SOIL SURVEY OF

Northern Santa Barbara Area, California

U. S. Department of Agriculture
Soil Conservation Service
In cooperation with
University of California
Agricultural Experiment Station

Issued July 1972

Major fieldwork for this soil survey was done in 1964. Soil names and descriptions were approved in 1964. Unless otherwise indicated, statements in this publication refer to conditions in the Area in 1964. This survey was made cooperatively by the Soil Conservation Service and the University of California Agricultural Experiment Station. It is part of the technical assistance furnished to the Lompoc Soil Conservation District, the Santa Maria Valley Soil Conservation District, and the Cuyama Soil Conservation District.

Either enlarged or reduced copies of the soil map in this publication can be made by commercial photographers, or they can be purchased on individual order from the Cartographic Division, Soil Conservation Service, United States Department of Agriculture, Washington, D.C. 20250

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY contains information that can be applied in managing farms and ranches; in selecting sites for roads, ponds, buildings, and other structures; and in judging the suitability of tracts of land for farming, industry, and recreation.

Locating Soils

All the soils of the Northern Santa Barbara Area are shown on the detailed map at the back of this survey. This map consists of many sheets made from aerial photographs. Each sheet is numbered to correspond with a number on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbols. 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. This guide lists all the soils of the Area in alphabetic order by map symbol and gives the capability classification of each. It also shows the page where each soil is described and the page for the range site in which the soil has been placed.

Individual colored maps showing the relative suitability or degree of limitation of soils for many specific purposes can be developed by using the soil map and the information in the text. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. 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 from the soil descriptions and from the discussions of the capability units and estimated yields of major crops.

Game managers, sportsmen, and others can find information about soils and wildlife in the section "Wildlife Habitat and Recreational Areas."

Ranchers and others can find, under "Range," groupings of the soils according to their suitability for range, and also the names of many of the plants that grow on each range site.

Engineers, builders, and community planners can find, under "Use of the Soils in Engineering," tables that contain test data, estimates of soil properties, and information about soil features that affect engineering practices and sites for nonindustrial buildings.

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

Newcomers in the Northern Santa Barbara Area may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the information about the Area given in the section "General Nature of the Area."

Cover Picture

Santa Maria in the Santa Maria Valley. In foreground are Metz, Mocho, and Sorrento soils.

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402

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SOIL SURVEY OF THE NORTHERN SANTA BARBARA AREA
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UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, IN COOPERATION
WITH UNIVERSITY OF CALIFORNIA AGRICULTURAL EXPERIMENT STATION

THE NORTHERN SANTA BARBARA AREA consists mainly of privately owned land in Santa Barbara County north of the Santa Ynez Mountains and parts of San Luis Obispo County and Ventura County within the Cuyama Valley. The Los Padres National Forest is between the Cuyama Valley and the western part of the survey area. Distances from Santa Maria to major cities in the State are shown in figure 1.

Figure 1.--Location of the Northern Santa Barbara Area in California.

The Area occupies about 830,870 acres, or 1,298 square miles. About 150,000 acres consists of valleys or low terraces. Much of this acreage is intensively used for irrigated and dryfarmed crops. The climate is mild and the soils are suited to a wide variety of flower, orchard, truck, and field crops. The rest of the Area consists of high terraces, rolling hills, and mountainous uplands. These more sloping areas are used mainly as range for beef cattle, but small scattered areas are used for dryland grain or hay.

Santa Maria and Lompoc are the largest communities in the Area. Santa Maria is in the Santa Maria Valley, about 14 miles from the ocean. It has a population of about 34,000. The urbanized area in the vicinity of Santa Maria, including the town of Orcutt, has a population of about 18,000. Other communities in the Santa Maria Valley are Guadalupe, Betteravia, Sisquoc, and Garey. Casmalia is about 11 miles southwest of Santa Maria. Lompoc is in the Lompoc Valley, about 9 miles from the ocean. It has a population of about 22,000. Los Alamos is in the Los Alamos Valley. Buellton, Solvang, Santa Ynez, Los Olivos, and Ballard are near the Santa Ynez River. The major towns in the Cuyama Valley are Cuyama, New Cuyama, and Ventucopa. In recent years, several communities have been built on and near Vandenberg Air Force Base.

Produce grown in the Area is marketed throughout the country and some is sold in world markets. Many perishable crops, such as lettuce, cauliflower, broccoli, and celery, are sold in open markets. Most baled hay from the Cuyama Valley is trucked to the Los Angeles milkshed for dairy feed.

Most industries in the Area are concerned with production and processing of farm produce. Many kinds of vegetables grown in the Santa Maria and Lompoc Valleys are packed, both fresh and frozen, at numerous plants. The production of flower seeds in the two valleys is the largest in the world. Alfalfa dehydrators for making alfalfa pellets for export have been installed near Santa Maria. A large sugar plant is at Betteravia. Byproducts from this plant provide large amounts of feed for cattle. Several dairy plants are in the coastal part of the Area.

In the Santa Ynez Mountains, south of Lompoc, two companies mine diatomaceous earth from one of the largest deposits in the world. Several large oilfields are in operation in the vicinity of Santa Maria and in the Solomon and Purisima Hills, and two large oilfields are in operation in the Cuyama Valley. Deposits of lightweight shale, in the Casmalia Hills southwest of Santa Maria, are mined, processed, and sold as lightweight aggregate. Flagstones are dug from a quarry in the Monterey Shale Formation in Tepusquet Canyon, and a quarry in Pine Canyon supplies rock from the Franciscan Formation for use in constructing roads and levees.

Manufacturing is becoming an important part of the economy of the Area. There are oil refineries,

companies for pressing and distributing phonograph records, and manufacturers of high-speed drills, concrete products and aggregates, control equipment, and packing boxes.

Transportation facilities in the Area include a network of roads and highways and railway service from Santa Maria and Lompoc to the main rail line along the coast. Most rural roads are paved and adequate for trucks. All farm produce from the Cuyama Valley is transported by truck. Commercial airlines have scheduled service from Santa Maria to Los Angeles and San Francisco, and buslines serve Santa Maria, Lompoc, Los Alamos, and Buellton.

HOW THIS SURVEY WAS MADE

Soil scientists made this survey to learn what kinds of soil are in the Northern Santa Barbara Area, where they are located, and how they can be used. The soil scientists went into the Area knowing they likely would find many soils they had already seen and perhaps some they had not. They observed the steepness, length, and shape of slopes, the size and speed of streams, the kinds of native plants or crops, the 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 the action of plant roots.

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. The soil series and soil phase are the categories of soil classification most used in a local survey.

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. Agueda and Santa Lucia, 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 affect their behavior in the undisturbed landscape.

Soils of one series can differ in texture of the surface soil and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Bayshore loam, drained, is one of several phases within the Bayshore series.

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 help in drawing boundaries accurately. The soil map in the back of this publication 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 the management of farms and fields, a mapping unit is nearly equivalent to a soil phase. 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 phase.

Some mapping units are made up of soils of different series, or of different phases within one series. Two such kinds of mapping units are shown on the soil map of the Northern Santa Barbara Area: soil complexes and undifferentiated groups.

A soil complex consists of areas of two or more soils, so intermingled or so small in size that they cannot be shown separately on the soil map. Each area of a complex contains some of each of the two or more dominant soils, and the pattern and relative proportions are about the same in all areas. The name of a soil complex consists of the names of the dominant soils, joined by a hyphen. An example is Toomes-Climara complex, 30 to 75 percent slopes.

An undifferentiated group is made up of two or more soils that could be delineated individually but are shown as one unit because, for the purpose of the soil survey, there is little value in separating them. The pattern and proportion of soils are not uniform. An area shown on the map may be made up of only one of the dominant soils, or of two or more. The name of an undifferentiated group consists of the names of the dominant soils, joined by "and." Salinas and Sorrento loams, 9 to 15 percent slopes, is an example.

In most areas surveyed there are places where the soil material is so rocky, so shallow, or so severely eroded that it cannot be classified by soil series. These places are shown on the soil map and are described in the survey, but they are called land types and are given descriptive names. Terrace escarpments, cobbly, is a land type in the Northern Santa Barbara Area.

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 soil 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 soil. Yields under defined management are estimated for all 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 such a way as to be

readily useful to different groups of users, among them farmers, managers of woodland and rangeland, and engineers.

On the basis of yield and practice tables and other data, the soil scientists set up trial groups. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others, then 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.

GENERAL SOIL MAP

The general soil map at the back of this survey shows, in color, the soil associations in the Northern Santa Barbara Area. 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 an Area, who want to compare different parts of an Area, or who want to know the location of large tracts that are suitable for a certain kind of land use. Such a map is a useful general guide in managing a watershed, a wooded tract, or a wildlife area, or in planning engineering works, recreational facilities, and community developments. It is not a suitable map for planning the management of a farm or field, or for selecting the exact location of a road, building, or similar structure, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect their management.

The 14 soil associations in the Northern Santa Barbara Area are described in the following pages. Three associations are on alluvial fans, flood plains, valleys, and terraces; five are on adjacent uplands; and four are on uplands and high terraces. Two consist of miscellaneous land types.

The terms for texture used in the title of the associations apply to the surface layer. For example, in the title for association 1, the words "sandy loams to silty clay loams" refer to texture of the surface layer.

Somewhat Excessively Drained to Somewhat Poorly Drained Nearly Level to Moderately Steep Soils of the Alluvial Fans, Flood Plains, Valleys, and Terraces

The three soil associations in this group make up about 19 percent of the Northern Santa Barbara Area. They are on alluvial fans and flood plains, in valleys, and in small areas on low terraces. The soils are somewhat excessively drained to somewhat poorly drained loamy sands to silty clay loams that formed in alluvium derived mostly from sedimentary rock.

Elevations range from near sea level to 2,500 feet. The average annual rainfall is 6 to 22 inches, and the average annual air temperature is about 58° to 60° F. The frost-free season is 180 to 365 days.

These associations are used extensively for field and truck crops and specialty crops. The steeper soils are used for range and dryland grain.

1. Sorrento-Mocho-Camarillo Association

Nearly level to moderately sloping, well-drained to somewhat poorly drained sandy loams to silty clay loams on flood plains and alluvial fans

This association is mainly in the Santa Maria and Lompoc Valleys and the western part of the Cuyama Valley. The Santa Maria Valley occupies flood plains and alluvial fans along the Santa Maria and Sisquoc Rivers, and the Lompoc Valley, the floodplains along the Santa Ynez River. The soils formed in very deep alluvium derived from sedimentary rock. Slopes are 0 to 9 percent. The plant cover consists of annual grasses, forbs, and scattered oaks. Elevations range from near sea level to 1,800 feet. The average annual rainfall is 12 to 20 inches, and the average annual air temperature is 59° to 60° F. The frost-free season is 190 to 330 days.

This association makes up 8 percent of the survey area. It is about 40 percent Sorrento soils, 30 percent Mocho soils, and 10 percent Camarillo soils. The rest is mainly Bayshore, Botella, Corralitos, Elder, Metz, and Salinas soils, and Riverwash and Sandy alluvial land.

Sorrento soils are well drained. The surface layer is grayish-brown sandy loam to clay loam. It is underlain by pale-brown and light yellowish-brown, calcareous sandy loam to clay loam.

Mocho soils are well drained. They are grayish-brown, calcareous sandy loam to silty clay loam throughout the profile.

Camarillo soils are somewhat poorly drained. The surface layer is brown and grayish-brown, calcareous sandy loam to silty clay loam. It is underlain by mottled grayish-brown to light yellowish-brown, stratified, calcareous sandy loam to clay loam. The content of soluble salts ranges from low to high. In places a seasonal water table is at a depth of 2 to 5 feet or more.

These soils are among the most productive in the Area. They are used for many kinds of truck and field crops and for cut flowers. Camarillo soils are also used for artichokes. Some areas, particularly those adjacent to the major rivers, are subject to occasional flooding.

2. Pleasanton-Botella-Elder Association

Nearly level to moderately steep, well drained and moderately well drained sandy loams to clay loams on terraces and alluvial fans and in valleys

This association is on the Santa Maria Mesa east of Santa Maria and on terraces in the southwestern part of the Cuyama Valley. The soils formed in very deep alluvium derived from sedimentary material. Slopes are 0 to 30 percent. The plant cover consists of grasses, forbs, scattered oaks, and California sagebrush. Elevations range from 50 to 2,000 feet. The average annual rainfall is 12 to 22 inches, and the average annual air temperature is 58° to 60° F. The frost-free season is 180 to 365 days.

This association makes up 5 percent of the survey area. It is about 35 percent Pleasanton soils, 25 percent Botella soils, and 25 percent Elder soils. The rest is mainly Chamise, Kettleman, Positas, Shedd, and Tierra soils.

Pleasanton soils are well drained. The surface layer is brown sandy loam and very fine sandy loam that is cobbly or gravelly in places. The subsoil is yellowish-brown cobbly heavy clay loam and very cobbly loam. The substratum is reddish-brown very cobbly sandy loam.

Botella soils are well drained and moderately well drained. The surface layer is gray loam and clay loam. The subsoil is gray sandy clay loam and silty clay loam.

Elder soils are well drained. The surface layer is dark-gray sandy loam, loam, or shaly loam. It is underlain by gray and light brownish-gray sandy loam and shaly loam.

On the Santa Maria Mesa these soils are used for irrigated field crops, dryland grain, and range. In the Cuyama Valley they are used for range.

3. Panoche-Metz-Stutzville Association

Nearly level to moderately sloping, somewhat excessively drained to somewhat poorly drained loamy sands to silty clay loams on flood plains and alluvial fans

This association is on alluvial fans and flood plains in the Cuyama Valley. The soils formed in very deep alluvium derived from sedimentary rock. Slopes are 0 to 9 percent. The plant cover consists of annual grasses, forbs, California sagebrush, and salt-tolerant plants. Elevations range from 1,800 to 2,500 feet. The average annual rainfall is 6 to 12 inches, and the average annual air temperature is 58° to 59° F. The frost-free season is 180 to 260 days.

This association makes up about 6 percent of the survey area. It is about 40 percent Panoche soils, 35 percent Metz soils, and 10 percent Stutzville soils. The rest is mainly Wasioja soils and Riverwash.

Panoche soils are well drained. The surface layer is pale-brown, calcareous sandy loam or loam. It is underlain by light brownish-gray and very pale-brown, stratified, calcareous loamy fine sand to silty clay loam.

Metz soils are somewhat excessively drained. The surface layer is brown, calcareous loamy sand. It is underlain by pale-brown and light yellowish-brown, stratified, calcareous loamy sand and sand.

Stutzville soils are naturally somewhat poorly drained, but through natural deepening of drainage channels and pumping water for irrigation the water table has been lowered to a depth of more than 6 feet. The surface layer is pale-brown, calcareous loamy sand to silty clay loam. It is underlain by mottled dark-brown and light yellowish-brown, calcareous, stratified sand to silty clay loam. The content of soluble salts ranges from low to high.

This association is used mostly for alfalfa. Some areas are used for sugar beets, potatoes, and orchards. Stutzville soils must be reclaimed before they can be used for crops. Areas adjacent to the Cuyama River are subject to frequent floods.

Somewhat Excessively Drained to Somewhat Poorly Drained, Nearly Level to Very Steep Soils of the Terraces and Adjacent Uplands

The five soil associations in this group make up about 20 percent of the Northern Santa Barbara Area. They are scattered throughout the survey area. The soils are somewhat excessively drained to somewhat poorly drained sands to clay loams that formed on terraces and adjacent uplands and, in places, on older sand dunes.

Elevations range from near sea level to 3,500 feet. The average annual rainfall is 5 to 22 inches, and the average annual air temperature is 55° to 65° F. The frost-free season is 180 to 340 days.

The more gently sloping soils are used for alfalfa, strawberries, and orchards. Steeper soils are used for dryland hay and grain or for range. A large acreage is part of a military base.

4. Betteravia-Garey Association

Nearly level to moderately steep, moderately well drained and well drained loamy sands to sandy loams on terraces

This association is south of Santa Maria. The soils formed in wind-modified sands on marine terraces. Slopes are 0 to 30 percent. The plant cover consists of annual grasses and forbs and scattered brush. Elevations range from near sea level to 1,000 feet. The average annual rainfall is 12 to 18 inches, and the average annual air temperature is 57° F. The frost-free season is 250 to 340 days.

The association makes up 4 percent of the survey area. It is about 30 percent Betteravia soils and 30 percent Garey soils. The rest is mainly Betteravia, dark variant, Corralitos, Marina, and Oceano soils.

Betteravia soils are moderately well drained. The surface layer is brown loamy sand. A light yellowish-brown and reddish-brown, massive, weakly cemented subsoil is at a depth of 36 to 50 inches.

Garey soils are well drained. The surface layer is brown sandy loam. The subsoil is light-brown and pinkish-gray sandy loam and loamy sand that contains cemented lenses at a depth of 20 to 30 inches.

This association is used mostly for range. Some areas are used for strawberries and alfalfa.

5. Tangair-Narlon Association

Nearly level to strongly sloping, somewhat poorly drained and moderately well drained sands and loamy sands on terraces

This association is mostly within the Vandenberg Air Force Base. The soils formed in marine terrace deposits. Slopes are 0 to 15 percent. The plant cover consists of annual grasses, forbs, and brush. Elevations range from 150 to 900 feet. The average annual rainfall is 14 to 18 inches, and the average annual air temperature is 55° to 57° F. The frost-free season is 300 to 320 days.

This association makes up about 4 percent of the survey area. It is about 30 percent Tangair soils and 30 percent Narlon soils. The rest is mainly Arnold, Corralitos, Crow Hill, Oceano, and Santa Lucia soils and Dune land.

Tangair soils are somewhat poorly drained. They have a surface layer of light-gray sand. The subsoil is very pale brown loamy sand that contains iron concretions. Below this is white sand. The soil is underlain by shale at a depth of more than 5 feet.

Narlon soils are moderately well drained. They have a surface layer of pale-brown and light-gray loamy sand or sand. The subsoil, at a depth of 20 to 50 inches, is gray, mottled, dense clay.

Most of this association is within the Vandenberg Air Force Base and is used primarily by the military.

6. Positas-Ballard-Santa Ynez Association

Nearly level to moderately steep, well drained and moderately well drained fine sandy loams to clay loams on terraces

This association is near Santa Ynez, Los Olivos, and Lake Cachuma. The soils formed in alluvium derived from sedimentary rocks. In some areas they are shallow to moderately deep over a clay or gravelly clay subsoil. In other areas they are very deep over a gravelly loam subsoil. Slopes are 0 to 30 percent. The plant cover consists of grasses, forbs, and scattered oaks. Elevations range from 400 to 1,000 feet. The average annual rainfall is 15 to 20 inches, and the average annual air temperature is 58° to 60° F. The frost-free season is 260 to 320 days.

This association makes up 4 percent of the survey area. It is about 25 percent Positas soils, 20 percent Ballard soils, and 20 percent Santa Ynez soils. The rest is mainly Agueda and Salinas soils in long narrow valleys and Chamise soils on terraces.

Positas soils are moderately well drained. The surface layer is brown and pale-brown fine sandy loam. The subsoil is reddish-brown and brown, very compact clay. Depth to the compact clay is 10 to 26 inches.

Ballard soils are well drained. The surface layer is grayish-brown fine sandy loam or gravelly fine sandy loam. The subsoil is yellowish-brown to very pale brown gravelly loam and very gravelly sandy loam. The substratum is very pale brown very gravelly loamy sand.

Santa Ynez soils are moderately well drained. The surface layer is gray and light brownish-gray gravelly fine sandy loam or clay loam. The subsoil is dense and compact, gravelly and very gravelly clay that has mixed colors of dark gray, light gray, and olive.

This association is used mainly for range. Some areas of more nearly level soils are used for irrigated field crops and orchards and for dryland grain and hay.

7. Kettleman-Wasioja Association

Gently sloping to very steep, well-drained fine sandy loams and cobbly fine sandy loams on uplands and terraces

This association is in the Cuyama Valley in the eastern part of the survey area. The soils formed in material weathered from calcareous sandstone and in old terrace deposits. Slopes are 2 to 75 percent. The plant cover consists of annual grasses, forbs, shrubs, and scattered oaks and junipers. Elevations range from 2,000 to 3,500 feet. The average annual rainfall is 5 to 10 inches, and the average annual air temperature is 58° to 65° F. The frost-free season is 180 to 260 days.

This association makes up 5 percent of the survey area. It is about 40 percent Kettleman soils and 30 percent Wasioja soils. The rest is mainly Metz and Panoche soils in small valleys.

Kettleman soils have a surface layer of light brownish-gray, calcareous fine sandy loam that is underlain at a depth of 6 to 30 inches by soft calcareous sandstone.

Wasioja soils have a surface layer of pale-brown and light yellowish-brown fine sandy loam or cobbly fine sandy loam. The subsoil is yellowish-brown and light yellowish-brown sandy clay loam and clay loam that is underlain by yellow loamy sand.

This association is used mostly for range. Small areas of more gently sloping soils are used for dryland grain.

8. Marina-Oceano Association

Nearly level to moderately steep, somewhat excessively drained and excessively drained sands on mesas and dunes

This association is north and east of Lompoc and on the coast in the southwestern corner of the survey area. The soils formed in wind-laid sands and on dunes. Slopes are 0 to 30 percent. The plant cover consists of annual grasses, forbs, brush, and scattered oaks. Elevations range from near sea level to 800 feet. The average annual rainfall is 14 to 22 inches, and the average annual temperature is about 57° F. The frost-free season is about 300 to 320 days.

This association makes up 3 percent of the survey area. It is about 70 percent Marina soils and 20 percent Oceano soils. The rest is mainly Tangair and Narlon soils.

Marina soils are somewhat excessively drained. The surface layer is grayish-brown and brown sand. The subsoil is light-brown loamy sand, and the underlying material is light-brown and pink sand.

Oceano soils are excessively drained. The surface layer is grayish-brown and light brownish-gray sand that is underlain by pale-brown and light yellowish-brown sand.

This association is used for range and for urban development. Part of the acreage is in the Vandenburg Air Force Base.

Well-Drained and Somewhat Excessively Drained, Gently Sloping to Very Steep Soils of the Uplands and High Terraces

The four associations in this group make up about 49 percent of the Northern Santa Barbara Area. They are on foothills and in mountains throughout the survey area. The soils are well-drained and somewhat excessively drained sands to clays that formed in material weathered mostly from sedimentary rock but partly from igneous rock.

Elevations range from 200 to 3,500 feet. The average annual rainfall is 8 to 30 inches, and the average annual air temperature is 58° to 60° F. The frost-free season is 180 to 325 days.

These associations are used mostly for range, wildlife habitat, and watershed. Small areas of gently sloping soils are used for dryland field crops and for irrigated specialty crops.

9. Chamise-Arnold-Crow Hill Association

Gently sloping to very steep, well-drained and somewhat excessively drained sands to clay loams on high terraces and uplands

This association is in the Solomon Hills and the Purisima Hills in the central part of the survey area. It extends from just south of the Santa Maria Valley to the Santa Ynez River. The soils formed on terraces in material derived from sedimentary rock. Slopes are 2 to 75 percent. The plant cover consists of annual grasses, forbs, shrubs, and scattered oaks. Elevations range from 200 to 1,500 feet. The average annual rainfall is 11 to 20 inches, and the average annual temperature is about 58° F. The frost-free season is 240 to 325 days.

This association makes up about 22 percent of the survey area. It is about 35 percent Chamise soils, 25 percent Arnold soils, and 10 percent Crow Hill soils. The rest is mainly Botella, Corralitos, Diablo, Elder, Gazos, Linne, Santa Lucia, and Shedd soils.

Chamise soils are well drained. The surface layer is dark-gray and gray sandy loam to clay loam that is shaly in many places. The subsoil is light brownish-gray, dense and compact shaly clay and very shaly clay loam.

Arnold soils are somewhat excessively drained. The surface layer is light brownish-gray sand. Below this is very pale brown sand that is underlain by very pale brown very soft sandstone at a depth of 20 to 60 inches.

Crow Hill soils are well drained. The surface layer is gray loam and silt loam. The subsoil is gray and very dark grayish-brown silty clay loam and extremely shaly silty clay loam that is underlain by diatomaceous shale at a depth of 22 to 42 inches.

This association is used for range.

10. Shedd-Santa Lucia-Diablo Association

Strongly sloping to very steep, well-drained shaly clay loams and silty clays on uplands

This association is on the coast northwest of Casmalia, in the San Rafael Mountains northeast of Sisquoc, in the western part of the Cuyama Valley, in an area northeast of the Cachuma Dam Site, and in an area south of Lompoc. The soils formed in material weathered from diatomaceous shale or calcareous shale. Slopes are 9 to 75 percent. The plant cover consists of annual grasses, forbs, and scattered oaks. Brush grows on the steeper areas. Elevations range from 200 to 3,000 feet. The average annual rainfall is 8 to 30 inches, and the average annual air temperature is 58° to 60° F. The frost-free season is 180 to 300 days.

This association makes up 16 percent of the survey area. It is about 35 percent Shedd soils, 30 percent Santa Lucia soils, and 10 percent Diablo soils. The rest is mainly Chamise, Contra Costa, Diablo, Elder, and Los Osos soils and Sedimentary rock land.

Shedd soils have a surface layer of pale-brown and light-gray, highly calcareous silty clay loam that is underlain by calcareous shale at a depth of 20 to 54 inches.

Santa Lucia soils have a surface layer of very dark gray shaly and very shaly clay loam about 20 to 44 inches thick over hard, weakly fractured, diatomaceous shale.

Diablo soils have a surface layer of very dark gray and dark-gray silty clay. Below this is pale-olive, calcareous silty clay that is underlain by calcareous mudstone at a depth of 20 to 40 inches.

This association is used for range.

11. Toomes-Climara Association

Moderately steep to very steep, somewhat excessively drained and well-drained clay loams and clays on uplands

This association occurs as a narrow band on the southern slope of Figueroa Mountain. The soils formed in materials weathered from basic igneous rock. Slopes are 15 to 75 percent. The plant cover consists of purple sage, black sage, yucca, and scattered stands of oak that have an understory of annual grasses and forbs. Elevations range from 1,500 to 3,000 feet. The average annual rainfall is 10 to 20 inches, and the average annual air temperature is 58° to 59° F. The frost-free season is 210 to 275 days.

This association makes up 3 percent of the survey area. It is about 30 percent Toomes soils and 30 percent Climara soils. The rest is mainly Arnold, Chamise, Montara, and Santa Lucia soils, and Igneous rock land.

Toomes soils are somewhat excessively drained. The surface layer is dark-brown clay loam about 10 to 20 inches thick. It is underlain by fractured basic igneous rock.

Climara soils are well drained. The surface layer is very dark grayish-brown clay. Below this is very dark gray and light-gray, calcareous clay and silty clay loam. Depth to decomposed basic igneous rock is 20 to 60 inches.

This association is used for range.

12. Los Osos-Gaviota Association

Moderately sloping to very steep, well-drained and somewhat excessively drained clay loams to sandy loams on uplands

This association is in the Santa Ynez Mountains along the southern border of the survey area. The soils formed in material weathered from shale and sandstone. Slopes are 5 to 75 percent. The plant cover consists of annual grasses, forbs, and oaks. Elevations range from 400 to 3,500 feet. The average annual rainfall is 10 to 25 inches, and the average annual air temperature is 59° to 60° F. The frost-free season is 190 to 320 days.

This association makes up 8 percent of the survey area. It is about 35 percent Los Osos soils and 25 percent Gaviota soils. The rest is Contra Costa, Crow Hill, Diablo, Linne, Lodo, San Benito, Santa Lucia, and Shedd soils.

Los Osos soils are well drained. The surface layer is dark grayish-brown loam and clay loam. The subsoil is dark grayish-brown and dark yellowish-brown clay loam and clay. Below this, at a depth of 20 to 40 inches, is highly fractured shale.

Gaviota soils are well drained and somewhat excessively drained. The surface layer is brown sandy loam and gravelly sandy loam. It is underlain by massive hard sandstone at a depth of 10 to 20 inches.

This association is used mostly for range. A few small areas are used for crops.

Miscellaneous Land Types

The two associations in this group make up about 12 percent of the Northern Santa Barbara Area. They consist of rocky land in mountains and sand dunes and beaches in coastal areas. Elevations range from sea level to about 4,000 feet. The average annual rainfall is 8 to 25 inches, and the average annual air temperature is 57° to 63° F. The frost-free season is 195 to 325 days.

Both of these associations are used for recreation and as watershed. They are not suited to cultivated crops.

13. Sedimentary Rock Land-Rough Broken Land Association

Steep to extremely steep, excessively drained lands on uplands

This association is in the Santa Ynez, San Rafael, Caliente, and Sierra Madre Mountains. It consists of very shallow soils over hard sedimentary rock, soft sandstone, or semiconsolidated gravelly sediments. Slopes are 30 to more than 75 percent. The plant cover consists of scattered brush and patches of annual grasses and forbs. Elevations range from 200 to 4,000 feet. The average annual rainfall is 8 to 25 inches, and the average annual air temperature is 57° to 63° F. The frost-free season is 195 to 325 days.

This association makes up 10 percent of the survey area. It is about 60 percent Sedimentary rock land and 35 percent Rough broken land. The rest is isolated areas of deeper, less sloping soils.

Sedimentary rock land consists of about 10 inches or less of soil material over hard sandstone and shale. Rock outcrop covers 30 percent or more of the area. Slopes are 60 to more than 75 percent.

Rough broken land consists of less than 10 inches of soil material over soft sandstone or semiconsolidated gravelly sediments. Slopes are 30 to more than 75 percent. These areas are highly erosive and contribute large amounts of sediment to lower lying areas.

This association is used only for watershed.

14. Dune Land Association

Coastal sand dunes and sandy beaches

This association consists of coastal sand dunes and beaches. The beaches are cobbly or stony in many places. The vegetation is extremely sparse, but some dunes are partly stabilized with brush and grass. Elevations range from sea level to 300 feet. The average annual rainfall is 14 to 20 inches, and the average annual air temperature is about 57°F. The frost-free season is about 300 days.

This association makes up 2 percent of the survey area. It is about 90 percent Dune land and 5 percent Coastal beaches. The rest is Marsh and Swamp.

This association is used only for recreation.

DESCRIPTIONS OF THE SOILS

This section describes and soil series and mapping units in the Northern Santa Barbara Area. Each soil series is described in considerable detail, and then, briefly, each mapping unit in that series. Unless it is specifically mentioned otherwise, it is to be assumed that what is stated about the soil series holds true for the mapping units in that series. Thus, to get full information about any one mapping unit, it is necessary to read both the description of the mapping unit and the description of the soil series to which it belongs.

An important part of the description of each soil series is the soil profile, that is, the sequence of layers from the surface downward to rock or other underlying material. Each series contains two descriptions of this profile. The first is brief and in terms familiar to the layman. The second, detailed and in technical terms, is for scientists, engineers, and others who need to make thorough and precise studies of soils.

As mentioned in the section "How This Survey Was Made," not all mapping units are members of a soil series. Landslides, for example, does not belong to a soil series, but nevertheless, is listed in alphabetic order along with the soil series.

Following the name of each mapping unit is a symbol in parentheses. This symbol identifies the mapping unit on the detailed soil map. Listed at the end of each description of a mapping unit is the capability unit and range site in which the mapping unit has been placed. The page for the description of each capability unit and range site can be found by referring to the "Guide to Mapping Units" at the back of this survey.

The acreage and proportionate extent of each mapping unit are shown in table 1. Many of the terms used in describing soils can be found in the Glossary at the end of this survey, and more detailed information about the terminology and methods of soil mapping can be obtained from the Soil Survey Manual (14). 1/

1/ Italic numbers in parentheses refer to Literature Cited, p. 179.

