—Clear Lake, Pacheco, and Willow—contain excessive amounts of soluble salts.

Because the properties estimated in table 4 are for a typical profile, some variations from the values given should be expected. A description of a profile representative of each series in the county is given in the section "Descriptions of the Soils."

Hydrologic soil groups are groups of soils having similar rates of infiltration when wetted and similar rates of water transmission within the soil. Four such groups currently are recognized.

Soils in group A have a high infiltration rate, even when thoroughly wetted. They have a high rate of water transmission and low runoff potential. The soils of this group are deep, are well drained or excessively drained, and consist chiefly of sand, gravel, or both.

Soils in group B have a moderate infiltration rate when thoroughly wetted. Their rate of water transmission and their runoff potential are moderate. These soils are moderately deep or deep, are moderately well drained or well drained, and are medium textured to moderately coarse textured.

Soils of group C have a slow infiltration rate when thoroughly wetted. Their rate of water transmission is slow, and their potential runoff is high. These soils have a layer that impedes the downward movement of water, or they are moderately fine textured or fine textured and have a slow infiltration rate.

Soils of group D have a slow infiltration rate when thoroughly wetted. Their rate of water transmission is very slow, and runoff potential is very high. In this group are (1) clay soils that have a high shrink-swell potential; (2) soils that have a permanent high water table; (3) soils that have a claypan or clay layer at or near the surface; and (4) soils that are shallow over nearly impervious material.

For each layer significant in engineering, table 4 lists the USDA textural classification and the Unified and AASHO engineering classifications.

The columns headed "Percentage passing sieve" list percentages of material that is small and passes the openings of a 3-inch sieve and No. 4, No. 10, No. 40, and No. 200 sieves. Material retained on the No. 200 sieve (0.074 millimeter) is generally considered coarse textured.

Soil permeability is the ability of a soil to transmit air or water. It is measured in terms of the rate at which water passes through the soil. In table 4 the column that shows permeability gives, in inches per hour, the estimated rate that water moves downward through the undisturbed soil.

The available water capacity, expressed in inches per inch of soil depth, is the capacity of a soil to retain water that can be readily absorbed by plants. It is essentially the amount of water held in a soil between field capacity and the permanent wilting point of plants.

The shrink-swell potential is an indication of the change in volume of the soil material that is expected when moisture content changes. It is estimated on the basis of the kind and amount of clay in the soil layers. In general soils classified as A–7 and CH have high shrink-swell potential. Clean sands and gravels and soils having a small amount of nonplastic to slightly plastic fines have a low shrink-swell potential.

Most materials, such as uncoated steel, corrode or deteriorate when buried in soil. The rate at which a material deteriorates depends largely on soil properties such as texture, drainage, total acidity, and electrical conductivity. Rated in the last column of table 4 is the potential corrosion of uncoated steel in each soil in the county.

Engineering interpretations of soils

In table 5 the soils of San Benito County are rated according to their suitability as a source of topsoil, sand and gravel, and road fill. Also indicated are those soil features that affect suitability as sites for roads, water-retention structures, and irrigation systems. The degree of limitation to the use of soil as filter fields for septic tanks also is shown.

Because the water table is below a depth of 5 feet in most soils of the county, agricultural drainage is not listed in table 5. Clear Lake, Pacheco, and Willows soils and Metz sandy loam, wet variant, have a water table above a depth of 5 feet and require some drainage.

The soils are rated as a source of topsoil for use on slopes, shoulders of roads, and along ditches. The soils are rated "good," "fair," "poor," or "unsuitable" according to their ability to support plants.

Some of the soil features that adversely affect the location of roads include texture, drainage, depth to bedrock or hardpan, high water table, slopes, and rockiness or stoniness.

Among the water-retention structures considered in table 5 are irrigation reservoirs, fish ponds, stock-water ponds, recreation lakes, and sewage lagoons. Soil features affecting both the floor, or impondment area, and the embankment need to be considered. Among the soil features affecting the floor are permeability, slope, depth to rock or water table, and drainage. The major soil features affecting embankment material are strength, piping, or subsurface erosion, cracking, shrink-swell potential, and depth to bedrock.

Suitability of a soil for irrigation is based chiefly on its water-holding capacity, rate of intake, slope, and depth. Also considered are barriers to the movement of air and water into the soils and salinity or alkalinity.

Ratings used to describe limitations to use of a soil as a filter field are "slight," "moderate," or "severe." These ratings are based on permeability, slope, depth to bedrock or water table, drainage, and hazard of flooding. A filter field is part of the septic tank soil absorption system for disposal of sewage on the site. It consists of subsurface tile lain in such a way that effluent from the septic tank is distributed with reasonable uniformity into the soil.

Engineering problems in San Benito County are complicated in areas of the San Andreas and associated faults. Along these faults, investigations of the site are required before work is planned.

Engineering test data

Table 6 contains test data for samples collected from selected soils and tested by the California Division of Highways. Tests were made to determine moisture density, liquid limit, and plasticity. A mechanical analysis of each sample was made so that the percentage of the various grain-size particles could be determined.

In the moisture-density, or compaction, test a sample of soil material is compacted several times using the same compactive effort, but each time at a higher content of moisture. The dry density, or unit weight, of the compacted material increases until the optimum moisture content is reached. After that, the dry density obtained in the compaction test is termed maximum dry density. Soil in earthwork is most stable if it is compacted to about maximum dry density when it is at the optimum moisture content.

The mechanical analysis data was determined by the sieve and hydrometer method. The data shows particle-size distribution for gravel, sand, silt, and clay. Tests for liquid limit and plastic limit measure the effect of water on the consistence of soil. As the moisture content of a clayey soil increases from a dry state, the material changes from a semisolid to a plastic state. As the moisture content is further increased, the soil material changes from a plastic to a liquid state. The plastic limit is the moisture content at which the soil passes from a semisolid to a plastic state. The liquid limit is the moisture content at which the soil material changes from a plastic to a liquid state. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which a soil material is plastic. A nonplastic soil is one that is granular or without cohesion and for which the liquid or plastic limit cannot be determined.

Formation and Classification of Soils

This section discusses the effects of the five factors of soil formation on the soils in San Benito County and describes important processes in the morphology of soils. Also, the current system of soil classification is explained, and each soil series represented in the county is placed in some categories in that system and in the great soil group of an older system.

Factors of Soil Formation

Soil is a natural body on the surface of the earth in which plants grow; it is composed of organic and mineral material. Soils differ in their appearance, composition, productivity, and management requirements in different localities or even within short distances in the same locality. The factors that cause soils to differ are (1) the physical and chemical composition of the parent material; (2) the climate under which the soil material has accumulated and existed since accumulation; (3) the living organisms; (4) the relief, or lay of the land, and (5) the length of time the forces of formation have acted on the soil material. The relative importance of each factor differs from place to place, but generally the interaction of all the factors determines the kind of soil that forms in any given place. The influence of each soil-forming factor on the soils in San Benito County is described in the pages that follow.

Parent material

Parent material in the unconsolidated mass from which a soil develops. It is largely responsible for the chemical and mineralogical composition of soils. In San Benito County the soils formed in residual and alluvial parent materials. Soils derived from residual material formed in place through weathering of the underlying rocks. Those formed in alluvial material occur in the valleys and along the major waterways of the county.

The residual parent material was derived from sandstone, sandstone conglomerate, shale, granite, basic igneous rock, serpentine, and soft formations that consist of stratified or mixed sand, gravel, and clay. Many of the sedimentary formations are limy, and the lime is generally retained by the material that developed from these formations and by the soils formed from the parent material. Granite weathers into fine gravelly or coarse sandy parent material. Much of the gravel or sand is quartz, which weathers very slowly. The soils formed from quartz are generally coarse textured.

Alluvial parent material is generally of local origin. It is washed from the geologic formations of the uplands that surround the valleys and along the major drainageways. The alluvium has mixed lithology because there

are a wide variety of sedimentary, metamorphic, and igneous formations in the uplands.

In San Benito County the alluvium ranges widely in texture because it was deposited in different ways. Alluvium on fans and toe slopes generally have texture and other characteristics similar to those of the material in the hills immediately above them. The alluvium in the larger valleys has been laid down by streams when they were normal or flooding. As a stream overflows its channel and the water spreads over the flood plain, the coarser textured sediments are deposited first. The floodwaters continue to spread but they move more slowly and finer sediments, such as silt, are next deposited. The silt is commonly mixed with some sand and clay. Most of the clay is deposited when the flood has passed and the water is left standing in the lowest part of the flood plain. The clay particles do not settle until the water becomes still.

In the larger valleys the alluvium generally is laid down in a pattern in which loamy sand and sandy loam are near the streams, clay and silty clay are in the lowest parts of the flood plain, and loam, silt loam, and clay loam are between these two positions. An earlier cycle of deposition when the streams had different courses is suggested by many alluvial soils that have buried horizons at a depth of 40 to 80 inches, by some clayey soils that are underlain by sand at a depth of 40 to 80 inches, and by some loams and sandy loams that have clay layers at a depth of 60 to 100 inches. Geologic changes, not stream meandering, are believed to have caused streams to change their courses and begin a new cycle of erosion and deposition.

Areas of older alluvium occur as hillocks in the present flood plains, are at higher elevations between the flood plains and the hills, or are along the larger waterways. Generally, the soils formed in older alluvium are moderately to strongly developed, and in places they are dissected by drainageways.