TABLE 1.--APPROXIMATE ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Soil	Area	Extent
	Acres	Percent
Agueda loam, 0 to 2 percent slopes	270	(1/)
Agueda silty clay loam, 0 to 2 percent slopes	705	0.1
Agueda silty clay loam, 2 to 9 percent slopes	424	(1/)
Arnold sand, 5 to 15 percent slopes	5,932	.7
Arnold sand, 15 to 45 percent slopes	29,443	3.5
Arnold sand, 9 to 45 percent slopes, severely eroded	2,077	.3
Ballard fine sandy loam, 0 to 2 percent slopes	1,255	.2
Ballard fine sandy loam, 2 to 9 percent slopes	2,242	.3
Ballard fine sandy loam, 9 to 15 percent slopes	333	(1/)
Ballard gravelly fine sandy loam, 0 to 2 percent slopes	838	.1
Ballard gravelly fine sandy loam, 2 to 9 percent slopes	1,955	.2
Ballard gravelly fine sandy loam, 9 to 15 percent slopes	1,001	.1
Ballinger silty clay, 15 to 30 percent slopes	2,569	.3
Ballinger silty clay, 30 to 45 percent slopes	553	.1
Ballinger silty clay, 45 to 75 percent slopes	1,065	.1
Bayshore loam, drained	933	.1

TABLE 1.--APPROXIMATE ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Soil	Area	Extent
	Acreage	Percent
Bayshore loam, sandy substratum, drained	395	(1/)
Bayshore silty clay loam	412	(1/)
Bayshore silty clay loam, drained	1,435	0.2
Betteravia loamy sand, 0 to 2 percent slopes	4,666	.6
Betteravia loamy sand, 0 to 2 percent slopes, severely eroded	260	(1/)
Betteravia loamy sand, 2 to 9 percent slopes	1,749	.2
Betteravia loamy sand, dark variant, 0 to 5 percent slopes, eroded	987	.1
Betteravia loamy sand, dark variant, 5 to 15 percent slopes, eroded	1,914	.2
Botella loam, 0 to 2 percent slopes	1,359	.2
Botella loam, 0 to 2 percent slopes, eroded	1,051	.2
Botella loam, 2 to 9 percent slopes	2,339	.3
Botella loam, 2 to 15 percent slopes, eroded	3,785	.5
Botella loam, slightly wet, 0 to 2 percent slopes	249	(1/)
Botella clay loam, 0 to 2 percent slopes	1,106	.1
Botella clay loam, 0 to 2 percent slopes, eroded	1,219	.1
Botella clay loam, 2 to 9 percent slopes	2,321	.3
Botella clay loam, 2 to 15 percent slopes, eroded	3,367	.4
Botella clay loam, wet, 0 to 2 percent slopes	281	(1/)
Camarillo sandy loam	1,489	.2
Camarillo sandy loam, drained	411	(1/)
Camarillo very fine sandy loam	716	.1
Camarillo silty clay loam	453	.1
Chamise sandy loam, 5 to 9 percent slopes	1,110	.1
Chamise sandy loam, 5 to 30 percent slopes, eroded	596	.1
Chamise loam, 2 to 9 percent slopes	1,042	.1
Chamise shaly sandy loam, 9 to 15 percent slopes	1,724	.2
Chamise shaly loam, 9 to 15 percent slopes	1,817	.2
Chamise shaly loam, 15 to 45 percent slopes	27,251	3.3
Chamise shaly loam, 45 to 75 percent slopes	7,178	.9
Chamise shaly loam, 30 to 75 percent slopes, eroded	10,897	1.3
Chamise clay loam, 30 to 45 percent slopes	3,757	.5
Climara-Toomes complex, 15 to 45 percent slopes	6,670	.8
Coastal beaches	445	.1
Cobbly alluvial land	1,392	.2
Contra Costa-Lodo loams, 15 to 30 percent slopes	656	.1
Contra Costa-Lodo loams, 30 to 45 percent slopes	1,764	.3
Contra Costa-Lodo loams, 45 to 75 percent slopes	4,153	.5
Contra Costa-Lodo stony loams, 30 to 75 percent slopes	4,191	.5
Corralitos sand, 0 to 2 percent slopes	1,026	.1
Corralitos sand, 2 to 15 percent slopes	3,101	.4
Corralitos sand, 9 to 15 percent slopes, eroded	634	.1
Corralitos loamy sand, 0 to 2 percent slopes	3,810	.5
Corralitos loamy sand, 2 to 9 percent slopes	2,967	.4
Corralitos loamy sand, 9 to 15 percent slopes	1,406	.2
Cropley silty clay	754	.1
Crow Hill loam, 15 to 30 percent slopes	1,172	.1
Crow Hill loam, 30 to 45 percent slopes	5,636	.7
Crow Hill loam, 45 to 75 percent slopes	4,890	.6
Crow Hill loam, 15 to 75 percent slopes, severely eroded	1,645	.2
Diablo silty clay, 9 to 15 percent slopes	1,064	.1
Diablo silty clay, 15 to 30 percent slopes	2,265	.3
Diablo silty clay, 30 to 45 percent slopes	4,029	.5
Diablo silty clay, 15 to 45 percent slopes, severely eroded	323	(1/)
Diablo silty clay, 45 to 75 percent slopes	585	.1
Dune land	12,029	1.5
Elder sandy loam, 0 to 2 percent slopes	364	(1/)
Elder sandy loam, 0 to 2 percent slopes, eroded	691	.6
Elder sandy loam, 2 to 9 percent slopes, eroded	4,675	.6

TABLE 1.--APPROXIMATE ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Soil	Area	Extent
	Acreage	Percent
Elder sandy loam, 9 to 15 percent slopes, eroded	740	0.1
Elder loam, 0 to 2 percent slopes	690	.1
Elder loam, 2 to 9 percent slopes	3,355	.4
Elder shaly loam, 0 to 2 percent slopes, eroded	1,157	.1
Elder shaly loam, 2 to 9 percent slopes, eroded	2,847	.3
Elder shaly loam, 9 to 15 percent slopes, eroded	971	.1
Garey sandy loam, 0 to 2 percent slopes, eroded	188	(1/)
Garey sandy loam, 2 to 9 percent slopes, eroded	4,836	.6
Garey sandy loam, 9 to 30 percent slopes, eroded	531	.1
Garey sandy loam, 5 to 30 percent slopes, severely eroded	1,630	.2
Garey loam, wet variant, 0 to 5 percent slopes	186	(1/)
Gaviota sandy loam, 5 to 15 percent slopes	987	.1
Gaviota sandy loam, 15 to 30 percent slopes	4,172	.5
Gaviota sandy loam, 30 to 75 percent slopes	8,103	1.0
Gazos clay loam, 9 to 15 percent slopes	1,026	.1
Gazos clay loam, 15 to 30 percent slopes	4,274	.5
Gazos clay loam, 30 to 45 percent slopes	8,022	1.0
Gazos clay loam, 45 to 75 percent slopes	3,516	.4
Gullied land	6,422	.8
Igneous rock land	1,516	.2
Kettleman fine sandy loam, 9 to 30 percent slopes	6,033	.7
Kettleman fine sandy loam, 15 to 30 percent slopes, severely eroded	658	.1
Kettleman fine sandy loam, 30 to 75 percent slopes	18,259	2.2
Landslides	1,978	.2
Linne clay loam, 9 to 15 percent slopes	756	.1
Linne clay loam, 15 to 30 percent slopes	2,731	.3
Linne clay loam, 30 to 45 percent slopes	7,286	.9
Linne clay loam, 45 to 75 percent slopes	2,244	.3
Lodo loam, 30 to 75 percent slopes	8,233	1.0
Lopez shaly clay loam, 15 to 75 percent slopes	36,960	4.4
Lopez rocky loam, 75 to 100 percent slopes	12,321	1.5
Los Osos clay loam, 15 to 30 percent slopes	1,015	.1
Los Osos clay loam, 30 to 75 percent slopes	2,802	.3
Los Osos-San Benito clay loams, 15 to 30 percent slopes	2,905	.3
Los Osos-San Benito clay loams, 30 to 45 percent slopes	10,982	1.3
Los Osos-San Benito clay loams, 30 to 75 percent slopes, severely eroded	1,596	.2
Marina sand, 0 to 2 percent slopes	2,938	.4
Marina sand, 2 to 9 percent slopes	7,905	1.0
Marina sand, 9 to 30 percent slopes	9,803	1.2
Marina sand, 9 to 30 percent slopes, severely eroded	1,394	.2
Marsh	659	.1
Maymen stony loam, 45 to 75 percent slopes	3,538	.4
Metz loamy sand, 0 to 2 percent slopes	8,488	1.0
Metz loamy sand, overflow, 0 to 2 percent slopes	1,941	.3
Metz loamy sand, 2 to 9 percent slopes	626	.1
Metz loamy sand, 2 to 9 percent slopes, eroded	7,345	.9
Mine pits and dumps	1,632	.2
Mocho sandy loam, overflow	605	.1
Mocho sandy loam, sandy substratum	572	.1
Mocho sandy loam, sand substratum, overflow	1,097	.1
Mocho fine sandy loam	2,281	.3
Mocho loam	3,243	.4
Mocho loam, overflow	408	(1/)
Mocho silty clay loam	4,323	.5
Montara rocky clay loam, 30 to 75 percent slopes	908	.1
Narlon sand, 0 to 5 percent slopes	1,977	.2
Narlon loamy sand, 0 to 2 percent slopes	1,214	.1
Narlon loamy sand, 2 to 9 percent slopes	2,099	.3

TABLE 1.--APPROXIMATE ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Soil	Area	Extent
	Acreage	Percent
Narlon loamy sand, 9 to 15 percent slopes	588	0.1
Narlon sand, hardpan variant, 0 to 2 percent slopes	924	.2
Narlon sand, hardpan variant, 2 to 9 percent slopes	1,672	.3
Oceano sand, 0 to 2 percent slopes	639	.1
Oceano sand, 2 to 15 percent slopes	9,997	1.2
Oceano sand, 2 to 15 percent slopes, severely eroded	2,568	.3
Panoche sandy loam, 0 to 2 percent slopes	4,930	.6
Panoche sandy loam, overflow, 0 to 2 percent slopes	2,442	.3
Panoche sandy loam, 2 to 9 percent slopes	3,253	.4
Panoche sandy loam, overflow, 2 to 5 percent slopes	5,098	.6
Panoche loam, 0 to 2 percent slopes	2,896	.3
Panoche loam, overflow, 0 to 2 percent slopes	672	.1
Panoche loam, 2 to 9 percent slopes	524	.1
Pleasanton sandy loam, 0 to 2 percent slopes	1,309	.2
Pleasanton sandy loam, 2 to 9 percent slopes	11,381	1.4
Pleasanton sandy loam, 9 to 15 percent slopes	987	.1
Pleasanton cobbly sandy loam, 5 to 30 percent slopes	6,323	.8
Pleasanton very fine sandy loam, 0 to 2 percent slopes	1,339	.2
Pleasanton very fine sandy loam, 2 to 9 percent slopes	821	.1
Pleasanton gravelly very fine sandy loam, 9 to 15 percent slopes	592	.1
Positas fine sandy loam, 2 to 9 percent slopes	6,458	.8
Positas fine sandy loam, 9 to 15 percent slopes	3,113	.4
Positas fine sandy loam, 9 to 15 percent slopes, severely eroded	176	(1/)
Positas fine sandy loam, 15 to 30 percent slopes	1,345	.2
Positas cobbly fine sandy loam, 2 to 15 percent slopes	657	.1
Riverwash	15,895	1.9
Rough broken land	30,116	3.5
Salinas loam, 0 to 2 percent slopes	2,713	.4
Salinas loam, overflow, 0 to 2 percent slopes	130	(1/)
Salinas loam, 2 to 9 percent slopes	919	.1
Salinas silty clay loam, 0 to 2 percent slopes	2,275	.3
Salinas silty clay loam, 2 to 9 percent slopes	2,466	.3
Salinas and Sorrento loams, 9 to 15 percent slopes	401	(1/)
San Andreas-Tierra complex, 5 to 15 percent slopes	1,517	.2
San Andreas-Tierra complex, 9 to 45 percent slopes, severely eroded	1,745	.2
San Andreas-Tierra complex, 15 to 30 percent slopes	6,729	.8
San Andreas-Tierra complex, 30 to 75 percent slopes	11,119	1.3
San Benito-Diablo complex, 30 to 45 percent slopes	875	.1
San Benito-Diablo complex, 45 to 75 percent slopes	1,143	.1
Sandy alluvial land	10,817	1.3
Sandy alluvial land, wet	855	.1
Santa Lucia shaly clay loam, 9 to 15 percent slopes	262	(1/)
Santa Lucia shaly clay loam, 15 to 30 percent slopes	1,161	.1
Santa Lucia shaly clay loam, 15 to 45 percent slopes, eroded	605	.1
Santa Lucia shaly clay loam, 30 to 45 percent slopes	11,690	1.4
Santa Lucia shaly clay loam, 45 to 75 percent slopes	18,764	2.2
Santa Ynez gravelly fine sandy loam, 2 to 9 percent slopes	3,300	.4
Santa Ynez gravelly fine sandy loam, 9 to 15 percent slopes	1,063	.1
Santa Ynez clay loam, 2 to 9 percent slopes	740	.1
Santa Ynez clay loam, 9 to 30 percent slopes	1,003	.1
Sedimentary rock land	44,205	5.3
Shedd silty clay loam, 15 to 30 percent slopes	1,980	.2
Shedd silty clay loam, 30 to 45 percent slopes	5,118	.6
Shedd silty clay loam, 30 to 75 percent slopes, severely eroded	22,999	2.7
Shedd silty clay loam, 45 to 75 percent slopes	13,472	1.6
Shedd silty clay loam, diatomaceous variant, 15 to 30 percent slopes	439	.1
Shedd silty clay loam, diatomaceous variant, 30 to 45 percent slopes	2,763	.3

TABLE 1.--APPROXIMATE ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Soil	Area	Extent
	Acreage	Percent
Shedd silty clay loam, diatomaceous variant, 45 to 75 percent slopes	518	0.1
Sorrento sandy loam, 0 to 2 percent slopes	6,403	.8
Sorrento sandy loam, 2 to 9 percent slopes	1,109	.1
Sorrento sandy loam, sandy substratum, 0 to 2 percent slopes	4,443	.5
Sorrento loam, 0 to 2 percent slopes	4,521	.5
Sorrento loam, 2 to 9 percent slopes	2,109	.2
Sorrento clay loam, 0 to 5 percent slopes, eroded	255	(1/)
Stutzville loamy sand	1,458	.2
Stutzville sandy loam	1,098	.1
Stutzville loam	754	.1
Stutzville loam, strongly saline	548	.1
Stutzville silty clay loam	1,573	.2
Stutzville silty clay loam, strongly saline	1,424	.2
Swamp	412	(1/)
Tangair sand, 0 to 2 percent slopes	5,353	.6
Tangair sand, 2 to 9 percent slopes	3,713	.4
Terrace escarpments, sandy	6,036	.7
Terrace escarpments, loamy	5,035	.6
Terrace escarpments, cobbly	7,021	.8
Tierra loamy sand, 2 to 9 percent slopes	377	(1/)
Tierra loamy sand, 9 to 30 percent slopes	1,116	.1
Tierra sandy loam, 2 to 9 percent slopes	1,446	.2
Tierra sandy loam, 9 to 15 percent slopes, eroded	1,360	.2
Tierra sandy loam, 15 to 30 percent slopes, eroded	2,254	.3
Tierra loam, 2 to 9 percent slopes	2,017	.2
Tierra loam, 9 to 15 percent slopes	1,270	.1
Tierra loam, 15 to 30 percent slopes, eroded	1,064	.1
Tierra loam, 5 to 30 percent slopes, severely eroded	3,078	.4
Tierra clay loam, 15 to 45 percent slopes	1,477	.2
Toomes-Climara complex, 30 to 75 percent slopes	5,492	.6
Wasioja fine sandy loam, 2 to 5 percent slopes	2,047	.2
Wasioja fine sandy loam, 5 to 9 percent slopes	3,970	.5
Wasioja fine sandy loam, 9 to 15 percent slopes	1,636	.2
Wasioja cobbly fine sandy loam, 2 to 9 percent slopes	1,912	.2
Wasioja cobbly fine sandy loam, 9 to 45 percent slopes	6,473	.8
Water	3,032	.4
Total	830,870	100.0

Agueda Series

The Agueda series consists of well-drained loams and silty clay loams that formed in alluvium derived from sandstone and shale sediments. Slopes are 0 to 9 percent. These soils are in valleys in the western part of the survey area, generally within 20 miles of the coast. Elevations range from 50 to 700 feet. The average annual rainfall is 14 to 20 inches, the average annual air temperature is 58° F., and the frost-free season is 280 to 320 days. The vegetation consists of annual grasses, forbs, and scattered oak trees. Agueda soils are associated with Salinas and Bayshore soils.

In a representative profile, the surface layer is dark-gray silty clay loam about 42 inches thick. Below is stratified, dark-gray, grayish-brown, and gray sandy loam to silty clay loam. In some places the surface layer is loam. Agueda soils are calcareous throughout the profile.

Where water is available, Agueda soils are used for irrigated crops. Dryland crops are grown where water is not available. Small isolated areas are used for range.

Representative profile of the Agueda series (on the San Julian ranch, 6 miles west of U.S. Highway No. 101 on State Highway No. 1, at a gully bank on Jaro Creek about 350 feet north of Highway No. 1 and 50 feet southwest of a small dam and pump):

Ap--0 to 6 inches, dark-gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) when moist; strong, medium and coarse, granular structure; hard, firm, sticky and plastic; many very fine, fine, and medium roots and few micro roots; many fine and very fine interstitial pores and many fine and very fine tubular pores; strongly effervescent; disseminated lime; moderately alkaline (pH 8.0); clear, wavy boundary.

A1--6 to 42 inches, dark-gray (10YR 4/1) silty clay loam, black (10YR 2/1) when moist; weak, coarse, prismatic breaking to strong, fine, granular structure; hard, friable, sticky and plastic; many very fine, fine, and medium roots; many micro and very fine interstitial pores and many very fine and fine tubular pores; strongly effervescent; disseminated lime and lime in filaments and threads; moderately alkaline (pH 8.0); diffuse, irregular boundary.

AC--42 to 55 inches, dark-gray (10YR 4/1) silty clay loam with sparse grayish-brown (10YR 5/2) blotches, pale brown (10YR 6/3), very dark gray (10YR 3/1), dark grayish brown (10YR 4/2), and grayish brown (10YR 5/2) when moist; few, fine, prominent, dark reddish-brown (5YR 3/3d) mottles in lower half of horizon; weak, medium, subangular blocky breaking to strong, fine and medium, granular structure; hard, firm, sticky and plastic; common very fine and fine roots; many very fine interstitial pores and many fine and medium tubular pores; strongly effervescent; disseminated lime and lime in filaments, threads, and soft masses; moderately alkaline (pH 8.0); clear, smooth boundary.

IIC1--55 to 63 inches, grayish-brown (10YR 5/2) sandy loam, very dark gray (10YR 3/1) when moist; few, medium, distinct, dark grayish-brown (10YR 4/2) mottles; massive; hard, very friable, slightly sticky and slightly plastic; common very fine and fine roots; many very fine roots; many very fine interstitial pores and many very fine, fine, and medium tubular pores; slightly effervescent; disseminated lime and lime in threads and filaments; moderately alkaline (pH 8.0); clear, smooth boundary.

IIIC2--63 to 72 inches, gray (10YR 5/1) light silty clay loam, very dark gray (10YR 3/1) when moist; few reddish-brown (5YR 4/4) mottles; weak, medium, subangular blocky, breaking to moderate, fine and medium, granular structure; hard, firm, sticky and plastic; common micro roots and very fine and few fine roots; many very fine interstitial pores and many micro, fine, and medium tubular pores; strongly effervescent; disseminated lime and lime in threads and filaments; moderately alkaline (pH 8.0).

In this profile, the A1 horizon has vertical cracks 1/4 to 1/2 inch wide that extend to the IIC1 horizon; material from the Ap horizon is in the cracks. The AC, IIC1, and IIIC2 horizons contain a few iron concretions.

Color in the A horizon ranges from dark gray to very dark gray. The texture ranges from loam to silty clay loam. The C horizon ranges in color from grayish brown to gray or yellowish brown.

Agueda loam, 0 to 2 percent slopes, is a taxadjunct to the Agueda series because it contains fine sand at a depth of 30 to 40 inches. The difference does not alter use and management of the soil.

Agueda loam, 0 to 2 percent slopes (AdA).--This soil has a profile similar to the one described as representative for the series except that the surface layer is dark-gray loam, 30 to 40 inches thick, over light-colored fine sand. This soil occurs along Green Canyon Creek west of Santa Maria.

Included in mapping are small areas of Agueda loam that do not have a sand substratum, and small areas of Salinas soils that are underlain by sand.

This soil is moderately permeable above the sand layer and rapidly permeable in the sand. Surface runoff is very slow, and the erosion hazard is none to slight. The available water capacity is 6.0 to 7.5 inches. Fertility is high. The effective rooting depth is 30 to 40 inches and is limited by the sand layer.

This soil is used for most of the irrigated crops grown in the Area. Lime-induced chlorosis is a problem for the more lime-sensitive crops. Capability unit IIs-0(14).

Agueda silty clay loam, 0 to 2 percent slopes (AgA).--This soil has the profile described as representative for the series. Included in mapping are small areas of Salinas soils, and areas that are underlain by sand at depths of 4 to 6 feet. Also included are a few areas in the Santa Ynez Valley in which about 5 to 15 percent of the entire soil profile is shale fragments. Other included small areas consist of soils that formed under somewhat poor drainage conditions. These areas are now drained.

Permeability is moderate. Surface runoff is very slow, and the erosion hazard is none to slight. Fertility is high. The available water capacity is 11.0 to 13.0 inches, and the effective rooting depth is more than 60 inches.

This Agueda soil is used for lime-tolerant irrigated row and field crops. Capability unit I-1(14).

Agueda silty clay loam, 2 to 9 percent slopes (AgC).--This soil has a profile similar to the one described as representative for the series except that it is more stratified throughout. It occurs in small, irregularly shaped areas on alluvial fans and terrace breaks. Slopes are 2 to 9 percent.

Included in mapping are areas in which 5 to 15 percent of the entire soil profile is shale fragments. Also included are areas of Agueda soils where slopes are less than 2 percent or greater than 9 percent.

Permeability is moderate. Surface runoff is slow to medium, and the erosion hazard is slight to moderate. This soil is cut by shallow channels in places. Fertility is high. The available water capacity is 11.0 to 13.0 inches. The effective rooting depth is more than 60 inches.

This soil is used primarily for dryland grain, hay, and pasture. The more gently sloping areas are used for lime-tolerant irrigated row crops. Capability unit IIe-1(14) and IIe-1(15); Clayey range site.

Arnold Series

The Arnold series consists of somewhat excessively drained sands that developed over soft sandstone. These soils occur in widely scattered areas south and west of Orcutt, in the Vandenberg Air Force Base, and in the vicinity of Los Alamos. Slopes range from 5 to 45 percent. Arnold soils occur at elevations of 200 to 1,500 feet. The average annual rainfall is 14 to 18 inches, the average annual air temperature is 58° F., and the frost-free season is 260 to 300 days. Arnold soils are associated with Oceano, Marina, Narlon, and Tangair soils.

In a representative profile, the soil is light-brown to very pale brown sand about 55 inches thick. It is underlain by very pale brown, soft, porous sandstone that can be dug with hand tools. Reaction is medium acid to strongly acid.

Vegetation varies widely on the Arnold soils. On north-facing slopes there is generally a dense growth of oak trees with an undercover of sparse annual grasses, forbs, and California sagebrush. On south-facing slopes the vegetation is generally a combination of annual grasses, forbs, scattered oak trees, and California sagebrush. Steep areas normally are covered with brush.

Arnold soils are used for range and annual pasture. They erode readily and contribute sand, silt, rocks, brush, and other debris to lower lying areas.

Representative profile of the Arnold series (southeast of Orcutt, 2 1/4 miles southeast from Clark Road on Bradley Road, 0.2 mile past cattle guard in oil field, 40 feet upslope):

O1--1/2 inch to 0, incomplete cover of twigs and leaves.

A11--0 to 2 inches, light brownish-gray (10YR 6/2) loamy sand, dark gray (10YR 4/1) when moist; weak, fine, granular structure; soft, very friable, nonsticky and nonplastic; common fine roots; many very fine and few fine interstitial pores; many fine flakes of organic matter; medium acid (pH 6.0); clear, wavy boundary.

A12--2 to 12 inches, light brownish-gray (10YR 6/2) sand, dark grayish brown (10YR 4/2) when moist; single grain when dry; loose, nonsticky and nonplastic; few very fine roots and very few medium roots; many very fine interstitial pores; strongly acid (pH 5.5); diffuse, smooth boundary.

A13--12 to 23 inches, light brownish-gray (10YR 6/2) sand, dark grayish brown (10YR 4/2) when moist; single grain; loose, nonsticky and nonplastic; similar to A12 horizon but slightly lighter in color and coarser in texture; few very fine roots and very few medium roots; many very fine interstitial pores; strongly acid (pH 5.5); gradual, wavy boundary.

C1--23 to 39 inches, very pale brown (10YR 8/3) sand, brown (10YR 5/3) when moist; single grain; loose, nonsticky and nonplastic; very few very fine roots; many very fine interstitial pores; strongly acid (pH 5.1); gradual, smooth boundary.

C2--39 to 55 inches, very pale brown (10YR 8/3) sand, pale brown (10YR 6/3) when moist; single grain; loose, nonsticky and nonplastic; very few fine roots; many very fine interstitial pores; strongly acid (pH 5/5); gradual, wavy boundary.

C3--55 inches, very pale brown (10YR 7/3) very soft sandstone, reddish yellow (7.5YR 6/6) when moist; very easily cut with hand tools, only slightly more firm than C2 horizon; includes 10 percent subangular pieces of brown (7.5YR 5/4) hard sandstone, 2 to 8 inches across; yellowish red (5YR 5/6) when moist; continuous moderately thick clay films as bridges and in pores of hard fragments; fragments are extremely firm when moist, in the upper part, to firm when moist at depths below 60 inches.

A few indistinct pockets in the C horizon of this profile are filled with material from the A horizon, and the A13 horizon has similar pockets filled with material from the C horizon.

Color of the A1 horizon ranges from gray to light brownish gray, and texture ranges from sand to loamy sand. Thickness of the A horizon ranges from 10 to 30 inches but normally is about 26 inches. Depth to sandstone ranges from 20 to 60 inches.

Arnold sand, 5 to 15 percent slopes (ArD).--This soil occupies low hills and ridgetops. Depth to soft sandstone averages 40 inches but ranges to 60 inches.

Included in mapping are small areas of Chamise, Crow Hill, Linne, San Andreas, and Santa Lucia soils.

Permeability is rapid. Surface runoff is medium, and the erosion hazard is moderate. Fertility is very low. Available water capacity is 2 to 4 inches. The effective rooting depth is 40 to 60 inches.

This soil is used for annual pasture and range. Capability unit VIe-4(15); Sandy range site.

Arnold sand, 15 to 45 percent slopes (ArF).--This soil has the profile described as representative for the series. Depth to soft sandstone ranges from 40 to 60 inches.

Included in mapping are small areas of Chamise, Crow Hill, Linne, San Andreas, and Santa Lucia soils. Also included are areas in the draws that have an accumulation of clay in the subsoil.

Permeability is rapid. Surface runoff is rapid, and the hazard of erosion is high. The soil is easily gullied. Fertility is very low. Available water capacity is 2 to 4 inches, and the effective rooting depth is 40 to 60 inches.

This Arnold soil is used for range. Capability unit VIIe-4(15); Sandy range site.

Arnold sand, 9 to 45 percent slopes, severely eroded (ArF3).--This soil has a profile similar to that described as representative for the series except that the surface layer is dark colored and very thin and is absent in places. Depth to soft sandstone is 20 to 30 inches.

Included in mapping are small areas of Chamise, Crow Hill, Linne, San Andreas, and Santa Lucia soils. Also included are areas shallower than 20 inches, and areas where sandstone rock crops out.

Permeability is rapid. Surface runoff is rapid, and the erosion hazard is high. This soil is severely rilled and gullied. Many areas are sharply dissected and have steep uneven slopes and sharp ridgetops. The available water capacity is 1.0 to 2.0 inches, and the effective rooting depth is 20 to 30 inches. Fertility is very low.

This soil has limited use as range. Because the erosion hazard is high, the soil contributes large amounts of sand and silt to lower lying areas. Capability unit VIIe-4(15); Eroded or Shallow Sandy range site.

Ballard Series

The Ballard series consists of well-drained fine sandy loams and gravelly fine sandy loams that formed in alluvium derived from acid shale and sandstone. These soils occur on remnants of old terraces that have been somewhat dissected by drainageways. Slopes are 0 to 15 percent. The vegetation is annual grasses and forbs and scattered large oak trees. Elevations range from 500 to 1,000 feet. The average annual rainfall is 15 to 20 inches, the average annual temperature is 58° F., and the frost-free season is 270 to 300 days. Ballard soils are associated with Chamise, Positas, Santa Ynez, and Elder soils.

In a representative profile, the surface layer is grayish-brown gravelly fine sandy loam about 18 inches thick. The subsoil is light yellowish-brown and yellowish-brown gravelly loam, gravelly heavy loam, and very gravelly sandy loam that extends to a depth of about 59 inches. The substratum is very pale brown, very gravelly, stratified loamy sand. In some areas the soil lacks gravel in the surface layer.

Ballard soils are used mainly for pasture and range, and to a limited extent for dryfarmed grain. Where water is available, they are irrigated for orchards, alfalfa, pasture, and field crops.

Representative profile of the Ballard series (on the Dean Brown ranch, approximately 8 miles north of Buellton, California, 2 1/2 miles north on Zaca cutoff road from U.S. Highway No. 101, 1/4 mile west on oil road and about 750 feet south on farm road):

A11--0 to 10 inches, grayish-brown (10YR 5/2), gravelly fine sandy loam, very dark brown (10YR 2/2) when moist; moderate, medium and coarse, granular structure; slightly hard, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine and fine interstitial pores; medium acid (pH 6.0); gradual, wavy boundary.

A12--10 to 18 inches, grayish-brown (10YR 5/2) gravelly fine sandy loam, very dark brown (10YR 2/2) when moist; weak, fine and medium, granular structure; slightly hard, very friable, slightly sticky and slightly plastic; common micro and very fine roots; many very fine interstitial pores and many fine and medium tubular pores; slightly acid (pH 6.2); clear, wavy boundary.

B1--18 to 34 inches, light yellowish-brown (10YR 6/4) gravelly loam, dark yellowish brown (10YR 4/4) when moist; massive; hard, friable, slightly sticky and slightly plastic; common micro and very fine roots; many micro interstitial pores and common very fine and fine tubular pores; few thin clay films in pores, few thin colloidal stains on mineral grains; slightly acid (pH 6.2); clear, wavy boundary.

B2t--34 to 44 inches, yellowish-brown (10YR 5/4) gravelly heavy loam, dark yellowish brown (10YR 4/4) when moist; massive; hard, friable, sticky and slightly plastic; few micro and very fine roots; many micro interstitial pores and common very fine and fine tubular pores; common moderately thick clay films in pores;

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few thin colloidal stains on mineral grains; slightly acid (pH 6.5); gradual, irregular boundary.

B3--44 to 59 inches, very pale brown (10YR 7/3) very gravelly sandy loam, dark yellowish brown (10YR 4/4) when moist; massive, slightly hard, very friable, slightly sticky and slightly plastic; very few micro and very fine roots; many very fine interstitial pores; few thin clay films bridging mineral grains, very few thick clay films in pores; slightly acid (pH 6.5); gradual boundary.

C--59 to 72 inches, very pale brown (10YR 7/4) very gravelly loamy sand, yellowish brown (10YR 5/6) when moist; massive; slightly hard, very friable, nonsticky and nonplastic; no roots; many very fine interstitial pores; few moderately thick clay bridges between mineral grains and common thin films on gravel; slightly acid (pH 6.5).

In most Ballard soils that are high in content of Monterey Shale, the A horizon has a color chroma of 2; in some, the chroma is almost 1. Nongravelly Ballard soils generally formed in material derived from formations other than Monterey Shale and have chromas of 2 to 3. Value typically is 5, but in areas where oak trees grow it is 4. Texture generally is gravelly fine sandy loam. In some places it is sandy loam, and in many places it is gravelly loam. Gravel content ranges from 5 to less than 35 percent in the A and B horizons and 35 to 55 percent in the C horizon. The B horizon is generally heavy loam. In a few places it is finer textured. The B horizon occurs at depths of 14 to 20 inches. In the B and C horizons, the chromas are 3 and 4, the dry value is 5 and 7, and the hue is 10YR. Reaction ranges from pH 6.0 to 6.5, but in many areas it is nearer to 6; there is no clear trend in relation to depth.

Ballard fine sandy loam, 0 to 2 percent slopes (BaA).--This soil is nearly level and occurs on terraces in the Santa Ynez Valley along the Santa Ynez River. It has a profile similar to the profile described as representative for the series except that the surface layer is brown fine sandy loam that is less than 15 percent gravel.

Included in mapping are small areas of Chamise and Elder soils and of gravelly Ballard soils.

Permeability is moderate. Surface runoff is very slow, and the erosion hazard is slight. Fertility is moderate. The available water capacity is 7.5 to 9.0 inches, and the effective rooting depth is more than 60 inches.

This Ballard soil is used for annual pasture and range and for dryfarmed grain. Where irrigation water is available, the soil is used for irrigated orchards, corn silage, sugar beets, dry lima beans, alfalfa, and pasture. Capability unit I-1(14); Loamy range site.

Ballard fine sandy loam, 2 to 9 percent slopes (BaC).--This soil has a profile similar to the one described as representative for the series except that the brown fine sandy loam surface layer does not contain gravel.

Included in mapping are small areas of Chamise and Elder soils.

Permeability is moderate. Surface runoff is slow to medium, and the erosion hazard is slight to moderate. Fertility is moderate. The available water capacity is 7.5 to 9.0 inches, and the effective rooting depth is more than 60 inches.

This soil is used for irrigated orchards, sugar beets, lima beans, alfalfa, and pasture. It is also used for dryfarmed grain and for annual pasture and range. Capability units IIe-1(14) and IIIe-1(15); Loamy range site.

Ballard fine sandy loam, 9 to 15 percent slopes (BaD).--This soil has a profile similar to the profile described as representative for the series except that the surface layer is brown fine sandy loam 14 to 16 inches thick. The soil is strongly sloping and occurs on terraces that are dissected by drainageways.

Included in mapping are small areas of Elder, Positas, and Santa Ynez soils.

Permeability is moderate. Surface runoff is medium, and the erosion hazard is moderate. Fertility is moderate. The available water capacity is 7.5 to 9.0 inches. The effective rooting depth is more than 60 inches.

This Ballard soil is used mainly for annual pasture and range. Some areas are used for dryfarmed hay and grain. Capability unit IVe-1(15); Loamy range site.

Ballard gravelly fine sandy loam, 0 to 2 percent slopes (BbA).--This soil is nearly level and occupies terraces. The gravel content of the surface layer and subsoil ranges from 15 to 35 percent.

Included in mapping are areas of Chamise and Elder soils and of nongravelly Ballard soils.

Permeability is moderate. Surface runoff is very slow, and the erosion hazard is none to slight. Fertility is moderate. The available water capacity is 6.0 to 7.5 inches. The effective rooting depth is more than 60 inches.

This Ballard soil is used for irrigated orchards, silage corn, lima beans, sugar beets, and alfalfa hay and pasture. It is also used for dryfarmed hay and grain, and for annual pasture and range. Capability unit IIs-4(14); Loamy range site.

Ballard gravelly fine sandy loam, 2 to 9 percent slopes (BbC).--This soil has the profile described as representative for the series. It is gently sloping to moderately sloping and occupies terraces at slightly higher elevations than the valleys. Slopes normally are 3 to 4 percent but range to 9 percent.

Included in mapping are small areas of Chamise, Elder, Positas, and Santa Ynez soils. Also included are areas of Ballard soils that are nongravelly and of Ballard soils that are 35 to 60 percent gravel.

Permeability is moderate. Surface runoff is slow to medium, and the erosion hazard is slight to moderate. Fertility is moderate. The available water capacity is 6.0 to 7.5 inches, and the effective rooting depth is more than 60 inches.

This soil is used for irrigated orchards, corn silage, sugar beets, dry lima beans, and alfalfa hay and pasture. It is also used for dryland hay and grain, and for annual pasture and range. Capability unit IIe-1(14) and IIIe-1(15); Loamy range site.

Ballard gravelly fine sandy loam, 9 to 15 percent slopes (BbD).--This soil occupies dissected terraces. The surface layer is 14 to 18 inches thick, and 25 to 35 percent of the surface layer and subsoil is gravel. Otherwise the profile is similar to the one described as representative for the series.

Included in mapping are small areas of Chamise, Elder, Positas, and Santa Ynez soils. Also included are small areas in which 50 to 75 percent of the entire soil profile is gravel.

Permeability is moderate. Surface runoff is medium, and the erosion hazard is moderate. Fertility is moderate. The available water capacity is 6.0 to 7.5 inches, and the effective rooting depth is more than 60 inches.

This soil is used for dryland hay and grain and for annual pasture and range. Capability unit IVe-1 (15); Loamy range site.

Ballinger Series

The Ballinger series consists of well-drained silty clays. These soils are underlain by soft mudstone at depths of 18 to 40 inches and contain a large amount of lime, gypsum, and soluble salts. They occur on smooth hills in the Cuyama Valley. The largest area is south of the Cuyama River, several miles west of New Cuyama. A small area is near the western edge of Cuyama Valley at the Kern and Ventura County lines. Slopes range from 15 to 75 percent. The vegetation is sparse grasses and forbs. Elevations range from 1,800 to 3,000 feet. The average annual air temperature is about 58° F., the average annual rainfall is 6 to 12 inches, and the frost-free season is 180 to 250 days. Ballinger soils are associated with Kettleman and Shedd soils.

In a representative profile, the surface layer is pale-brown silty clay about 15 inches thick. The underlying layers are predominantly yellowish-brown and grayish-brown silty clay. At about 36 inches is grayish-brown and olive-gray mudstone. Salt and gypsum crystals occur in seams and nodules throughout the soil but are more prominent in the lower part and in the mudstone.

The Ballinger soils are used for range and wildlife.

Representative profile of the Ballinger series (approximately 12 miles west of New Cuyama on Highway No. 166, 1.3 miles south on ranch road, and 100 feet west on hillside):

A11--0 to 2 1/2 inches, pale-brown (10YR 6/3) silty clay, dark brown (10YR 4/3) when moist; 1/8- to 1/4- inch peaty surface crust; strong, medium, granular structure; hard, friable, very sticky and very plastic; few very fine roots; few very fine tubular pores and many fine interstitial pores; strongly effervescent; disseminated lime; moderately alkaline (pH 8.0); abrupt, smooth boundary.

A12--2 1/2 to 15 inches, pale-brown (10YR 6/3) silty clay, dark brown (10YR 4/3) when moist; weak, coarse, prismatic structure; hard, friable, very sticky and very plastic; few very fine roots; few very fine tubular pores and many very fine interstitial pores; strongly effervescent; disseminated lime and lime in filaments and seams; moderately alkaline (pH 8.0); gradual, irregular boundary.

C1cs--15 to 23 inches, yellowish-brown (10YR 5/4) mixed with light-gray (10YR 7/2), reddish-gray (5YR 5/2) and gray (5Y 5/1) silty clay, dark yellowish brown (10YR 4/4) when moist; moderate, fine, angular blocky structure; very hard, firm, very sticky and very plastic; very few very fine roots; common very fine interstitial pores; violently effervescent; disseminated lime and lime in filaments, seams, and soft masses; moderately alkaline (pH 8.0); gradual, irregular boundary.

C2cs--23 to 36 inches, grayish-brown (2.5Y 5/2) mixed with light-gray (10YR 7/2), brown (7.5YR 5/2, and olive (5Y 5/3) silty clay, very dark grayish brown (2.5Y 3/2) when moist; weak, angular blocky structure; hard, firm, very sticky and very plastic; no roots; common very fine interstitial pores; violently effervescent; disseminated lime and lime in filaments, seams, and soft masses; moderately alkaline (pH 8.0); clear, wavy boundary.

C3--36 inches, grayish-brown (2.5Y 5/2) mudstone with beds of olive gray (5Y 4/2), very dark grayish brown (2.5Y 3/2) and olive (5Y 5/4) when moist; fractured, softens to silty clay when wet and rubbed.

Typically, the A1 horizon is pale brown but ranges to light yellowish brown where the soil is eroded or shallow. In most areas, the content of soluble salt is 0.1 to 0.3 percent in the A horizon and 0.4 to 0.5 percent in the substrata. In the more barren and dry areas in the eastern part of the Cuyama Valley, the content of soluble salt is 0.4 to 1.0 percent in the A horizon and more than 1.0 percent in the substrata. In all areas the soils have thick seams of gypsum crystals in cracks and on ped faces. In some areas numerous fragments of gypsum crystals are on the surface and in the profile. Based on laboratory analysis, the content of gypsum in the profile ranges from 8 to 20 percent. Depth to mudstone ranges from 18 inches to about 40 inches.

Ballinger silty clay, 15 to 30 percent slopes (BcE).--This soil is on low hills and moderately steep hilltops. It has the profile described as representative for the series. Depth to mudstone averages 26 inches but ranges from 20 inches on the tops of ridges to 40 inches in concave areas.

Included in mapping are areas of Kettleman soils in the drier areas and of Shedd soils intermingled with Ballinger soils in the more moist areas. Also included are small isolated areas capped by old terrace deposits.

Permeability is slow. Surface runoff is medium to rapid, and the erosion hazard is moderate to high. Fertility is very low. The available water capacity is 3.0 to 6.0 inches, and the effective rooting depth is 20 to 40 inches.

This soil can be used for light grazing early in spring when the sparse vegetation is green. Capability unit VIIe-9(15); Gypsum Hills range site.

Ballinger silty clay, 30 to 45 percent slopes (BcF).--This soil is commonly 20 to 30 inches deep over mudstone.

Included in mapping are areas of Kettleman and Shedd soils.

Permeability is slow. Surface runoff is rapid, and the erosion hazard is high. Fertility is very low. The available water capacity is 3.0 to 4.5 inches, and the effective rooting depth is 20 to 30 inches.

This soil is used for very limited grazing in spring. Capability unit VIIe-9(15); Gypsum Hills range site.

Ballinger silty clay, 45 to 75 percent slopes (BcG).--This soil has a profile similar to the profile described as representative for the series except that it is 18 to 26 inches deep, and the color of the surface layer is light yellowish brown.

Included with this soil in mapping are small areas of Kettleman and Shedd soils and Rough broken land.

Permeability is slow. Surface runoff is very rapid, and the erosion hazard is very high. Fertility is very low. The available water capacity is 2.5 to 4.0 inches, and the effective rooting zone is 18 to 26 inches.

This Ballinger soil is used for very limited grazing (pl. I, top). Capability unit VIIe-9(15); Gypsum Hills range site.

Bayshore Series

The Bayshore series consists of somewhat poorly drained to poorly drained silty clay loams and loams that formed in recently deposited alluvium derived from calcareous sandstone and shale. These soils have slopes of 0 to 2 percent and occur on flood plains. The vegetative cover is marsh grasses, sedges, and other water-tolerant plants. Elevations range from 30 to 100 feet. The average annual rainfall is 13 to 15 inches, the average annual air temperature is 59° F., and the frost-free season is 310 to 340 days. Bayshore soils are associated with Salinas and Agueda soils.

In a representative profile, the surface layer is dark-gray, calcareous, silty clay loam about 24 inches thick. This layer is underlain by stratified, mottled, dark grayish-brown calcareous loam. Thin, peaty strata are common in the lower part of the profile. In some places the surface layer is loam.

Most areas of Bayshore soils have been artificially drained and are used for irrigated crops.

Representative profile of the Bayshore series (approximately 1 1/4 miles west of Betteravia; slightly less than 1/2 mile southwest of the intersection of Bay Road and Betteravia Lateral Road, 3/8 mile northwest, near middle of field):

Ap1--0 to 4 inches, dark-gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) when moist; strong, fine and medium, granular structure; hard, friable, sticky and plastic; common very fine roots; many very fine and fine interstitial pores; strongly effervescent; disseminated lime; moderately alkaline (pH 8.0); abrupt, smooth boundary.

Ap2--4 to 17 inches, dark-gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) when moist; moderate, fine and medium, granular structure; hard, firm, sticky and plastic; common very fine, fine, and medium roots; few very fine tubular pores and many very fine interstitial pores; strongly effervescent; disseminated lime; moderately alkaline (pH 8.0); clear, smooth boundary.

Alca--17 to 24 inches, dark-gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) when moist; weak, medium, subangular blocky, parting to weak, medium, granular structure; very hard, friable, sticky and plastic; common very fine and fine roots; common very fine and fine tubular pores and common very fine interstitial pores; strongly effervescent; disseminated lime and lime in fine and medium irregularly shaped seams and soft masses; moderately alkaline (pH 8.0); clear, wavy boundary.

IIC1ca--24 to 38 inches, dark grayish-brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) when moist; few fine, distinct mottles of very dark gray (10YR 3/1) and dark yellowish brown (10YR 4/4); weak, medium, subangular blocky, parting to weak, medium, granular structure; hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; common fine tubular pores and many micro interstitial pores; violently effervescent; disseminated lime and lime in fine, irregularly shaped filaments and soft masses; moderately alkaline (pH 8.2); clear, smooth boundary.

IIC2ca--38 to 56 inches, dark grayish-brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) when moist; common, medium, prominent mottles and blotches of light brownish gray (2.5Y 6/2), olive yellow (2.5Y 6/6), and white (10YR 8/2); weak, fine and medium, granular structure; hard, very friable, slightly sticky and

slightly plastic; very few fine roots; very few very fine tubular pores and many micro and very fine interstitial pores; violently effervescent; disseminated lime and lime in fine, irregularly shaped seams and soft masses; moderately alkaline (pH 8.2); gradual, irregular boundary.

IIC3ca--56 to 72 inches, dark grayish-brown (10YR 4/2) loam, very dark grayish brown (2.5Y 3/2) when moist; many medium prominent mottles of grayish brown (2.5Y 5/2), light gray (N 7), pale olive (5Y 6/4), and olive (5Y 5/4); medium, fine, granular structure; slightly hard, very friable, sticky and slightly plastic; very few fine roots; many micro interstitial pores and few fine tubular pores; violently effervescent; disseminated lime and lime in medium, irregularly shaped seams and soft masses; moderately alkaline (pH 8.2); gradual, irregular boundary.

The A horizon ranges in color from gray to dark gray, in texture from loam to silty clay loam, and in thickness from 20 to 30 inches. The C horizons have varying degrees of coloring, mottling, and gleying, depending upon the degree of drainage. The C horizons are stratified and, typically, the texture is loam to silty clay loam. Some areas are underlain at a depth of 3 to 4 feet by fine sand or silty clay. Peaty strata are common in the lower part of the A horizon and in the C horizon. Poorly drained areas normally are slightly to strongly saline.

Bayshore loam, drained (Bd).--This soil is nearly level and occurs on low-lying flood plains. It has a profile similar to the one described as representative for the series except that the loam surface layer is underlain by silty clay at a depth of 3 to 4 feet.

Included with this soil in mapping are small areas of Agueda and Salinas soils.

This soil formed under somewhat poor drainage conditions but is now artificially drained. Permeability is moderately slow. Surface runoff is very slow, and the erosion hazard is none to slight. Fertility is high. The available water capacity is 8.0 to 10.0 inches, and the effective rooting depth is 48 to 60 inches. As a result of artificial drainage, the water table is below a depth of 4 to 5 feet.

This soil is used for most crops grown in the Area except those affected by poor drainage (pl. I, bottom). Capability unit IIw-2(14).

Bayshore loam, sandy substratum, drained (Be).--This soil is nearly level and occupies low flood plains. It has a loam surface layer that is underlain at a depth of about 40 inches by sand. The water table is within 2 to 3 feet of the surface during the winter and drops below a depth of 6 feet in summer.

Included in mapping are small areas of Salinas and Agueda soils. Also included are small areas that are inundated during floods, and scattered areas where the sand substratum is at a depth of less than 40 inches.

This soil formed under somewhat poor drainage conditions but most areas are now artificially drained. Permeability is moderate above the sand and rapid in the sand. Surface runoff is very slow, and the erosion hazard is none to slight. Fertility is moderate. The available water capacity is 7.0 to 8.0 inches. The effective rooting depth is 40 to 60 inches.

This soil is used for most crops grown in the Area except those that are affected by poor drainage. Capability unit IIw-2(14).

Bayshore silty clay loam (Bg).--This soil is nearly level and occupies flood plains. The water table is within a foot of the surface in winter but may drop to 3 or 4 feet below the surface during the summer. The soil is moderately to strongly saline.

Included in mapping are areas of Agueda and Salinas soils and Marsh.

This soil is poorly drained. Permeability is moderately slow. Surface runoff is very slow, and the erosion hazard is none to slight. Fertility is high. The available water capacity of drained soil is 10.0 to 12.0 inches. The effective rooting depth is 12 to 48 inches.

This Bayshore soil is used chiefly for limited grazing. Small areas are used for dryfarmed grain. Capability unit IIIw-2(14).

Bayshore silty clay loam, drained (Bh).--This soil is nearly level and occurs on low flood plains. It has the profile described as representative for the series.

Included with this soil in mapping are small areas of Agueda and Salinas soils. Also included are areas near the Green Canyon drainageway that are underlain by sand at a depth of 3 to 5 feet.

This soil formed under somewhat poor drainage conditions, but ditches and tile have been installed and the water table is no longer a problem. Permeability is moderately slow. Surface runoff is very slow, and the erosion hazard is none to slight. Fertility is high. The available water capacity is 10.0 to 12.0 inches, and the effective rooting depth is more than 60 inches.

This soil is drained and is used for most crops grown in the Area. Crops such as walnuts and alfalfa do not grow so well on this soil as do sugar beets, flowers, and artichokes. Capability unit IIw-2(14).

Betteravia Series

The Betteravia series consists of moderately well drained loamy sands developed from coarse-textured, wind-modified marine sands. These soils are on low terraces, chiefly on low benches south of the Santa Maria Valley, in the northern part of the Area. Some of these terraces are dissected by drainageways. Slopes are 0 to 9 percent. The

vegetation is annual grasses and forbs. Elevations range from near sea level to 800 feet. The average annual rainfall is 13 to 18 inches, the average annual air temperature is 57° F., and the frost-free season is 310 to 340 days. Betteravia soils are associated with Marina and Oceano soils.

In a representative profile, the surface layer is brown loamy sand about 20 inches thick. The subsurface layer is light yellowish-brown loamy sand about 16 inches thick. The upper part of the subsoil is light yellowish-brown and reddish-yellow sandy loam and sandy clay loam that is weakly cemented and brittle. The lower part of the subsoil is an old bed of marine soil material and generally is reddish-brown sandy loam and loamy sand. Depth to the brittle, weakly cemented subsoil is about 36 to 50 inches.

Most areas of Betteravia soils are used for range or for nonfarm purposes. Small areas are used for irrigated row crops and for dryland grain.

Representative profile of the Betteravia series (3/8 mile west of Betteravia and Blosser Road intersection, 180 feet north of Betteravia Road, about 140 feet east of paved access road to oil well):

Ap--0 to 10 inches, brown (10YR 5/3) loamy sand, dark brown (10YR 3/3) when moist; weak, medium, granular structure; soft, very friable, nonsticky and nonplastic; many fine and very fine roots; common very fine tubular pores and many very fine interstitial pores; strongly acid (pH 5.1); abrupt, wavy boundary.

A1--10 to 20 inches, brown (10YR 5/3) loamy sand, dark brown (10YR 3/3) when moist; massive; soft, very friable, nonsticky and nonplastic; common very fine roots; many very fine interstitial pores and many very fine tubular pores; strongly acid (pH 5.1); clear, wavy boundary.

A2--20 to 36 inches, light yellowish-brown (10YR 6/4) light loamy sand, yellowish brown (10YR 5/4) when moist; massive; soft, very friable, nonsticky and nonplastic; few very fine roots; many very fine tubular pores and many very fine interstitial pores; strongly acid (pH 5/2); abrupt, wavy boundary.

B21tsi--36 to 41 inches, light yellowish-brown (10YR 6/4), weakly cemented sandy loam, brown (7.5YR 4/4) when moist; massive; very hard, very firm, slightly sticky and slightly plastic; does not slake, and softens only slightly after prolonged wetting; no roots; common very fine tubular pores and many very fine interstitial pores; few moderately thick clay films as bridges, and colloid stains on mineral grains; neutral (pH 6.7); clear, wavy boundary.

B22tsi--41 to 50 inches, reddish-yellow (7.5YR 6/6), weakly cemented heavy sandy loam, strong brown (7.5YR 5/6) when moist; massive; hard, firm, slightly sticky and slightly plastic; does not slake on wetting, not quite so cemented or firm as B21tsi horizon; no roots; common very fine tubular pores and many micro interstitial pores; few thick clay films as bridges and in pores, and colloid stains on mineral grains; neutral (pH 7.0); clear, wavy boundary.

B23t--50 to 56 inches, reddish-yellow (7.5YR 6/6) heavy sandy clay loam, strong brown (7.5YR 5/6) when moist; moderate, medium, angular blocky structure; hard, very firm, sticky and plastic; no roots; few very fine tubular pores and few micro interstitial pores; many thick clay films in pores; neutral (pH 7.0); clear, wavy boundary.

IIB31t--56 to 65 inches, reddish-brown (5YR 5/4) heavy sandy loam, reddish brown (5YR 4/4) when moist; massive; hard, firm, slightly sticky and slightly plastic; no roots; many micro interstitial pores; common thin clay films in pores; neutral (pH 7.1); about 2 percent of horizon is quartzitic gravels; clear, wavy boundary.

IIIB32--65 to 80 inches, reddish-brown (5YR 5/4) light loamy sand, reddish-brown (5YR 4/4) when moist; massive; soft, friable, nonsticky and nonplastic; no roots; many very fine interstitial pores; few thin clay films in pores; neutral (pH 7.0); 5 percent of horizon is quartzitic gravels.

The A horizon has been affected by much rodent activity. All of the B horizons except the IIIB32 horizon have common, small, black concretions less than 6 millimeters in diameter.

Color of the A1 horizon ranges from grayish brown, brown, and pale brown to light yellowish brown. Texture ranges from sand to loamy sand. In some places the A2 horizon is 1 to 2 inches thick and is prominently expressed. In others it is 6 to 20 inches thick and weakly expressed over the B2tsi horizon. In some places a few soft, reddish-black concretions are present in the lower part of the A1 horizon and in the A2 horizon. In local areas are blowouts from which all or most of the A horizon has been removed, and the B horizon is exposed.

Generally the B2tsi horizon is sandy loam or sandy clay loam. In some places, clay films and clay bridges make the soil material brown or reddish brown. Depth to the B2tsi horizon ranges from 6 to 50 inches but averages about 42 inches. Local land operators call the B2tsi horizon a hardpan; the pan material does not slake upon wetting, but it does soften. In scattered areas, the pan is exposed and is indurated. In most areas, the B2tsi horizon is underlain by finer textured, yellowish-brown to reddish-brown horizons. Where these horizons contain considerable amounts of sand and sandy clay loam but no gravel, they appear to be related genetically without unconformity. Where the lower horizons are abruptly fine textured, they appear to be IIB2t horizons, but in places are more like IIC horizons. Generally, the fine-textured material has moderate structure, and there are thick clay films on the peds. In a few places the B2tsi horizon is underlain by unconforming, poorly sorted sediments.

Betteravia loamy sand, 0 to 2 percent slopes (BmA).--This nearly level soil occurs on low

terraces. It has the profile described as representative for the series. Depth to the weakly cemented subsoil is 36 to 50 inches.

Included in mapping are areas of Marina and Oceano soils and of Dune land.

Permeability is very slow. Surface runoff is very slow, and the hazard of water erosion is none to slight. The hazard of soil blowing is high. Fertility is very low. The available water capacity is 3.0 to 4.0 inches, and the effective rooting depth is 36 to 50 inches. This soil tends to become boggy after rains.

This Betteravia soil is used primarily for range and for nonfarm purposes. A few areas are used for dryfarmed grain and for irrigated row crops, particularly strawberries. Capability unit IVe-4(14) and VIe-4(15); Sandy range site.

Betteravia loamy sand, 0 to 2 percent slopes, severely eroded (BmA3).--This soil has been severely eroded through soil blowing, and the surface layer is only 6 to 24 inches thick. The surface layer is generally light yellowish brown or pale brown. In places the weakly cemented subsoil is exposed.

Included with this soil in mapping are areas of Marina and Oceano soils and of Dune land.

Permeability is very slow. Surface runoff is very slow, and the hazard of water erosion is none to slight. The hazard of soil blowing is high. Fertility is very low. The available water capacity is 0.5 inch to 2.0 inches, and the effective rooting depth is 6 to 24 inches.

This soil is used for nonfarm purposes and for limited grazing. Some small areas where the surface layer is thicker are used for specialty crops such as strawberries. Capability unit VIIe-4(15); Eroded (15); Eroded or Shallow Sandy range site.

Betteravia loamy sand, 2 to 9 percent slopes (BmC).--This soil is gently sloping to moderately sloping and occurs on low terraces. Depth to the weakly cemented subsoil averages 36 inches, but ranges from 24 to 42 inches.

Included with this soil in mapping are areas of Marina and Oceano soils.

Permeability is very slow. Surface runoff is slow to medium, and the hazard of water erosion is slight to moderate. The hazard of soil blowing is high. Fertility is very low. The available water capacity is 2.0 to 3.5 inches, and the effective rooting depth is 24 to 42 inches.

This soil is used mainly for annual pasture and range and for nonfarm purposes. Small areas are used for specialty crops such as strawberries. Capability units IVe-4(14) and VIe-4(15); Sandy range site.

Betteravia Series, Dark Variant

These variants from the Betteravia series consist of well-drained loamy sands that formed in alluvium derived from acid sandstone and diatomaceous shale. These soils are on alluvial fans and flood plains. Slopes range from 0 to 15 percent. The vegetative cover consists of annual grasses, forbs, and scattered oak trees. Elevations range from near sea level to 800 feet. The average annual rainfall is 13 to 18 inches, the average annual air temperature is about 59° F., and the frost-free season is 310 to 340 days. Betteravia soils, dark variant, are associated with Botella and Corralitos soils.

In a representative profile, the surface layer is dark-gray and grayish-brown loamy sand about 26 inches thick. The subsoil is light brownish-gray and pale-brown sandy loam. Below the subsoil at about 50 inches is very pale brown loamy sand.

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

Representative profile of the Betteravia series, dark variant (1 mile north of San Antonio Road junction on State Highway No. 1, 2/3 mile up first canyon east, then right on black top road 2/3 mile to fence, and 100 yards to the right on dirt road at the edge of a grove of oak trees):

A11--0 to 1 inch, dark-gray (10YR 4/1) heavy loamy sand, very dark gray (10YR 3/1) when moist; moderate, fine, granular structure; slightly hard, very friable, nonsticky and nonplastic; many very fine roots; many fine interstitial pores; medium acid (pH 6.0); abrupt, smooth boundary.

A12--1 inch to 16 inches, dark-gray (10YR 4/1) loamy sand, very dark gray (10YR 3/1) when moist; weak, coarse, granular structure; slightly hard, very friable, nonsticky and nonplastic; many very fine roots, few coarse woody roots; common medium tubular pores and common fine interstitial pores; medium acid (pH 6.0); clear, smooth boundary.

A13--16 to 26 inches, grayish-brown (10YR 5/2) loamy sand, dark grayish brown (10YR 4/2) when moist; massive; slightly hard, very friable, nonsticky and nonplastic; many very fine roots, few coarse woody roots; common medium pores and few fine and very fine interstitial pores; gopher krotovinas filled with material from the A1 horizon; slightly acid (pH 6.5); clear, smooth boundary.

B2t--26 to 38 inches, light brownish-gray (10YR 6/2) weakly cemented sandy loam, brown (10YR 4/3) when moist; massive; very hard, firm, slightly sticky and slightly plastic; few coarse and very fine roots; few fine and very fine tubular pores; few thin clay films as bridges and very few thin films on indistinct faces; medium acid (pH 6.0); gradual, smooth boundary.

B3t--38 to 50 inches, pale-brown (10YR 6/3) light sandy loam, brown (10YR 5/3) when moist; massive; hard, friable, slightly sticky and slightly plastic; very few coarse, woody roots; few thin clay films in pores, and very few thin clay films in joints; neutral (pH 6.6); gradual, smooth boundary.

C--50 to 61 inches, very pale brown (10YR 7/3) loamy sand, light yellowish brown (10YR 6/4) when moist; massive; slightly hard, very friable,

nonsticky and nonplastic; very few coarse roots; medium acid (pH 6.0).

In this profile there are a few small, water-rounded Monterey Shale fragments between depths of 16 and 61 inches.

In the Betteravia soils, dark variant, texture of the A horizon ranges from light loamy sand to heavy loamy sand. Fans of Corralitos sand grade into the loamy sand. In the trough of the valley these fans, in turn, grade into sandy loam or finer textured materials. Local variations in the sand deposits change this pattern. Texture of the B2 horizon ranges from light sandy loam to light loam. The B2 horizon is weakly cemented. This limits penetration by plant roots and water. The effective rooting depth is 24 to 36 inches. Colors are darker, textures are finer, and horizons are more pronounced in the lowest part of the concave, gently sloping valleys.

Betteravia loamy sand, dark variant, 0 to 5 percent slopes, eroded (BnB2).--This soil is nearly level to gently sloping and occupies valleys. It has the profile described as representative for the Betteravia series, dark variant. This soil is subject to occasional overflow by runoff from adjoining hills. During floods, fresh deposits of alluvium are laid down and removed, and deep and shallow gullies have formed in many places.

Included in mapping are small areas of Corralitos loamy sand and sand. Also included are small areas of wet soils in the valley troughs, areas of soils that have a very slowly permeable clay subsoil, and small areas of moderately well drained soils.

Permeability is slow. Surface runoff is very slow to slow, and the erosion hazard is none to slight. Available water capacity is 3.5 to 5.0 inches, and the effective rooting depth is 24 to 36 inches. Fertility is low.

This soil is used for dryfarmed hay and grain and for annual pasture and range. Where irrigation water is available, the soil is used for alfalfa, sugar beets, lima beans, and walnuts. Capability units IVe-4(14) and IVe-4(15); Sandy range site.

Betteravia loamy sand, dark variant, 5 to 15 percent slopes, eroded (BnD2).--This soil is moderately sloping to strongly sloping and occurs in small valleys.

Included in mapping are areas of Corralitos soils. Also included are areas of soil that has a very slowly permeable clay subsoil and small areas of moderately well drained soils.

Permeability is slow. Surface runoff is medium, and the erosion hazard is moderate. Fertility is low. Available water capacity is 3.5 to 5.0 inches, and the effective rooting depth is 24 to 36 inches.

This soil is used largely for range. Small areas are used for dryland grain and beans. Irrigation water generally is not available. Capability unit IVe-4(14) and IVe-4(15); Sandy range site.

Botella Series

The Botella series consists of well drained and moderately well drained loams and clay loams that developed in recently deposited alluvium derived from acid sandstone and shale. These soils are on alluvial fans, in narrow valleys, and to some extent on nearly level flood plains. Slopes are 0 to 15 percent. The vegetation is annual grasses, forbs, scattered oak trees, and coastal sagebrush. Elevations range from 50 to 800 feet. The average annual rainfall is 12 to 22 inches, the average annual air temperature is about 58° F., and the frost-free season is 250 to 320 days. Botella soils are associated with the Betteravia and Elder soils.

In a representative profile, the surface layer is gray clay loam about 9 inches thick. The subsoil is gray and light brownish-gray silty clay loam, sandy clay loam, and light sandy clay. This layer extends to a depth of about 65 inches. It is underlain by light-gray sandy clay loam. In some places the surface layer is loam.

These soils are used for range, dryland crops, and irrigated crops.

Representative profile of the Botella series (2.2 miles southeast of Los Alamos, California, on U.S. Highway No. 101, 0.6 mile north on Alisos Canyon Road, 0.2 mile northwest, in field):

Ap--0 to 9 inches, gray (N 5/0) clay loam, black (10YR 2/1) when moist; moderate, medium, subangular blocky structure; very hard, friable, sticky and plastic; common very fine roots; few very fine interstitial pores, common very fine, fine, and medium tubular pores; medium acid (pH 6.0); gradual, smooth boundary.

B1t--9 to 14 inches, gray (N 5/0) silty clay loam, black (10YR 2/1) when moist; weak, coarse, prismatic breaking to moderate, medium, angular blocky structure; extremely hard, firm, sticky and plastic; common very fine roots; few very fine interstitial pores, common very fine pores, and few fine tubular pores; few thin clay films in tubular pores; medium acid (pH 6.0); gradual, wavy boundary.

B21t--14 to 28 inches, gray (10YR 5/1) silty clay loam, black (10YR 2/1) when moist; weak, coarse, prismatic breaking to strong, medium, angular blocky structure; extremely hard, firm, very sticky and very plastic; common very fine roots; few very fine interstitial pores and many very fine tubular pores; common thin clay films on ped faces; slightly acid (pH 6.4); gradual, smooth boundary.

B22t--28 to 41 inches, gray (10YR 5/1) silty clay loam, black (10YR 2/1) when moist; strong, medium, angular blocky structure; extremely hard, firm, very sticky and very plastic; common very fine roots; few very fine interstitial pores and common very fine tubular pores; many thin clay films on ped faces and in tubular pores; neutral (pH 6.8); gradual, smooth boundary.

B31t--41 to 59 inches, gray (10YR 5/1) heavy sandy clay loam, very dark grayish brown (2.5YR 3/2) when moist; moderate, medium, angular blocky structure grading to nearly massive; extremely hard, friable, sticky and plastic; very few very fine roots; few very fine interstitial pores and many very fine and common fine tubular pores; common moderately thick clay films on ped faces, continuous black (10YR 2/1d) moderately thick clay films in fine tubular pores; neutral (pH 6.8); gradual, smooth boundary.

B32t--59 to 65 inches, light brownish-gray (10YR 6/2) light sandy clay, dark grayish brown (10YR 4/2) when moist; weak, coarse, angular blocky structure; very hard, firm, very sticky and very plastic; very few very fine roots; common very fine interstitial pores, common very fine pores, and few fine tubular pores; many very dark brown (10YR 2/2d) moderately thick clay films in fine tubular pores; slightly acid (pH 6.2); clear, smooth boundary.

C--65 to 72 inches, light-gray (10YR 6/1) heavy sandy clay loam, very dark grayish brown (10YR 3/2) when moist; massive; very hard, friable, sticky and plastic; very few very fine roots; few very fine interstitial pores, common very fine pores, and few tubular pores; few moderately thick clay films in fine tubular pores; medium acid (pH 6.0).

The A horizon ranges in color from gray to dark grayish brown and very dark gray, and in texture from fine sandy loam to silty clay loam. The amount of shale fragments in the profile ranges from few to numerous, but is less than 35 percent of the total volume. Soil reaction ranges from medium acid to neutral in both the A horizon and the B horizon.

Botella loam, 0 to 2 percent slopes (BoA).--This soil is nearly level and occurs in fairly broad valleys and on flood plains. It has a profile similar to the one described as representative for the series except that the surface layer is loam and the subsoil is clay loam.

Included in mapping are areas that have moderate to strong clay accumulations in the subsoil. Also included are areas of Botella loam in which as much as 20 percent of the entire profile is coarse shale fragments. Also included are areas of Botella clay loam and some areas near Los Alamos that have sand at a depth of 36 to 48 inches.

This soil is well drained. Permeability is moderately slow. Surface runoff is very slow, and the erosion hazard is none to slight. Fertility is high. The available water capacity is 10.0 to 12.0 inches, and the effective rooting depth is more than 60 inches.

This Botella soil is used for all irrigated and dryfarmed crops normally grown in the Area. Capability unit I-1(14).

Botella loam, 0 to 2 percent slopes, eroded (BoA2).--This nearly level soil occurs in valleys on alluvial fans that are gullied or contain recently deposited alluvium. It has a profile similar to the one described as representative for the series except that the surface layer is loam and the subsoil is clay loam.

Included with this soil in mapping are several areas that have a surface layer of fine sandy loam and areas where a thin sandy layer has been deposited over the surface. Some noneroded areas are also included.

This soil is well drained. Permeability is moderately slow. Surface runoff from adjacent sloping areas is medium, and the erosion hazard is moderate. Fertility is high. The available water capacity is 10.0 to 12.0 inches, and the effective rooting depth is more than 60 inches.

This soil is used for all crops normally grown in the Area. Capability units IIe-1(14) and IIe-1(15); Loamy range site.

Botella loam, 2 to 9 percent slopes (BoC).--This soil is gently sloping to moderately sloping and occurs on alluvial fans. It has a loam surface layer and a clay loam subsoil, and 5 to 15 percent of the entire soil profile is gravel.

Included in mapping are areas that are moderately eroded. Also included are areas that have a higher clay accumulation in the subsoil than is typical for this soil and areas that have a fine sandy loam surface layer. Also included are areas where the soil contains no gravel in the profile and areas in which 20 to 35 percent of the surface layer and 20 to 45 percent of the subsoil is gravel.

This soil is well drained. Permeability is moderately slow. Runoff is slow to medium, and the erosion hazard is slight to moderate. Fertility is high. The available water capacity is 10.0 to 12.0 inches, and the effective rooting depth is more than 60 inches.

This Botella soil is used for dryland hay, grain, and beans and for annual pasture and range. It is also used for alfalfa, sugar beets, and walnuts. Capability units IIe-1(14) and IIe-1(15); Loamy range site.

Botella loam, 2 to 15 percent slopes, eroded (BoD2).--This soil is gently to strongly sloping and is in long, narrow, irregular valleys. The surface layer is loam and the subsoil is clay loam, but otherwise this soil has a profile similar to the one described as typical for the series. The soil is cut by small to large gullies.

Included in mapping are small areas of Tierra soils and areas that have a fine sandy loam surface layer.

The soil is well drained. Permeability is moderately slow. Surface runoff is slow to medium, and the erosion hazard is slight to moderate. Fertility is high. Available water capacity is 10.0 to 12.0 inches, and the effective rooting depth is more than 60 inches.

This soil is used for dryland beans, grain, and hay and for annual pasture and range. Capability unit IIIe-1(15); Loamy range site.

Botella loam, slightly wet, 0 to 2 percent slopes (BsA).--This soil occurs in slightly depressed areas and is subject to wetness during the rainy season. It occupies a few small, isolated areas. The surface layer is very dark gray loam that dries out slowly. Otherwise the profile is similar to the one described as representative for the series. In some places the soil is mottled below a depth of 36 inches. In some years a water table is at a depth of 3 to 5 feet.

Included in mapping are small areas that have a sandy loam surface layer. Areas where drainage is good are also included.

This soil is moderately well drained. Permeability is moderately slow. Surface water is ponded, and there is little or no erosion hazard. Fertility is high. The available water capacity is 10 to 12 inches, and the effective rooting depth is more than 60 inches.

This soil is used for dryfarmed hay, grain, and beans and for annual pasture. It is also used for corn silage, sugar beets, and artichokes. Capability unit IIw-2(14).

Botella clay loam, 0 to 2 percent slopes (BtA).--This soil is nearly level and occurs in fairly broad valleys and on flood plains. It has the profile described as representative for the series.

Included with this soil in mapping are areas that have sand deposits on the surface and areas of Elder soils. In the swales are included areas of a soil that has a very slowly permeable clay subsoil.

Drainage is good, and permeability is moderately slow. Surface runoff is very slow, and the erosion hazard is none to slight. Fertility is high. The available water capacity is 11.0 to 13.0 inches, and the effective rooting depth is more than 60 inches.

This Botella soil is used for most crops suited to the climate in the Area. Capability unit I-1(14).

Botella clay loam, 0 to 2 percent slopes, eroded (BtA2).--This soil is nearly level. It occurs in small valleys and on fans that are subject to overflow from higher areas. Gullies are common. In some areas, deposits of unrelated soil material are on the surface.

Included in mapping are small areas of Elder soils and of Botella loam. Also included are areas that are not eroded or only slightly eroded.

This soil is moderately well drained. Permeability is moderately slow. Surface runoff from surrounding steeply sloping areas is medium, and the erosion hazard is moderate. Fertility is high. The available water capacity is 11.0 to 13.0 inches in the 60 inches of effective rooting depth.

This soil is used mostly for dryland grain and for annual pasture and range. It is also used for alfalfa, lima beans, silage corn, sugar beets, and walnuts. Capability units IIe-1(14) and IIe-1(15); Clayey range site.

Botella clay loam, 2 to 9 percent slopes (BtC).--This soil is gently sloping to moderately sloping and occurs on alluvial fans. It has a profile similar to that described as representative for the series except that in some places as much as 15 percent of the entire profile is gravel.

Included in mapping are areas of Botella loam and of Elder soils. Also included is an area of Botella clay loam where up to 35 percent of the profile is gravel. Also included are areas where gullies and rills have formed.

This soil is well drained. Permeability is moderately slow. Surface runoff is slow to medium, and the erosion hazard is slight to moderate. Fertility is high. The available water capacity is 11.0 to 13.0 inches, and the effective rooting depth is more than 60 inches.

This Botella soil is used for dryland hay, grain, and beans and for annual pasture and range. It is also used for alfalfa, sugar beets, and walnuts. Capability units IIe-1(14) and IIe-1(15); Clayey range site.

Botella clay loam, 2 to 15 percent slopes, eroded (BtD2).--This soil occupies small, irregular areas in long, narrow valleys. It is gently sloping to strongly sloping, and is subject to overflow from higher areas. The amount and type of erosion vary, but long, deep gullies are common.

Included in mapping are areas of Elder soils and of gravelly Botella soils. Some noneroded and severely eroded areas are also included.

This soil is well drained. Permeability is moderately slow. Surface runoff is slow to medium, and the erosion hazard is slight to moderate. Fertility is high. The available water capacity is 11.0 to 13.0 inches. Plant roots can penetrate to a depth of more than 60 inches.