Differences in the texture of the alluvium are generally accompanied by differences in chemical and mineralogical composition. The sandier sediments generally contain more quartz and less feldspars and ferromagnesian minerals than do the finer textured sediments and generally are more siliceous and lower in bases. In addition, the sandier sediments generally have less exchangeable sodium than the finer textured sediments, but there are some sandy alluvial areas that have a high water table and contain moderate to large amounts of sodium.

Climate

Climate as a genetic factor affects the physical, chemical, and biological relationships in soils, primarily through the influence of precipitation and temperature. Water dissolves minerals, supports biological activity, and transports mineral and organic residues through the soil. Temperature determines the kinds of physical, chemical, and biological activities that take place in the soil and determines the speed at which they act.

The soils in San Benito County formed in a Mediterranean climate that is generally semiarid but is subhumid in the northwestern part because of the cool moist air from the Pacific Ocean. Generally, climate has been a uniform factor in soil formation throughout the county.

Precipitation varies considerably from year to year. In some years the soils may be moistened only for a few feet, but in other years they are saturated to their full depth. Usually, the soils are moist and subject to some leaching from January through April and are dry to very dry from May through December. Winters are mild and the soils are not frozen, but frost may affect the top few inches.

The flood plains of the streams are geologically young and have not had time to be strongly weathered. Also, the sediments have come from sections of the county where weathering is not intense. For these reasons, soils formed in these materials show little development other than an accumulation of organic matter in the surface layer and some downward movement of carbonates.

Living organisms

In San Benito County, the living organisms that affect development of soils are micro-organisms, vegetation, animals, and man. Native vegetation was the most important of these before the county was settled. Large areas consisted of open grassland covered with perennial grasses. Many hilly and mountainous areas had open stands of oaks, Digger pine, and Coulter pine and there were some areas of brush. Cottonwoods and willows grew along the streams, and willows and swamp plants covered wet areas.

In general, differences in native vegetation on soils of the uplands seems to be associated with differences in parent materials; and differences in vegetation on soils of the flood plains, with differences in drainage. Open stands of Digger and Coulter pines grew on soils underlain by granite and serpentine, and brush grew where these soils were thin. A mixture of grasses, Digger pine, and oaks generally grew where the parent material was acid weathered sandstone and shale. Soils formed on calcareous sandstone and shale were grassland with open stands of oaks on north-facing slopes and along drainageways.

Since the county was settled and formed, man has caused changes in the native vegetation. Annual grasses have been substituted for perennial grasses; erosion has been accelerated; areas of brush have increased; and large areas have been cleared and cultivated. Swampy areas have been drained, and the water table has been lowered. Also, irrigation has greatly increased the amount of water passing through soils, and fertilization and crop removal have changed their chemical composition. Other than accelerated erosion, few results of these changes as yet are reflected in the development of soils. Some may not be evident for hundreds of years, but the activities of man have drastically changed the living organisms that affect soil formation.

Relief

Relief is largely determined by the underlying geologic formation, the geologic history of the region, and the effects of dissection by rivers and streams. Relief influences soil formation through its effects on drainage, erosion, temperature, and plant cover.

San Benito County is an area of valleys, hills, and mountains in the central coastal range of California. Elevations range from 120 feet above sea level on the Pajaro River in the north, to 5,248 feet on top of San

Benito Mountain in the southeastern end of the county. Drainage is northwestward and most of the county is drained by the San Benito River and its tributaries.

The upland areas are generally deeply dissected by drainage. This dissection has formed in long winding ridges that have relatively steep side slopes. Some of the ridgetops are broad and have slopes ranging from 10 to 25 percent. Other ridgetops, generally steep ones, are narrow and somewhat angular. Slopes in the uplands generally range from 30 to 70 percent, but large areas have slopes ranging from 45 to 60 percent. Some small upland valleys, mainly at the heads of drainageways, have slopes that range from 3 to 12 percent.

Most of the soils in the uplands are well drained, but on the very steep slopes drainage ranges to excessive. Geologic erosion is active in the uplands particularly on the steeper slopes over softer formations. Also, accelerated erosion has followed overgrazing, fires, and cultivation in many areas.

The flood plains in the larger valleys generally have slopes of 2 percent or less. Slopes are 2 to 9 percent in some areas, generally along major drainageways and on fans.

The flatness of the flood plains is partly responsible for the slow drainage of many areas, especially areas of slack-water clays. Runoff is slow to very slow, and movement of water through these clays is generally slow. This causes a high or fluctuating water table and a concentration of exchangeable sodium because the flood plain is flat and drainage outlets are lacking.

On the terraces many soils occur in large areas that have slopes of 1 to 3 percent. These soils are generally moderately well drained to well drained. The more poorly drained soils on terraces have a tight subsoil and slow or very slow movement of water through it.

Time

The age of a soil is usually related to the degree of development or degree of horizon differentiation within the soil. For this reason, a soil that has little or no development is considered young, while one that is strongly developed is considered old or mature. The age of any one soil is directly dependent on the action and interaction of the soil forming factors.

In San Benito County the oldest soils are on terraces and are moderately to strongly developed. These soils formed in old alluvium above the flood plains and are more stable than the soils on these plains.

The soils in more recent alluvium are generally young. Many of them are on fans or are close to major drainageways, and they receive sediments from the hills above or from stream overflow. In the larger valleys, however, many of the soils are no longer flooded and receive little or no sediments. These soils have been in place a relatively short time and show little or no development other than some downward movement of carbonates.

Soils in the uplands formed on metamorphosed sandstone and shale, granite, arkosic sandstone, and moderately hard sandstone. Some of these soils are moderately developed, but most are young and show little development other than the accumulation of organic matter in the surface layer and some leaching of carbonates.

Morphology

The morphology of soils in San Benito County generally is expressed by faint horizons in soils formed in alluvium and in many soils of the uplands and by distinct horizons in soils on terraces and in some soils of the uplands. The differentiation of horizons in soils is the result of one or more of the following processes: (1) Accumulation of organic matter, (2) leaching of carbonates and salts more soluble than calcium carbonate, (3) accumulation of exchangeable sodium and related salts, (4) translocation of silicate clay minerals, (5) stratification of parent material, and (6) reduction and transfer of iron. In most of the soils in the county, two or more of these processes have affected the development of horizons. For example, the accumulation of organic matter, leaching of carbonates, and stratification of the parent material are reflected in the faint horizons of Sorrento silt loam. The accumulation of organic matter, stratification of the parent material, and the reduction and transfer of iron are reflected in the morphology of Pacheco loam. All processes have operated to some extent in the horizon differentiation of Cotati loam.

Some organic matter has accumulated in the uppermost layer to form an A1 horizon in all the soils in San Benito County. Much of that organic matter is in the form of humus. The quantity ranges from very small in some soils to relatively large in others. Metz gravelly sandy loam and Los Banos clay loam are examples of soils that have faint A1 horizons and that are low in organic-matter content. Other soils, such as Pacheco silt loam, have a thick dark-colored A1 horizon that is moderately high in organic-matter content. The accumulation of organic matter has been the most important process in horizon differentiation in many of the soils in this county.

Leaching of carbonates and salts has occurred to some extent in most soils of the county, except perhaps in Metz gravelly sandy loam, Panoche sandy loam, and other soils in very recent alluvium. The degree of leaching varies considerably throughout the county. Sorrento silt loam, Salinas clay loam, and other soils are partly leached and have an accumulation of carbonates in the C horizon. Other soils, such as Antioch loam, are leached in the A horizon, but some carbonates remain in the B and C horizons. Sheridan coarse sandy loam and Gazos clay loam formed from acid material, and they lost fertility through the leaching process. Exchangeable sodium is generally accumulated in soils on alluvium that have poor drainage and a high or fluctuating water table. Under the influence of sodium, the clay particles tend to disperse in the soil and to pass downward with the percolating water. These particles form dense layers that are very slowly permeable. With alternate wetting and drying, coarse structure that is columnar, prismatic, or blocky forms in some of the affected soils. Willows clay has a moderate to large accumulation of exchangeable sodium. Accumulation is also moderate to large in some areas of Clear Lake clay, Pacheco silty clay, and Pacheco silt loam.

Translocation of silicate clay minerals has contributed to the formation of horizons mostly in soils of the terraces and some soils of the uplands. Many soils of the uplands, such as Los Gatos, and some soils on alluvium,

such as Botella, show that there has been a little downward movement of silicate clay minerals to the layer immediately below the A horizon. This is indicated by a few clay films, generally in the larger pores, and a few darker coatings on the ped surfaces.

Antioch loam and Cotati loam, the soils with the most strongly developed horizons in the county, have a clay B horizon. This horizon has columnar or prismatic structure and abruptly underlies a 1- to 4-inch A2 horizon. Clay films are evident both in pores and on surfaces of peds. The abrupt change in texture from a loam A horizon to a clay B horizon indicates the amount of translocation of clay that has taken place.

Translocation of silicate clay minerals is important in the development of horizons in Auberry fine sandy loam, Botella loam, Cometa loam, Arguello loam, Los Banos clay loam, Pleasanton loam, Rincon loam, Rincon silty clay loam, and Vallecitos loam. This translocation is indicated by difference in texture in the A and B horizons. The B horizon is finer textured and contains clay films in pores and on surfaces of peds. Most of these soils are medium acid to neutral in the A and B horizons, but Rincon silty clay loam and Los Banos clay loam generally are mildly alkaline to moderately alkaline in the A horizon and calcareous in the B horizon. Rincon silty clay loam evidently was not completely leached of carbonates before the translocation of silicate clay minerals began, and the two processes are operating simultaneously. Los Banos clay loam may have formed under a more moist climate than Rincon silty clay loam and was probably recharged with carbonates after the climate became much drier.

Stratification of parent materials is important in horizon differentiation in many of the soils on alluvium, such as the Panoche, in some of the soils on terraces, such as the Pleasanton, and in a few of the soils on uplands, especially those formed in stratified soft sediments. In many soils stratification determines or affects the texture of various horizons, determines the amount, size, and composition of gravel in some horizons, and partly accounts for the variation of color in the soils of some soil series. The movement and content of water in some soils are affected by strata of rapidly permeable sand or of slowly permeable clay. Stratification also indicates changes in erosion and deposition and in drainage, steam channels, and flooding.

Restricted drainage in Pacheco silt loam and similar soils is partly caused by a slowly permeable layer at a depth of 4 to 10 feet. In some places Pleasanton loam shows stratification of parent material by variation in the amount, size, and composition of gravel in the horizons and by variation in texture in the lower part of the B and in the C horizons. Soils in alluvium generally have stratified parent material. This stratification is normally apparent in the subsoil and is partly responsible for differences in texture in the A horizon.

The reduction and transfer of iron, a process called gleying, has occurred to some extent in most of the soils in San Benito County that have impeded drainage. The effects of gleying are evident, but not prominent in the profiles of Willows clay, Pacheco silty clay, Pacheco silt loam, Clear Lake clay, Edenvale clay, and other somewhat poorly drained or poorly drained soils. Evidence of iron reduction and transfer can also be seen in small areas of soils with impeded drainage that are within larger areas of the well-drained soils.

The gray colors in the deeper horizons of somewhat poorly drained and poorly drained soils indicate the reduction of iron. This reduction is commonly accompanied by some transfer of iron. After reduction, iron may be removed completely from some horizons and may be removed from the soil. In San Benito County, however, the iron generally has moved only a short distance and has stopped either in the horizons of origin or in a horizon nearby. In some of the coarser textured soils, iron has been segregated within horizons and has formed strong-brown or yellowish-brown mottles and, in a few places, reddish-brown mottles.

Classification of Soils

Soils are classified so that we can more easily remember their significant characteristics. Classification enables us to assemble knowledge about the soils, to see their relationships to one another and to the whole environment, and to develop principles that help us to understand their behavior and their response to manipulation. First, through classification and then through use of soil maps, we can apply our knowledge of soils to specific fields and other tracts of land.

Thus, in classification, soils are placed in narrow categories that are used in detailed soil surveys, so that knowledge about the soils can be organized and applied in managing farms, fields, and woodlands; in developing rural areas; in engineering work; and in many other ways. They are placed in broad classes to facilitate study and comparison in large areas, such as countries and continents.

Two systems of classifying soils have been used in the United States in recent years. The older system was adopted in 1938 (*2*) and later revised (*7*). The system currently used was adopted for general use by the National Cooperative Soil Survey in 1965. The current system is under continual study. Therefore, readers interested in developments of this system should search the latest literature available (*5*, *9*). The soil series of San Benito County are placed in some categories of the current system in table 7. The classes in the current system are briefly defined in the following paragraphs.

ORDER: Ten soil orders are recognized in the current system. They are Entisols, Vertisols, Inceptisols, Aridisols, Mollisols, Spodosols, Alfisols, Ultisols, Oxisols, and Histosols. The properties used to differentiate the soil order are those that tend, generally, to give broad climatic groupings of soils. Two exceptions, Entisols and Histosols, occur in many different climates. The soil orders represented in San Benito County are Alfisols, Aridisols, Entisols, Inceptisols, Mollisols, Ultisols, and Vertisols.

SUBORDER: Each order is subdivided into suborders, primarily on the basis of those soil characteristics that seem to produce classes having the greatest genetic similarity. The suborders narrow the broad climatic range permitted in the orders. The soil properties used to separate suborders mainly reflect either the presence or absence of waterlogging or soil differences resulting from the climate or vegetation.

TABLE 7.—*Soil series classified according to the current system of classification*[1] *and the 1938 system with its later revisions*

Series	Current classification			1938 classification
	Family	Subgroup	Order	Great soil group
Antioch	Fine, montmorillonitic, thermic	Haplic Natrixeralfs	Alfisols	Soloth soils.
Arguello	Fine-loamy, mixed, thermic	Pachic Ultic Argixerolls	Mollisols	Brunizems.
Arnold	Sandy, mixed, thermic	Typic Xeropsamments	Entisols	Regosols.
Auberry	Fine-loamy, mixed, thermic	Ultic Haploxeralfs	Alfisols	Noncalcic Brown soils.
Botella	Fine-loamy, mixed, thermic	Pachic Argixerolls	Mollisols	Brunizems.
Cibo	Fine, montmorillonitic, thermic	Typical Chromoxererts	Vertisols	Grumusols.
Cieneba	Loamy, mixed, nonacid, thermic, shallow	Typic Xerorthents	Entisols	Lithosols.
Clear Lake	Fine, montmorillonitic, thermic	Typic Pelloxererts	Vertisols	Grumusols.
Climara	Fine, montmorillonitic, thermic	Chromic Pelloxererts	Vertisols	Grumusols.
Cometa	Fine, montmorillonitic, thermic	Typic Palexeralfs	Alfisols	Noncalcic Brown soils.
Conejo	Fine-loamy, mixed, thermic	Pachic Haploxerolls	Mollisols	Alluvial soils.
Corralitos	Sandy, mixed, thermic	Typic Xerpsamments	Entisols	Alluvial soils.
Cotati	Clayey, montmorillonitic, mesic	Typic Haploxerults	Ultisols	Planosols.
Cropley	Fine, montmorillonitic, thermic	Chromic Pelloxererts	Vertisols	Grumusols.
Diablo	Fine, montmorillonitic, thermic	Chromic Pelloxererts	Vertisols	Grumusols.
Docas	Fine-loamy, mixed, calcareous, thermic	Xeric Torrifluvents	Entisols	Alluvial soils.
Edenvale	Fine, montmorillonitic, thermic	Typic Pelloxererts	Vertisols	Grumusols.
Gaviota	Loamy, mixed, nonacid, thermic	Lithic Xerorthents	Entisols	Lithosols.
Gazos	Fine-loamy, mixed, thermic	Panhic Haploxerolls	Mollisols	Regosols intergrading to Brunizems.
Hanford	Coarse-loamy, mixed, nonacid, thermic	Typic Xerorthents	Entisols	Alluvial soils.
Henneke	Clayey-skeletal, serpentinitic, thermic	Lithic Argixerolls	Mollisols	Noncalcic Brown soils.
Kettleman	Fine-loamy, mixed, calcareous, thermic	Xeric Torriorthents	Entisols	Regosols.
Laniger	Ashy, thermic	Typic Vitrandepts	Inceptisols	Regosols.
Linne	Fine-loamy, mixed, thermic	Calcic Pachic Haploxerolls.	Mollisols	Regosols intergrading to Chestnut soils.
Lodo	Loamy, mixed, thermic	Lithic Haploxerolls	Mollisols	Lithosols.
Los Banos	Fine, montmorillonitic, thermic	Typic Haplargids	Aridisols	Noncalcic Brown soils.
Los Gatos	Fine-loamy, mixed, mesic	Typic Argixerolls	Mollisols	Brunizems.
Metz	Sandy, mixed, thermic	Typic Xerorthents	Entisols	Alluvial soils.
Mocho	Fine-loamy, mixed, thermic	Calcic Entic Haploxerolls.	Mollisols	Alluvial soils.
Montara	Loamy, serpentinitic, thermic	Lithic Haploxerolls	Mollisols	Lithosols.
Nacimiento	Fine-loamy, mixed, thermic	Calcic Entic Haploxerolls.	Mollisols	Regosols intergrading to Chestnut soils..
Pacheco	Fine-loamy, mixed, thermic	Aquic Haploxerolls	Mollisols	Humic Gley soils.
Panhill	Fine-silty, mixed, thermic	Typic Haplargids	Aridisols	Noncalcic Brown soils.
Panoche	Fine-loamy, mixed, calcareous, thermic	Xeric Torriorthents	Entisols	Alluvial soils.
Pinnacles	Fine, montmorillonitic, thermic	Ultic Palexeralfs	Alfisols	Noncalcic Brown soils.
Pinto	Fine-loamy, mixed, mesic	Argic Durixerolls	Mollisols	Noncalcic Brown soils intergrading to Yellowish-Brown Lateritic soils.
Pleasanton	Fine-loamy, mixed, thermic	Mollic Haploxeralfs	Alfisols	Noncalcic Brown soils.
Reiff	Coarse-loamy, mixed, nonacid, thermic	Typic Xerorthents	Entisols	Alluvial soils.
Rincon	Fine, montmorillonitic, thermic	Mollic Haploxeralfs	Alfisols	Noncalcic Brown soils intergrading to Brunizems.
Salinas	Fine-loamy, mixed, thermic	Calcic Pachic Haploxerolls.	Mollisols	Brunizems intergrading to Alluvial soils.
San Benito	Fine-loamy, mixed, thermic	Calcic Pachic Haploxerolls.	Mollisols	Regosols intergrading to Chestnut soils.
Santa Lucia	Clayey-skeletal, mixed, thermic	Pachic Ultic Haploxerolls.	Mollisols	Brunizems intergrading to Lithosols.
Shedd	Fine-loamy, mixed, calcareous, thermic	Xeric Torriorthents	Entisols	Regosols.
Sheridan	Coarse-loamy, mixed, mesic	Pachic Haploxerolls	Mollisols	Brunizems intergrading to Regosols.
Soper	Fine-loamy, mixed, thermic	Typic Argixerolls	Mollisols	Noncalcic Brown soils intergrading to Brunizems.
Sorrento	Fine-loamy, mixed, thermic	Calcic Entic Haploxerolls.	Mollisols	Alluvial soils.
Sween	Fine, montmorillonitic, thermic	Typic Argixerolls	Mollisols	Brunizems.
Vallecitos	Clayey, montmorillonitic, thermic	Ruptic-Lithic Mollic Palexeralfs.	Alfisols	Noncalcic Brown soils.
Willows	Fine, montmorillonitic, thermic	Chromic Pelloxererts	Vertisols	Solonchaks.
Yolo	Fine-silty, mixed, nonacid, thermic	Typic Xerocrepts	Inceptisols	Alluvial soils.