This soil is used for dryfarmed grain, hay, and beans and for annual pasture and range. Some areas are used for walnuts. Capability unit IIIe-1(15); Clayey range site.

Botella clay loam, wet, 0 to 2 percent slopes (BwA).--This nearly level soil is on low flood plains and alluvial fans. The largest area is near Casmalia. A water table is 1 to 2 feet below the surface in winter and falls to a depth of 4 to 5 feet late in the growing season. The lower part of the subsoil has some mottling. Otherwise this soil has a profile similar to the one described as representative for the series.

Included in mapping are some moderately saline wetland meadows. Also included is a small area near Los Alamos that is finer textured throughout the profile than is typical and is wet most of the year.

Although it is now wet, this soil formed under moderately good drainage conditions. Permeability is moderately slow. Water stands on the surface, and there is no erosion hazard. Fertility is high. The available water capacity is 11.0 to 13.0 inches for the drained profile. The effective rooting depth varies according to the fluctuations of the water table.

This soil is used for late-growing annual pasture and range. Some areas are used for dryland grain and for sugar beets. Capability unit IIIw-2(14); Clayey range site.

Camarillo Series

The Camarillo series consists of somewhat poorly drained very fine sandy loams to silty clay loams that developed in recently deposited alluvium derived from sandstone and shale. These soils are on low alluvial fans and flood plains. Slopes are 0 to 2 percent. The vegetation consists of a wide variety of water-tolerant plants. Annual grasses and forbs grow in areas where the drainage problem is least severe. The most poorly drained areas are covered with willows and sedges. Elevations range from near sea level to 100 feet. The average annual rainfall is 12 to 15 inches, the average annual air temperature is about 59° F., and the frost-free season is 275 to 330 days. Camarillo soils are associated with Mocho soils.

In a representative profile, the surface layer is calcareous, brown and grayish-brown very fine sandy loam about 36 inches thick. Below this is stratified, mottled, calcareous sand to very fine sandy loam extending to a depth of 80 inches or more. Surface texture ranges from sandy loam to silty clay loam.

Camarillo soils are used for pasture, small grain, and hay. Some areas are used for irrigated crops.

Representative profile of the Camarillo series (in an open field on Vandenberg Air Force Base property, 1 3/8 miles east of Surf and 370 feet south of a fence on the north edge of the Lompoc Valley):

A11--0 to 7 inches, brown (10YR 5/3) very fine sandy loam, dark brown (10YR 3/3) when moist; massive; hard, friable, slightly sticky and slightly plastic; common micro roots and very fine and medium roots; few very fine and fine tubular pores and many micro interstitial pores; strongly effervescent; disseminated lime; moderately alkaline (pH 8.2); clear, smooth boundary.

A12--7 to 18 inches, grayish-brown (2.5Y 5/2) very fine sandy loam, very dark grayish brown (2.5Y 3/2) when moist; massive; hard, friable, slightly sticky and slightly plastic; few micro and fine roots and common medium roots; common very fine tubular pores and many micro interstitial pores; strongly effervescent; disseminated lime; moderately alkaline (pH 8.2); gradual, smooth boundary.

A13--18 to 31 inches, brown (10YR 5/3) very fine sandy loam, dark brown (10YR 3/3) when moist; few, fine, distinct mottles of strong brown (7.5YR 5/6) and dark yellowish brown (10YR 4/4); massive; hard, friable, slightly sticky and slightly plastic; few micro and fine roots; many micro interstitial pores; strongly effervescent; disseminated lime; moderately alkaline (pH 8/2); abrupt, smooth boundary.

IIA14b--31 to 36 inches, grayish-brown (10YR 5/2) light silty clay loam, dark grayish brown (10YR 4/2) when moist; massive; hard, friable, sticky and plastic; common micro and few fine roots; very few tubular pores; strongly effervescent; disseminated lime; moderately alkaline (pH 8.2); abrupt, smooth boundary.

IIIC1--36 to 40 inches, light yellowish-brown (2.5Y 6/4) fine sand, light olive brown (2.5Y 5/4) when moist; massive; soft, very friable, nonsticky and nonplastic; very few micro and fine roots; few very fine and fine tubular pores and many micro interstitial pores; strongly effervescent; disseminated lime; moderately alkaline (pH 8.2); clear, smooth boundary.

IVC2--40 to 62 inches, brown (10YR 5/3) very fine sandy loam, dark brown (10YR 4/3) mottled with grayish brown (2.5Y 5/2) when moist; many, fine, distinct mottles of light yellowish brown (2.5Y 6/4); massive; hard, friable, slightly sticky and slightly plastic; very few micro and fine roots; many micro interstitial pores; strongly effervescent; disseminated lime; moderately alkaline (pH 8.1); gradual, smooth boundary.

IVC3--62 to 72 inches, light brownish-gray (2.5Y 6/2) fine sandy loam, dark grayish brown (2.5Y 4/2) mottled with olive brown (2.5Y 4/4) and light reddish brown (5YR 6/4) when moist; many, medium, distinct mottles of light olive brown (2.5Y 5/4) and reddish brown (2.5YR 5/4); massive; slightly hard, friable, slightly sticky and slightly plastic; very few micro and fine roots; many micro interstitial pores; strongly effervescent; disseminated lime; moderately alkaline (pH 8.1); clear, smooth boundary.

Color of the A horizon is generally brown, grayish brown, dark grayish brown, gray, or dark gray. Texture of the A horizon varies widely from one mapped area to another and within mapped areas. It ranges from sandy loam to silty clay loam. Texture of the C horizon varies widely because of stratification, ranging from sandy loam to silty clay loam at a depth of about 10 to 36 inches; in some places there is an underlying layer of coarse material below a depth of 36 inches. The C horizon is mottled. A water table is within 5 feet of the surface at some time during the year. The water table fluctuates seasonally and at times is within a foot or two of the surface, dropping to more than 5 feet in depth late in summer and in fall. In areas that are drained artificially, the water table is maintained at depths below 5 to 6 feet.

Camarillo sandy loam (Ca).--This nearly level soil occupies flood plains. A fairly large area is in the lower Lompoc Valley within 1 or 2 miles of the ocean. Widely scattered small areas of this soil are in the Santa Maria, Lompoc, and San Antonio Valleys. This soil has a profile similar to that described as representative for the series except

that it is sandy loam throughout. The water table fluctuates from 3 to 6 feet below the surface, depending upon the time of year.

Included in mapping are areas where the water table is at or near the surface during parts of the year. In other included areas the surface layer is loamy sand.

Permeability is moderately rapid. Water stands on the surface, and there is no erosion hazard. Fertility is moderate. Where the soil is drained, the available water capacity is 6.0 to 7.0 inches. The effective rooting depth is limited by the water table, which is at depths of 3 to 6 feet.

This soil is used for pasture or range. If drained, it is suited to a wide variety of crops. Capability unit IIw-2(14); Loamy range site.

Camarillo sandy loam, drained (Cb).--This nearly level soil occupies flood plains mainly along the Green Canyon drainageway west of Santa Maria. It has a profile similar to that described as representative for the series except that this soil is sandy loam throughout. Colors are grayish brown, gray, and dark gray. This soil has been drained artificially, but most areas need additional drainage to maintain the water table below a depth of 5 feet.

Included in mapping are small areas where the water table is 20 to 30 inches below the surface.

Permeability is moderately rapid. Water stands on the surface, and there is no erosion hazard. Fertility is moderate. Where the soil is drained, its capacity for holding water available to plants is 6.0 to 7.0 inches. The effective rooting depth is about 60 inches.

This soil is used for all crops normally grown in the Area except those that have deep roots. Capability unit IIw-2(14).

Camarillo very fine sandy loam (Cc).--This soil is nearly level. It occupies flood plains in the Lompoc Valley within 1 or 2 miles of the ocean, and a small acreage in the San Antonio Valley. This soil has the profile described as representative for the series. Depth to the water table varies. The water table generally is within 3 feet of the surface in winter and spring and at a depth of 6 feet or more late in summer and in fall.

Included in mapping are areas of Camarillo sandy loam and areas that are underlain by sand below a depth of 30 inches.

Permeability is moderate. Surface runoff is slow, and the erosion hazard is none to slight. Fertility is high. Where the soil is drained, the capacity for holding water available to plants is 9.0 to 11.0 inches. Root penetration is limited to a depth of 3 to 5 feet by the water table.

This soil is used for annual pasture and range and to a limited extent for dryland hay and grain. Some shallow-rooted row crops are also grown on this soil. Capability unit IIw-2(14); Loamy range site.

Camarillo silty clay loam (Cd).--This soil is nearly level and occupies low flood plains in the Lompoc Valley about midway between Lompoc and the ocean. The surface layer is dark grayish-brown or dark-gray silty clay loam, and the profile is loam to clay loam throughout; otherwise this soil has a profile similar to the one described as representative for the series. The water table normally is within 2 feet of the surface during the rainy season, but drops to a depth of about 5 feet or more during the dry season.

Included in mapping are small areas of Mocho soils and areas of Camarillo very fine sandy loam.

Permeability is moderately slow. Water stands on the surface, and there is no erosion hazard. Fertility is high. The soil is difficult to work when moist or when dry. Where the soil is drained, the capacity for holding water available to plants is 11.0 to 13.0 inches. The effective rooting depth is limited by the water table to about 24 inches.

This soil is used for dryland hay, grain, and beans. It is also used for shallow-rooted, irrigated row crops and for flowers. Capability unit IIw-2(14).

Chamise Series

The Chamise series consists of well-drained soils that developed over gravelly beds of silt and clay and sandy water-deposited materials. These soils have a sandy loam, loam, clay loam, or shaly loam surface layer and a shaly clay subsoil. Chamise soils normally contain a large number of water-rounded fragments of Monterey Shale. These soils are on dissected high terraces in widely scattered areas, extending from the coast to the vicinity of Los Alamos. Slopes are 2 to 72 percent. The vegetation consists of annual grasses and oak trees; brush grows on the steeper and eroded areas. Elevations range from 200 to 1,500 feet. The average annual rainfall is 12 to 20 inches, the average annual air temperature is about 58° F., and the frost-free season is 240 to 300 days. Chamise soils are associated with Tierra soils.

In a representative profile, the surface layer is dark-gray and gray shaly loam about 18 inches thick. The upper part of the subsoil is light brownish-gray shaly clay and very shaly heavy clay loam about 19 inches thick. The lower part of the subsoil is pale-brown very shaly clay loam to a depth of 60 inches and more. In places the surface layer is sandy loam, shaly sandy loam, loam, or clay loam.

Chamise soils are used mainly for range. Small areas are used for dryland hay and grain and for irrigated crops.

Representative profile of the Chamise series (1 1/4 miles south and slightly east of Luton Ranch Headquarters, approximately 11 miles north of Buellton, California):

A11--0 to 2 inches, dark-gray (10YR 4/1) shaly loam, very dark grayish brown (10YR 3/2) when moist; strong, fine, granular structure; slightly

hard, friable, slightly sticky and slightly plastic; common micro roots, common very fine and fine roots; many very fine pores and fine interstitial pores; medium acid (pH 6.0); clear, smooth boundary.

A12--2 to 9 inches, dark-gray (10YR 4/1) shaly loam, very dark grayish brown (10YR 3/2) when moist; weak, medium, angular blocky, parting to weak, fine and medium, granular structure; hard, firm, slightly sticky and slightly plastic; many micro, very fine and fine roots; many very fine interstitial pores and many very fine, fine and medium tubular pores; medium acid (pH 5.8); clear, wavy boundary.

A13--9 to 18 inches, gray (10YR 5/1) shaly loam, dark grayish brown (10YR 4/2) when moist; moderate, medium, granular structure; slightly hard, friable, slightly sticky and plastic; common micro, very fine, and fine roots; many very fine interstitial pores and many very fine, fine, and medium tubular pores; medium acid (pH 5.7); clear, wavy boundary.

B21t--18 to 24 inches, light brownish-gray (10YR 6/2) shaly clay, dark brown (10YR 4/3) when moist; massive; very hard, firm, sticky and very plastic; common micro, very fine, fine and medium roots; few very fine interstitial pores and few very fine and fine tubular pores; many thick clay films line tubular and interstitial pores; mineral grains have colloidal staining; strongly acid (pH 5.5); clear, wavy boundary.

B22t--24 to 37 inches, light brownish-gray (10YR 6/2) very shaly heavy clay loam, yellowish brown (10YR 5/4) when moist; dark brown (10YR 4/3) when crushed; massive; very hard, firm, sticky and plastic; few very fine roots; few very fine interstitial pores and few very fine and fine tubular pores; many thick clay films line tubular and interstitial pores; colloidal stains on mineral grains; strongly acid (pH 5.3); diffuse, smooth boundary.

B3t--37 to 60 inches, pale-brown (10YR 6/3) very shaly clay loam, yellowish brown (10YR 5/4) when moist; brown (10YR 5/3) when rubbed; massive; very hard, firm, sticky and plastic; no roots; common very fine interstitial pores; common thick clay films line interstitial pores and coat gravels; colloidal staining on mineral grains; strongly acid (pH 5.3).

The A horizon is generally gray or dark gray and less commonly grayish brown or dark grayish brown. In a few mesalike areas it is almost brown. Texture of the A horizon ranges from sandy loam to clay loam. Thickness of the A horizon ranges from 3 to 36 inches. Content of shale fragments ranges from 5 to 50 percent in the A horizon and 50 to 90 percent in the B horizon. Near the bottom and ends of ridges, lime is commonly in the parent material. On narrow ridgetops and around the edge of most level mesas, the B horizon is exposed as rocklike ledges and is indurated.

Chamise shaly loam, 30 to 75 percent slopes, eroded, is a taxadjunct to the Chamise series because its surface layer is light gray and light brownish gray and is 3 to 10 inches thick. This soil is used and managed in much the same way as Chamise soils.

Chamise sandy loam, 5 to 9 percent slopes (CeC).--This soil is gently rolling and occurs on terraces. It has a profile similar to the one described as representative for the series except that it has a sandy loam surface layer about 28 inches thick that is 5 to 15 percent shale fragments.

Included in mapping are small areas that have either a very slowly permeable clay subsoil or a hardpan. Also included are areas of Chamise shaly loam.

Permeability is moderately slow. Surface runoff is slow to medium, and the erosion hazard is slight to moderate. Fertility is low. The available water capacity is 4.0 to 5.0 inches, and the effective rooting depth is 34 to 46 inches.

This Chamise soil is used mainly for range or annual pasture. Some small areas are used for dryland grain. Capability units IIIe-1(14) and IVe-1(15); Loamy range site.

Chamise sandy loam, 5 to 30 percent slopes, eroded (CeE2).--This soil is gently rolling to hilly and occurs on old mesalike terrace remnants. It has a sandy loam surface layer about 16 inches thick that is less than 15 percent shale fragments. Otherwise it has a profile similar to the one described as representative for the series. It is eroded and has numerous gullies.

Included in mapping are areas of Chamise shaly loam and areas that are underlain by a hardpan. Also included are some areas of severely eroded Ballard soils along the Santa Ynez River near Santa Ynez.

Permeability is moderately slow. Surface runoff is medium to rapid, and the erosion hazard is moderate to high. Fertility is low. The available water capacity is 3.0 to 5.0 inches, and the effective rooting depth is 24 to 40 inches.

This soil is used for range. Capability unit VIe-1(15); Loamy range site.

Chamise shaly sandy loam, 9 to 15 percent slopes (CfD).--This soil is rolling and occurs in irregularly shaped areas on dissected terraces. It has a shaly sandy loam surface layer that is 15 to 30 percent shale fragments; otherwise it has a profile similar to the one described as representative for the series.

Included in mapping are eroded areas. Also included are areas in which the surface layer is less than 15 percent or more than 30 percent shale.

Permeability is moderately slow. Surface runoff is medium, and the erosion hazard is moderate. Fertility is low. The available water capacity is 4.0 to 5.0 inches in the 32 to 44 inches of effective rooting depth.

This soil is used mainly for range. A few small areas are used for dryland grain. Capability unit IVe-1(15); Loamy range site.

Chamise loam, 2 to 9 percent slopes (CgC).--This soil is gently sloping to moderately sloping and occurs on the remnants of high terraces. It has a gray loam surface layer that is 2 to 12 percent shale fragments. Otherwise it has a profile similar to the one described as representative for the series.

Included in mapping are areas that have a brown surface layer. Some areas of Chamise sandy loam are also included. In other included areas is a soil that has a very slowly permeable clay subsoil or a hardpan.

Permeability is moderately slow. Surface runoff is slow to medium, and the erosion hazard is slight to moderate. Fertility is low. The available water capacity is 4.0 to 5.0 inches in the 20 to 40 inches of effective rooting depth.

This soil is used mainly for range. Small areas are used for dryland grain or hay. Capability units IIIe-1(14) and IVe-1(15); Loamy range site.

Chamise shaly loam, 9 to 15 percent slopes (ChD).--This strongly sloping soil occupies small, scattered, irregularly shaped areas on top of dissected terraces. It has a profile similar to the one described as represenative for the series except that the surface layer averages about 26 inches in thickness.

Included in mapping are areas of Chamise loam. Also included are areas of a soil that has a very slowly permeable clay subsoil or a hardpan.

Permeability is moderately slow. Surface runoff is medium, and the erosion hazard is moderate. Fertility is low. The available water capacity is 4.0 to 5.0 inches, and the effective rooting depth is 26 to 40 inches.

This soil is used mainly for range. Small areas are used for dryland grain or hay. Capability unit IVe-1(15); Loamy range site.

Chamise shaly loam, 15 to 45 percent slopes (ChF).--This soil is moderately steep to steep and occurs on dissected, old terraces (pl. II, top). It is the most extensive mapping unit in this series. This soil has the profile described as typical for the Chamise series. The surface layer is 16 to 24 inches thick.

Included in mapping are areas of Tierra soils and of Chamise sandy loam and Chamise clay loam. Also included are areas of a soil along the Cuyama River that has a brown surface layer.

Permeability is moderately slow. Surface runoff is medium to rapid, and the erosion hazard is moderate to high. Fertility is low. The available water capacity is 3.5 to 5.0 inches in the 22 to 40 inches of rooting depth.

This soil is used primarily for range. Capability unit VIe-1(15); Loamy range site.

Chamise shaly loam, 45 to 75 percent slopes (ChG).--This soil is very steep and occurs on the side slopes of dissected terraces. It has a profile similar to the one described as representative for the series except that the surface layer is 10 to 18 inches thick.

Included in mapping are small areas of eroded soils and areas of Chamise shaly sandy loam.

Permeability is moderately slow. Surface runoff is very rapid, and the erosion hazard is very high. Fertility is low. The available water capacity is 3.0 to 4.0 inches, and the effective rooting depth is 20 to 30 inches.

This soil is used for range and as watershed. Capability unit VIIe-1(15); Steep Loamy range site.

Chamise shaly loam, 30 to 75 percent slopes, eroded (ChG2).--This soil is steep to very steep and occurs on sharply ridged, dissected terraces. As a result of sheet erosion, the surface layer is 3 to 10 inches thick and is light gray and light brownish gray in color.

Included in mapping are areas that have a gray shaly loam surface layer 10 to 18 inches thick. Areas of Chamise soils that have a shaly clay loam surface layer are also included.

Permeability is moderately slow. Surface runoff is very rapid, and the erosion hazard is high. Fertility is low. The available water capacity is 2.0 to 3.0 inches, and the effective rooting depth is 10 to 20 inches.

This soil is used for range and for watershed. Capability unit VIIe-1(15); Shallow Loamy range site.

Chamise clay loam, 30 to 45 percent slopes (CkF).--This soil is steep and occurs on dissected high terraces. It has a grayish-brown or dark grayish-brown clay loam surface layer 18 to 26 inches thick that is 5 to 15 percent shale fragments. Otherwise it has a profile similar to the profile described as typical for the series.

Included in mapping are eroded areas, and areas that have shaly loam surface layers.

Permeability is moderately slow. Surface runoff is rapid, and the erosion hazard is high. Fertility is low. The available water capacity is 5.0 to 7.0 inches in the 32 to 48 inches of effective rooting depth.

This soil is used for range. Capability unit VIe-1(15); Clayey range site.

Climara Series

The Climara series consists of well-drained clays that developed on basic igneous bedrock. These soils are intermingled in a complex pattern with Toomes soils. Climara soils occur in mountainous areas near the central part of Santa Barbara County in the vicinity of Figueroa Mountain. Large and small land slips are common on these soils. Slopes

are 15 to 75 percent. Vegetation consists of annual grasses, forbs, shrubs, and scattered oak trees. Elevations range from 1,500 to 3,000 feet. The average annual rainfall is 12 to 20 inches, the average annual air temperature is about 59° F., and the frost-free season is 210 to 275 days. Climara soils are associated with Montara and Toomes soils.

In a representative profile, the surface layer is very dark grayish-brown clay about 20 inches thick. This layer is underlain by very dark gray and light-gray calcareous clay and silty clay loam about 17 inches thick. Below is light-gray silty clay loam mixed with decomposed basic igneous rock. Depth to bedrock ranges from 20 inches on ridgetops to 60 inches in the swales.

These soils are used for range and as watershed.

Representative profile of the Climara series (in the road bank along Figueroa Mountain Road about 3/8 mile inside the Los Padres National Forest boundary):

A11--0 to 1 inch, very dark grayish-brown (10YR 3/1) light clay, black (10YR 2/1) when moist; strong, medium, granular structure; hard, friable, very sticky and very plastic; many very fine roots; many very fine interstitial pores; mildly alkaline (pH 7.5); abrupt, wavy boundary.

A12--1 inch to 9 inches, very dark grayish-brown (10YR 3/1) clay, black (10YR 2/1) when moist; moderate, coarse, angular blocky, breaking to moderate, medium, granular structure; hard, friable, very sticky and very plastic; many very fine roots; common very fine tubular pores and very few micro interstitial pores; mildly alkaline (pH 7.8); gradual, irregular boundary.

A13--9 to 20 inches, very dark grayish-brown (10YR 3/1) clay, black (10YR 2/1) when moist; strong, very coarse, prismatic, breaking to moderate, medium, granular structure; very hard, friable, very sticky and very plastic; common very fine roots; many very fine tubular pores; moderately alkaline (pH 8.2); clear, wavy boundary.

AC--20 to 24 inches, very dark gray (10YR 3/1) light clay mixed with gray (10YR 5/1), dark grayish brown (10YR 4/2) when moist; weak, coarse, subangular blocky structure; very hard, friable, very sticky and very plastic; few very fine roots; common very fine tubular pores; slightly effervescent; disseminated lime; moderately alkaline (pH 8.4); clear, wavy boundary.

C1ca--24 to 37 inches, light-gray (10YR 7/1) and very dark grayish-brown (10YR 3/2) silty clay loam, pale brown (10YR 6/3) and very dark brown (10YR 3/2) when moist; weak, coarse, subangular blocky structure; hard, friable, sticky and plastic; very few micro roots; many very fine tubular pores and few fine interstitial pores; violently effervescent; disseminated lime; thick lime coatings on ped faces and rocks; moderately alkaline (pH 8.4); gradual, irregular boundary.

C2--37 to 60 inches, light-gray (10YR 7/2) mottled with olive (5Y 5/3) silty clay loam, brown (10YR 5/3) when moist; massive; slightly hard, very firm, sticky and plastic; very few medium roots; common fine tubular pores; violently effervescent; disseminated lime; moderately alkaline (pH 8.4); large quantity partly of decomposed serpentine rock, becoming firmer with depth.

Color of the A horizon ranges from very dark gray to very dark grayish brown and dark grayish brown; texture ranges from heavy clay loam to clay. Depth to bedrock ranges from about 20 inches on ridgetops to more than 60 inches in the swales. Typically, lime occurs 18 to 24 inches below the surface.

Climara-Toomes complex, 15 to 45 percent slopes (CmF).--The strongly sloping to steep soils that make up this complex occur on mountainous uplands. About 70 percent of the mapping unit is Climara clay, and about 30 percent is Toomes clay loam (pl. II, bottom). These soils are in such intricate patterns that mapping them separately was impractical. Included in mapping are small areas of Montara soils and of Igneous rock land.

Both of the major soils have medium to rapid runoff and are moderately to highly susceptible to erosion.

The Climara soil has the profile described as representative for the Climara series. It is well drained and is slowly permeable. The available water capacity is 4 to 8 inches in the 20- to more than 60-inch root zone. Fertility is moderate.

The Toomes soil has a profile that is similar to the one described as representative for the Toomes series. It is somewhat excessively drained and is moderately permeable. The available water capacity is 2 to 4 inches in the 10- to 20-inch root zone. Fertility is low.

These soils are used for range and as watershed. Capability unit VIe-5(15); the Climara soil is in Clayey range site and the Toomes soil is in Shallow Loamy range site.

Coastal Beaches

Coastal beaches (CnB) consists of narrow, sandy beaches along the Pacific Ocean that are covered or partly covered by water during high tide and exposed during low tide. Where cliffs and bluffs rise abruptly at the edge of the ocean, there are no beaches, or they are very narrow. In a few places they are gravelly or cobbly.

This land type has no value for farming. It is used for recreation. Capability unit VIIIw-4(14).

Cobbly Alluvial Land

Cobbly alluvial land (CoB) consists of long, narrow areas of recently deposited materials along drainageways in mountainous areas. The deposited material is mainly sand, gravel, and cobbles, but

some areas contain small islands that have loamy sand, sandy loam, or loam surface texture. Cobbly alluvial land areas generally are bounded by very steep hills and mountains and are subject to overflow. During floods, fresh deposits of raw, coarse soil material are laid down and removed as a result of streambank erosion in the meandering channels. Cobbly alluvial land normally is covered with brush and sparse annual grasses, but some areas have fairly large oak trees.

This land type is used for range and recreation. Capability VIIw-4(14); Sandy Alluvial range site.

Contra Costa Series

The Contra Costa series consists of well-drained loams that formed over metamorphosed sedimentary rock of the Franciscan Formation. They are on the mountainous uplands. In this Area, Contra Costa soils are intermingled with Lodo soils and are mapped only in complexes with Lodo soils. They occur in the northern part of the survey area, mainly in the vicinity of the Twenty Mile Station, and to a minor extent at the west end of Cuyama Valley and on the Sisquoc Ranch. Slopes are 15 to 75 percent. Vegetation consists of annual grasses, forbs, and oak trees on the deeper, less steep areas and chaparral brush on the steeper, shallower, and rocky areas. Elevations range from 1,000 to 3,500 feet. The average annual rainfall is 14 to 25 inches, the average annual air temperature is about 59° F., and the frost-free season is 200 to 275 days. Contra Costa soils are associated with Lodo and Los Osos soils.

In a representative profile, the surface layer is brown loam about 11 inches thick. The subsoil is reddish-brown heavy clay loam and yellowish-red gravelly heavy clay loam. Below is weathered and shattered shale bedrock at a depth of 26 inches. In some places the soils are stony throughout the profile.

Contra Costa soils are used for range and as watershed.

Representative profile of the Contra Costa series (0.4 mile east of Twenty Mile Station, 2.5 miles south on Ranch Road near the fork of three ranch roads; SE1/4 sec. 17, T. 11 N., R. 31 W.):

A11--0 to 1 1/2 inches, brown (10YR 5/3) loam, dark brown (10YR 4/3) when moist; weak, fine and medium, granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine interstitial pores; neutral (pH 7.0); abrupt, smooth boundary.

A12--1 1/2 to 11 inches, brown (10YR 5/3) loam, dark brown (10YR 4/3) when moist; massive; hard, friable, slightly sticky and slightly plastic; few medium and coarse roots and common very fine roots; many very fine interstitial pores and many fine and medium tubular pores; slightly acid (pH 6.3); abrupt, wavy boundary.

B21t--11 to 18 inches, reddish-brown (5YR 5/4) heavy clay loam, reddish brown (5YR 4/4) when moist; weak, coarse, subangular blocky structure; very hard, firm, sticky and plastic; few very fine, medium, and coarse roots; few fine tubular pores and few very fine interstitial pores; continuous moderately thick clay films line pores; slightly acid (pH 6.1); clear, wavy boundary.

B22t--18 to 26 inches, yellowish-red (5YR 5/6) gravelly heavy clay loam, yellowish red (5YR 5/6) when moist; massive; very hard, firm, sticky and plastic; few very fine, medium, and coarse roots; few very fine interstitial pores and few fine tubular pores; continuous moderately thick clay films line pores; slightly acid (pH 6.1); gradual, irregular boundary.

R--26 inches, grayish-brown (2.5Y 5/2) decomposed shale mixed with yellowish-red (5YR 5/6) soil material from the B22t horizon, blending to fairly solid bedrock at 38 inches; horizon is about 90 percent shale and 10 percent material from the B22t horizon; very few medium and coarse roots in cleavage planes.

Texture of the A horizon is loam and light clay loam. The content of detached angular stones and gravels ranges from 2 to 35 percent. Soil on ridgetops and on very steep slopes generally is stony throughout the profile. Color of the A horizon normally is brown, but on slopes facing north and northeast it tends toward grayish brown. Depth to the B2t horizon ranges from 5 to 20 inches. Depth to bedrock ranges from 16 to 36 inches, but in most areas is 20 to 28 inches. Color of the B2t horizon is reddish brown to reddish yellow or yellowish red. Reaction is medium acid to neutral but normally is less acid with increasing depth.

Contra Costa-Lodo loams, 15 to 30 percent slopes (CrE).--This complex consists of moderately steep soils on the uplands. They are so intermingled that it was not feasible to map them separately. About 70 percent of this complex is Contra Costa loam, and about 30 percent is Lodo loam.

Included in mapping are small areas that have a clay loam surface layer. Also included are areas in which as much as 15 percent of the surface has rock outcrops.

The Contra Costa soil is well drained. Permeability is moderately slow. The available water capacity is 3.5 to 6 inches in the 20- to 36-inch root zone. Fertility is moderate.

The Lodo soil is somewhat excessively drained and is moderately permeable. The available water capacity is 2.0 to 3.0 inches in the 10- to 18-inch root zone. Fertility is low.

In both soils surface runoff is medium to rapid, and the erosion hazard is moderate to high.

These soils are used primarily for range. Capability unit VIe-1(15); Contra Costa soil is in Loamy Range site; Lodo soil is in Shallow Loamy range site.

Contra Costa-Lodo loams, 30 to 45 percent slopes (CrF).--This complex consists of steep soils on mountainous uplands. These soils are in such intricate patterns that mapping them separately was impractical. About 70 percent of the complex is Contra Costa loam, and about 30 percent is Lodo loam.

Included in mapping are small areas that have a clay loam surface layer. Also included are areas of Los Osos soils.

The Contra Costa soil is well drained. Permeability is moderately slow. The available water capacity is 3.5 to 6 inches in the 20- to 36-inch root zone. Fertility is moderate. This soil has the profile described as representative for the Contra Costa series.

The Lodo soil is excessively drained and is moderately permeable. The available water capacity is 2.0 to 3.0 inches in the 10- to 18-inch root zone. Fertility is low.

In both soils, surface runoff is rapid and the erosion hazard is high.

These soils are used for range and as watershed. Capability unit VIe-1(15); Contra Costa soil is in Loamy range site; Lodo soil is in Shallow Loamy range site.

Contra Costa-Lodo loams, 45 to 75 percent slopes (CrG).--This complex consists of very steep soils on mountainous uplands. They are intermingled in an extremely complex pattern. About 70 percent of the complex is Contra Costa loam, and about 30 percent is Lodo loam.

Included in mapping are small areas of Sedimentary rock land. Small areas of Los Osos soils are also included.

The Contra Costa soil is well drained, and permeability is moderately slow. The available water capacity is 2.0 to 4.0 inches in the 16- to 24-inch effective rooting depth.

The Lodo soil is somewhat excessively drained and is moderately permeable. The available water capacity is 1.5 to 2.5 inches in the 8- to 12-inch effective rooting zone.

In both soils, surface runoff is very rapid, and the erosion hazard is very high. Fertility in both soils is low.

These soils are used for range and for watershed. Capability unit VIIe-1(15); Steep Loamy range site.

Contra Costa-Lodo stony loams, 30 to 75 percent slopes (CsG).--This complex consists of steep and very steep soils on mountainous uplands. They are in such complex patterns that it was not feasible to map them separately. About 65 percent of this complex is Contra Costa stony loam, and about 35 percent is Lodo stony loam.

Included in mapping are small areas of Sedimentary rock land. Some areas of Los Osos soils and some severely eroded areas are also included.

The Contra Costa soil is well drained. Permeability is moderately slow. The available water capacity is 1.5 to 3.5 inches in the 16- to 24-inch rooting zone.

The Lodo soil is somewhat excessively drained and is moderately permeable. The available water capacity is 1.0 to 2.0 inches in the 8- to 12-inch rooting zone.

Both soils have profiles similar to the one described as representative for their respective series except that 15 to 30 percent of the entire soil profile is stones and gravel. In both soils, surface runoff is rapid to very rapid, the erosion hazard is high to very high, and fertility is low.

These soils are used for range and as watershed. Capability unit VIIe-1(15); Steep loamy range site.

Corralitos Series

The Corralitos series consists of somewhat excessively drained loamy sands that developed over recent water-deposited sandy materials. Areas of Corralitos soils are widely scattered. They occur on alluvial fans and flood plains along drainageways from the Santa Maria Valley to Point Arguello and eastward to the vicinity of Los Olivos. Slopes are 0 to 15 percent. The vegetation consists of annual grasses, forbs, scattered oak trees, and sagebrush. Elevations range from 100 to 800 feet. The average annual rainfall is 14 to 18 inches, the average annual air temperature is about 59° F., and the frost-free season is 250 to 310 days. Corralitos soils are associated with Elder soils.

In a representative profile, the Corralitos soils are brown, grayish-brown, light brownish-gray, and pale-brown loamy sand to a depth of 60 inches and more. In some places the texture is sand.

Corralitos soils are used for range, for strawberries, and, where water is available, for irrigated row crops.

Representative profile of the Corralitos series (3 1/4 miles east along the north edge of San Antonio Valley from the Lompoc-Casmalia Road intersection, and 1.8 miles north on side road, east of road fork):

A11--0 to 8 inches, brown (10YR 5/3) loamy sand, dark brown (10YR 4/3) when moist; single grain, loose when dry and moist, nonsticky and nonplastic; many micro and very fine roots, common fine and few medium and coarse roots; many very fine pores and fine interstitial pores; medium acid (pH 6.0); abrupt, wavy boundary.

A12--8 to 20 inches, grayish-brown (10YR 5/2) loamy sand, dark grayish brown (10YR 4/2) when moist; massive; slightly hard, very friable, nonsticky and nonplastic; common very fine and fine roots, and few medium and coarse roots; many very fine and fine interstitial pores and many very fine, fine, and medium tubular pores; medium acid (pH 6.0); gradual, irregular boundary.

A13--20 to 32 inches, grayish-brown (10YR 5/2) loamy sand, dark brown (10YR 4/3) when moist; massive; soft, very friable, nonsticky and nonplastic; few very fine, fine, medium, and coarse roots; many very fine and fine interstitial pores and many fine and common medium tubular pores; medium acid (pH 6.0); gradual, irregular boundary.

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C1--32 to 49 inches, light brownish-gray (10YR 6/2) light loamy sand, dark yellowish brown (10YR 4/4) when moist; massive; soft, very friable, nonsticky and nonplastic; few very fine, fine, medium, and coarse roots; many very fine and fine interstitial pores and many very fine, fine, and medium tubular pores; medium acid (pH 6.0); abrupt, wavy boundary.