[1] Placement of some soil series in the current system of classification, particularly in families, may change as more precise information becomes available.

GREAT GROUP: Soil suborders are separated into great groups on basis of uniformity in the kinds of major soil horizons in sequence of these horizons, and in characteristics these horizons possess. The horizons used to make separations into great groups are those in which clay, iron, or humus have accumulated or those that have pans interfering with growth of roots or movement of water. Among the characteristics considered are the self-mulching properties of clays, soil temperature, and major differences in chemical composition (mainly calcium, magnesium, sodium, and potassium). The great group is not shown separately in table 7, because it is the last word in the name of the subgroup.

SUBGROUP: Great groups are subdivided into subgroups, one representing the central (typic) segment of the group, and others, called intergrades, that have properties of one great group and also one or more properties of another great group, suborder, or order. Subgroups may also be made in those instances where soil properties intergrade outside of the range of any other great group, suborder, or order.

FAMILY: Families are separated within a subgroup primarily on the basis of properties important to the growth of plants or behavior of soils used for engineering. Among the properties considered are texture, mineralogy, reaction, soil temperature, permeability, thickness of horizons, and consistence.

SERIES: As explained in the section "How This Survey Was Made," the series is a group of soils that have major horizons that, except for texture of the surface layer, are similar in important characteristics and arrangement in the profile. New soil series must be established and concepts of some established series, especially older ones that have been used little in recent years, must be revised in the course of the soil survey program across the country. A proposed new series has tentative status until review of the series concept at State, regional, and national levels of responsibility for soil classification results in a judgment that new series should be established. Most of the soil series described in this publication have been established earlier. Eight of the soil series used in this survey had tentative status when the survey was sent to the printer. They are the Cibo, Cieneba, Climara, Pacheco, Pinnacles, Reiff, San Benito, and Sween series.

General Nature of the County

This section discusses settlement and population, industries and transportation, water supply, agriculture, and climate of San Benito County. Statistics for population and agriculture are from reports by the U.S. Bureau of the Census.

Settlement and Population

The first settlement in the area that is now San Benito County was the San Juan Bautista Mission, which was founded by the Franciscan Fathers in 1797. The mission was the nucleus of the town of San Juan Bautista, and now it is one of the major tourist attractions in the county. The town of Hollister was laid out in 1868.

In February 1874, San Benito County was established by the California Legislature from part of Monterey County and Hollister was named the county seat. Later the county was enlarged to 893,440 acres when 43,440 acres were added from parts of Fresno and Merced Counties.

Rural settlement and growth of nonrural areas in San Benito County has closely paralleled agricultural development, though population has increased more slowly than in other areas of California. The population of San Benito County increased from 8,040 in 1910 to 15,396 in 1960. Hollister, which is the largest town had a population of 6,071 in 1960.

Industry and Transportation

The principal industries in San Benito County are those that process farm products. Petroleum and commercial sand and gravel are produced, and there is the mining of dolomite quicksilver, magnesite, limestone, and granite. Also, small manufacturing plants are located in the county.

The county is served by Federal, State, and local highways. State Route No. 25 (Airline Highway) crosses the county from north to south, and New Idria Road runs from Paicines to the southeastern part of the county. State Route No. 156 and U.S. Highway No. 101, the main coastal highway, cross the northern part of the county.

A branch of the Southern Pacific Lines extends to Hollister from a main line of that railroad in Santa Clara Valley nearby. This branch furnishes freight service. A municipal airport is located 2 miles north of Hollister.

Water Supply

In San Benito County both farming and industry depend on the quantity and quality of water. Quantity varies according to the amount of water in underground reservoirs that can be economically pumped, the annual drawdown of the underground water by pumping, the annual recharge of underground water, and the long-term effects of overdrafts on the underground water.

The use of irrigation for agricultural production started about 1890, and by 1960, 31,500 acres were irrigated from more than 700 wells. Water is pumped from depths ranging from 35 feet to more than 200 feet, but the average depth is about 100 feet. Drawdown is more than recharge, and reports indicate that the average annual overdraft is about 7,500 acre feet of water. Shortages of water may be serious if overuse of underground water continues.

The water generally is of good quality, but it contains an excessive amount of boron in several areas in the county. Some boron is necessary for plant growth but some crops are damaged if concentration reaches 1 part per million (p.p.m.). A concentration greater than 2 parts per million is generally considered hazardous to plants. Some evidence links the high content of boron to areas where geologic faulting is caused by deep intrusions of magma but the content of boron is also high in some deposits in old lakebeds.

Agriculture

Soon after settlement of San Benito County began, the grazing of livestock on the open range was the most important kind of agriculture. As settlement increased, however, the production of hay and small grains gradually replaced grazing on the deep, nearly level alluvial land in the Hollister and San Juan Valleys. Barley grown in these areas was noted for its brewing qualities. In about 1890, irrigation was introduced in these fertile valleys, and fruits and vegetables were intensively cultivated, as they are today. The surrounding hills and mountains are still used for grazing livestock.

Table 8 shows the acreage of the principal crops harvested in the county in 1964, and the numbers of grapevines and fruit and nut trees. The principal kinds and numbers of livestock grazed in the county in 1964 are shown in table 9.

TABLE 8.—*Acreage of crops in 1964* [1]

Crops	Acres
Barley	11, 493
Wheat	353
Oats	97
Corn	389
Alfalfa	3, 643
Sugar beets	3, 759
Tomatoes	3, 178
Lettuce	645
Green lima beans	298
Potatoes	296
Onions	271
Snap beans	200
Peppers	171
Seed beans	154
Squash	107
Fruit trees of all ages:	*Numbers*
Apple	23, 699
Peach	66
Pear	96, 222
Plum	259, 220
Prune	612
Cherry	4, 990
Apricot	372, 484
Grapevines	1, 509, 087
Nut trees of all ages:	
Walnut (English)	269, 517
Almond	373

[1] Small acreages of cucumbers, cabbage, spinach, cauliflower, and dry lima beans were also grown.

TABLE 9.—*Number of livestock on farms in 1964*

Livestock	Number
Cattle and calves	49, 876
Hogs and pigs	246
Sheep and lambs	14, 218
Chickens [1]	5, 937, 585

[1] 4 months old and older.

In 1964, approximately 87.2 percent of the 893,440 acres in San Benito County was in farms. The cropland totaled 119,961 acres, of which 44,355 acres was cropland pastured. Pasture totaled 693,288 acres and was made up of the cropland pastured, 16,387 acres of woodland pasture, and 632,546 acres of other pasture (noncropland, open range, or brush).

Climate

San Benito County has a moderate, relatively dry climate. Temperatures are occasionally high, particularly at the inland areas, but extremely low temperatures are rare. Precipitation is generally light, and irrigation is required for intensive cultivation of crops. Humidity is normally moderate to low, winds are light, and sunshine is abundant.

Effect of terrain on climate

San Benito County is characterized by mountains, peaks, passes, and valleys. These features affect climate by modifying the cool moist air that moves eastward from the Pacific Ocean and the hot, dry air that moves westward from the San Joaquin Valley in Fresno County.

The Gabilan Range, a spur of the Diablo Range, lies along the western border of the county and is a barrier to the cool moist air that moves in from the Pacific Ocean through the Salinas Valley in Monterey County. Some air from the Pacific, however, comes through the Chittenden Pass and spreads out through the rather broad Hollister Valley. The Diablo Range is in the eastern half of the county and has peaks that rise 4,000 and 5,000 feet above sea level and block out much of the hot air moving from the west. Near the extreme southeastern corner of the county, elevations fall as the east slopes of the range extend toward the San Joaquin Valley. West of the Diablo Range and within the Hollister Valley, summers are made cooler by the cool moist air from the Pacific Ocean, but the eastern part of the county near the San Joaquin Valley, particularly the southeastern corner, is hot and dry. The cool air moving into the Hollister Valley modifies afternoon temperatures that otherwise would be very high.

Precipitation is also affected by the rugged terrain. Winter storms bringing moisture from the Pacific Ocean cross the Santa Lucia Mountains and lose some moisture before crossing the Salinas Valley and entering the southern part of the county. The added lifting caused by a spur of the Diablo Range increases precipitation somewhat, but rainfall in the southern part of the county is less than it would be if the Santa Lucia Mountains had not already extracted some of the moisture. To the north, air moves from the Monterey Bay area through the Chittenden Pass and enters the Hollister area with a minimum of lifting and loss of moisture. As a result, the amount of moisture is somewhat greater in the northern part than the amount at equivalent elevations elsewhere in the county. Only in the southern part are the mountains so high that snow occurs with some regularity, but even here snowfall is light.

Temperature.—Table 10 gives temperature data for six weather bureau stations in San Benito County and adjacent Fresno County. The data in this table were compiled from records of different lengths and covering different periods of years.

The mean annual temperatures shown in table 10 reflect the influence of the mountainous terrain, of the marine air from the Pacific Ocean, and of the hot air from the San Joaquin Valley. The mean annual temperatures are lowest at the northwestern corner of the county near Chittenden Pass, where cool marine air holds temperatures down throughout most of the summer. Some of the mountain valleys are also cool during summer. The highest mean annual temperatures occur at low elevations in the southeastern part of the county near the San Joaquin Valley.

The mean minimum temperature in January averages below freezing in most of the mountain valleys and above freezing at lower elevations. Temperatures of 15° F. or lower have occurred at most places in the county,

TABLE 10.—*Temperature data for six weather stations*

HOLLISTER, SAN BENITO COUNTY

Month	Highest	Mean maximum	Mean temperature	Mean minimum	Lowest
January	84	60.3	48.8	37.3	15
February	84	64.1	52.1	40.1	22
March	89	68.2	55.1	42.0	29
April	98	72.2	58.4	44.5	31
May	101	75.1	61.6	48.1	36
June	108	79.2	65.0	50.7	38
July	109	82.5	67.6	52.6	37
August	104	82.2	67.2	52.2	41
September	109	83.4	67.5	51.1	41
October	105	77.7	62.6	47.5	28
November	92	69.6	55.4	41.2	24
December	81	62.2	50.3	38.4	21
Annual	109	73.1	59.3	45.5	15

INDRIA, SAN BENITO COUNTY

January	85	54.5	45.2	36.1	14
February	82	56.8	47.3	37.2	18
March	90	61.8	51.0	40.1	18
April	94	68.6	56.7	44.6	25
May	103	77.0	63.8	50.5	30
June	111	85.7	71.8	57.7	34
July	113	93.2	80.0	66.7	40
August	112	93.1	78.4	64.7	41
September	104	86.1	72.9	59.0	39
October	96	75.1	63.2	51.3	30
November	85	64.5	53.6	42.6	21
December	86	57.7	47.8	38.3	20
Annual	113	72.8	61.0	49.1	14

MERCEY HOT SPRINGS, FRESNO COUNTY

January	76	53.7	44.4	35.2	16
February	76	57.4	48.9	38.5	23
March	83	63.1	52.2	41.2	27
April	92	70.8	58.4	46.0	30
May	100	81.3	66.5	51.7	32
June	108	88.5	73.5	58.4	42
July	113	97.2	81.3	65.5	46
August	113	95.6	79.8	64.0	47
September	104	88.7	73.5	58.2	42
October	99	78.0	64.1	50.2	33
November	81	66.6	53.7	40.6	20
December	76	57.3	47.3	36.9	18
Annual	113	74.9	61.9	48.9	16

TABLE 10.—*Temperature data for six weather stations*—Con.

PANOCHE JUNCTION, FRESNO COUNTY

Month	Highest	Mean maximum	Mean temperature	Mean minimum	Lowest
January	72	54.9	46.0	37.1	21
February	79	61.1	50.5	39.8	24
March	85	66.9	54.7	42.4	27
April	98	76.3	62.0	47.6	32
May	107	85.2	69.0	52.7	38
June	114	93.4	76.0	58.6	41
July	114	100.6	82.2	63.7	46
August	110	96.8	79.1	61.4	46
September	113	91.7	75.8	59.8	41
October	104	80.0	70.0	60.0	35
November	86	66.3	54.9	43.4	25
December	74	56.7	47.6	38.4	22
Annual	114	77.5	64.0	50.4	21

PINNACLES NATIONAL MONUMENT, SAN BENITO COUNTY

January	83	59.5	46.5	33.5	10
February	85	61.8	48.7	35.6	18
March	88	65.5	51.3	37.1	22
April	96	71.5	55.8	40.0	24
May	104	79.3	61.7	44.1	30
June	112	88.2	67.8	47.4	32
July	113	96.2	73.6	51.0	38
August	112	94.6	72.4	50.1	38
September	114	91.0	70.1	49.1	33
October	106	80.6	62.2	43.7	26
November	93	70.4	54.0	37.6	20
December	90	62.4	48.9	35.3	20
Annual	114	76.8	59.4	42.0	10

PRIEST VALLEY, SAN BENITO COUNTY

January	74	54.5	40.7	26.8	5
February	79	57.5	42.7	27.8	11
March	81	60.8	45.4	30.0	15
April	91	68.5	51.4	34.3	18
May	102	75.0	56.3	37.6	22
June	103	83.4	63.0	42.5	29
July	110	92.4	70.7	49.0	35
August	106	90.4	68.8	47.2	34
September	106	86.5	64.9	43.2	26
October	99	76.3	56.4	36.4	15
November	85	64.4	47.5	30.6	11
December	83	56.7	43.7	28.6	14
Annual	110	72.2	54.2	36.2	5

and a reading of 5° has been recorded at the Priest Valley Station. Such extreme temperatures, however, are infrequent and of short duration.

The mean maximum temperature in July ranges from about 75° in the Chittenden Pass area to about 100° east of Panoche. Temperatures above 100° are common in the eastern corner of the county, but they are infrequent in the western part. Maximum temperatures of at least 105° have been reported in areas most affected by marine air, and readings of 114° have been observed at other points within the county.

The length of the frost-free period, or growing season, varies throughout the county. It ranges from 275 days in the northwestern tip to 150 days at the southern tip. The growing season is about 275 days at Hollister, 250

days at Idria and Panoche, 200 days near Pinnacles National Monument, and 150 days in Priest Valley.

Precipitation.—Table 11 gives average monthly and annual precipitation for 15 weather bureau stations in San Benito County and in nearby Fresno County. The data in this table were compiled from records of different lengths and covering different periods of years. Because of the varied terrain, average annual precipitation varies considerably within short distances. Over most of the San Benito Valley, the annual rainfall is between 12 and 15 inches, but at higher elevations in the northern part of the county, rainfall is more than 20 inches. An annual total of 16 to 18 inches is common at the higher elevations in the central and southern parts of the county. In the southeastern part of the county near the San Joaquin Valley, annual rainfall is about 8 inches.

Total annual precipitation also varies considerably from year to year. In 5 years out of 10, between 5 and 10 inches can be expected in the southeastern part of the county and between 13 and 20 inches can be expected at the higher elevations in the northwestern and southern corners. In 1 year in 10, as much as 10 to 12 inches or as little as 4 inches can be expected in the southeastern part and as much as 25 to 30 inches or as little as 11 to 12 inches in the northwestern and southern corners.

The average intensity of rainfall in 1 year out of 2 amounts to 0.40 to 0.50 inch in 1 hour, 0.75 to 1.50 inches in 6 hours, and 1.00 to 3.00 inches in 24 hours. Only once in 100 years do these amounts increase to 0.90 to 1.00 inch in 1 hour, 1.90 to 3.75 inches in 6 hours, and 2.60 to 7.80 inches in 24 hours. The mountain areas receive the heaviest amounts.

Relative humidity.—During winter relative humidity is more than 50 percent most of the time. It averages 90 percent or more during the night in cooler areas and 75 percent or more in warmer areas. In spring relative humidity averages 60 to 75 percent at night and 40 to 50 percent during the day. Summers are quite dry, the average relative humidity in the daytime is about 20 to 25 percent in inland areas and 30 to 40 percent in areas that receive large amounts of marine air. In the areas receiving marine air, relative humidity increases to 70 percent or higher at night. In fall readings of 45 to 60 percent are common at night, but during the day readings generally range from 30 to 50 percent.

Wind.—Although records have not been kept, it appears that winds blow from the northwest during summer and from the southeast during winter. Winds in local areas may vary considerably from these typical conditions because of the terrain. Winds are normally light. Strong winds carrying marine air flow into the Hollister area at times during the summer. Strong winds blow over the entire county during winter storms.

Windspeeds may be expected to reach 30 miles per hour or slightly higher once every 2 years, 60 to 70 miles per hour once in 50 years, and 70 to 75 miles per hour once in 100 years.