C2--49 to 72 inches, pale-brown (10YR 6/3) loamy sand, yellowish brown (10YR 5/4) when moist; massive; soft, very friable, nonsticky and nonplastic; very few very fine and fine roots and few medium roots; many very fine and fine interstitial pores and few very fine and fine tubular pores; medium acid (pH 6.0).

Texture of the A horizon ranges from sand to loamy fine sand. Color is grayish brown to pale brown. The C horizons normally are stratified sands and loamy sands, and are light brownish gray to very pale brown in color.

Corralitos sand, 0 to 2 percent slopes (CtA).--This soil is nearly level and occurs on alluvial fans. It is sand throughout the profile, but otherwise resembles the profile described as representative for the series. This soil is subject to occasional flooding by runoff from higher areas. Some channel erosion occurs.

Included in mapping are small areas of Corralitos loamy sand. Small areas of Elder soils are also included.

Permeability is rapid. Surface runoff is very slow, and there is no hazard of erosion by water. However, the hazard of soil blowing is high. Fertility is very low. The available water capacity is 2 to 4 inches in the 60 inches of effective rooting depth.

This soil is used mainly for range and for strawberries. Small areas are used for alfalfa, lima beans, and walnuts. Capability units IVe-4(14) and VIe-4(15); Sandy range site.

Corralitos sand, 2 to 15 percent slopes (CtD).--This soil is gently sloping to strongly sloping and occurs on alluvial fans and in small fingering valleys. It has a profile similar to the one described as representative for the series except that this soil is sand throughout the profile.

Included in mapping are areas of Arnold and of Elder soils. Also included are areas where gullies are active and eroded materials are being deposited.

Permeability is rapid. Surface runoff is slow, and the hazard of erosion by water is slight. The hazard of soil blowing is high. Fertility is very low. The available water capacity is 2.0 to 4.0 inches. The effective rooting depth is more than 60 inches.

This Corralitos soil is used for range and for strawberries, alfalfa, and walnuts in selected areas. Capability units IVe-4(14) and VIe-4(15); Sandy range site.

Corralitos sand, 9 to 15 percent slopes, eroded (CtD2).--This strongly sloping soil occurs in narrow valleys and at the mouths of small alluvial fans. It has a profile similar to the one described as representative for the series except that this soil is sand throughout the profile. Deep and shallow gullies occur in many areas. Stream channels meander through areas of this soil.

Included in mapping are small areas of Arnold soils, some noneroded Corralitos soils, and Riverwash.

Permeability is rapid. Surface runoff is medium, and the hazard of erosion by water is moderate. The hazard of soil blowing is high. Fertility is very low. The available water capacity is 2.0 to 4.0 inches in the 60 inches of effective rooting depth.

This soil is used for range. Capability unit VIe-4(15); Sandy range site.

Corralitos loamy sand, 0 to 2 percent slopes (CuA).--This soil is nearly level and occurs on alluvial fans and flood plains.

Included in mapping are several small areas of overwash at the mouths of drainageways that are underlain by Elder, Botella, Salinas, and Agueda soils at depths of 24 to 36 inches.

Permeability is rapid. Surface runoff is very slow, and there is no hazard of erosion by water. The hazard of soil blowing is high. Fertility is low. The available water capacity is 4.0 to 5.0 inches. The effective rooting depth is more than 60 inches.

This soil is used for strawberries and, to a limited extent, for other irrigated crops. It is also used for annual pasture and range. Capability units IIIs-4(14) and IVe-4(15); Sandy range site.

Corralitos loamy sand, 2 to 9 percent slopes (CuC).--This soil is gently sloping to moderately sloping and occurs on alluvial fans and in fingering valleys that extend into the uplands. This soil has the profile described as representative for the Corralitos series.

Included in mapping are areas of Arnold soils and of Corralitos sand. Also included are areas that have a sandy loam surface layer overlying the loamy sand substratum.

Permeability is rapid. Surface runoff is slow, and the hazard of erosion by water is slight. The hazard of soil blowing is high. Fertility is low. The available water capacity is 4.0 to 5.0 inches. The effective rooting depth is more than 60 inches.

This soil is used for range. To a limited extent it is used for strawberries and for other irrigated crops. Capability units IIIs-4(14) and IVe-4(15); Sandy range site.

Corralitos loamy sand, 9 to 15 percent slopes (CuD).--This strongly sloping soil occurs on the higher parts of alluvial fans. It is pale brown and stratified with sand; otherwise it has a profile that is similar to the one described as representative for the series. Although runoff water from

higher areas flows across this soil, there is little gully erosion.

Included in mapping are areas of Corralitos sand and of Arnold soils. Also included are some eroded areas.

Permeability is rapid. Surface runoff is slow except where water overflows from higher areas. The hazard of erosion by water is slight to moderate. The hazard of soil blowing is high. Fertility is very low. The available water capacity is 4.0 to 5.0 inches in the 60 inches of effective rooting depth.

This soil is used for range and annual pasture. Capability units IVe-4(14) and VIe-4(15); Sandy range site.

Cropley Series

The Cropley series consists of well-drained silty clays that formed in sandstone and shale alluvium. These soils are on flood plains, mainly in an area about 3 miles west of Lompoc and also in a few small areas in the Lompoc Valley. Slopes are 0 to 2 percent. Elevations range from 50 to 1,500 feet. The average annual rainfall is 12 to 18 inches, the average annual air temperature is about 59° F., and the frost-free season is 300 to 330 days. Cropley soils are associated with Salinas soils.

In a representative profile, the Cropley soils have a very dark gray to dark-gray silty clay and silty clay loam surface layer about 32 inches thick. The underlying layer is calcareous pale-brown and light yellowish-brown silty clay loam and very fine sandy loam that extends to a depth of 60 inches or more.

The Cropley soils are used for irrigated crops.

Representative profile of the Cropley series (about 3 miles west of Lompoc, 60 feet northwest of pole 309 on Lompoc Branch of the Southern Pacific Railroad):

Ap--0 to 6 inches, very dark gray (10YR 3/1) silty clay, black (10YR 2/1) when moist; moderate, fine and medium, angular blocky structure; very hard, firm, sticky and very plastic; few very fine roots; common fine interstitial pores and few very fine tubular pores; moderately alkaline (pH 8.0); noncalcareous; clear, smooth boundary.

A11--6 to 11 inches, very dark gray (10YR 3/1) silty clay, black (10YR 2/1) when moist; moderate, fine and medium, subangular blocky structure; very hard, firm, sticky and very plastic; few very fine roots; common fine interstitial pores and few very fine and fine tubular pores; moderately alkaline (pH 8.0); noncalcareous; clear, smooth boundary.

A12--11 to 20 inches, dark-gray (10YR 4/1) silty clay, black (10YR 2/1) when moist; moderate, fine and medium, subangular blocky structure; very hard, firm, sticky and very plastic; few very fine roots; common very fine interstitial pores and few very fine tubular pores; common slickensides; moderately alkaline (pH 8.0); noncalcareous; gradual, smooth boundary.

A13--20 to 32 inches, dark-gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) when moist; moderate, fine and medium, subangular blocky structure; very hard, firm, sticky and plastic; few very fine roots; few very fine interstitial pores and many very fine and few fine tubular pores; a few slickensides; moderately alkaline (pH 8.0); noncalcareous; gradual, wavy boundary.

AC--32 to 49 inches, mixed pale-brown (10YR 6/3) and brown (10YR 5/3) silty clay loam, dark brown (10YR 4/3) when moist; weak, fine, subangular blocky structure; very hard, friable, sticky and plastic; few very fine roots; many micro interstitial pores, common very fine tubular pores, and few fine tubular pores; strongly effervescent; disseminated lime; moderately alkaline (pH 8.0); gradual, smooth boundary.

C1--49 to 67 inches, light yellowish-brown (10YR 6/4) light silty clay loam, olive brown (2.5Y 4/4) when moist; massive; very hard, friable, sticky and plastic; very few very fine roots; many micro interstitial pores and many very fine tubular pores; strongly effervescent; disseminated lime; moderately alkaline (pH 8.0); clear, smooth boundary.

IIC2--67 to 75 inches, light yellowish-brown (10YR 6/4) very fine sandy loam, olive brown (2.5Y 4/4) when moist; massive; hard, friable, slightly sticky and slightly plastic; very few very fine roots; many very fine interstitial pores and common very fine tubular pores; strongly effervescent; disseminated lime; moderately alkaline (pH 8.0).

The A horizon ranges from very dark gray to dark gray. Areas near the mouths of fans have a few Monterey Shale fragments in the surface that were deposited in recent overwash. The C horizon ranges from silty clay loam to fine sandy loam and is stratified.

Cropley silty clay (Cv).--This soil is nearly level and occurs on flood plains. It is the only Cropley soil mapped in the Area. This soil is subject to occasional overflow.

Included in mapping are areas that have a layer of material that was washed from higher lying soils and areas in which 5 to 20 percent of the entire soil profile is shale fragments. Also included are small areas of Salinas soils.

Permeability is slow. Surface runoff is slow, and the erosion hazard is none to slight. Fertility is high. The available water capacity is 8 to 10 inches for the 60 inches of rooting depth. This soil can be tilled only within a very narrow range of moisture content.

This soil is used for irrigated row crops and for dryland hay and grain. Capability unit IIs-5(14).

Crow Hill Series

The Crow Hill series consists of well-drained loams that formed in soft, diatomaceous shale. These soils are on uplands in areas where slopes range from 15 to 75 percent. These soils occur within 20 miles of the coast, from the vicinity of Casmalia south into the Santa Ynez Mountains. The vegetation is annual grasses, forbs, and oak trees on the less steep areas. Brush grows on the steep, severely eroded areas. Elevations range from 200 to 1,500 feet. The average annual rainfall is 11 to 18 inches, the average annual air temperature is about 58° F., and the frost-free season is 275 to 325 days. Crow Hill soils are associated with the Santa Lucia soils and with Shedd soils, diatomaceous variant.

In a representative profile, the surface layer is gray loam and silt loam about 21 inches thick. The subsoil is gray light silty clay loam, underlain at about 36 inches by fractured diatomaceous shale.

The Crow Hill soils are used for range and for dryland hay and grain.

In many places the deposits of diatoms are several hundred feet thick and are quite pure. There are large-scale mining operations in the Santa Ynez mountains near Lompoc. The diatomaceous materials are used for many industrial purposes.

Representative profile of the Crow Hill series (0.6 mile south on Bodger Road from the intersection of Bodger Road and West Olive, about 1 mile southwest of Lompoc, California):

O1--Thin discontinuous layer of small twigs and leaves.

A11--0 to 7 inches, gray (10YR 5/1) heavy loam, black (10YR 2/1) when moist; strong, medium, granular structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine and very fine roots and many medium roots; many very fine interstitial pores; medium acid (pH 6.0); gradual, smooth boundary.

A12--7 to 21 inches, gray (10YR 5/1) heavy silt loam, black (10YR 2/1) when moist; weak, medium, subangular blocky, parting to moderate, coarse, granular structure; slightly hard, very friable, slightly sticky and slightly plastic; few fine and very fine roots; and many medium roots; many very fine interstitial pores and common very fine and few fine tubular pores; medium acid (pH 5.8); gradual, wavy boundary.

B2--21 to 36 inches, gray (10YR 5/1) light silty clay loam, very dark gray (10YR 3/1) when moist; moderate, medium, subangular blocky structure; hard, friable, sticky and plastic; few fine and very fine roots and many medium roots; many very fine interstitial pores, and many very fine, few fine, and common medium tubular pores; common, thin, dark-gray clay films in pores; strongly acid (pH 5.5); this horizon is indistinct and discontinuous; small areas have bleached silt grains on ped faces; abrupt, wavy boundary.

R1--36 to 47 inches, very dark grayish brown (10YR 3/2) extremely shaly silty clay loam, black (10YR 2/1) when moist; 90 percent coarse rock fragments with soil filling joints; moderate, fine and medium, granular structure; hard, very friable, sticky and plastic; few fine and very fine and common medium roots; many very fine interstitial pores and common very fine tubular pores; continuous thin clay films in pores; strongly acid (pH 5.5); gradual, irregular boundary.

R2--47 inches, white, firm, brittle, diatomaceous shale that has a bulk density of less than 1; very dark brown stains on fractures in first foot or two.

In this profile, 3 percent of the A11 and A12 horizons and about 15 percent of the B2 horizon is fine shale fragments.

The A1 horizon is light brownish gray, light gray, gray, and, in a few places, dark gray. Texture of the A1 horizon is loam, silt loam, and light clay loam. Normally a weak B horizon is above the bedrock, and thin clay films and colloidal stains extend into the fractured bedrock. On some sloping areas and ridgetops, the B horizon is lacking. Soil reaction ranges from very strongly acid to slightly acid. Depth to bedrock ranges from 22 to 42 inches.

Crow Hill loam, 15 to 75 percent slopes, severely eroded, is a taxadjunct to the Crow Hill series because depth to bedrock is 7 to 22 inches. This soil is used and managed in much the same way as Crow Hill soils.

Crow Hill loam, 15 to 30 percent slopes (CwE).--This soil is rolling and occurs on hills and long, narrow, irregularly shaped ridgetops. Depth to bedrock ranges from 22 to 38 inches, but averages 28 inches.

Included in mapping are areas of an unnamed soil that has a very dark brown silty clay subsoil. Also included are small areas of Santa Lucia, Shedd diatomaceous variant, Arnold, and Chamise soils.

Permeability is moderately slow. Surface runoff is medium to rapid, and the erosion hazard is moderate to high. Fertility is moderate. The available water capacity is 4.0 to 6.0 inches in the 22 to 38 inches of rooting depth.

This Crow Hill soil is used for range and for dryland hay. Some areas are mined, and the diatomaceous earth is used for a number of industrial purposes. Capability unit IVe-1(15); Loamy range site.

Crow Hill loam, 30 to 45 percent slopes (CwF).--This soil is steep and occurs on smooth uplands and low hills. Depth to bedrock ranges from 22 to 42 inches, but averages about 26 inches.

Included in mapping are areas of Arnold and Santa Lucia soils and a small area of an unnamed soil that has a very dark brown silty clay subsoil.

Permeability is moderately slow. Surface runoff is rapid, and the erosion hazard is high. Fertility

is moderate. Available water capacity is 4.0 to 6.0 inches in the 22- to 42-inch rooting zone.

This soil is used for range. Some areas are mined, and the diatomaceous earth is used for industrial purposes. Capability unit VIe-1(15); Loamy range site.

Crow Hill loam, 45 to 75 percent slopes (CwG).--This very steep soil is in the hills. Drainageways normally are V-shaped and ridgetops are narrow. This soil has the profile described as representative for the series. Depth to bedrock ranges from 22 inches on the tops of the hills to 40 inches on deeply weathered sloping areas.

Included in mapping are small areas of Shedd soils, diatomaceous variant, and of Santa Lucia soils.

Permeability is moderately slow. Surface runoff is very rapid, and the erosion hazard is very high. Fertility is moderate. The available water capacity is 4.0 to 6.0 inches in the 22 to 40 inches of effective rooting depth.

This Crow Hill soil is used for range and is mined for the diatomaceous earth. Capability unit VIIe-1(15); Steep Loamy range site.

Crow Hill loam, 15 to 75 percent slopes, severely eroded (CwG3).--This soil is moderately steep to very steep and occurs on severely eroded mountainous uplands. It has a profile similar to the one described as representative for the series except that depth to bedrock is only 7 to 22 inches. Rill and gully erosion are severe, and much of the surface soil has been removed.

Included in mapping are areas of a Crow Hill soil that is more than 22 inches deep and areas of soil that has a clay loam surface layer. Small areas of Shedd soils, diatomaceous variant, and of Santa Lucia soils are also included.

Permeability is moderately slow. Runoff is rapid to very rapid, and the erosion hazard is very high. Fertility is low. The available water capacity is 1.0 to 4.0 inches in the 7 to 22 inches of effective rooting depth.

This soil is used for limited range and is mined for the diatomaceous earth. Capability unit VIIe-1 (15); Shallow Loamy range site.

Diablo Series

The Diablo series consists of well-drained silty clays underlain by calcareous shale or mudstone at a depth of 20 to 40 inches. They occur on rounded hills and mountains in widely scattered areas in the western part of the survey area. Slopes are 9 to 75 percent. The vegetation is annual grasses, forbs, and a few scattered oak trees. Elevations range from 500 to 3,000 feet. The average annual rainfall is 12 to 20 inches, the average annual air temperature is about 60° F., and the frost-free season is 250 to 275 days. Diablo soils are associated with the Linne and Santa Lucia soils.

In a typical profile, the surface layer is very dark gray and dark-gray silty clay about 26 inches thick. A pale-olive, calcareous, silty clay substratum extends to a depth of about 35 inches. It is underlain by strongly calcareous mudstone.

Diablo soils are used for range and for dryland hay and grain.

Representative profile of the Diablo series (in Figueroa Canyon, about 7 miles north of San Marcos Pass Road and Santa Barbara Avenue intersection, 400 feet south and 300 feet east of Brinkerhoff Ranch house on berm of farm road):

A11--0 to 5 inches, very dark gray (10YR 3/1) silty clay, black (10YR 2/1) when moist; strong, medium and coarse, subangular blocky, parting to weak, medium, granular structure; very hard, firm, sticky and plastic; many micro and very fine roots; many medium and coarse interstitial pores and common very fine tubular pores; mildly alkaline (pH 7.5); clear, wavy boundary.

A12--5 to 15 inches, dark-gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) when moist; weak, coarse and very coarse, prismatic, breaking to weak, medium and coarse, subangular blocky structure; very hard, firm, sticky and plastic; many micro and very fine roots; many micro and very fine interstitial pores and common micro tubular pores; mildly alkaline (pH 7.8); gradual, wavy boundary.

A13--15 to 26 inches, dark-gray (10YR 4/1) silty clay, very dark grayish brown (10YR 3/2) when moist; moderate, medium and coarse, subangular blocky structure; very hard, firm, sticky and plastic; common micro and very fine roots; many very fine interstitial pores and common micro tubular pores; moderately alkaline (pH 8.0); abrupt, wavy boundary.

C1ca--26 to 35 inches, pale-olive (5Y 6/3) mixed with dark-gray (10YR 4/1) and dark grayish-brown (10YR 4/2) silty clay, olive (5Y 5/3) mixed with very dark gray (10YR 3/1) and very dark grayish brown (10YR 3/2) when moist; weak, fine and medium, granular structure; hard, friable, sticky and plastic; few micro and very fine roots; many very fine interstitial pores and many very fine tubular pores; strongly effervescent; disseminated lime; moderately alkaline (pH 8.2); clear, wavy boundary.

C2--35 inches, light olive-gray (5Y 6/2) mudstone wetting to silty clay texture, olive (5Y 5/3) when moist; massive; very hard, firm, sticky and plastic; very few micro roots; many very fine interstitial pores; strongly effervescent; disseminated lime; moderately alkaline (pH 8.2).

Texture of the A horizon ranges from silty clay to light clay. Depth to bedrock is typically about 36 inches but ranges from 20 inches to 40 inches. In most areas Diablo soils are underlain by partially

consolidated mudstone, but in a few areas they are underlain by hard shale bedrock. The Diablo soils that formed from soft bedrock generally have a high concentration of disseminated lime in the lower part of the A horizon or in the C horizon. The soils that formed from hard bedrock have lime only in the lower part of the C horizon and lime coatings on rock fragments or ped faces.

Diablo silty clay, 9 to 15 percent slopes (DaD).--This soil is sloping and occurs on low hills, on ridgetops, and on small meadows in mountainous areas. It is limited in extent and occurs in small scattered areas.

Included in mapping are some areas of Chamise, Linne, and Shedd soils. Also included are small eroded areas.

Permeability is slow. Surface runoff is medium, and the erosion hazard is moderate. Fertility is high. The available water capacity is 4.0 to 6.0 inches. Depth to bedrock is 20 to 40 inches but averages about 36 inches.

This soil is used mainly for range. Small, scattered areas are used for dryland hay and grain. Capability unit IIIe-5(15); Clayey range site.

Diablo silty clay, 15 to 30 percent slopes (DaE).--This soil is moderately steep and occurs on low hills and ridgetops. It has a profile similar to the one described as representative for the series, but it is generally about 30 inches deep over bedrock.

Included with this soil in mapping are areas of Chamise, Linne, and Shedd soils. Some small eroded areas and small land slips are also included.

Permeability is slow. Surface runoff is medium to rapid, and the erosion hazard is moderate to high. Fertility is high. The available water capacity is 4.0 to 7.0 inches in the 20 to 40 inches of rooting depth.

This soil is used mainly for range. Small areas are used for dryland hay. Capability unit IVe-5 (15); Clayey range site.

Diablo silty clay, 30 to 45 percent slopes (DaF).--This soil is steep and occurs on rounded hills. It has the profile described as representative for the series. Depth to bedrock ranges from 20 to 36 inches.

Small areas of Chamise and Shedd soils are included with this soil in mapping. Also included are small, severely eroded areas.

Permeability is slow. Surface runoff is rapid, and the erosion hazard is high. Fertility is high. The available water capacity is 4.0 to 6.0 inches, and the effective rooting depth is 20 to 36 inches.

This soil is used for range, wildlife habitat, and watershed. Capability unit VIe-5(15); Clayey range site.

Diablo silty clay, 15 to 45 percent slopes, severely eroded (DaF3).--This mapping unit occupies small scattered areas within larger areas of Diablo soils. The profile is similar to the one described as representative for the series except that depth to bedrock ranges from 20 to 30 inches. Many gullies and rills have formed, and much of the surface layer has been eroded away in areas that have been excessively cultivated or overgrazed. The vegetative cover is sparse and brushy.

Included with this soil in mapping are areas that are not so severely eroded and have rock outcrops. Also included are many small land slips.

Permeability is slow. Surface runoff is medium to rapid, and the erosion hazard is moderate to high. Fertility is moderate. The available water capacity is 4.0 to 5.0 inches in the 20 to 30-inch rooting zone.

This soil is used for range and as watershed. Capability unit VIIe-5(15); Shallow Clayey range site.

Diablo silty clay, 45 to 75 percent slopes (DaG).--This soil is very steep. In most places slopes are about 50 percent. The profile is similar to that described as typical for the series except that this soil is 20 to 30 inches deep over bedrock.

Included in mapping are areas of Chamise, Linne, and Shedd soils. Other included areas are moderately to severely eroded. Some areas of land slips are also included.

Permeability is slow. Surface runoff is very rapid, and the erosion hazard is very high. Fertility is high. The available water capacity is 4.0 to 5.0 inches in the 20- to 30-inch rooting zone.

This soil is used for range and as watershed. Capability unit VIIe-5(15); Clayey range site.

Dune Land

Dune land (DuE) consists of hummocks, mounds, and hills of loose, wind-deposited quartzitic marine sand. It occurs in large areas along the Pacific Ocean and in small areas inland within 15 miles of the coast. The most extensive areas are in the vicinity of Guadalupe and the Marshallia Ranch. Elevations range from 10 to 300 feet. Some areas are stabilized by coastal sagebrush and dune grass; other areas are active and shifting.

This land type has no value for farming but is used for recreation. Where dunes are encroaching upon cultivated land, urban developments, or military establishments, vegetation is needed to stabilize them and prevent further movement. Capability unit VIIIe-4(14).

Elder Series

The Elder series consists of well-drained sandy loams that developed in alluvium derived from acid shale and sandstone. These soils occur on flood plains and on alluvial fans. The vegetation is annual grasses, forbs, and oak trees. Slopes are 0 to 15 percent. In some areas this soil is subject to overflow from higher areas. It generally is necessary to control the overflow in order to

cultivate these areas. Elevations range from 100 to 1,500 feet. The average annual rainfall is 12 to 18 inches, the average annual air temperature is about 58° F., and the frost-free season is 240 to 300 days. Elder soils are associated with Corralitos and Botella soils.

In a representative profile, the surface layer is dark-gray sandy loam about 23 inches thick. The underlying layers are gray and light brownish-gray stratified sandy loam and fine sandy loam to depths of 60 inches and more. In some areas the soil is loam or shaly loam throughout the profile.

Elder soils are used for irrigated crops, for dryland hay and grain, and for range.

Representative profile of the Elder series (in a grain field in Canada del Comasa Canyon, 3 1/2 miles southeast of Los Alamos, on U.S. Highway No. 101, 1.1 miles northeast of Barham Ranch buildings):

Ap--0 to 8 inches, dark-gray (10YR 4/1) sandy loam, very dark gray (10YR 3/1) when moist; moderate, medium and coarse, granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many micro and very fine roots; many very fine and fine interstitial pores, few very fine and very few fine tubular pores; medium acid (pH 6.0); clear, smooth boundary.

A1--8 to 23 inches, dark-gray (10YR 4/1) sandy loam, very dark gray (10YR 3/1) when moist; weak, fine and medium, granular structure; hard, very friable, slightly sticky and slightly plastic; common micro and very fine roots; many very fine interstitial pores, common very fine and fine pores, and many medium tubular pores; slightly acid (pH 6.5); gradual, wavy boundary.

AC--23 to 35 inches, gray (10YR 5/1) sandy loam, dark grayish brown (10YR 4/2) when moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; common micro and very fine roots; many very fine interstitial pores and many very fine tubular pores; few thin colloidal stains on mineral grains; much mixing of A and C horizon material because of rodent activity; slightly acid (pH 6.5); clear, wavy boundary; a thin discontinuous gravel lens is present below this horizon.

C--35 to 72 inches, light brownish-gray (10YR 6/2) fine sandy loam, grayish brown (10YR 5/2) when moist; massive; hard, very friable, sticky and slightly plastic; few micro and very fine roots; many micro interstitial pores and many very fine and fine tubular pores; few thin colloidal stains on mineral grains; 1-inch wavy, continuous band, (10YR 4/2) when dry, (10YR 3/2) when moist; silty clay loam texture at 45-inch depth, 1/4- to 1/2-inch bands of silty clay loam at 51- and 57-inch depths; neutral (pH 7.0).

Texture of the A horizon ranges from sandy loam to loam, and color ranges from dark gray to gray. Typically, Elder soils contain shale fragments, ranging in amount from a few percent to about 30 percent of the profile. Reaction ranges from medium acid to neutral throughout the profile. The most prominent variations in the profile are the result of stratification. Strata throughout the profile are sandy loam to loam; there are minor strata of loamy sand, sand, and gravel.

Elder sandy loam, 0 to 2 percent slopes (EdA).--This soil is nearly level and occurs on flood plains that are not subject to severe overflow or erosion. It has the profile described as representative for the series.

Included in mapping are areas of shaly Elder soils and of Botella and Corralitos soils. Also included are small areas in long narrow valleys where seepage occurs.

Permeability is moderately rapid. Surface runoff is very slow, and the erosion hazard is none to slight. Fertility is moderate. The available water capacity is 7.5 to 8.5 inches in the 60 inches of rooting depth.

This Elder soil is used for irrigated crops, for dryland hay and grain, and for range. Capability unit I-1(14).

Elder sandy loam, 0 to 2 percent slopes, eroded (EdA2).--This soil is nearly level and occurs on flood plains that are subject to overflow by runoff water from surrounding areas. During years when runoff is high, fresh deposits of alluvium are laid down and removed. This deposition and erosion damages crops. The profile of this soil is similar to the one described as representative for the series except that this soil is more stratified and contains coarser textured materials.

Included in mapping are small areas of Botella and Corralitos soils and of Elder shaly loam.

Permeability is moderately rapid. Surface runoff is very slow. The erosion hazard is none to slight except when water overflows from higher areas. Fertility is moderate. The available water capacity is 6.0 to 7.5 inches in the 60 inches of rooting depth.

This soil is used for irrigated and dryland crops, for range, and as wildlife habitat. Capability units IIe-1(14) and IIIe-1(15); Loamy range site.

Elder sandy loam, 2 to 9 percent slopes, eroded (EdC2).--This soil occurs in narrow valleys and on sloping alluvial fans that are subject to overflow by runoff water from higher areas. Long, deep gullies are common, especially in areas that have been cultivated. This soil has a profile similar to the one described as representative for the series except that it is stratified with coarser textured materials.

Included in mapping are small noneroded areas. Also included are areas of Botella and Corralitos soils and areas of Elder soils in which 15 to 30 percent of the entire profile is shale fragments.

Permeability is moderately rapid. Surface runoff is medium to slow, and the erosion hazard is moderate. This soil is moderately fertile. The available

water capacity is 6.0 to 7.5 inches in the 60 inches of rooting depth.

This Elder soil is used mainly for range. A few small areas are used for dryland hay, grain, and beans. Capability unit IIIe-1(15); Loamy range site.

Elder sandy loam, 9 to 15 percent slopes, eroded (EdD2).--This soil occupies narrow valleys and alluvial fans and is subject to overflow by runoff from surrounding hills during heavy rains. This soil has a profile similar to the one described as representative for the series except that it is stratified with layers of loamy fine sand and coarse sandy loam.

Botella, Corralitos, and shaly Elder soils are included in mapping.

Permeability is moderately rapid. Surface runoff is medium, and the erosion hazard is moderate. Fertility is low. The available water capacity is 6.0 to 7.5 inches in the 60 inches of rooting depth.

This soil is used for range and for dryland grain. Capability unit IVe-1(15); Loamy range site.

Elder loam, 0 to 2 percent slopes (EmA).--This nearly level soil occurs on flood plains that are not subject to overflow. It has a profile similar to the one described as representative for the series except that this soil is loam throughout the profile.

Included in mapping are small areas of Botella and Corralitos soils. Some eroded areas and areas of Elder shaly loam are also included.

Permeability is moderate. Surface runoff is very slow, and the erosion hazard is none to slight. Fertility is high. The available water capacity is 9 to 11 inches in the 60 inches of rooting depth.

This soil is used for both irrigated and dryland crops. Capability unit I-1(M4).

Elder loam, 2 to 9 percent slopes (EmC).-- This soil occurs on alluvial fans. It is subject to slight runoff from adjacent hills. The profile is similar to the one described as representative for the series except that this soil is loam throughout the profile.

Included in mapping are small areas of Botella and Corralitos soils. Areas of Elder shaly loam and of eroded Elder soils are also included.

Permeability is moderate. Surface runoff is slow to medium, and the erosion hazard is slight to moderate. Fertility is high. The available water capacity is 9.0 to 11.0 inches in the 60 inches of rooting depth.

This soil is used for irrigated and dryland crops and for range. Capability unit IIe-1(14) and IIe-1 (15); Loamy range site.

Elder shaly loam, 0 to 2 percent slopes, eroded (EnA2).--This soil is nearly level and is subject to overflow from higher surrounding areas. It has a profile similar to the one described as representative for the series except that it is loam throughout and 15 to 35 percent of the profile is shale fragments. Shallow, meandering gullies are common. During flooding, fresh deposits of alluvium are laid down and removed. This deposition and erosion damages crops.

Included in mapping are Botella and Corralitos soils. Also included are small areas of nonshaly Elder soils and of Elder soils in which 35 to 50 percent of the entire profile is shale fragments.

Permeability is moderate. Surface runoff is very slow. Fertility is moderate. The available water capacity is 7.0 to 9.0 inches in the 60 inches of rooting depth.

This soil is used for irrigated and dryland crops and for range. Capability units IIe-1(14) and IIe-1 (15); Loamy range site.

Elder shaly loam, 2 to 9 percent slopes, eroded (EnC2).--This soil occurs on long narrow valleys and flood plains that are subject to overflow by runoff from higher areas. The profile is similar to the one described as representative for the series except that this soil is loam throughout and 15 to 35 percent of the entire profile is shale fragments. Most areas have long, deep gullies.

Included in mapping are areas of Botella soils and areas in which 35 to 50 percent of the soil profile is shale fragments.

This soil is moderately permeable. Surface runoff is slow to medium, and the erosion hazard is slight to moderate. Fertility is moderate. The available water capacity is 7.0 to 9.0 inches in the 60 inches of rooting depth.

This Elder soil is used for range and for dryland beans, hay, and grain. Capability unit IIe-1(15); Loamy range site.

Elder shaly loam, 9 to 15 percent slopes, eroded (EnD2).--This soil occurs in small, irregularly shaped areas along minor drainage channels. The profile is similar to the one described as representative for the series except that this soil is stratified loam and sandy loam throughout and is 20 to 40 percent shale fragments. Deep gullies or deeply entrenched drainageways are common.

Included in mapping are small areas of Botella soils. Also included are areas of Elder soils in which 40 to 60 percent of the entire soil profile is shale fragments.

Permeability is moderate. Surface runoff is medium, and the erosion hazard is moderate. Fertility is moderate. The available water capacity is 6.5 to 8.5 inches in the 60 inches of rooting depth.

This soil is used mainly for range. Small areas are used for dryland grain or sudangrass. Capability unit IIIe-1(15); Loamy range site.

Garey Series

The Garey series consists of well-drained sandy loams that developed on wind-modified terraces that have been dissected by deep drainageways. These soils are south of the Santa Maria Valley. Slopes

are 0 to 30 percent. The vegetation consists of annual grasses, forbs, and scattered California sagebrush. Elevations range from 300 to 1,000 feet. The average annual rainfall is 12 to 18 inches, the average annual air temperature is about 57° F., and the frost-free season is 250 to 300 days. Garey soils are associated with Marina and Oceano soils.

In a representative profile, the Garey soils have brown and light-brown sandy loam surface and subsurface layers about 27 inches thick. The subsoil is light-brown and pinkish-gray sandy loam and loamy sand and has weakly brittle bands about 1/2 inch thick. At a depth of about 70 inches is very pale brown sand (pl. III, top).

Garey soils are used for shallow-rooted irrigated and dryland crops and for range.

Representative profile of the Garey series (approximately 3.8 miles east of Orcutt, 1 1/4 miles east of Clark Avenue and Telephone Road intersection, 820 feet north on ranch road, then 20 feet west in field; SW1/4 SW1/4 sec. 9, T. 9 N., R. 33 W.):

Ap1--0 to 4 inches, brown (10YR 5/3) sandy loam, dark brown (10YR 4/3) when moist; weak, fine, subangular blocky and weak, medium, granular structure; slightly hard, very friable, nonsticky and slightly plastic; many very fine roots; many very fine interstitial pores; medium acid (pH 5.9); clear, smooth boundary.

Ap2--4 to 8 inches, brown (10YR 5/3) sandy loam, dark brown (7.5YR 4/3) when moist; slightly finer than Ap1 horizon; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots and many very fine roots in joints; many very fine interstitial pores, very few fine and medium tubular pores; strongly acid (pH 5.5); clear, wavy boundary.

A1--8 to 16 inches, brown (10YR 5/3) sandy loam, dark brown (7.5YR 3/3) when moist; weak, fine, and medium, subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; very few very fine roots and common very fine roots in joints; very few medium and coarse woody roots; many very fine interstitial pores and common fine and very few medium tubular pores; medium acid (pH 5.6); gradual, smooth boundary.

A3--16 to 27 inches, light-brown (7.5YR 6/3) sandy loam, dark brown (7.5YR 3/3) when moist; slightly more clay than in Ap1, Ap2, and A1 horizons; massive; hard, friable, slightly sticky and slightly plastic; very few very fine roots, mostly in joints; many very fine interstitial pores and common fine and very few medium tubular pores; few thin clay films as bridges and in pores; slightly acid (pH 6.2); gradual, wavy boundary.