TABLE 11.—*Average monthly and annual precipitation*

Station	January	February	March	April	May	June	July	August	September	October	November	December	Annual
	Inches	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*
Buena Vista	2. 45	2. 28	2. 19	1. 28	0. 49	0. 02	(1)	0. 01	0. 17	0. 55	1. 41	2. 55	13. 40
Chittenden Pass	3. 89	2. 90	2. 71	1. 57	. 59	. 06	. 01	. 01	. 46	. 62	1. 84	3. 63	18. 29
Hollister	2. 64	2. 20	2. 15	1. 01	. 44	. 10	. 02	. 01	. 50	. 57	1. 32	2. 33	13. 29
Idria	3. 09	3. 40	2. 60	1. 47	. 46	. 06	. 01	. 05	. 08	. 53	1. 07	3. 04	15. 86
Mercey Hot Springs	1. 90	1. 69	1. 16	. 79	. 24	. 02	. 02	. 01	. 17	. 31	. 48	1. 58	8. 37
Paicines Ohrwall Ranch	2. 75	2. 78	2. 24	1. 35	. 49	. 03	. 01	. 03	. 21	. 57	1. 58	3. 08	15. 12
Panoche	1. 97	1. 24	1. 10	. 82	. 31	. 03	(1)	. 01	. 10	. 36	. 92	1. 62	8. 48
Panoche Junction	1. 16	1. 05	. 99	. 68	. 29	. 04	(1)	(1)	. 09	. 23	. 45	. 98	5. 96
Pinnacles National Monument	3. 15	3. 25	2. 86	1. 37	. 37	. 03	(1)	(1)	. 14	. 47	1. 43	2. 95	16. 02
Priest Valley	3. 97	4. 39	3. 09	1. 75	. 50	. 09	. 01	. 02	. 16	. 55	1. 45	3. 89	19. 87
San Benito	2. 36	2. 56	2. 05	1. 24	. 33	. 06	(1)	. 01	. 10	. 54	1. 04	2. 73	13. 02
San Juan Bautista	3. 54	2. 79	2. 72	1. 49	. 59	. 08	(1)	. 03	. 29	. 58	2. 24	2. 88	17. 23
Stayton Mine	4. 30	3. 95	3. 49	2. 15	. 82	. 13	(1)	. 01	. 31	. 77	2. 57	4. 04	22. 54
Tres Pinos	4. 26	1. 69	2. 28	. 51	. 47	. 06	0	(1)	. 08	. 25	. 83	2. 21	12. 64
Upper Tres Pinos	2. 63	2. 52	2. 15	1. 14	. 29	. 05	. 01	. 01	. 09	. 44	1. 35	2. 95	13. 63

[1] Trace.

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Glossary

Accelerated erosion. Erosion of the soil or rock over and above normal erosion brought about by changes in the natural cover or ground conditions, including changes due to human activity and those caused by lightning or rodent invasion. (See also, Geologic Erosion.)

Alluvium. Fine material, such as gravel, sand, silt, or clay, deposited on land by streams.

Available water holding capacity (also termed available moisture holding capacity). The difference between the amount of water in a soil at field capacity and the amount in the same soil at the permanent wilting point of plants. Commonly expressed as inches of water per inch depth of soil.

Claypan. A compact, very slowly permeable soil horizon that contains more clay than the horizon above and below it. A claypan is commonly hard when dry and plastic or stiff when wet.

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; will not hold together in a mass when dry or moist.

Friable.—When moist, crushes easily under gentle to moderate pressure between thumb and forefinger and can be pressed together in a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material; tends to stretch somewhat and pull apart rather than 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 and brittle; little affected by moistening. A weakly cemented mass is brittle and hard, but it can be broken in the hands. A strongly cemented mass is brittle; it is too hard to be broken in the hand but can easily be broken with a hammer. An indurated mass is very strongly cemented and brittle, does not soften under prolonged wetting, and a sharp blow with a hammer is required to break it.

Drainage, natural. Soil drainage that existed during the development of the soil, 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 different classes of natural drainage are recognized. These classes range from excessively drained to very poorly drained.

Effective rooting depth. The depth from the surface, in inches, to which plant roots will penetrate. Depth classes: Very deep (60 inches or more), deep (40 to 60 inches), moderately deep (20 to 40 inches), shallow (10 to 20 inches), very shallow, (less than 10 inches).

Flood plain. Nearly level land, consisting of stream sediments, that borders a stream and is subject to flooding unless protected artificially.

Forb. Any herbaceous plant, neither a grass nor a sedge, that is grazed on western ranges.

Geologic erosion. The wearing away of the land surface by wind, running water, and other geological agents.

Gleyed soil. A soil in which waterlogging and lack of oxygen have caused the material in one or more horizons to be neutral gray in color. The term "gleyed" is applied to soil horizons with yellow and gray mottling caused by intermittent waterlogging.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes.

O horizon.—The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.

A horizon.—The mineral horizon at the surface or just below an O horizon. This horizon is the mineral horizon in which living organisms are most active, and it is therefore marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay and sesquioxides (iron and aluminum oxides).

B horizon.—The mineral horizon below an A horizon, The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused by (1) accumulation of clay, sesquioxides, humus, or some combination of these; (2) prismatic or blocky structure; and (3) redder or stronger colors than the A horizon; or (4) some combination of these. Combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The weathered rock material immediately beneath the solum. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum, a Roman numeral precedes the letter, C.

R layer.—Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Montmorillonite. A fine, platy, alumino-silicate clay mineral that expands and contracts with the absorption and loss of water. It has a high cation-exchange capacity and is plastic and sticky when moist.

Morphology, soil. The makeup of the soil, including the texture, structure, consistence, color, and other physical, chemical, mineralogical, and biological properties of the various horizons that make up the soil profile.

Munsell notation. A system for designating color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with a hue of 10YR, a value of 6, and a chroma of 4.

Organic matter. For the purposes of this survey, organic matter content is classified as follows: Low, 0 to 1½ percent; medium, 1½ to 2½ percent; high, over 2½ percent.

Permeability, soil. The quality of a soil horizon that enables water or air to move through it. Terms used to describe permeability are as follows: Very slow, slow, moderately slow, moderate, moderately rapid, rapid, and very rapid.

Profile soil. A vertical section of the soil through all its horizons and extending into the parent material. See Horizon, soil.

Reaction, soil. The degree of acidity or alkalinity of a soil expressed in words and in pH values, as follows:

	pH		*pH*
Extremely acid	Below 4.5	Neutral	6.6 to 7.3
Very strongly acid	4.5 to 5.0	Mildly alkaline	7.4 to 7.8
Strongly acid	5.1 to 5.5	Moderately alkaline	7.9 to 8.4
Medium acid	5.6 to 6.0	Strongly alkaline	8.5 to 9.0
Slightly acid	6.1 to 6.5	Very strongly alkaline	9.1 and higher

Saline-alkali soil. A soil that contains a harmful quantity of salts and either a high degree of alkalinity, a large amount of exchangeable sodium, or both, so distributed in the soil profile that the growth of most crop plants is less than normal.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the base of a slip surface on a relatively steep slope; and in swelling clays, where there is marked change in moisture content.

Soil separates. Mineral particles, less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows: *Very coarse sand* (2.0 to 1.0 millimeter); *coarse sand* (1.0 to 0.5 millimeter); *medium sand* (0.5 to 0.25 millimeter); *fine sand* (0.25 to 0.10 millimeter); *very fine sand* (0.10 to 0.05 millimeter); *silt* (0.05 to 0.002 millimeter); and *clay* (less than 0.002 millimeter).

Solum. The upper part of the soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soil includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plants and animal life characteristic of the soil are largely confined to the solum.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. 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 (1) *single grain* (each grain by itself, as in dune sand) (2) *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically, the B horizon; roughly the part of the profile below plow depth and above the substratum.

Surface soil or layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness. The plowed layer.

Terrace (geological). A level or gently undulating old alluvial plain bordering a stream valley, river, lake or the sea. Elevation is intermediate between that of the flood plain and the upland.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportions 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 textural classes may be further described as "coarse," "fine," or "very fine" and by "gravely," "stony," or "rocky."

GUIDE TO MAPPING UNITS

For a full description of a mapping unit, read both the description of the mapping unit and the description of the soil series to which the mapping unit belongs.

Dashes indicate that the soil was not placed in a pasture and range site. Other information is given in tables as follows:

Acreage and extent, table 1, p. 7.
Estimated yields, table 2, p. 69.
Storie index rating, table 3, p. 73.

Engineering uses of the soils, tables 4, 5, and 6, pp. 80 through 99.