B21--27 to 36 inches, light-brown (7.5YR 6/3) heavy sandy loam, dark brown (7.5YR 3/3) when moist; massive; hard to very hard, firm, slightly sticky and slightly plastic; very few very fine roots; many very fine interstitial pores, common fine and very fine pores, and very few medium tubular pores; common thin clay films as bridges and in pores; few weakly cemented nodules; indistinct bands, 1/2 inch thick, that are dark reddish brown (5YR 3/3m) and slightly brittle; slightly acid (pH 6.5); gradual, smooth boundary.

B22--36 to 47 inches, light-brown (7.5YR 6/4) sandy loam, reddish brown (5YR 4/4) when moist; massive; hard to very hard, soil mass friable, bands firm, slightly sticky and slightly plastic; very few very fine roots; many very fine interstitial pores and common very fine and very few medium tubular pores; common thin clay films as bridges and in pores; several indistinct, discontinuous, firm, dark reddish-brown (5YR 3/2, 3/3m) bands that are weakly brittle; neutral (pH 6.8); clear, wavy boundary.

B31--47 to 58 inches, pinkish-gray (7.5YR 7/2) loamy sand, dark brown (7.5YR 4/3) when moist; massive; slightly hard, very friable, nonsticky and nonplastic, bands are very hard, dry, and firm when moist; very few very fine roots; many very fine interstitial pores, very few very fine tubular pores in bands only; distinct continuous bands about 1/2 inch thick, reddish brown (5YR 5/3d) and dark reddish brown (5YR 3/3) when moist; slightly acid (pH 6.3); clear, wavy boundary.

B32--58 to 70 inches, pinkish-gray (7.5YR 7/3) loamy sand, brown (7.5YR 5/4) when moist; massive; slightly hard, very friable, nonsticky and nonplastic; no roots; many very fine interstitial pores; no clay films except thin, weak bridges in bands; bands are 1/4 to 1/2 inch thick, continuous and wavy, thinner at bottom, similar to those in B31 horizon; neutral (pH 7.0); clear, wavy boundary.

C--70 to 83 inches, very pale brown (10YR 7/3) sand, brown (7.5YR 5/4) when moist; massive; soft, very friable, nonsticky and nonplastic; no roots; many very fine interstitial pores; weak bands 1/4 to 1/2 inch thick, 5 to 7 inches apart, continuous and wavy, reddish brown (5YR 4/3d); a few pendants of bands 1 to 1 1/2 inches long; neutral (pH 7.3), bands have same reaction.

The texture of the A horizon ranges from sandy loam to loam, and the depth to the B21 horizon ranges from 8 to 30 inches. Color of the A horizon ranges from light yellowish brown to brown. The B horizons are harder at the edge of the mesalike areas but the hardness is variable within mapping delineations. Most of the long swales are cut by shallow gullies.

Garey sandy loam, 0 to 2 percent slopes, eroded (GaA2).--This soil is nearly level and occurs on terraces that are partly dissected by deep drainageways. Shallow gullies are common in draws, and deep gullies are common near the edge of terraces. Depth to the indistinct bands is 26 to 30 inches.

Included in mapping are small areas of Garey loam, wet variant. Also included are bands of Oceano soils. Other included areas consist of an unnamed soil that has a very slowly permeable clay subsoil.

Permeability is slow. The indistinct bands reduce permeability. These bands impede root penetration but do not prevent it. Surface runoff is slow to medium, and the erosion hazard is slight to moderate. Fertility is low. The available water capacity is 6.0 to 7.0 inches in the 60 inches of effective rooting depth.

This soil is used for some irrigated and dryland crops and for range. Capability unit IIe-3(14); Loamy range site.

Garey sandy loam, 2 to 9 percent slopes, eroded (GaC2).--This soil occupies rounded rolling terraces. It has the profile described as representative for the series. The average depth to the indistinct bands is 20 to 28 inches. There are numerous shallow gullies that were formed when the areas of this soil were dryfarmed.

Included with this soil in mapping are small bands of Oceano soils, and an unnamed soil that has a very slowly permeable subsoil.

Permeability is slow. Surface runoff is medium, and the erosion hazard is moderate to high. Fertility is low. The available water capacity is 6 to 7 inches in the 60 inches of effective rooting depth. The indistinct bands restrict but do not prevent root and water penetration.

This Garey soil is used for dryland crops and for some irrigated crops. It is also used for range. Capability unit IIIe-1(14) and IIIe-1(15); Loamy range site.

Garey sandy loam, 9 to 30 percent slopes, eroded (GaE2).--This soil occurs in irregularly shaped areas along deep drainageways and on the edges of terraces. The profile is similar to the one described as representative for the series except that this soil has a pale-brown surface layer and depth to the cemented indistinct bands is 15 to 27 inches. This soil is gullied in some places. Hardpanlike outcrops are common near the top of the terrace side slopes. The kind and degree of erosion varies within short distances.

Included in mapping are areas of an unnamed soil that has a very slowly permeable clay subsoil.

Permeability is slow. Surface runoff is medium to rapid, and the erosion hazard is high. Fertility is low. The available water capacity is 5.0 to 6.0 inches in the 60 inches of effective rooting depth. The indistinct bands restrict but do not prevent root and water penetration.

This soil is used for range. Capability unit VIe-1(15); Loamy range site.

Garey sandy loam, 5 to 30 percent slopes, severely eroded (GaE3).--This soil has a pale-brown surface layer about 8 to 15 inches thick. Rills and deep gullies are common.

Included with this soil in mapping are areas that are not so severely eroded. Some Arnold soils are also included. Other included areas consist of an unnamed soil that has a very slowly permeable clay subsoil.

Permeability is slow. Surface runoff is medium to rapid, and the erosion hazard is high. Fertility is very low. The available water capacity is 5.0 to 6.0 inches.

This Garey soil is used for range and as wildlife habitat. Capability unit VIIe-1(15); Shallow Loamy range site.

Garey Series, Wet Variant

These variants of the Garey series are somewhat poorly drained soils in basins within larger areas of Garey sandy loam. These basin areas normally have no outlets and they are inundated during wet winters. These soils are completely surrounded by and blend into the large areas of Garey sandy loam. Because the total acreage is too small to justify establishing a new series, these soils are mapped as variants of the Garey series.

The vegetation consists of annual grasses and forbs. Elevations range from 300 to 1,000 feet. The average annual rainfall is 12 to 18 inches, the average annual air temperature is about 57° F., and the frost-free season is 250 to 300 days.

In a representative profile, these soils have light brownish-gray to very pale brown, mottled loam surface and subsurface layers about 33 inches thick. The subsoil is reddish-brown and light-brown mottled loam extending below 60 inches in depth.

These soils are used for small grain, for range, and for nonfarm purposes.

Representative profile of the Garey series, wet variant (approximately the center of the NE1/4 SW1/4 sec. 2, T. 9 N., R. 33 W., about 3/4 mile southwest of Garey):

A11--0 to 5 inches, light brownish-gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) mottled with red (2.5YR 4/6) when moist; common fine, prominent mottles of red (2.5YR 5/6); massive; hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores and many very fine interstitial pores; strongly acid (pH 5.3); clear, wavy boundary.

A12--5 to 13 inches, light brownish-gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) mottled with red (2.5YR 4/6) when moist; many large, prominent mottles of reddish brown (2.5YR 4/4) and (5YR 5/4); massive; hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine tubular pores and many very fine interstitial pores; strongly acid (pH 5.5); gradual, wavy boundary.

A21--13 to 21 inches, pale-brown (10YR 6/3) loam, brown (10YR 5/3) mottled with dark reddish brown (2.5YR 3/4) when moist; many medium, prominent mottles of reddish brown (2.5YR 4/4); massive; hard, friable, slightly sticky and slightly plastic; common very fine roots;

many very fine and fine tubular pores and many very fine interstitial pores; medium acid (pH 5.8); gradual, wavy boundary.

A22--21 to 33 inches, very pale brown (10YR 7/3) loam, pale brown (10YR 6/3) with mottles of dark reddish brown (2.5YR 3/4) when moist; common, medium, prominent mottles of reddish brown (2.5YR 4/4); massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; many very fine and fine tubular pores and many very fine interstitial pores; medium acid (pH 5.8); abrupt, smooth boundary.

B21--33 to 43 inches, reddish-brown (5YR 5/4) heavy loam, reddish brown (5YR 4/4) mottled with dark reddish brown (5YR 3/3) when moist; common, medium, faint mottles of reddish brown (5YR 4/3); massive; very hard, very firm, sticky and slightly plastic; very few very fine roots in cleavage planes; few very fine tubular pores and many interstitial pores; few moderately thick clay films in cleavage planes and in tubular pores, and many thin clay bridges between mineral grains; slightly acid (pH 6.5); gradual, irregular boundary.

B22--43 to 58 inches, reddish-brown (5YR 5/4) loam, reddish brown (5YR 4/4) with mottles of dark reddish brown (5YR 3/3) when moist; common, medium, faint mottles of reddish brown (5YR 4/3); massive; very hard, very firm, slightly sticky and slightly plastic; very few very fine roots in cleavage planes; common very fine tubular pores and many micro interstitial pores; few moderately thick clay films in tubular pores and cleavage planes, and many thin clay bridges between mineral grains; medium acid (pH 6.0); gradual, wavy boundary.

B3--58 to 72 inches, light-brown (7.5YR 6/4) loam, dark brown (7.5YR 4/4) mottles of dark reddish brown (5YR 3/3) when moist; common, medium, distinct mottles of reddish brown (5YR 4/3); massive; hard, very firm, slightly sticky and slightly plastic; no roots; many very fine tubular pores and common very fine interstitial pores; few moderately thick clay films in tubular pores, and many thin clay bridges between mineral grains; slightly acid (pH 6.5).

The texture of the A horizon ranges from sandy loam to loam. The color and mottling of the B horizons and the degree of drainage vary with the position within the basins. The lower areas in the basins have the most severe drainage problem and are mostly mottled. Drainage is better and there is less mottling as the varriant blends into the higher lying Garey sandy loam soils. B horizons normally are heavy loam but are clay loam in some of the lowest spots. The A2 horizon normally has red concretions with black centers, 5 to 10 millimeters in diameter, that make up 1 percent of the soil mass. A few dark reddish-brown bands commonly occur in the A2 and B horizons; these bands are wavy, generally continuous, and 1/8 to 1/4 inch thick.

Garey loam, wet variant, 0 to 5 percent slopes (GbB).--This is the only variant of the Garey series mapped in the Area.

Depth to the slowly permeable subsoil is 26 to 40 inches. A water table is 2 to 5 feet below the surface during wet seasons.

Included in mapping are areas of Garey sandy loam.

This soil is slowly permeable. Surface runoff is slow, and the erosion hazard is slight. Fertility is low. The available water capacity is 8.0 to 9.0 inches in the 60 inches of rooting depth.

This soil is used for small grains, for range, and for homesites and other nonfarm purposes. Capability unit IIw-2(14); Loamy range site.

Gaviota Series

The Gaviota series consists of well-drained to somewhat excessively drained sandy loams that are underlain by hard, medium-grained sandstone at a depth of 10 to 20 inches. These soils are on hills and mountains in areas where slopes range from 5 to 75 percent. Gaviota soils occur most extensively in the northern foothills of the Santa Ynez Mountains south of the Santa Ynez River and Cachuma Lake and less extensively in the Solomon Hills, Buckhorn Canyon, and the eastern part of the Cuyama Valley. The vegetation is annual grasses and oak trees on the deeper soils, and chaparral brush on the steeper, shallower soils. Elevations range from 400 to 3,500 feet. The average annual rainfall is 10 to 20 inches, the average annual air temperature is about 60° F., and the frost-free season is 190 to 250 days. Gaviota soils are associated with Maymen, Contra Costa, Lodo, and Santa Lucia soils.

In a representative profile, the surface layer is brown sandy loam and gravelly sandy loam about 20 inches thick over fractured sandstone bedrock.

Gaviota soils are used for range, for wildlife habitat, and watershed.

Representative profile of the Gaviota series (5 miles south of Buellton on U.S. Highway 101, 100 yards north of the intersection of Highway 101 and Nojoqui Road, on the east side of Highway 101 in the highway right-of-way):

A11--0 to 2 inches, brown (10YR 5/3) sandy loam, dark brown (10YR 4/3) when moist; moderate, fine and medium, granular structure; slightly hard, friable, nonsticky and nonplastic; many very fine and fine roots; many very fine and fine interstitial pores; slightly acid (pH 6.5); clear, smooth boundary.

A12--2 to 13 inches, brown (10YR 5/3) sandy loam, dark brown (10YR 4/3) when moist; massive; slightly hard, friable, nonsticky and nonplastic; many very fine, fine, and medium roots; many very fine interstitial pores and many very fine and fine tubular pores; slightly acid (pH 6.5); gradual, irregular boundary.

AC--13 to 20 inches, brown (10YR 5/3 toward 10YR 5/4) gravelly sandy loam, dark brown (10YR 4/3) when moist; massive; hard, friable, nonsticky and nonplastic; common very fine, fine, and medium roots; many very fine interstitial pores, common very fine and fine tubular pores; few thin clay films and stains on mineral

grains; slightly acid (pH 6.3); abrupt, irregular boundary.

R--20 inches, yellowish-brown, massive, hard, medium-grained sandstone; few fractures into the bedrock; very dusky red and dark reddish-brown stains in joints and rock fragments.

The A horizon normally is brown but is dark brown in some tree-covered areas. The texture is sandy loam or fine sandy loam. Reaction is slightly acid to neutral. Rock outcrops and detached rocks cover less than 2 percent of the surface area. Soil depth ranges from about 10 to 20 inches but averages 16 to 18 inches.

Gaviota sandy loam, 5 to 15 percent slopes (GmD).--This soil occurs in small scattered areas, mainly in the low foothills of the Santa Ynez Mountains and in a small area in the Cuyama Valley.

Included in mapping are areas in draws that have a moderate clay accumulation in the subsoil. Also included are small areas of Contra Costa, Lodo, Maymen, and Santa Lucia soils.

This soil is well drained and moderately permeable. Surface runoff is slow to medium, and the erosion hazard is slight to moderate. Fertility is low. The available water capacity is 2.0 to 3.0 inches in the 12- to 20-inch root zone.

This soil is used for range, for wildlife habitat, and as watershed. Capability unit VIe-1(15); Shallow Loamy range site.

Gaviota sandy loam, 15 to 30 percent slopes (GmE).--This soil has the profile described as representative for the series. Rock outcrops occupy as much as 2 percent of the surface area.

Included in mapping are areas in which rock outcrops occupy 2 to 15 percent of the surface. Some gullied areas and small areas of Contra Costa, Lodo, Maymen, and Santa Lucia soils are also included.

This soil is well drained and moderately permeable. Surface runoff is medium to rapid, and the erosion hazard is moderate to high. Fertility is low. The available water capacity is 2.0 to 3.0 inches in the 10- to 20-inch rooting zone.

This soil is used for range, for wildlife habitat, and as watershed. Capability unit VIe-1(15); Shallow Loamy range site.

Gaviota sandy loam, 30 to 75 percent slopes (GmG).--This soil is steep to very steep and occurs on hills and mountains in the Santa Ynez Mountains, along Buckhorn Road, and in the Cuyama area. This soil has a profile similar to the one described as representative for the series except that depth to rock averages 10 to 16 inches.

Included in mapping are areas in which rock outcrops occupy 2 to 20 percent of the surface. Areas of an unnamed soil that has a loam surface and a clay loam subsoil are also included. Other included areas consist of Contra Costa, Lodo, Maymen, and Santa Lucia soils.

This soil is somewhat excessively drained and moderately permeable. Surface runoff is rapid to very rapid, and the erosion hazard is high to very high. Fertility is low. The available water capacity is 2.0 to 3.0 inches in the 10- to 16-inch root zone.

This soil is used for range, wildlife, and watershed. Capability unit VIIe-1(15); Shallow Loamy range site.

Gazos Series

The Gazos series consists of well-drained clay loams that are underlain by shale bedrock at a depth of 18 to 36 inches. These soils occur on rounded hills in the upland. Slopes are 9 to 75 percent. The vegetation is annual grasses and forbs. A few areas are covered with scattered oak trees, grasses, forbs, and patches of sagebrush. Elevations range from 50 to 2,500 feet. The average annual rainfall is 15 to 22 inches, the average annual air temperature is about 58° F., and the frost-free season is 250 to 300 days. Gazos soils are associated with Crow Hill and Santa Lucia soils.

In a representative profile, the surface layer is dark grayish-brown clay loam about 30 inches thick over soft, brittle, shale bedrock.

These soils are used mainly for range and for wildlife habitat. Small areas are used for dry-farmed grain.

Representative profile of the Gazos series (2.5 miles southeast of Los Alamos on U.S. Highway 101 to Alisos Canyon Road, 0.6 mile north on Alisos Canyon Road, 2.6 miles north on ranch road, 0.3 mile west on Branch Ranch Road just over top of hill, 30 feet to right of road):

A11--0 to 1 inch, dark grayish-brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) when moist; strong, fine and medium, granular structure; hard, friable, sticky and plastic; no roots; many very fine interstitial pores; slightly acid (pH 6.2); abrupt, smooth boundary.

A12--1 inch to 14 inches, dark grayish-brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) when moist; moderate, coarse, subangular blocky structure; strong, fine, granular material from A11 horizon filling rodent holes and making up 1/4 of the soil volume; hard, firm, sticky and plastic; many very fine roots concentrated in cracks and krotovinas; many very fine interstitial pores and few very fine tubular pores; slightly acid (pH 6.2); abrupt, smooth boundary.

A13--14 to 30 inches, dark grayish-brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) when moist; weak, coarse, subangular blocky structure; hard, firm, sticky and plastic; common very fine roots; few very fine interstitial pores and few very fine tubular pores; slightly acid (pH 6.2); gradual, irregular boundary. Lower 4.5 inches of this horizon is 50 to 80 percent rock fragments.

R--30 inches, very pale brown (10YR 7/3) fractured soft shale, with very dark grayish brown (10YR 3/2) colloidal coatings on fracture planes;

pale brown (10YR 6/3) with coatings of very dark brown (10YR 2/2) when moist; shale is brittle but can be broken by hand; it has a low specific gravity, but not so low as the bedrock of the Crow Hill soils.

Color of the A horizon generally is dark grayish brown, but in some places it is dark gray, gray, and grayish brown. Texture of the A horizon is mostly silty clay loam and clay loam. AC or C horizons are present in some of the deeper areas and are grayish brown, brown, or dark brown in color. Depth to bedrock ranges from 18 to 36 inches. In most places the soils are not shaly, but in some areas as much as 15 percent of the soil profile is shale fragments. Reaction ranges from strongly acid to slightly acid but typically is slightly acid. The bedrock of the Gazos series is firm mudstone or flinty, hard shale.

Gazos clay loam, 9 to 15 percent slopes (GsD).--This soil is on ridgetops and low rolling hills in small scattered tracts in the western part of the survey area. Depth to bedrock ranges from about 20 inches on ridgetops to about 36 inches on some rolling hills. In most areas the bedrock is hard, fractured Monterey Shale or massive firm mudstone. In small areas it is soft, lightweight diamtomaceous shale.

Included in mapping are areas of shaly Gazos soils, and small areas of a soil similar to Gazos soil except that the texture throughout the profile is silty clay.

Permeability is moderately slow. Surface runoff is medium, and the erosion hazard is moderate. Fertility is moderate. The available water capacity is 4.0 to 7.0 inches in the 20- to 36-inch rooting depth.

This soil is used mainly for range. Some small areas are used for dryland grain. Capability unit IVe-1(15); Loamy range site.

Gazos clay loam, 15 to 30 percent slopes (GsE).--The depth to rock in this soil ranges from 20 to 30 inches and averages about 28 inches.

Included in mapping are small areas of a soil that is similar to Gazos soil except that the texture is silty clay throughout the profile. Also included are some shaly Gazos soils.

Permeability is moderately slow. Surface runoff is medium to rapid, and the erosion hazard is moderate to high. Fertility is moderate. The available water capacity is 4.0 to 6.0 inches in the 20- to 30-inch rooting zone.

This soil is used for range. Capability unit IVe-1(15); Loamy range site.

Gazos clay loam, 30 to 45 percent slopes (GsF).--This soil is on hilly and mountainous areas. It has the profile described as representative for the series. Depth to rock ranges from 20 to 28 inches but averages about 26 inches.

Included in mapping is a soil that is similar to Gazos soil except that the texture is silty clay throughout the profile. Land slips are also included.

Permeability is moderately slow. Surface runoff is rapid, and the erosion hazard is high. Fertility is moderate. The available water capacity is 3.0 to 5.0 inches in the 20 to 28 inches of rooting depth.

This soil is used for range. Capability unit VIe-1(15); Loamy range site.

Gazos clay loam, 45 to 75 percent slopes (GsG).--This soil is very steep and occurs on hills and mountains. Depth to rock ranges from 18 to 26 inches but averages about 24 inches.

Included in mapping are numerous areas of land slips. Also included are areas of a soil that is similar to Gazos soil except that the texture is silty clay.

Permeability is moderately slow. Surface runoff is very rapid, and the erosion hazard is very high. Fertility is moderate. The available water capacity is 3.0 to 5.0 inches in the 18 to 26 inches of rooting depth.

This soil is used for range and as wildlife habitat. Capability unit VIIe-1(15); Steep Loamy range site.

Gullied Land

Gullied land (GuE) consists of areas in which the soil profile has been largely destroyed by deep gullies. This land type occurs on recent alluvial soils, on terrace soils, and on upland soils. It includes nearly vertical banks along major streams and a few raw eroded areas that are similar to badlands. In some places small remnants of the original soil between deep gullies still remain, but these areas are not useful for crops or pasture without extensive reclamation. Some areas are partly stabilized by brush cover. Some areas are actively eroding. This land type contributes large amounts of sediment to lower lying areas. These sediments often cause severe damage to roads, fences, soils, and crops.

Gullied land is not suitable for farming. In some areas it is necessary to establish plant cover or to install engineering structures to slow the erosion. Capability unit VIIIe-1(14).

Igneous Rock Land

Igneous rock land (IrG) consists of very steep and extremely steep, almost barren upland areas of basic igneous rock. Rock outcrops occupy 50 to 90 percent of the surface, and the rest is small pockets of moderately fine textured soil material less than 10 inches deep. Except for scattered brush, grass, and other plants, this land type is bare of vegetation. Runoff is very rapid, and the erosion hazard is very high.

Igneous rock land is suitable for use only as a source of water. To control excessive runoff and erosion, protection from fire is needed. Capability unit VIIIs-1(15).

Kettleman Series

The Kettleman series consists of well-drained fine sandy loams that are underlain by sandstone and shale at a depth of 6 to 30 inches. These soils are on sloping to steep uplands in the eastern part of the Cuyama Valley. They occupy the lower foothills adjacent to the valley. The vegetation consists of sparse annual grasses, forbs, and scattered brush and juniper trees. Elevations range from 2,000 to 3,500 feet. Slopes are 9 to 75 percent. The average annual rainfall is 6 to 10 inches, the average annual air temperature is about 65° F., and the frost-free growing season is 180 to 250 days. Kettleman soils are associated with Shedd and Wasioja soils.

In a representative profile, the surface layer is light brownish-gray, calcareous, fine sandy loam about 24 inches thick, underlain by soft, highly calcareous sandstone bedrock (pl. III, bottom).

Kettleman soils are used for range and for wildlife habitat.

Representative profile of the Kettleman series (four miles south and slightly west of New Cuyama on Perkins Road in Richfield oil fields; 0.7 miles west and south of Richfield Refinery in road cut):

A11--0 to 3 inches, light brownish-gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) when moist; moderate, medium and coarse, granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many micro and very fine roots; many very fine and fine interstitial pores; violently effervescent; moderately alkaline (pH 8.0); clear, wavy boundary.

A12--3 to 15 inches, light brownish-gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) when moist; weak, medium and coarse, granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many micro and very fine roots; many micro and very fine interstitial pores, common micro and very fine tubular pores; violently effervescent; moderately alkaline (pH 8.0); gradual, wavy boundary.

AC--15 to 24 inches, light brownish-gray (10YR 6/2) heavy sandy loam; dark brown (10YR 4/3) when moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; common micro and very fine roots; many micro and very fine interstitial pores, common micro and very fine tubular pores; violently effervescent; moderately alkaline (pH 8.0); abrupt, irregular boundary.

C--24 inches, tilted, bedded soft sandstone with thick lime coating on bedding planes and seams. The main body of the rock is light brownish gray (2.5Y 6/2) with white (10YR 8/2) coatings and thin veins of pink (5YR 7/4). The bedrock is soft enough to be broken by hand.

Typically, the A horizon is light brownish gray. It is darker in color, almost grayish brown, at higher elevations because of higher rainfall. The parent material of Kettleman soils varies widely. In most areas it is deep, partly consolidated, calcareous deposits of water-rounded sandstone gravel and cobblestones and soil material. In other areas it is mainly soft sandstone, shale, and mudstone. Kettleman soils are bedded, and in some places the beds consist of many different types of material. The areas underlain by the more consolidated sandstone and shale are smoother and more rounded and have a more open grass cover. The areas underlain by gravelly and cobbly beds have sharper slopes and narrow ridges, and the plant cover generally is brush and sparse grass.

Kettleman fine sandy loam, 9 to 30 percent slopes (KtE).--This soil has the profile described as representative for the series. It occurs on low rolling hills along the edge of the Cuyama Valley. Depth to bedrock is 20 to 30 inches.

Included in mapping are areas of Kettleman soils in the extreme eastern part of the Cuyama Valley that have a loam or clay loam texture. Areas of Wasioja soils on the lower hills near the valley are also included.

This soil is moderately permeable. Surface runoff is medium to rapid, and the erosion hazard is moderate to high. Fertility is low to moderate. The available water capacity is about 3.0 to 4.0 inches in the 20 to 30 inches of effective rooting depth.

This Kettleman soil is used for range and for wildlife habitat. Capability unit VIIe-9(15); Arid Loamy range site.

Kettleman fine sandy loam, 15 to 30 percent slopes, severely eroded (KtE3).--This soil has a variable surface layer caused by the mixing of soil and rock. As a result of cultivation, the soil is severely eroded and only 6 to 20 inches of soil remains.

Included in mapping are areas of Kettleman soil that are not so severely eroded. Other included Kettleman soils have a loam or clay loam surface texture. Also included are areas of Wasioja soils.

Permeability is moderate. Surface runoff is rapid, and the erosion hazard is high. Fertility is very low. The available water capacity is 1.0 to 3.0 inches in the 6 to 20 inches of rooting depth.

This soil is used for limited range, for wildlife habitat, and watershed. Capability unit VIIe-9(15); Arid Loamy range site.

Kettleman fine sandy loam, 30 to 75 percent slopes (KtG).--This soil has a profile similar to the one described as representative for the series except that as much as 20 percent of the surface area is covered with gravel and cobbles. The soil is deeply dissected by drainageways. Depth to rock is 18 to 24 inches.

Included in mapping are areas of Kettleman soil in the extreme eastern part of the Cuyama Valley that have a loam or clay loam texture. Also included are areas of Wasioja soils near the valley.

Permeability is moderate. Surface runoff is rapid to very rapid, and the erosion hazard is high to very high. Fertility is low. The available water capacity is 2.0 to 3.0 inches in the 18 to 24 inches of rooting depth.

This soil is used for range, wildlife habitat, and watershed. Capability unit VIIe-9(15); Arid Loamy range site.

Landslides

Landslides (LaF) consists of areas, large enough to map, of soil and rock fragments that have slid downslope in recent times. The scarred surfaces resulting from this movement are also mapped as Landslides. Small slide areas are shown on the map by a special symbol. Larger areas are delineated on the map. The largest acreage of this land type is in areas of Los Osos soils. Areas of Landslides large enough to map also occur in areas of Santa Lucia, Shedd, Linne, and Climara soils. Landslides most commonly occur on hillsides where slopes are 30 to 50 percent, but in some places they occur where slopes are somewhat gentler or are steeper. The wrinkled and rough surface characteristic of this land type limits the movement of cattle.

This land type, along with the surrounding areas, is used for range. Vegetation consists of annual grasses and forbs. Accessibility generally is limited. Road or other construction is hazardous on these areas. Capability unit VIIe-5(15); Shallow Clayey range site.

Linne Series

The Linne series consists of well-drained clay loam upland soils that are underlain by mudstone at a depth of 20 to 60 inches. These soils are on rounded hills in areas scattered throughout the western part of the survey area. Slopes are 9 to 75 percent. The vegetation is annual grasses and forbs and includes burclover. A few areas are covered with a dense growth of mustard. Elevations range from 200 to 2,000 feet. The average annual rainfall is 12 to 18 inches, the average annual air temperature is about 59° F., and the frost-free season is 210 to 300 days. Linne soils are associated with Diablo soils.

In a representative profile, the surface layer is very dark gray, dark-gray, and gray, calcareous clay loam about 32 inches thick that is underlain by white, calcareous, fine sandy loam. At a depth of about 56 inches is soft, marly mudstone.

Linne soils are used for range and for dryland grain.

Representative profile of the Linne series (approximately 11 miles southeast of Santa Maria, latitude 34 degrees 48' 62" north, longitude 120 degrees 21' 06" west):

Ap--0 to 9 inches, very dark gray (10YR 3/1) clay loam, black (10YR 2/1) when moist; moderate, coarse, subangular blocky structure, 1/6 to 1/3 of horizon is strong, fine, granular structure between larger peds, larger peds break mostly to granules; very hard, friable, sticky and plastic; common very fine roots; many very fine and few fine interstitial pores; slightly effervescent; disseminated lime; moderately alkaline (pH 8.0); clear, smooth boundary.

A11--9 to 14 inches, dark-gray (10YR 4/1) clay loam, black (10YR 2/1) when moist; weak, coarse, prismatic structure; very hard, friable, sticky and plastic; common very fine roots; many very fine and common fine interstitial pores and few fine tubular pores; strongly effervescent; disseminated lime and some fine lime filaments, especially on faces of larger peds; moderately alkaline (pH 8.0); gradual, wavy boundary.

A12--14 to 29 inches, gray (10YR 5/1) clay loam, very dark gray (10YR 3/1) when moist; weak, coarse, prismatic structure, breaking to medium and coarse, angular blocky with many medium granules; very hard, friable, sticky and plastic; few very fine roots; many very fine interstitial pores; few fine and medium tubular pores; violently effervescent; disseminated lime and many fine lime filaments, especially on faces of larger peds; moderately alkaline (pH 8.0); gradual, smooth boundary.

AC--29 to 32 inches, gray and light-gray (10YR 5/1 and 7/1) sandy clay loam, gray and light brownish gray (10YR 5/1 and 6/2) when moist; weak, coarse and medium, angular blocky structure with some coarse granules; very hard, friable, sticky and plastic; very few very fine roots; many very fine interstitial pores and few very fine tubular pores; violently effervescent; disseminated lime and many distinct lime filaments; moderately alkaline (pH 8.0); clear, irregular boundary.

C1ca--32 to 36 inches, white (N 8 and 10) fine sandy loam, very pale brown and white (10YR 7/2 and 8/2) when moist; massive; extremely hard, firm, sticky and plastic; no roots; common very fine interstitial pores and few very fine tubular pores; this horizon is somewhat discontinuous and variable in thickness, and is broken by squirrel holes; violently effervescent; moderately alkaline (pH 8.0); clear, irregular boundary.

C2--36 to 51 inches, white (N 8) mudstone, wetting to very fine sandy loam, light gray and pale yellow (2.5Y 7/2 and 8/4) when moist; massive; strongly effervescent; moderately alkaline (pH 8.0).

Color of the A horizon ranges from very dark gray to dark gray. The texture of the A horizon ranges from clay loam to silty clay loam. Depth to bedrock ranges from 20 inches to 60 inches or more.

Linne clay loam, 9 to 15 percent slopes (LcD).--This soil occurs in small, irregular shaped areas on low hills and on ridgetops. The depth of the soil and the color of the surface layer vary, depending on the relief. On some ridgetops the soil is dark gray and is about 30 inches deep over bedrock. On concave areas the soil is very dark gray and is more than 40 inches deep. Depth to rock ranges from 30 to more than 60 inches.

Included in mapping is a soil that is very similar to the Linne soils except that it is silty clay throughout the profile. Also included are areas on ridgetops where the soil is gray and is less than 30 inches deep over rock. A few areas cut by shallow gullies are also included.

Permeability is moderately slow. Surface runoff is medium, and the erosion hazard is moderate. Fertility is high. The available water capacity is 5.0 to 10.0 inches in the 30 to 60 inches of rooting depth.

This Linne soil is used for range and for dryland grain. Most areas are difficult to cultivate because of their small irregular shape. Capability unit IIIe-1(15); Clayey range site.

Linne clay loam, 15 to 30 percent slopes (LcE).--This soil is moderately steep and occurs on rounded hills. It has the profile described as representative for the series. Depth to rock ranges from 36 to 50 inches.

Included in mapping is a soil that is very similar to the Linne soils except that it is silty clay throughout the profile. Also included are small areas of Diablo soils. Some small areas of Landslides are also included.

Permeability is moderately slow. Surface runoff is medium to rapid, and the erosion hazard is moderate to high. Fertility is high. The available water capacity is 6.0 to 9.0 inches in the 36 to 50 inches of rooting depth.

This soil is used for range and wildlife. Capability unit IVe-1(15); Clayey range site.

Linne clay loam, 30 to 45 percent slopes (LcF).--This steep soil is on smooth, rolling hills. Depth to bedrock ranges from 20 inches on ridgetops to 40 inches near the lower part of slopes.

Included in mapping is an unnamed silty clay soil that is otherwise very similar to the Linne soils. Also included are small areas, mainly on ridgetops, of a gray, calcareous clay loam soil that is less than 20 inches deep. Areas of Landslides are also included.

Permeability is moderately slow. Surface runoff is rapid, and the erosion hazard is high. Fertility is high. The available water capacity is 3.0 to 7.0 inches in the 20 to 40 inches of rooting depth.

This soil is used for range, wildlife habitat, and watershed. Capability unit VIe-1(15); Clayey range site.

Linne clay loam, 45 to 75 percent slopes (LcG).--This soil is about 20 to 30 inches deep over bedrock. Slopes are about 50 percent and normally do not exceed 60 percent.

Included in mapping are areas of Landslides and small areas of gray calcareous clay loam that is less than 20 inches deep.

Permeability is moderately slow. Surface runoff is very rapid, and the erosion hazard is very high. Fertility is high. The available water capacity is 3.0 to 5.0 inches in the 20 to 30 inches of rooting depth.

This Linne soil is used for range, wildlife, and watershed. Capability unit VIIe-1(15); Clayey range site.

Lodo Series

The Lodo series consists of somewhat excessively drained loams that are underlain by fine-grained sandstone and shale at a depth of 8 to 20 inches. These soils are on hills and mountains. Slopes range from 30 to 75 percent. The vegetation is trees, brush, and sparse annual grasses and forbs. Elevations range from 300 to 2,000 feet. The average annual rainfall is 18 to 22 inches, the average annual air temperature is about 60° F., and the frost-free season is about 275 to 300 days. Lodo soils are associated with Los Osos soils.

In a representative profile, the surface layer is dark grayish-brown loam about 11 inches thick. This layer is underlain by firm, fractured sandstone and shale.

Lodo soils are used for range, for wildlife, and as a source of water.

Representative profile of the Lodo series (about 6 miles south on U.S. Highway No. 101 from the south end of Santa Ynez River bridge, 0.8 mile east on paved farm road, 6 feet from edge of road under an oak tree):

A11--0 to 1 1/2 inches, dark grayish-brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) when moist; strong, very fine and medium, granular structure; hard, very friable, slightly sticky and slightly plastic; many micro and very fine roots; many micro and very fine interstitial pores; slightly acid (pH 6.5); abrupt, smooth boundary.

A12--1 1/2 to 6 inches, dark grayish-brown (10YR 4/2) heavy loam, very dark grayish brown (10YR 3/2) when moist; weak, fine and medium, subangular blocky structure; very hard, very friable, slightly sticky and slightly plastic; common micro and very fine roots; common micro and very fine interstitial pores and many micro and very fine tubular pores; slightly acid (pH 6.5); abrupt, wavy boundary.

A13--6 to 11 inches, dark grayish-brown (10YR 4/2) heavy loam, very dark grayish brown (10YR 3/2) when moist; strong, fine and medium, granular structure; hard, very friable, slightly sticky and slightly plastic; common micro and very fine roots; many micro and very fine interstitial pores; slightly acid (pH 6.5); abrupt, wavy boundary.

R--11 inches, firm, olive (5Y 4/3) shale; very dark gray (10YR 3/1) stainings on fracture planes; shale is highly fractured but not highly weathered.

The A horizon ranges from brown to dark grayish brown. This horizon is loam in most places, but there are spots of light clay loam and clay loam. In some places the A12 and A13 horizons are not slightly finer textured than the A11 horizon. Reaction ranges from medium acid to neutral throughout the profile. Commonly, the R layer is sandstone.

Lodo loam, 30 to 75 percent slopes (LdG).--This soil is underlain by bedrock at a depth of 8 to 20 inches.

Included in mapping are small areas that are cut by many shallow gullies, small areas of Landslides, and some areas where 2 to 15 percent of the surface is covered with rock outcrops. Also included are small areas of Los Osos and San Benito soils.

Permeability in this Lodo soil is moderate. Surface runoff is rapid to very rapid, and the erosion hazard is high to very high. Fertility is low. The available water capacity is 1 inch to 3 inches in the 8 to 20 inches of rooting depth.

This soil is used for range, wildlife habitat, and watershed. Capability unit VIIe-1(15); Shallow Loamy range site.

Lopez Series

The Lopez series consists of somewhat excessively drained and excessively drained shaly clay loams that are underlain by siliceous shale bedrock at a depth of 8 to 20 inches. These soils are on hills and mountains in widely scattered areas throughout the western part of the survey area. Slopes range from 15 to 100 percent. The vegetation is sagebrush, chaparral, oak trees, and sparse annual grasses and forbs. Elevations range from 200 to 3,000 feet. The average annual rainfall is 12 to 25 inches, the average annual air temperature is about 58° F., and the frost-free season is about 210 to 300 days. Lopez soils are associated with Santa Lucia and Crow Hill soils.

In a representative profile, the surface layer is dark-gray shaly clay loam, about 8 inches thick, over gray very shaly clay loam. At a depth of about 14 inches is hard, fractured Monterey Shale. In some areas the texture of the surface layer is loam, and about 2 to 10 percent of the surface is covered with shale outcrops.

Lopez soils are used for very limited range, for wildlife, and for watershed.

Representative profile of the Lopez series (2 miles south from the summit of Tepusquet and Buckhorn Divide on Tepusquet Road, about 30 feet west from edge of road on hillside):

A11--0 to 8 inches, dark-gray (10YR 4/1) shaly clay loam, very dark gray (10YR 3/1) when moist; about 15 percent, by volume, is angular shale fragments larger than 3/4 inch across, about 30 percent is larger than 2 millimeters; strong, fine and medium, granular structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine, fine, medium, and coarse roots; many very fine and fine interstitial pores; neutral (pH 6.8); gradual, irregular boundary.

A12--8 to 14 inches, gray (10YR 5/1) very shaly clay loam, dark grayish brown (10YR 4/2) when moist; about 40 percent, by volume, is shale fragments larger than 3/4 inch across, about 30 percent is larger than 2 millimeters but less than 3/4 inch across; strong, fine and medium, granular structure; slightly hard, very friable, sticky and slightly plastic; common very fine, fine, medium, and coarse roots; many very fine and fine interstitial pores; neutral (pH 6.6); abrupt, irregular boundary.

R--14 inches, hard, fractured Monterey shale. Shale stratum tilted about 45 degrees, some hard outcrop exposed. Many rock fragments coated with thin, dark-brown clay films.

The A horizon ranges from gray to very dark gray and is most commonly dark gray. This horizon is heavy loam, clay loam, or silty clay loam. Normally more than 15 percent of the upper part of the A horizon, and more than 50 percent of the lower part is shale fragments. Structure normally is moderate to strong granular except where the soil has been heavily trampled. Reaction ranges from almost neutral to medium acid. In some places thin films are on the fractured shale fragments and in cracks in the upper part of the bedrock. Depth to bedrock ranges from 8 to 20 inches. The parent material includes fairly soft, lightweight diatomaceous earth deposits, and firm, brittle, fractured siliceous shale. In some places contact between soil and bedrock is clear; they are mixed in some places.

Lopez rocky loam, 75 to 100 percent slopes (LkG).--This extremely steep soil is on mountainous uplands. The surface layer is loam, and about 2 to 10 percent of the surface is shale outcrops. Otherwise the profile is similar to the one described as representative for the series. The soil contains large amounts of flat, angular, flaggy shale fragments that range in size from coarse sand to about 10 inches across. Depth to rock ranges from 8 to 12 inches.

Included in mapping are areas where the soil is less than 8 inches thick over the rock. Also included are small areas of soil that is similar to Lopez soils except that it is calcareous throughout the profile.

This excessively drained soil is moderately permeable. Surface runoff is very rapid, and the erosion hazard is very high. Fertility is low. The available water capacity is 1 inch to 2 inches in the 8 to 12 inches of rooting depth.

This soil is used as watershed and for wildlife. Capability unit VIIIs-1(15).

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Lopez shaly clay loam, 15 to 75 percent slopes (LmG).--This soil is mainly very steep and occurs in dissected, mountainous areas. A few moderately steep areas are on ridgetops. This soil has the profile described as representative for the series. Depth to rock ranges from 10 to 20 inches. In about half the acreage, this soil is underlain by lightweight diatomaceous shale, and in the rest, by brittle, flaggy, siliceous shale. The soil on the siliceous shale contains more gravel in the upper layers than does the soil on the diatomaceous shale, although the lower layers in both soils are more than 40 to 45 percent shale.

Included in mapping are areas of Crow Hill and Santa Lucia soils.

This soil is somewhat excessively drained. Permeability is moderately slow. Surface runoff is rapid to very rapid, and the erosion hazard is high to very high. Fertility is low. The available water capacity is 1 inch to 3 inches in the 10 to 20 inches of rooting depth.

This soil is used for very limited range. Many areas are inaccessible to cattle or lack water for livestock. This soil is also used for wildlife and watershed. Capability unit VIIe-1(15); Shallow Loamy range site.

Los Osos Series

The Los Osos series consists of well-drained clay loams that are underlain by fine-grained sandstone and shale at a depth of 20 to 40 inches. These soils have slopes of 15 to 75 percent. They occur in widely scattered areas on hills and mountains in the western part of the survey area. The largest acreage is in the Santa Ynez mountains south and east of Lompoc. The vegetation is annual grasses and forbs, as well as a few sagebrush plants and oak trees. Elevations range from 500 to 2,000 feet. The average annual rainfall is 15 to 25 inches, the average annual air temperature is 59° F., and the frost-free season is about 240 to 320 days. Los Osos soils are associated with San Benito and Lodo soils.

In a representative profile, the surface layer is mostly dark grayish-brown clay loam about 12 inches thick. The subsoil is dark grayish-brown heavy clay loam, dark yellowish-brown clay, and yellowish-brown very stony clay loam. This layer extends to a depth of about 25 inches, where it is underlain by highly fractured shale. Most of the Los Osos soils in this Area are mapped as a complex with the San Benito soils.

Los Osos soils are used chiefly for range. Small areas are used for dryfarmed hay and grain.

Representative profile of the Los Osos series (about 50 yards north of first cattle guard at top of hill on Point Sal Road, about 4 miles southwest of Guadalupe):

A11--0 to 1 inch, dark grayish-brown (10YR 4/2) sandy loam, very dark grayish brown (10YR 3/2) when moist; wind-deposited material from nearby sandy area; weak, very fine, granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many fine interstitial pores; slightly acid (pH 6.5); abrupt, smooth boundary.

A12--1 inch to 12 inches, dark grayish-brown (10YR 4/2) light clay loam, very dark grayish brown (10YR 3/2) when moist; weak, medium, subangular blocky and moderate, coarse subangular blocky structure; hard, friable, sticky and slightly plastic; many fine roots; common fine and very few medium tubular pores; slightly acid (pH 6.2); clear, wavy boundary.

B21t--12 to 15 inches, dark grayish-brown (10YR 4/2) and dark yellowish-brown (10YR 4/4) heavy clay loam, very dark grayish brown (10YR 3/2) when moist; strong, coarse, angular blocky structure; very hard, friable, sticky and plastic; common fine roots; common very fine tubular pores; continuous thin clay film on ped faces; many thin clay films in pores; slightly acid (pH 6.2); clear, wavy boundary.

B22t--15 to 21 inches, dark yellowish-brown (10YR 4/4) and dark-brown (10YR 3/3) light clay, dark yellowish brown (10YR 4/4) when moist; strong, coarse, angular blocky structure; extremely hard, firm, very sticky and very plastic; common very fine roots; few very fine tubular pores; common thin clay films on peds; continuous thin clay films in pores; neutral (pH 7.3); clear, wavy boundary.

B3t--21 to 25 inches, yellowish-brown (10YR 5/6) and dark-brown (10YR 4/3) very stony clay loam, dark yellowish brown (10YR 4/4) when moist; strong, fine, subangular blocky structure; hard, friable, sticky and plastic; common very fine roots; few very fine tubular pores; many thin clay films on ped faces; about 70 percent of soil mass is rock fragments; mildly alkaline (pH 7.8); clear, wavy boundary.

R--25 inches, brownish-yellow (10YR 6/6), fine-grained, highly fractured shale; rock fragments coated with very dark gray (10YR 3/1) clay films.

Typically, the A horizon ranges from dark brown to dark grayish brown in color. This horizon is dominantly light clay loam in texture, but it ranges from loam to clay loam. The B2t horizons are heavy clay loam to clay. Reaction generally is slightly acid to medium acid in the A horizon and is slightly acid to mildly alkaline in the B2t horizons. The parent bedrock is slightly firm sandstone or hard, metamorphosed shale. The depth to bedrock ranges from about 40 inches in the less sloping areas to about 20 inches in the steeper areas.

Los Osos clay loam, 15 to 30 percent slopes (LoE).--This hilly soil has the profile described as representative for the series. Bedrock is at a depth of 24 to 30 inches.

Included in mapping are small areas of Gaviota, Diablo, and San Benito soils. Also included are small gullied areas.

Permeability is slow. Surface runoff is medium to rapid, and the erosion hazard is moderate to high. Fertility is moderate. The available water capacity is 4.0 to 5.0 inches in the 24 to 30 inches of rooting depth.

This Los Osos soil is used for range and, in some areas, for dryland hay. Capability unit IVe-3(15); Clayey range site.

Los Osos clay loam, 30 to 75 percent slopes (LoG).--This soil occurs in the hills and mountains. Depth to rock ranges from 20 to 40 inches.

Included in mapping are areas of Arnold, Tangair, and San Benito soils. Landslides and small eroded areas are also included.

Permeability is slow. Surface runoff is rapid to very rapid, and the erosion hazard is high to very high. Fertility is moderate. The available water capacity is 3 to 7 inches in the 20- to 40-inch root zone.

This soil is used for range, wildlife habitat, and watershed. Capability unit VIIe-1(15); Clayey range site.

Los Osos-San Benito clay loams, 15 to 30 percent slopes (LsE).--The moderately steep soils that make up this complex occur in the hills. Nearly 70 percent of the mapping unit is Los Osos clay loam, and nearly 30 percent is San Benito clay loam. These soils are in such intricate patterns that mapping them separately was impractical. Included in mapping are small areas of Diablo, Lodo, and Gaviota soils.

Each of the major soils has a profile similar to the one described as representative for its series. Both soils have medium to rapid runoff and are moderately to highly susceptible to erosion. Their fertility is moderate.

The Los Osos soil is slowly permeable. Its available water capacity is 3 to 7 inches in the 20 to 40 inches of rooting depth.

In the San Benito soil, permeability is moderately slow. The available water capacity is 6 to 8 inches in the 36 to 48 inches of rooting depth.

These soils are used chiefly for range. Small areas are used for dryfarmed grain and hay. Capability unit IVe-3(15); Clayey range site.

Los Osos-San Benito clay loams, 30 to 45 percent slopes (LsF).--These steep soils are in the hills. Nearly 70 percent of the mapping unit is Los Osos clay loam, and nearly 30 percent is San Benito clay loam. Small areas of Landslides and of Diablo and Gaviota soils are included in mapping.

Each of the major soils has a profile similar to the one described as representative for its series. On both soils, surface runoff is rapid, and the hazard of erosion is high. Their fertility is moderate.

Permeability in the Los Osos soil is slow. The available water capacity is 3 to 6 inches in the 20 to 36 inches of rooting depth.

In the San Benito soil, permeability is moderately slow. The available water capacity is 5 to 7 inches in the 34 to 40 inches of rooting depth.

The soils of this complex are used for range, for wildlife, and as watershed. Capability unit VIe-3(15); Clayey range site.

Los Osos-San Benito clay loams, 30 to 75 percent slopes, severely eroded (LsG3).--These soils are steep to very steep. Los Osos clay loam makes up nearly 70 percent of the mapping unit, and San Benito clay loam, nearly 30 percent. In most places the soils are covered with brush and scattered patches of grass. Included in mapping are small areas of deeper, less eroded soils and of Landslides.

Severe erosion is evident, but in other respects each of the major soils has a profile similar to the one described as representative for its series. Surface runoff on both soils is very rapid, and the erosion hazard is very high. Fertility is moderate.

Los Osos clay loam has slow permeability. The available water capacity is 3 to 4 inches in the 20 to 25 inches of rooting depth.

San Benito clay loam has moderately slow permeability. The available water capacity is 4 to 5 inches in the 20 to 25 inches of rooting depth.

These soils are used for range, for wildlife habitat, and as watershed. Capability unit VIIe-1 (15); Clayey range site.

Marina Series

The Marina series consists of somewhat excessively drained sandy soils that are underlain by wind-deposited sand. These soils are on mesalike areas within 20 miles of the coast. In some places the mesalike areas are broken by deeply entrenched drainageways. Slopes are 0 to 30 percent. The vegetation is sparse annual grasses, forbs, brush, and scrubby live oak. Elevations range from 100 to 600 feet. The average annual rainfall is 14 to 22 inches, the average annual air temperature is about 57° F., and the frost-free season is 300 to 320 days. Marina soils are associated with Oceano soils.

In a representative profile, the surface layer is grayish-brown and brown sand and light loamy sand about 27 inches thick. The subsoil, about 23 inches thick, is light-brown loamy sand and contains thin clay bands. The substratum is light-brown and pink sand extending to a depth of 60 inches and deeper.

Marina soils are used for a variety of irrigated crops, such as strawberries and alfalfa, and for range.

Representative profile of the Marina series (about 7 miles southeast of Santa Maria, NW1/4 of SW1/4 sec. 7, T. 9 N., R. 33 W.):

Ap1--0 to 7 inches, grayish-brown (10YR 5/2) sand, dark brown (10YR 4/3) when moist; weak, fine and medium, granular structure; soft, very friable, nonsticky and nonplastic; many very fine and few fine roots; many very fine interstitial pores and few fine tubular pores; slightly acid (pH 6.5) (low acidity may be

related to past management); abrupt, smooth boundary.

Ap2--7 to 12 inches, grayish-brown (10YR 5/2) light loamy sand, dark brown (10YR 4/3) when moist; massive; hard, friable (tillage pan), nonsticky and nonplastic; common very fine and few fine roots; many very fine interstitial pores and common fine and few medium tubular pores; medium acid (pH 6.0); clear, wavy boundary.

A1--12 to 27 inches, brown (7.5YR 5/4) light loamy sand, dark brown (7.5YR 4/4) when moist; single grain; soft, very friable, nonsticky and nonplastic; few very fine and very few fine roots; many very fine interstitial pores and many fine tubular pores; medium acid (pH 6.0); clear, wavy boundary.

B21--27 to 33 inches, light-brown (7.5YR 6/4) loamy sand, appears to be slightly finer than A1 horizon; reddish brown (5YR 4/4) when moist; massive; slightly hard, friable, nonsticky and nonplastic; few very fine and fine roots; common very fine interstitial pores and few fine and medium tubular pores; several thin (1/4 inch) discontinuous, dark reddish-brown (5YR 3/2, 3/3m) weak clay bands; bands are hard when dry; medium acid (pH 6.0); gradual, wavy boundary.

B22--33 to 50 inches, light-brown (7.5YR 6/4) light loamy sand, reddish brown (5YR 5/4) when moist; massive; slightly hard, very friable, nonsticky and nonplastic; very few very fine and fine roots; many very fine interstitial pores and few very fine tubular pores; 3 continuous distinct bands at top, bottom, and middle of horizon, 1/4 to 3/4 inch thick, hard and friable, reddish brown (5YR 4/4) when dry; strongly acid (pH 5.5); gradual, wavy boundary.

C1--50 to 61 inches, light-brown (7.5YR 6/4) sand, strong brown (7.5YR 5/6) when moist; massive; soft, loose, nonsticky and nonplastic; very few very fine roots; many very fine interstitial pores; several bands 1/4 to 3/4 inch thick, brown (7.5YR 4/3d); bands hard and friable; medium acid (pH 6.0); gradual, wavy boundary.

C2--61 to 72 inches, pink (7.5YR 7/4) sand, reddish yellow (7.5YR 6/6) when moist; single grain; soft, loose, nonsticky and nonplastic; many very fine interstitial pores; weak continuous bands 1 inch to 1 1/2 inches thick on about 3-inch centers; medium acid (pH 6.0).

The A horizon ranges from brown and grayish brown, to pale brown in color and from sand to loamy sand in texture. Soil reaction ranges from strongly acid to slightly acid. In the B and C horizons, in some areas, are distinct, wavy, yellowish-red bands that are irregular and discontinuous. These bands are light sandy loam in texture and contain clay bridges. In some places, in the nonbanded part of the B horizon, there are a few thin clay films on fracture planes and in pores.

Marina sand, 0 to 2 percent slopes (MaA).--This soil is nearly level and occurs on mesalike areas and in swales. It has the profile described as representative for the series.

Included in mapping are small areas of Oceano soils and areas of steeper Marina soils.

Permeability is moderate. Surface runoff is very slow, and the hazard of erosion by water is none to slight. The hazard of soil blowing is high. Fertility is very low. The available water capacity is 3 to 4 inches in the 60-inch effective rooting depth.

This soil is used for strawberries and alfalfa and for range. Capability units IVe-4(14) and VIe-4 (15); Sandy range site.

Marina sand, 2 to 9 percent slopes (MaC).--This gently rolling soil is on mesalike areas.

Included in mapping are small areas of Oceano soils and gullied areas.

Permeability is moderate. Surface runoff is slow to medium, and the hazard of erosion by water is slight to moderate. The hazard of soil blowing is high. Fertility is very low. The available water capacity is 3 to 4 inches, and the effective rooting depth is more than 60 inches.

This soil is used for irrigated alfalfa and for range. Capability units IVe-4(14) and VIe-4(15); Sandy range site.

Marina sand, 9 to 30 percent slopes (MaE).--This soil is rolling and occurs on dissected terraces. It has a profile similar to the one described as representative for the series except that the sand content is higher throughout the profile.

Included in mapping are areas of Oceano soils and gullied areas.

Permeability is moderate. Surface runoff is medium to rapid, and the hazard of erosion by water is moderate to high. The hazard of soil blowing is high. Fertility is very low. The available water capacity is 3 to 4 inches, and the effective rooting depth is more than 60 inches.

This soil is used for range. Capability unit VIIe-4(15); Sandy range site.

Marina sand, 9 to 30 percent slopes, severely eroded (MaE3).--Areas of this soil generally are small and scattered and are limited in extent. Deep gullies are numerous, and most areas are severely rilled.

Included in mapping are areas of Oceano soils and small areas of Marina soils that are less eroded.

This soil is moderately permeable. Surface runoff is rapid, and the hazard of erosion by water is high. The hazard of soil blowing is also high. Fertility is very low. The available water capacity is 3 to 4 inches in the 60-inch rooting zone.

Range is the primary use for this soil. Capability unit VIIe-4(15); Eroded or Shallow Sandy range site.

Marsh

Marsh (Mh) consists of very poorly drained soils that formed in basins from recently deposited alluvial material. Areas of Marsh are scattered widely throughout the survey area.

Soil profiles vary between and within areas. The surface layer is mostly medium-textured to fine-textured mineral soil. The subsoil consists of strata of coarse-textured to fine-textured mineral soil material and, in some places, layers of peat. The soil is mottled throughout and is waterlogged most of the time.

Salty, fine-textured areas adjacent to the ocean are affected somewhat by tidewater, and have a cover of pickleweed and other salt-tolerant plants. Inland areas have vegetation consisting of marshgrass, sedges, and willows, and are not so salty as are the areas near the ocean.

This land type can be grazed occasionally during very dry years, but the yield is very low and the feed is low in quality. Reclaiming this land type generally is not feasible. Capability unit VIIw-9 (14); Saline range site.

Maymen Series

The Maymen series consists of shallow, somewhat excessively drained stony loams that are underlain by sandstone and shale bedrock at a depth of 10 to 20 inches. These soils are on mountains in areas where slopes range from 45 to 75 percent. They occupy fairly extensive areas in the Santa Ynez Mountains in the vicinity of Lake Cachuma. The vegetation is largely chaparral, but there are some wooded areas in protected canyons. Elevations range from 1,000 to 3,000 feet. The average annual rainfall is 20 to 30 inches, the average annual air temperature is about 57° F., and the frost-free season is about 200 to 300 days. Maymen soils are associated with Gaviota soils.

In a representative profile, the surface layer is brown and dark-brown stony loam and gravelly loam about 7 inches thick. The subsoil is pale-brown gravelly heavy clay loam. At a depth of about 10 inches is shattered shale.

Maymen soils are used for wildlife and watershed.

Representative profile of the Maymen series (about 1.5 miles south of Lake Cachuma and 2 miles southeast of Camp Drake, SW1/4 of SE1/4 sec. 4, T. 5 N., R. 29 W.):

O1--1/2 inch to 0, fresh oak leaves, twigs and charcoal.

A11--0 to 3 inches, dark-brown (10YR 3/3) stony light loam, very dark brown (10YR 2/2) when moist; moderate, fine and medium, granular structure; soft, very friable, slightly sticky and slightly plastic; common very fine roots; many very fine interstitial pores and few very fine tubular pores; medium acid (pH 6.0); gradual, smooth boundary.

A12--3 to 7 inches, brown (7.5YR 5/2) gravelly loam, dark brown (7.5YR 4/3) when moist; moderate, medium and coarse, granular structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine, fine, and medium roots; many very fine interstitial pores and common very fine tubular pores; medium acid (pH 6.0); gradual, smooth boundary.

B2--7 to 10 inches, pale-brown (10YR 6/3) gravelly heavy clay loam, brown (10YR 5/3) when moist; massive; hard, firm, sticky and plastic; common fine and medium roots; few very fine interstitial pores and many very fine tubular pores; few thin clay films in pores and colloidal stains on mineral grains; medium acid (pH 6.0); clear, smooth boundary.

R--10 inches, fine-grained light yellowish-brown (10YR 6/4) shale, broken to fine, angular, brittle fragments, becoming more massive with depth.

The area where this profile was taken burned 7 years ago, leaving considerable charcoal on the surface and in the upper part of the profile. The new growth of brush is 3 to 8 feet high.

The dark color of the A horizon is probably the result of charcoal accumulation after fires. Texture of the A horizon normally is heavy sandy loam or light loam but in some places it is sandy loam. The B horizon is heavy loam or clay loam and generally contains thin clay films. The bedrock is either massive, fine-grained, hard sandstone or shattered, shaly, bedded rock.

Maymen stony loam, 45 to 75 percent slopes (MmG).--This is the only Maymen soil mapped in the survey area. Depth to rock is 10 to 20 inches.

Included in mapping are areas in draws and on toe slopes where the soil is 30 to 40 inches deep over the rock.

Permeability is moderate, surface runoff is very rapid, and the erosion hazard is very high. Fertility is very low. The available water capacity is 1 inch to 3 inches in the 10- to 20-inch root zone.

This soil is used for wildlife and as watershed. Capability unit VIIIs-1(15).

Metz Series

The Metz series consists of somewhat excessively drained loamy sands that are underlain by coarse, stratified, calcareous sediments. These soils are on low flood plains along major streams and on coarse, recently deposited alluvial fans in the Santa Maria, Cuyama, and Lompoc Valleys and to a minor extent in the San Antonio Valley. Slopes are 0 to 9 percent. The vegetation is annual grasses, forbs, and scattered sagebrush. Elevations range from 25 to 2,500 feet. The average annual rainfall is 12 to 18 inches, the average annual air temperature is about 59° F., and the frost-free period is about 180 to 340 days. Metz soils are associated with Mocho soils.

In a representative profile, the surface layer is brown, calcareous loamy sand about 17 inches thick. The underlying layer is pale-brown and light yellowish-brown, calcareous, stratified loamy sand and loamy coarse sand extending to a depth of 60 inches and more. Many areas are subject to overflow. During floods, fresh deposits of material are laid down and removed. As a result, the appearance of the surface may change from year to year.

Metz soils are used for irrigated vegetables and field crops and for range.

Representative profile of the Metz series (in Lompoc Valley, 0.6 mile west of the north end of Union Sugar Ave., 36 feet south of the center of the farm road):

Ap1--0 to 6 inches, brown (10YR 5/3) loamy sand, dark yellowish brown (10YR 4/4) when moist; weak, fine and medium, crumb structure; slightly hard, very friable, slightly sticky and nonplastic; few micro roots; few micro tubular pores and many very fine interstitial pores; strongly effervescent; disseminated lime; moderately alkaline (pH 8.0); abrupt, wavy boundary.

Ap2--6 to 17 inches, brown (10YR 5/3) loamy sand, dark yellowish brown (10YR 4/4) when moist; massive; hard, very friable, slightly sticky and nonplastic; very few micro roots; few micro tubular pores and many very fine interstitial pores; strongly effervescent; disseminated lime; moderately alkaline (pH 8.0); abrupt, smooth boundary.

C1--17 to 32 inches, pale-brown (10YR 6/3) light loamy sand, yellowish brown (10YR 5/4) when moist; massive; slightly hard, very friable, nonsticky and nonplastic; very few micro roots; few very fine and fine tubular pores and many very fine interstitial pores; slightly effervescent; moderately alkaline (pH 8.0); clear, wavy boundary.

C2--32 to 51 inches, pale-brown (10YR 6/3) light loamy sand, dark yellowish brown (10YR 4/4) when moist; massive; soft, very friable, nonsticky and nonplastic; few micro and coarse roots; common micro and medium tubular pores and many very fine interstitial pores; slightly effervescent; moderately alkaline (pH 8.0); gradual, wavy boundary.

C3--51 to 72 inches, light yellowish-brown (10YR 6/4) loamy coarse sand, yellowish brown (10YR 5/4) when moist; massive; soft, very friable, nonsticky and nonplastic; very few micro and medium roots; very few medium tubular pores and many very fine interstitial pores; slightly effervescent; moderately alkaline (pH 8.0). The C3 horizon contains discontinuous bands, 1/4 inch to 1 1/2 inches thick, that are silty clay loam in texture, dark brown (10YR 4/3) when moist, and strongly effervescent.

The main variations in the Metz soils are the result of stratification. Texture of the A horizon ranges from loamy coarse sand to loamy fine sand. Color ranges from grayish brown to brown and pale brown. Stratification in this soil varies widely; most profiles contain layers of fine, medium, and coarse sand. The Ap1 horizon is not discernible everywhere, particularly in the dryer parts of Cuyama Valley, and is weakly discernible in other areas.

Metz loamy sand, 0 to 2 percent slopes (MnA).--Strips of this soil are along streams in the coastal part of the survey area. They are not subject to flooding except during highly intensive storms. The largest areas are close to the Santa Ynez River in the Lompoc Valley. Numerous small areas are along the Santa Maria River and San Antonio Creek. Large areas that are affected occasionally by overflow occupy nearly level flood plains in the eastern part of the Cuyama Valley.

This soil has the profile described as representative for the series.

Included in mapping are small areas of Mocho and Panoche soils, particularly around the fringes of the valley where the Metz soils blend with the finer textured soils.

Permeability is rapid. Surface runoff is very slow, and the erosion hazard is none to slight. Fertility is low. The available water capacity is 4 to 5 inches in the 60-inch effective rooting zone.

This soil is used for irrigated vegetables and field crops and for alfalfa. Capability units IIIs-4(14) and IIIs-4(17); Sandy range site in the coastal part of the Area; Arid Sandy range site in the Cuyama Valley.

Metz loamy sand, 2 to 9 percent slopes (MnC).--This soil occupies small areas in alluvial fans and sloping flood plains in the coastal part of the survey area. This soil has a profile similar to the one described as representative for the series except that it contains more coarse sand throughout the profile. The soil is subject to occasional flooding.

Included in mapping are areas of Sandy Alluvial Land.

Permeability is rapid. Surface runoff is slow, and the erosion hazard is slight. Fertility is low. The available water capacity is 4 to 5 inches in the 60-inch rooting zone.

Because the areas of this soil are small and irregular in shape, they are used mainly for range. Selected areas are used for irrigated vegetables and field crops. Capability unit IIIs-4(14); Sandy range site.

Metz loamy sand, 2 to 9 percent slopes, eroded (MnC2).--This soil is gently sloping and sloping and occurs on alluvial fans in the Cuyama Valley. It is subject to frequent flooding during the rainy season. This soil has a profile similar to the one described as representative for the series except that it contains more coarse sand. In most areas the surface is raw and uneven and is dissected by numerous shallow channels.

Included in mapping are areas of Cobbly alluvial land, which make up about 10 to 20 percent of the mapping unit. These cobbly areas are so mixed with the Metz soils that they cannot be mapped separately.

Permeability is rapid. Surface runoff is slow to medium, and the erosion hazard is slight to moderate. Fertility is low. The available water capacity is 4 to 5 inches in the 60-inch effective rooting depth.

This soil is used chiefly for alfalfa, dry lima beans, and sugar beets. Limited areas are in orchards. Some areas are used for range. Capability unit IIIs-4(17); Arid Sandy range site.

Metz loamy sand, overflow, 0 to 2 percent slopes (MoA).--This soil has a profile similar to the one described as representative for the series except that it contains more stratified sediments that are finer textured. It occurs mainly along the Santa Maria River in the lower Santa Maria Valley, although there are numerous small areas along the Sisquoc River, Santa Ynez River, and San Antonio Creek. In the Cuyama Valley this soil occupies broad, nearly level flood plains. This soil is subject to overflow and flooding during severe storms. However, the area along the Santa Maria River has largely been protected by levees and dikes.

Included in mapping are small areas of Sandy alluvial land and Cobbly alluvial land.

Permeability is moderately rapid. Surface runoff is very slow, and the erosion hazard is slight. Fertility is low. The available water capacity is 4 to 5 inches in the 60-inch root zone.

Where it is protected from flooding, this soil is used for alfalfa. Unprotected areas are used for range and wildlife. Capability units IIIs-4(14) and IIIs-4(17); Sandy range site in the coastal part of the Area; Arid Sandy range site in the Cuyama Valley.

Mine Pits and Dumps

Mine pits and dumps (MpG) consists of pits from which raw diatomaceous earth is taken in mining and areas where the waste materials from these pits is dumped. Most mining for diatomaceous earth is in the Santa Ynez Mountains near Lompoc. Diatomaceous earth deposits occupy large areas and are several hundred feet thick. They are made up of nearly pure, siliceous, skeletal deposits from microscopic algae.

Also in this unit are smaller areas of flagstone rock quarries, chiefly in the Tepusquet area, and a few rock quarries for road building and other construction.

This land type has no value for farming but has value as a source of raw material. Capability unit VIIIs-1(15).

Mocho Series

The Mocho series consists of well-drained silty clay loams developed from recently deposited alluvium. These soils occur on alluvial fans and on flood plains in the Santa Maria and Santa Ynez Valleys and to a minor extent in the smaller valleys of the surface area. Slopes are 0 to 2 percent. Vegetation is annual grasses and forbs. Elevations range from 40 to 1,800 feet. The average annual rainfall is 12 to 20 inches, the average annual air temperature is about 59° F., and the frost-free season is about 190 to 320 days. Mocho soils are associated with the Metz and Sorrento soils.

In a representative profile, the surface layer is grayish-brown, calcareous silty clay loam about 26 inches thick. Below is grayish-brown and pale-olive, calcareous, stratified silty clay loam extending to a depth of 60 inches and more.

Most areas of Mocho soils are irrigated and are used for a variety of crops. Some areas are used for nonfarm purposes.

Representative profile of the Mocho series (approximately 0.8 mile north of Central Avenue, Lompoc Valley, 75 feet east of Union Sugar Avenue and 70 feet north of farm road):

Ap1--0 to 4 inches, grayish-brown (2.5Y 5/2) light silty clay loam, very dark grayish brown (2.5Y 3/2) when moist; weak, coarse, platy and weak, medium, subangular blocky structure; hard, friable, sticky and plastic; few very fine roots; few very fine tubular pores and many medium interstitial pores; strongly effervescent; disseminated lime; moderately alkaline (pH 8.0); clear, smooth boundary.

Ap2--4 to 13 inches, grayish-brown (10YR 5/2) light silty clay loam, very dark grayish brown (10YR 3/2) when moist; weak, medium, subangular blocky structure; hard, friable, sticky and plastic; few very fine roots; common very fine pores, many medium tubular pores, and common fine and very fine interstitial pores; strongly effervescent; disseminated lime; moderately alkaline (pH 8.0); clear, smooth boundary.

A1--13 to 26 inches, grayish-brown (2.5Y 5/2) light silty clay loam, dark grayish brown (10YR 4/2) when moist; massive; hard, friable, sticky and plastic; few micro roots; common very fine and medium tubular pores and many micro interstitial pores; strongly effervescent; disseminated lime; moderately alkaline (pH 8.2); gradual, wavy boundary.

C1--26 to 41 inches, grayish-brown (2.5Y 5/2) light silty clay loam, dark brown (10YR 4/3) when moist; massive; hard, sticky and plastic; few micro roots; common very fine and medium tubular pores and many micro interstitial pores; strongly effervescent; disseminated lime and lime in fine irregular soft masses; moderately alkaline (pH 8.2); gradual, smooth boundary.

C2--41 to 67 inches, grayish-brown (2.5Y 5/2) silty clay loam, dark brown (10YR 4/3) when moist; massive; hard, friable, sticky and plastic; very few micro roots; many very fine tubular pores and common micro interstitial pores; strongly effervescent; disseminated lime and lime in fine irregular soft masses; moderately alkaline (pH 8.2); gradual, smooth boundary.