Map symbol	Mapping unit	Described on page	Capability unit		Pasture and range site	
			Symbol	Page	Number	Page
AnA	Antioch loam, 0 to 2 percent slopes	9	IIIs-3(14)	63	4	77
AnB	Antioch loam, 2 to 5 percent slopes	9	IIIe-3(14)	60	4	77
			IVe-3(15)	64		
AnC2	Antioch loam, 5 to 9 percent slopes, eroded	9	IIIe-3(14)	60	4	77
			IVe-3(15)	64		
AoD2	Antioch clay loam, 9 to 15 percent slopes, eroded	9	IVe-3(15)	64	4	77
ArC	Arguello loam, 2 to 9 percent slopes	10	IIIe-1(15)	60	--	--
AsD	Arguello shaly loam, 9 to 15 percent slopes	10	IVe-1(15)	64	2	76
AtD	Arnold loamy sand, 9 to 15 percent slopes	11	IIIs-4(14)	63	3	76
AtE2	Arnold loamy sand, 15 to 30 percent slopes, eroded	11	VIe-4(15)	66	3	76
AtF3	Arnold loamy sand, 30 to 50 percent slopes, severely eroded	10	VIIe-4(15)	67	3	76
AuE	Auberry fine sandy loam, 15 to 30 percent slopes	11	VIe-1(15)	66	3	76
AuG2	Auberry fine sandy loam, 30 to 75 percent slopes, eroded	11	VIIe-1(15)	67	3	76
BaG	Badland	12	VIIIe-1(15)	68	--	--
BoA	Botella loam, 0 to 2 percent slopes	12	I-1(14)	56	--	--
			IIIc-1(15)	64		
BoC	Botella loam, 2 to 9 percent slopes	12	IIe-1(14)	57	--	--
			IIIe-1(15)	60		
CbF2	Cibo stony clay, 15 to 50 percent slopes, eroded	13	VIs-5(15)	66	5	78
CcG2	Cibo rocky clay, shallow, 15 to 75 percent slopes, eroded	13	VIIs-1(15)	68	5	78
CgG3	Cieneba gravelly sandy loam, 15 to 75 percent slopes, severely eroded	13	VIIIs-1(15)	68	--	--
CgG2	Cieneba gravelly sandy loam, 30 to 75 percent slopes, eroded	14	VIIe-4(15)	67	3	76
Ch	Clear Lake clay	14	IIs-5(14)	59	--	--
Ck	Clear Lake clay, saline	14	IIIw-5(14)	62	11	79
Cl	Clear Lake silty clay loam	14	IIIw-5(15)	62	--	--
CmD	Climara clay, 9 to 15 percent slopes	14	IIIe-5(15)	62	1	76
CmF2	Climara clay, 15 to 50 percent slopes, eroded	15	VIe-5(15)	66	1	76
CnD2	Cometa loam, 5 to 15 percent slopes, eroded	15	IVe-3(15)	64	4	77
CoD2	Cometa sandy loam, 5 to 15 percent slopes, eroded	15	IVe-3(15)	64	4	77
CpC	Conejo clay loam, 2 to 9 percent slopes	16	IIIe-5(15)	62	--	--
CuC	Corralitos loamy sand, 2 to 9 percent slopes	16	IIIs-4(14)	63	--	--
CvC	Cotati loam, 2 to 9 percent slopes	17	IVe-3(15)	64	4	77
CvD2	Cotati loam, 9 to 15 percent slopes, eroded	17	VIe-3(15)	66	4	77
CvE2	Cotati loam, 15 to 30 percent slopes, eroded	17	VIe-3(15)	66	4	77
CwA	Cropley clay, 0 to 2 percent slopes	18	IIs-5(14)	59	--	--
CwC	Cropley clay, 2 to 9 percent slopes	18	IIe-5(14)	58	--	--
			IIIe-5(15)	62		
CyC	Cropley silty clay loam, 2 to 9 percent slopes	19	IIe-5(14)	58	--	--
DaD	Diablo clay, 9 to 15 percent slopes	20	IIIe-5(15)	62	1	76
DaE2	Diablo clay, 15 to 30 percent slopes, eroded	19	IVe-5(15)	65	1	76
DaF2	Diablo clay, 30 to 50 percent slopes, eroded	20	VIe-5(15)	66	1	76
DaG3	Diablo clay, 50 to 75 percent slopes, severely eroded	20	VIIe-5(15)	67	1	76
DlD	Diablo-Linne complex, 9 to 15 percent slopes	20	IIIe-5(15)	62	1	76
DlE2	Diablo-Linne complex, 15 to 30 percent slopes, eroded	20	IVe-5(15)	65	1	76

GUIDE TO MAPPING UNITS--Continued

Map symbol	Mapping unit	Described on page	Capability unit		Pasture and range site	
			Symbol	Page	Number	Page
DlF2	Diablo-Linne complex, 30 to 50 percent slopes, eroded	20	VIe-5(15)	66	1	76
DoA	Docas silt loam, 0 to 2 percent slopes	20	IVc-1(15)	65	7	78
DoC	Docas silt loam, 2 to 9 percent slopes	21	IVc-1(15)	65	7	78
DsA	Docas clay loam, 0 to 2 percent slopes	21	IVc-1(15)	65	7	78
DsC	Docas clay loam, 2 to 9 percent slopes	21	IVc-1(15)	65	7	78
EcA	Edenvale clay, 0 to 2 percent slopes	21	IIIw-5(15)	62	--	--
GaE	Gaviota loam, 15 to 30 percent slopes	23	VIe-1(15)	66	6	78
GaE2	Gaviota loam, 15 to 30 percent slopes, eroded	23	VIe-1(15)	66	6	78
GaF2	Gaviota loam, 30 to 50 percent slopes, eroded	22	VIIe-1(15)	67	6	78
GrF2	Gaviota rocky loam, 15 to 50 percent slopes, eroded	23	VIIs-1(15)	68	6	78
GsD	Gazos silty clay loam, 9 to 15 percent slopes	24	IIIe-5(15)	62	5	78
GtE2	Gazos clay loam, 15 to 30 percent slopes, eroded	23	IVe-5(15)	65	5	78
GtF2	Gazos clay loam, 30 to 50 percent slopes, eroded	24	VIe-5 (15)	66	5	78
GtG3	Gazos clay loam, 50 to 75 percent slopes, severely eroded	24	VIIe-5(15)	67	5	78
GuE	Gullied land	24	VIIe-1(15)	67	6	78
HaA	Hanford coarse sandy loam, 0 to 2 percent slopes	24	IIs-4(14) IIIs-4(15)	59 63	--	--
HaC	Hanford coarse sandy loam, 2 to 9 percent slopes	25	IIIe-4(14) IIIe-1(15)	61 60	--	--
HfA	Hanford loam, 0 to 2 percent slopes	25	I-1(14) IIIc-1(15)	56 64	--	--
HfC	Hanford loam, 2 to 9 percent slopes	25	IIe-1(14) IIIe-1(15)	57 60	--	--
HnF2	Henneke fine gravelly loam, 15 to 50 percent slopes, eroded	25	VIIe-1(15)	67	8	78
HsG3	Henneke soils, 15 to 75 percent slopes, severely eroded	26	VIIIs-1(15)	68	--	--
IgC	Igneous rock land	26	VIIIs-1(15)	68	--	--
KeD	Kettleman loam, 5 to 15 percent slopes	27	VIe-1(15)	66	9	79
KeF2	Kettleman loam, 15 to 50 percent slopes, eroded	26	VIIe-1(15)	67	9	79
KmF2	Kettleman soils, 15 to 50 percent slopes, eroded	27	VIIe-1(15)	67	9	79
LaG3	Laniger gravelly sandy loam, 30 to 75 percent slopes, severely eroded	27	VIIe-4(15)	67	3	76
LdF	Landslides	27	VIIe-5(15)	67	1	76
LnD	Linne clay loam, 9 to 15 percent slopes	28	IIIe-5(15)	62	1	76
LnE2	Linne clay loam, 15 to 30 percent slopes, eroded	28	IVe-5(15)	65	1	76
LnF2	Linne clay loam, 30 to 50 percent slopes, eroded	28	VIe-5(15)	66	1	76
LnF3	Linne clay loam, 30 to 50 percent slopes, severely eroded	28	VIIe-5(15)	67	1	76
LsE2	Linne-Shedd complex, 15 to 30 percent slopes, eroded	28	IVe-5(15)	65	7	78
LsF2	Linne-Shedd complex, 30 to 50 percent slopes, eroded	29	VIe-5(15)	66	7	78
LtG2	Lodo shaly loam, 50 to 75 percent slopes, eroded	29	VIIe-1(15)	67	5	78
LuC	Los Banos clay loam, 2 to 9 percent slopes	30	VIIe-1(15)	67	10	79
LuD2	Los Banos clay loam, 9 to 15 percent slopes, eroded	29	VIIe-1(15)	67	10	79
LuF3	Los Banos clay loam, 15 to 50 percent slopes, severely eroded	30	VIIe-1(15)	67	9	79
LvE	Los Gatos clay loam, 15 to 30 percent slopes	30	IVe-5(15)	65	5	78
LvF2	Los Gatos clay loam, 30 to 50 percent slopes, eroded	30	VIe-5(15)	66	5	78
LwF2	Los Gatos rocky clay loam, 15 to 50 percent slopes, eroded	31	VIs-5(15)	66	5	78
MeA	Metz sandy loam, 0 to 2 percent slopes	31	IIs-4(14) IIIs-4(15)	59 63	--	--
MgA	Metz gravelly sandy loam, 0 to 2 percent slopes	31	IIIs-4(14)	63	--	--
MgC	Metz gravelly sandy loam, 2 to 9 percent slopes	31	IIIe-4(14)	61	--	--
MhA	Metz sandy loam, wet variant, 0 to 2 percent slopes	32	IIw-2(14)	59	--	--
MnG	Mine pits and dumps	32	VIIIs-1(15)	68	--	--
MoA	Mocho sandy loam, 0 to 2 percent slopes	33	I-1(14) IIIc-1(15)	56 64	--	--
MoC	Mocho sandy loam, 2 to 9 percent slopes	33	IIe-1(14) IIIe-1(15)	57 60	--	--

GUIDE TO MAPPING UNITS--Continued

Map symbol	Mapping unit	Described on page	Capability unit		Pasture and range site	
			Symbol	Page	Number	Page
MpA	Mocho loam, 0 to 2 percent slopes	32	I-1(14) IIIc-1(15)	56 64	--	--
MpC	Mocho loam, 2 to 9 percent slopes	33	IIe-1(14) IIIe-1(15)	57 60	--	--
MrB	Mocho gravelly loam, 2 to 5 percent slopes	33	IIe-1(14)	57	--	--
MsC	Mocho clay loam, 2 to 9 percent slopes	33	IIe-5(14) IIIe-5(15)	58 62	--	--
MtF2	Montara rocky silty clay loam, 15 to 50 percent slopes, eroded	33	VIIs-9(15)	68	8	78
NaD	Nacimiento clay loam, 9 to 15 percent slopes	34	IIIe-5(15)	62	1	76
NaE	Nacimiento clay loam, 15 to 30 percent slopes	34	IVe-5(15)	65	1	76
NaF2	Nacimiento clay loam, 30 to 50 percent slopes, eroded	34	VIe-5(15)	66	1	76
NaG2	Nacimiento clay loam, 50 to 75 percent slopes, eroded	34	VIIe-5(15)	67	1	76
NcG3	Nacimiento loam, 30 to 75 percent slopes, severely eroded	34	VIIIe-1(15)	68	--	--
Pa	Pacheco silt loam	35	IIw-2(14)	59	11	79
Pc	Pacheco loam	35	IIw-2(14)	59	--	--
Pd	Pacheco clay loam over clay	35	IIw-2(14)	59	--	--
Pe	Pacheco silty clay	35	IIs-5(14)	59	--	--
PhC	Panhill loam, 2 to 9 percent slopes	36	VIIc-1(15)	68	10	79
PkA	Panoche sandy loam, 0 to 2 percent slopes	37	I-1(17) VIIc-1(15)	57 68	10	79
PkC	Panoche sandy loam, 2 to 9 percent slopes	38	IIe-1(17) VIIc-1(15)	58 68	10	79
PlA	Panoche loam, 0 to 2 percent slopes	37	I-1(17) VIIc-1(15)	57 68	10	79
PlC	Panoche loam, 2 to 9 percent slopes	37	IIe-1(17) VIIc-1(15)	58 68	10	79
PnE2	Pinnacles coarse sandy loam, 15 to 30 percent slopes, eroded	38	VIe-3(15)	66	3	76
PnG3	Pinnacles coarse sandy loam, 30 to 75 percent slopes, severely eroded	38	VIIe-1(15)	67	3	76
PsE2	Pinto sandy loam, 15 to 30 percent slopes, eroded	39	VIe-1(15)	66	3	76
PtB	Pleasanton loam, 2 to 5 percent slopes	39	IIe-1(14) IIIe-3(15)	57 61	4	77
PvC2	Pleasanton gravelly loam, 5 to 9 percent slopes, eroded	39	IIIe-1(14) IIIe-3(15)	60 61	4	77
ReA	Reiff sandy loam, 0 to 2 percent slopes	40	I-1(14) IIIc-1(15)	56 64	--	--
ReC	Reiff sandy loam, 2 to 9 percent slopes	40	IIe-1(14) IIIe-1(15)	57 60	--	--
RnA	Rincon loam, 0 to 2 percent slopes	41	IIs-5(14)	59	--	--
RnC	Rincon loam, 2 to 9 percent slopes	41	IIIe-1(14) IIIe-3(14)	60	--	--
RnD2	Rincon loam, 9 to 15 percent slopes, eroded	41	IVe-1(15)	64	4	77
RsA	Rincon silty clay loam, 0 to 2 percent slopes	40	IIs-5(14) IIe-5(14)	59 58	--	--
RsC	Rincon silty clay loam, 2 to 9 percent slopes	41	IIIe-5(15)	62	--	--
RsD2	Rincon silty clay loam, 9 to 15 percent slopes, eroded	41	IIIe-5(15)	62	4	77
Rw	Riverwash	41	VIIIw-4(14)	68	--	--
SaA	Salinas clay loam, 0 to 2 percent slopes	42	I-1(14) IIIc-1(15)	56 64	--	--
SaC	Salinas clay loam, 2 to 9 percent slopes	42	IIe-5(14) IIIe-5(15)	58 62	--	--
SbD	San Benito clay loam, 9 to 15 percent slopes	43	IIIe-5(15)	62	5	78
SbE2	San Benito clay loam, 15 to 30 percent slopes, eroded	42	IVe-5(15)	65	5	78

GUIDE TO MAPPING UNITS--Continued

Map symbol	Mapping unit	Described on page	Capability unit		Pasture and range site	
			Symbol	Page	Number	Page
SbF2	San Benito clay loam, 30 to 50 percent slopes, eroded-	43	VIe-5(15)	66	5	78
SbF3	San Benito clay loam, 30 to 50 percent slopes, severely eroded----------	43	VIIe-5(15)	67	5	78
Sc	Sandy alluvial land----------	44	VIIw-4(14)	67	5	78
SdF2	Santa Lucia shaly loam, 30 to 50 percent slopes, eroded----------	44	VIe-1(15)	66	2	76
SdG3	Santa Lucia shaly loam, 30 to 75 percent slopes, severely eroded----------	44	VIIe-1(15)	67	2	76
SeG	Sedimentary rock land----------	44	VIIIs-1(15)	68	--	--
ShD	Shedd loam, 9 to 15 percent slopes----------	45	IVe-1(15)	64	7	78
ShE2	Shedd loam, 15 to 30 percent slopes, eroded----------	45	VIe-1(15)	66	7	78
ShF2	Shedd loam, 30 to 50 percent slopes, eroded----------	45	VIIe-1(15)	67	7	78
ShF3	Shedd loam, 30 to 50 percent slopes, severely eroded--	45	VIIe-1(15)	67	7	78
SkD	Sheridan coarse sandy loam, 9 to 15 percent slopes----	46	IVe-1(15)	64	3	76
SkE	Sheridan coarse sandy loam, 15 to 30 percent slopes---	46	VIe-4(15)	66	3	76
SkE2	Sheridan coarse sandy loam, 15 to 30 percent slopes, eroded----------	46	VIe-4(15)	66	3	76
SkG2	Sheridan coarse sandy loam, 30 to 75 percent slopes, eroded----------	46	VIIe-4(15)	67	3	76
SkG3	Sheridan coarse sandy loam, 30 to 75 percent slopes, severely eroded----------	46	VIIe-4(15)	67	3	76
SlD	Soper gravelly loam, 9 to 15 percent slopes----------	47	IVe-1(15)	64	3	76
SlE2	Soper gravelly loam, 15 to 30 percent slopes, eroded--	47	VIe-1(15)	66	3	76
SlF2	Soper gravelly loam, 30 to 50 percent slopes, eroded--	47	VIIe-1(15)	67	3	76
SmD	Soper sandy loam, 9 to 15 percent slopes----------	47	IVe-1(15)	64	3	76
SmE2	Soper sandy loam, 15 to 30 percent slopes, eroded-----	47	VIe-1(15)	66	3	76
SmF2	Soper sandy loam, 30 to 50 percent slopes, eroded-----	47	VIIe-1(15)	67	3	76
SnA	Sorrento silt loam, 0 to 2 percent slopes----------	48	I-1(14) IIIc-1(15)	56 64	--	--
SnC	Sorrento silt loam, 2 to 9 percent slopes----------	48	IIe-1(14) IIIe-1(15)	57 60	--	--
SoB	Sorrento gravelly loam, 0 to 5 percent slopes---------	48	IIs-4(14)	59	--	--
SrA	Sorrento silty clay loam, 0 to 2 percent slopes-------	48	I-1(14) IIIc-1(15)	56 64	--	--
SrC	Sorrento silty clay loam, 2 to 9 percent slopes-------	48	IIe-5(14) IIIe-5(15)	58 62	--	--
SsE2	Sween rocky clay loam, 15 to 30 percent slopes, eroded----------	50	VIs-5(15)	66	5	78
SsF2	Sween rocky clay loam, 30 to 50 percent slopes, eroded----------	50	VIs-5(15)	66	5	78
StE2	Sween stony clay loam, 15 to 30 percent slopes, eroded----------	50	VIs-5(15)	66	5	78
SwF2	Sween very stony clay loam, 15 to 50 percent slopes, eroded----------	50	VIIs-1(15)	68	5	78
TeF	Terraces escarpments----------	51	VIe-1(15)	66	4	77
VaD	Vallecitos loam, 9 to 15 percent slopes----------	51	IVe-1(15)	64	6	78
VaE	Vallecitos loam, 15 to 30 percent slopes----------	51	VIe-1(15)	66	6	78
VaF	Vallecitos loam, 30 to 50 percent slopes----------	51	VIe-1(15)	66	6	78
VaF2	Vallecitos loam, 30 to 50 percent slopes, eroded------	51	VIIe-1(15)	67	6	78
VrE2	Vallecitos rocky loam, 9 to 30 percent slopes, eroded-	52	VIs-5(15)	66	6	78
VrF2	Vallecitos rocky loam, 30 to 50 percent slopes, eroded----------	52	VIIs-1(15)	68	6	78
Wc	Willows clay----------	52	IIIw-5(14) IIIw-5(15)	62 62	--	--
Wk	Willows clay, saline-alkali----------	52	IVw-6(14)	65	11	79
Ws	Willows sandy loam----------	52	IIIw-5(14)	62	--	--
Ww2	Willows soils, eroded----------	53	IVw-6(14)	65	11	79
YoA	Yolo loam, 0 to 2 percent slopes----------	53	IIIc-1(15)	64	--	--
YoC	Yolo loam, 2 to 9 percent slopes----------	53	IIIe-1(15)	60	--	--
YvB	Yolo gravelly loam, 0 to 5 percent slopes----------	53	IIIe-1(15)	60	--	--

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