IIC3--67 to 72 inches, pale-olive (5Y 6/3) fine sandy loam, olive brown (2.5Y 4/4) when moist; massive; slightly hard, very friable, nonsticky and nonplastic; no roots; few very fine tubular pores and many micro interstitial pores; strongly effervescent; disseminated lime; moderately alkaline (pH 8.2).

In the A horizon of this profile are numerous medium tubular pores caused by heavy earthworm activity. The IIC3 horizon is indistinctly stratified with loam to loamy fine sand.

The A horizon ranges from brown to grayish brown in color and from sandy loam to silty clay in texture. The C horizon is sandy loam to silty clay but generally is slightly coarser textured at lower depths. Color of the C horizon normally is grayish brown to pale brown or pale olive.

Mocho sandy loam, overflow (Mr).--This soil is adjacent to channels of large drainageways and is inundated during severe floods. It has a profile similar to the one described as representative for the series except that the texture of this soil is sandy loam, fine sandy loam, and loam throughout. During floods fresh deposits of alluvium are laid down and removed and crops are damaged.

Included in mapping are small areas of Metz and of Sorrento soils.

Permeability is moderately rapid. Surface runoff is slow, and the erosion hazard is slight. Fertility is moderate. The available water capacity is 7 to 8 inches in the 60-inch rooting zone.

This soil is used for a variety of irrigated and dryland crops. Capability unit IIw-1(14).

Mocho sandy loam, sandy substratum (Ms).--This nearly level soil occurs on flood plains in the upper Santa Maria Valley. It has a profile similar to the one described as representative for the series except that it has a layer of sandy loam, 30 to 60 inches thick, overlying sand and gravel. Because the substratum consists of sand and gravel, the water-holding capacity of this soil is less than that of other Mocho soils.

Included in mapping are small areas where the sand and gravel substratum is 20 to 30 inches below the surface. Also included are small areas of Metz and Sorrento soils.

Permeability is moderately rapid above the substratum and very rapid in the substratum. Surface runoff is very slow, and the erosion hazard is none to slight. Fertility is moderate. The available water capacity is 5 to 7 inches in the 60-inch root zone.

This soil is used for a variety of lime-tolerant vegetables and field crops. Capability unit IIs-0 (14).

Mocho sandy loam, sandy substratum, overflow (Mt).--This nearly level soil occupies flood plains adjacent to major streams and channels. It is flooded occasionally during heavy storms and is damaged by the deposition and removal of alluvium. This soil has a profile similar to the one described as representative for the series except that it has a layer of sandy loam, 30 to 60 inches thick, overlying sand and fine gravel.

Included in mapping are small areas where there is 20 to 30 inches of sandy loam over the sand and gravel. Also included are small areas of Metz and Sorrento soils.

Permeability is moderately rapid above the substratum and very rapid in the substratum. Surface runoff is slow, and the erosion hazard is slight. Fertility is moderate. The available water capacity is 5 to 7 inches in the 60-inch rooting zone.

If protected from flooding, this soil can be used for a variety of irrigated crops. Capability unit IIw-1(14).

Mocho fine sandy loam (Mu).--This soil occupies flood plains in the Santa Maria and Santa Ynez Valleys and in the western part of the Cuyama Valley. It has a profile similar to the one described as representative for the series except that the texture is fine sandy loam to loam throughout. In some areas this soil has thin strata of gravel, sand, and silt below a depth of 3 feet.

Included in mapping are small areas in which a sand and gravel substratum occurs at depths shallower than 24 to 36 inches. Also included are some Metz and Sorrento soils.

Permeability is moderately rapid. Surface runoff is very slow, and the erosion hazard is none to slight. Fertility is high. The available water capacity is 7.5 to 8.5 inches in the 60-inch rooting depth.

This soil is used for a wide variety of irrigated and dryland crops. It is used for limited pasture in the Cuyama Valley. Capability unit I-1(14).

Mocho loam (Mv).--This soil is nearly level and occurs on flood plains in the Santa Maria and Lompoc Valleys. It is not subject to flooding. This soil has a profile similar to the one described as representative for the series except that the texture is loam throughout.

Included in mapping are areas of Sorrento soils. Some other soils in the Mocho series are also included.

Permeability is moderate. Surface runoff is very slow, and the erosion hazard is none to slight. Fertility is high. The available water capacity is 9 to 11 inches in the 60-inch root zone.

This soil is used for all lime-tolerant crops grown in the survey area. Capability unit I-1(14).

Mocho loam, overflow (Mw).--This soil has a profile similar to the one described as representative for the series except that the profile is stratified

and the soil is mostly loam in texture. This soil occurs near major streams. It is subject to occasional overflow, and some damage to crops usually occurs.

Included in mapping are small areas of Sorrento soils. Also included are small areas of Mocho loam that are not subject to overflow and some areas of Mocho silty clay loam that are subject to overflow.

Permeability is moderate. Surface runoff is slow, and the erosion hazard is slight. Fertility is high. The available water capacity is 9 to 11 inches in the 60-inch effective rooting depth.

Where this soil is protected from flooding, it is used for most crops normally grown in the survey area. Capability unit IIw-1 (14).

Mocho silty clay loam (Mx).--This nearly level soil occurs on flood plains in the Lompoc Valley. It has the profile described as representative for the series.

Included in mapping are small areas of Sorrento soils and of Mocho loam.

Permeability is moderately slow. Surface runoff is very slow, and the erosion hazard is none to slight. Fertility is high. The available water capacity is 11 to 13 inches in the 60-inch root zone.

This Mocho soil is used for most crops grown locally (pl. IV, top). Capability unit I-1(14).

Montara Series

In the Montara series are well-drained, gravelly clay loam uplands soils that are underlain by serpentine bedrock at a depth of 10 to 20 inches. These soils occur mainly in the vicinity of Figueroa Mountain. Slopes range from 30 to 75 percent. The vegetation consists of annual grasses and forbs, scattered oak trees, ceanothus, and sagebrush. Coulter pines and some perennial grasses grow at elevations above 1,500 feet. Elevations range from 100 to 2,500 feet. The average annual rainfall is 12 to 25 inches, the average air temperature is 57° F., and the frost-free season is 200 to 300 days. Montara soils are associated with Climara soils.

In a representative profile, the surface layer is very dark grayish brown, gravelly clay loam, about 13 inches thick, underlain by pale-olive and olive, fractured serpentine rock. Rock outcrops occupy 2 to 10 percent of the surface area.

Montara soils are used for range, wildlife habitat, and watershed.

Representative profile of the Montara series (on Figueroa Mountain Road, 1.4 miles east from bridge crossing of Birbent Creek, near Los Padres National Forest boundary):

O1--1 inch to 0, litter of partially decomposed coulter pine needles, grass, and twigs.

A11--0 to 3 inches, very dark grayish brown (10YR 3/2) clay loam, very dark brown (10YR 2/2) when moist; moderate, fine, granular structure; slightly hard, friable, sticky and plastic; many very fine, fine, medium, and coarse roots; many very fine and fine interstitial pores; about 20 percent of horizon is gravel; neutral (pH 6.8); clear, wavy boundary.

A12--3 to 13 inches, very dark grayish brown (10YR 3/2) clay loam, very dark brown (10YR 2/2) when moist; weak, fine and medium, subangular blocky structure, parting to weak, fine, granular structure; hard, friable, sticky and plastic; many very fine, fine, medium, and coarse roots; many very fine interstitial pores and many very fine and fine tubular pores; about 30 percent of horizon is gravel; mildly alkaline (pH 7.5); abrupt, irregular boundary.

R--13 inches, pale-olive and olive serpentine rocks, fractured but mostly unweathered.

In this profile a few grass roots extend into cracks in the bedrock. Coulter pine roots extend 4 to 5 feet into cracks in the bedrock.

Color of the A horizon ranges from very dark gray to very dark grayish brown and very dark brown. Texture ranges from gravelly clay loam to light clay. Depth to bedrock ranges from about 10 to 20 inches.

Montara rocky clay loam, 30 to 75 percent slopes (MyG).--This is the only Montara soil mapped in the Area. It occurs on smooth, steep mountains (pl. IV, bottom). Rock outcrops occupy 2 to 10 percent of the surface.

Included in mapping are areas in which 10 to 35 percent of the surface is rock outcrops and areas in which the soils are less than 10 inches deep. Also included are soils in swales that are 20 to 40 inches deep, are deeply weathered, and have a reddish-brown subsoil.

Permeability is moderately slow. Surface runoff is rapid to very rapid, and the erosion hazard is high to very high. The available water capacity is 2 to 4 inches in the 10- to 20-inch effective rooting zone. Fertility is low.

This soil is used for range, wildlife, and watershed. Capability unit VIIe-9(15); Shallow Loamy range site.

Narlon Series

The Narlon series consists of moderately well drained soils that have a loamy sand surface layer and a clay subsoil. These soils are underlain by old marine deposits. They are on moderately dissected terraces. Slopes range from 0 to 15 percent. The vegetation is annual grasses, forbs, and low chaparral. Elevations range from 200 to 800 feet. The average annual rainfall is 14 to 17 inches, the average annual air temperature is about 55° F., and the frost-free season is about 300 to 320 days. Narlon soils are associated with Tangair soils.

In a representative profile, the surface and subsurface layers are light brownish-gray, pale-brown, and light-gray loamy sand about 32 inches thick. The subsoil is gray and olive-gray clay and sandy clay that extends to a depth of more than 60 inches.

Beneath the subsoil are sandy marine sediments. These sediments normally are underlain by diatomaceous shale. In some areas the texture of the surface layer is sand.

Narlon soils are used mainly for military purposes and for range.

Representative profile of the Narlon series (on Vandenberg Air Force Base, 0.9 mile west of 13th Street on New Mexico Street, 270 feet south of railroad track):

A11--0 to 2 inches, light brownish-gray (10YR 6/2) loamy sand, dark grayish brown (10YR 4/2) when moist; weak, coarse, platy structure; slightly hard, very friable, nonsticky and nonplastic; many very fine roots; many very fine interstitial pores; medium acid (pH 6.0); clear, smooth boundary.

A12--2 to 15 inches, pale-brown (10YR 6/3) loamy sand, brown (10YR 4/3) when moist; massive; slightly hard, very friable, nonsticky and nonplastic; common very fine roots, abundant roots in a few soil joints; many very fine interstitial pores and few very fine tubular pores; strongly acid (pH 5.3); small reddish-brown sandy iron concretions, 1/8 to 1/4 inch in diameter, make up 2 percent of soil mass; gradual, wavy boundary.

A21--15 to 23 inches, light-gray (10YR 7/2) loamy sand, yellowish brown (10YR 5/4) when moist; many, medium, faint mottles of pale brown (10YR 6/3); massive; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; many very fine interstitial pores, common very fine and few fine tubular pores; strongly acid (pH 5.3); small reddish and larger yellowish concretions, 1/8 inch to 2 inches across, make up 8 percent of soil mass; gradual, smooth boundary.

A22--23 to 32 inches, light-gray (10YR 7/2) light loamy sand, brown (10YR 5/3) when moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; many very fine interstitial pores and few very fine tubular pores; strongly acid (pH 5.5); clear, wavy boundary.

AB--32 to 35 inches, 40 percent of soil mass is brown (10YR 4/3m) sandy clay loam that has continuous, moderately thick clay films in bridges; has relic-rounded column tops and irregular lumps of degrading material from B2 horizon 1/4 inch to 2 inches in diameter; remaining 60 percent of soil mass is light-gray to white (10YR 7/2), 8/1d) loamy sand that has weak, skeletal column tops and very few thin clay bridges in some places.

B21t--35 to 50 inches, gray (5Y 5/1) clay, dark gray (5Y 4/1) with dark reddish-brown to strong-brown and light olive-brown (2.5YR 3/4, 3/6, 7.5YR 5/6, 2.5Y 5/4) mottles when moist, dark yellowish brown (10YR 4/4) mixed when rubbed; many, medium, prominent, yellowish-red to reddish-yellow (5YR 5/6, 3/6, 4/4, and 7.5YR 6/6) mottles; moderate, coarse, columnar structure; very hard, extremely firm, very sticky and very plastic; few very fine roots on exterior of peds, very few very fine tubular pores; continuous moderately thick clay films on ped faces, clay nearly fills all pores; some clay films on ped faces are dusky-red (10R 3/2); very strongly acid (pH 5.0); few, random, distinct slickensides; diffuse, smooth boundary.

B22t--50 to 67 inches, olive-gray (5Y 5/2) sandy clay, mottled as in B21t horizon but olive hues more dominant; moderate, coarse, prismatic structure; very hard, extremely firm, very sticky and very plastic; very few very fine roots on ped faces; clay films and reaction same as in B21t horizon; very few irregularly shaped pockets and joints filled with white sand similar to A2 horizon, pockets and joints have very abrupt boundaries; few random distinct slickensides.

Round chert and quartzite gravel is scattered through the A horizon of this profile and makes up less than 1 percent of that horizon. A few fragments of siliceous shale are scattered through all horizons and make up about 1 percent of the total volume.

Color of the A1 horizon ranges from light brownish gray to gray or pale brown. Texture ranges from sand to light sandy loam. Thickness of the A1 horizon, in some places, ranges from 14 to 20 inches, and the thickness of the A2 horizon ranges from 6 to 36 inches. Thickness, texture, and color of the A1 horizon depends partly on the mild "hog-wallow" relief and other microswale features. The A1 horizon is darker, finer textured, and thicker in the swales and is lighter, coarser textured, and thinner on the knolls. The A2 horizon is thickest in the higher areas. Depth to the B21 horizon ranges from about 20 to about 50 inches. Where depth to the B2t horizon is greatest and the subsoil is less clayey, the Narlon soils grade into the Tangair soils. Narlon soils are underlain by siliceous shale at depths of 48 to more than 60 inches.

Narlon sand, 0 to 5 percent slopes (NrB).--This soil is nearly level and gently sloping and occurs on terraces. It has a profile similar to the one described as representative for the series except that it has a sand surface layer 20 to 40 inches thick. The relief is known locally as mild "hog wallow."

Included in mapping are small areas of soils that have a loamy sand surface layer. Areas of Tangair soils and Narlon soils, hardpan variant, are also included.

Permeability is very slow. A perched water table often forms above the clay subsoil after rains or irrigation. Surface runoff is slow, and the hazard of erosion by water is none to slight. The hazard of soil blowing is moderate to high. Fertility is very low. The available water capacity is 2 to 4 inches in the 20- to 40-inch root zone. A small amount of water in the clay subsoil is available very slowly for use by plants.

This soil is used mainly for military purposes and for range and watershed. Capability unit VIe-4 (15); Sandy range site.

Narlon loamy sand, 0 to 2 percent slopes (NsA).--This nearly level soil occupies mesalike terraces. It has the profile described as representative for the series. The relief is known locally as "hog wallow."

Included with this soil in mapping are small areas of soils that have a sandy loam surface layer. Areas of Tangair soils are also included.

Permeability is very slow. A perched water table often forms above the clay subsoil after a heavy rain or irrigation. Surface runoff is very slow, and the hazard of erosion by water is none to slight. The hazard of soil blowing is moderate. Fertility is very low. The available water capacity is 2 to 4 inches in the 20- to 40-inch rooting zone. A small amount of water in the clay subsoil is slowly available for use by plants.

This Narlon soil is used for military purposes and for range. Capability unit IVe-3(15); Sandy range site.

Narlon loamy sand, 2 to 9 percent slopes (NsC).--This soil is gently sloping to moderately sloping and occurs on slightly dissected terraces.

Included in mapping are small areas of soils that have a sandy loam or shaly sandy loam surface layer. Areas of Tangair and Oceano soils are also included.

Permeability is very slow. A perched water table sometimes forms above the clay subsoil immediately after a heavy or prolonged rain. Surface runoff is slow to medium, and the erosion hazard is moderate. Fertility is very low. The available water capacity is 2 to 4 inches in the 20- to 40-inch rooting zone. A small amount of water in the clay subsoil is slowly available for use by plants.

This soil is used for military purposes and for range. Capability unit IVe-3(15); Sandy range site.

Narlon loamy sand, 9 to 15 percent slopes (NsD).--This soil occurs on terrace breaks and on partially dissected, rolling terraces that are not eroded. Slopes average 12 percent.

Included in mapping are small areas of soils where the surface layer is sand or sandy loam. Also included are areas of Oceano and Tangair soils and areas of sand dunes.

Permeability is very slow. A perched water table sometimes forms above the clay subsoil after a rain. Surface runoff is medium, and the erosion hazard is moderate to high. Fertility is very low. The available water capacity is 2 to 4 inches in the 20- to 40-inch rooting zone. Some water in the clay subsoil is available very slowly for use by plants.

This Narlon soil is used mainly for military purposes and for range. Capability unit VIIe-4(15); Sandy range site.

Narlon Series, Hardpan Variant

The Narlon series, hardpan variant, consists of moderately well drained soils that formed on wind-modified, sandy, old marine terrace deposits. These soils are on terraces, most extensively in Vandenberg Air Force Base and to a small extent on low benches in the Santa Maria Valley. All areas are within 10 miles of the coast. Slopes are 0 to 9 percent. The vegetation consists of low brush and sparse annual grasses and forbs. Elevations range from 200 to 800 feet. The average annual rainfall is 14 to 17 inches, the average annual air temperature is about 57° F., and the frost-free season is about 300 to 320 days. Narlon soils, hardpan variant, are associated with Narlon and Tangair soils.

In a representative profile, the surface layer is grayish-brown and light-brown sand about 14 inches thick. It is underlain by about 12 inches of pink sand. The subsoil is mottled, mixed dark-brown, very dark grayish brown, and yellowish-brown sandy clay about 12 inches thick. Below are partially cemented sandy marine sediments.

These soils are used for range, for military purposes, and for homesites and other nonfarm uses.

Representative profile of the Narlon series, hardpan variant (approximately 3 miles north of Lompoc, about 120 feet south and 360 feet east of the intersection of Burton Mesa Road and Highway No. 1):

Ap--0 to 7 inches, grayish-brown (10YR 5/2) sand, dark grayish brown (10YR 4/2) when moist; massive; soft, very friable, nonsticky and nonplastic; many micro, very fine, fine and medium roots; many very fine interstitial pores and common very fine, fine and medium tubular pores; few hard concretions about 1/4 inch across have a black center and dark reddish-brown outer shell; medium acid (pH 6.0); abrupt, smooth boundary.

A1--7 to 14 inches, light-brown (7.5YR 6/4) sand, brown (7.5YR 5/4) when moist; massive; soft, very friable, nonsticky and nonplastic; few very fine and common medium roots; many very fine interstitial pores and many very fine, fine and medium tubular pores; concretions similar to those in the Ap horizon but slightly more numerous and larger; medium acid (pH 6.0); gradual, irregular boundary.

A2--14 to 26 inches, pink (7.5YR 7/4) sand, brown (7.5YR 5/4) when moist; massive; soft, very friable, nonsticky and nonplastic; few very fine roots and fine and common medium roots; many very fine interstitial pores and many very fine, fine and medium tubular pores; soil mass is 1 to 2 percent concretions similar to those in the Ap horizon except that they are 1/4 inch to 1 1/2 inches across; medium acid (pH 6.0); abrupt, wavy boundary.

B21t--26 to 30 inches, prominently mottled and mixed dark-brown to yellowish-brown (10YR 4/4, 4/3, 3/3, 5/4) light sandy clay, with seams of light gray (10YR 7/2, 7/3), very dark grayish brown to dark yellowish brown (10YR 3/3, 3/2, 4/4) when moist; strong, medium and coarse, columnar structure; very hard, firm, sticky and plastic; few very fine, fine, and medium roots; many micro and very fine interstitial pores and many very fine tubular pores; common moderately thick and thick clay films lining

tubular and interstitial pores, and common thin clay films on ped faces; column tops are strongly leached for 1/4 to 1/2 inch, and nearly all clay films are gone from the leached portion; tongues of A2 horizon material extend irregularly several inches into some joints; strongly acid (pH 5.5); gradual, wavy boundary.

B22t--30 to 38 inches, prominently mottled and mixed yellowish-brown to very dark grayish brown (10YR 5/6, 5/4, 4/3, 3/2) light sandy clay, about the same colors when moist; strong, medium and coarse, prismatic structure; very hard, firm, very sticky and very plastic; few very fine, fine, and medium roots; few micro interstitial pores and very fine tubular pores; continuous thick clay films in pores, and continuous moderately thick clay films on ped faces; continuous, nearly black wavy bands about 1/8 inch thick; very strongly acid (pH 5.0); gradual, irregular boundary.

C1si--38 to 46 inches, dark-brown (10YR 4/3) weakly cemented loamy sand, dark brown (10YR 3/3) mottled with yellowish brown and very dark brown (10YR 5/4 and 2/2) when moist; many large, distinct, pale-brown and brownish-yellow (10YR 6/3 and 6/6) mottles; massive; very hard, firm, brittle, nonsticky and nonplastic; few very fine and fine roots; many very fine interstitial pores; many thin clay bridges holding mineral grains together, common moderately thick clay films in old tubular pores; soil is weakly cemented and panlike; very hard silica-cemented cap, 1 to 3 millimeters thick, on top of pan; very strongly acid (pH 5.0); gradual, irregular boundary.

C2si--46 to 72 inches, yellowish-brown (10YR 5/6), weakly cemented light loamy sand; many medium, light brownish-gray and dark yellowish-brown (10YR 6/2, 4/4) prominent mottles, mottles grayish brown (10YR 5/2), 4/4), 4/2) when moist; massive; hard, firm, brittle, nonsticky and nonplastic; no roots; many very fine interstitial pores; many thin clay bridges between mineral grains, common moderately thick clay films filling old tubular pores; weakly cemented; strongly acid (pH 5.5).

In this profile, roots are concentrated in the top 2 inches of the Ap horizon. In the B21 and B22 horizons, almost all the roots are in the vertical cracks and very few are within the peds.

The Ap and A1 horizons range from light brownish gray and grayish brown to brown and light brown in color. The A2 horizon ranges from very pale brown and light yellowish brown to pink. Normally, a thin, light-gray layer lies directly on top of the B2t horizon. Texture of the Ap, A1, and A2 horizons is chiefly sand to loamy sand. These horizons contain small, very dark, manganese concretions, ranging from very few in number to 2 percent of the soil mass. Thickness of the A2 horizon varies. In most places, the top of the B horizon appears to be degrading and is mixed with the A2 horizon. The boundary between them is indistinct in some places. Depth to the B horizon ranges from 20 to 30 inches. The B2t horizon is prominently mottled and is about 12 to 24 inches thick; in some places it grades into mottled beds of sand or deep deposits of clay. Clay is dug from some of these deposits and is used to line the bottom of reservoirs. In some areas sand has been deposited on the clay beds by wind. Where the C horizon is quite sandy, it normally is very hard and brittle just below the B22t horizon. Where the C horizon is clayey, this cementation is not so distinct.

Narlon sand, hardpan variant, 0 to 2 percent slopes (NvA).--This nearly level soil is on terraces. It has the profile described as representative for the series. Depth to the sandy clay layer ranges from 24 to 30 inches.

Included with this soil in mapping are small areas where the surface texture is loamy sand. Areas of Narlon, Tangair, and Oceano soils are also included.

Permeability is very slow. A perched water table often forms after rains or after irrigation. Surface runoff is very slow, and the hazard of erosion by water is none to slight. The hazard of soil blowing is high. Fertility is very low. The available water capacity is 2 to 3 inches in the 24- to 30-inch rooting zone. Very little moisture is available from the clay subsoil for use by plants.

This soil is used for range. It is also used for military purposes and for homesites and other nonfarm purposes. Capability units IVe-4(14) and VIe-4(15); Sandy range site.

Narlon sand, hardpan variant, 2 to 9 percent slopes (NvC).--This soil occurs on terraces where the relief is slightly rolling and broken. Depth to the sandy clay subsoil ranges from 20 to 30 inches.

Included in mapping are areas that have a surface layer of loamy sand or sandy loam. Some areas of soils where the surface layer is 10 to 20 inches thick are also included. Other included small areas consist of Narlon and Tangair soils.

Permeability is very slow. A perched water table sometimes forms above the sandy clay subsoil after a rain or after irrigation. Surface runoff is medium, and the hazard of erosion by water is moderate. The hazard of soil blowing is high. Fertility is very low. The available water capacity is 2 to 3 inches in the 20- to 30-inch root zone. Some water is available very slowly from the sandy clay subsoil for use by plants.

This soil is used for range and for nonfarm purposes, such as military bases and homesites. Capability units IVe-4(14) and VIe-4(15); Sandy range site.

Oceano Series

The Oceano series consists of excessively drained sandy soils that formed in old coastal sand dunes. These soils are on coastal plains in scattered areas, between the Santa Maria River and Point

Arguello and within 20 miles of the coast. Slopes range from 0 to 15 percent. The vegetation is sparse annual grasses, forbs, and sagebrush. Elevations range from about sea level to 800 feet. The average annual rainfall is 14 to 20 inches, the average annual air temperature is about 57° F., and the frost-free season is about 300 to 320 days. Oceano soils are associated with Marina soils.

In a representative profile, the surface layer is grayish-brown and light brownish-gray sand about 20 inches thick. It is underlain by pale-brown and light yellowish-brown sand extending to a depth of more than 60 inches. The sand is mostly feldspathic and quartzitic; the grains are fine and medium in size and are rounded. A few clay or iron bands are below the surface layer and extend to undetermined depths.

Oceano soils are used for irrigated crops and for range.

Representative profile of the Oceano series (approximately 4 miles southeast of Santa Maria, NW1/4 sec. 36, T. 10 N., R. 34 W.):

A11--0 to 1 1/2 inches, grayish-brown (10YR 5/2) sand, dark grayish brown (10YR 4/2) when moist; single grain; soft, very friable, nonsticky and nonplastic; many very fine interstitial pores; medium acid (pH 5.8); clear, smooth boundary.

A12--1 1/2 to 4 inches, grayish-brown (10YR 5/2) sand, dark grayish brown (10YR 4/2) when moist; massive; soft, very friable, nonsticky and nonplastic; common very fine roots; many very fine interstitial pores; medium acid (pH 5.6); gradual, smooth boundary.

A13--4 to 15 inches, light brownish-gray (10YR 6/2) sand, brown (10YR 4/3) when moist; massive; soft, very friable, nonsticky and nonplastic; few very fine roots; many very fine interstitial pores, very few fine tubular pores; strongly acid (pH 5.5); gradual, smooth boundary.

AC--15 to 20 inches, light brownish-gray (10YR 6/2) sand, brown (10YR 4/3) when moist; massive; soft, very friable, nonsticky and nonplastic; very few very fine roots; many very fine interstitial pores and very few fine tubular pores; strongly acid (pH 5.3); gradual, smooth boundary.

C1--20 to 39 inches, pale-brown (10YR 6/3) sand, yellowish brown (10YR 5/4) when moist; massive; soft, very friable, nonsticky and nonplastic; very few very fine roots; many very fine interstitial pores and very few fine tubular pores; very strongly acid (pH 5.0); gradual, smooth boundary.

C2--39 to 55 inches, pale-brown (10YR 6/3) sand, yellowish brown (10YR 5/4) when moist; massive; soft, very friable, nonsticky and nonplastic; very few micro roots; many very fine interstitial pores; several weak Liesegang bands 1/8 inch thick (7.5YR 4/4m, 5/4d), slightly hard, somewhat branched, upper band bends up into C1 horizon; slightly more firm and more harsh than C1 horizon; very strongly acid (pH 5.0); gradual, smooth boundary.

C3--55 to 72 inches, light yellowish-brown (10YR 6/4) sand, yellowish brown (10YR 5/4) when moist; massive; soft, very friable, nonsticky and nonplastic; no roots; many very fine interstitial pores; Liesegang bands 1/4 inch thick, hard when dry; two continuous bands, several discontinuous, similar in color to bands in C2 horizon; black manganese specks 1 to 5 millimeters in diameter make up about 1 percent of mass; strongly acid (pH 5.1); gradual, smooth boundary.

C4--72 to 90 inches, light yellowish-brown (10YR 6/4) sand, yellowish brown (10YR 5/4) when moist; massive; soft, very friable, nonsticky and nonplastic; many very fine interstitial pores; weak bands 1/4 inch to 3/8 inch thick, discontinuous, slightly wavy, sand grains very thinly coated; sand slightly coarser than in C3 horizon; strongly acid (pH 5.5).

The A1 horizon ranges from sand to loamy sand in texture and from grayish brown and light brownish gray to pale brown in color. In some places a few brown to dark-brown bands of iron or clay, about 1/8 inch thick, are within 2 feet of the surface. Reaction ranges from very strongly acid to medium acid.

Oceano sand, 0 to 2 percent slopes (OcA).--This soil is nearly level to slightly hummocky and occurs on coastal plains in the vicinity of Santa Maria, Orcutt, Guadalupe, and Point Arguello. It consists chiefly of wind-blown sand several feet deep.

Included in mapping are small areas of Marina soils and of Dune land.

Permeability is rapid. Surface runoff is very slow, and the hazard of water erosion is none to slight. The hazard of soil blowing is very high. Fertility is very low. The available water capacity is 2 to 4 inches in the 60-inch effective root zone.

This soil is used for irrigated walnuts, alfalfa, and strawberries and for range. Capability units IVe-4(14) and VIe-4(15); Sandy range site.

Oceano sand, 2 to 15 percent slopes (OcD).--This soil is gently sloping to strongly sloping. It occurs on terracelike sites in widely scattered areas within 20 miles of the coast. This soil has the profile described as representative for the series.

Included in mapping are small areas of Marina sand in swales and small areas that have shallow gullies. Also included are small areas of Dune land.

Permeability is rapid. Surface runoff is slow to medium, and the hazard of water erosion is moderate. The hazard of soil blowing is very high. Fertility is very low. The available water capacity is 2 to 4 inches in the 60-inch rooting zone.

This soil is used to a limited extent for irrigated alfalfa and walnuts and for range (pl. V, top). Capability units IVe-4(14) and VIe-4(15); Sandy range site.

Oceano sand, 2 to 15 percent slopes, severely eroded (OcD3).--This soil is severely eroded and has numerous shallow gullies. Blowouts are common, and soil blowing is active in some places.

Included in mapping are small areas of Marina soils and of Dune land.

Permeability is rapid. Surface runoff is medium, and the hazard of erosion by water is moderate in most places. Where water from steeper areas runs onto this soil, the erosion hazard is greater. The hazard of soil blowing is very high. Fertility is very low. The available water capacity is 2 to 4 inches in the 60-inch root zone.

This Oceano soil is used for limited range. Capability unit VIIe-4(15); Eroded or Shallow Sandy range site.

Panoche Series

Soils of the Panoche series are well-drained sandy loams and loams on flood plains and alluvial fans in the arid eastern part of the Cuyama Valley. Slopes are 0 to 9 percent. The vegetation is annual grasses, forbs, and scattered sagebrush. Elevations range from 1,800 to 2,200 feet. The average annual rainfall is about 6 to 8 inches, the average annual air temperature is about 58° F., and the frost-free season is 190 to 260 days. Panoche soils are associated with Metz soils.

In a representative profile, the surface layer is pale-brown loam about 13 inches thick. This layer is underlain by pale-brown to light brownish-gray and light yellowish-brown stratified loamy fine sand to silty clay loam that extends to a depth of more than 60 inches. The surface layer is sandy loam in some places, and in others the soil is dominantly sandy loam throughout the profile. These soils are calcareous throughout the profile.

Panoche soils are used for a wide variety of crops.

Representative profile of the Panoche series (2.3 miles east of New Cuyama on Highway 166 to Bell Road, about 1/2 mile south on Bell Road, 1/8 mile east on farm road, and 50 feet north in field):

Ap--0 to 13 inches, pale-brown (10YR 6/3) loam, dark brown (10YR 4/3) when moist; moderate, medium and coarse, granular structure; hard, very friable, sticky and slightly plastic; many micro and very fine roots; many very fine and fine interstitial pores; strongly effervescent; disseminated lime; moderately alkaline (pH 8.0); abrupt, smooth boundary.

C1--13 to 15 inches, pale-brown (10YR 6/3) sandy loam, dark brown (10YR 4/3) when moist; massive; hard, very friable, slightly sticky and slightly plastic; common micro and very fine roots; many micro interstitial pores and many micro and very fine tubular pores; violently effervescent; disseminated lime and few fine lime nodules and filaments; moderately alkaline (pH 8.0); abrupt, smooth boundary.

IIC2--15 to 22 inches, light brownish-gray (10YR 6/2) silty clay loam, dark grayish brown (10YR 4/2) when moist; massive; hard, very friable, sticky and plastic; common micro and very fine roots; many micro interstitial pores and many micro and very fine tubular pores; violently effervescent; disseminated lime and lime in fine, soft nodules and filaments; moderately alkaline (pH 8.0); gradual, wavy boundary.

IIC3--22 to 47 inches, pale-brown (10YR 6/3) loam, yellowish brown (10YR 5/4) when moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; common micro and very fine roots; many micro interstitial pores and many micro and very fine tubular pores; violently effervescent; disseminated lime and lime in fine, soft nodules and filaments; moderately alkaline (pH 8.0); gradual, smooth boundary.

IIIC4--47 to 64 inches, light yellowish-brown (10YR 6/4) loamy fine sand, yellowish brown (10YR 5/4) when moist; massive; slightly hard, very friable, nonsticky and nonplastic; very few micro roots; many micro and very fine interstitial pores and many micro and very fine tubular pores; violently effervescent; disseminated lime and lime in fine, soft nodules and filaments; moderately alkaline (pH 8.0) abrupt, smooth boundary.

IVC5--64 to 72 inches, very pale brown (10YR 7/4) silty clay loam, yellowish brown (10YR 5/4) when moist; massive; hard, very friable, sticky and plastic; no roots; many micro interstitial pores, violently effervescent; disseminated lime and lime in fine, soft nodules and filaments; moderately alkaline (pH 8.0); abrupt, smooth boundary.

In the IIIC4 horizon of this profile, at a depth of 56 inches, there is a layer of coarse and medium sand that is about 1 inch thick, or too thin to sample. Other strata too thin to sample occur throughout the profile.

In the Panoche series, the color of the A horizon ranges narrowly from light grayish brown to pale brown. Texture of the A horizon ranges from sandy loam to loam. The C horizons vary widely within the profile and from place to place. The texture ranges from loamy fine sand to silty clay loam. The soil is calcareous throughout; however, in some places it is noncalcareous in the surface layer and strongly calcareous below a depth of 10 inches.

Panoche sandy loam, 0 to 2 percent slopes (PcA).--This soil occurs on broad, nearly level fans and flood plains in Cuyama Valley mainly east of New Cuyama. It has a profile similar to the one described as typical for the series except that the surface layer is sandy loam. The soil is highly stratified.

Included in mapping are areas of Panoche loam and of Metz soils.

Permeability is moderate. Because this soil is so highly stratified, it is less permeable than are typical sandy loam soils that are not so stratified. Surface runoff is very slow, and the erosion hazard is none to slight. Fertility is high. The available water capacity is 7.5 to 9.0 inches in the 60-inch root zone.

This soil is used chiefly for alfalfa. Some areas are used for sugar beets, potatoes, and corn silage. Capability unit I-1(17).

Panoche sandy loam, 2 to 9 percent slopes (PcC).--This soil is gently sloping to moderately sloping and occurs on alluvial fans. It has a profile similar to the one described as typical for the series except that the surface layer is sandy loam.

Included in mapping are small areas that have rills and shallow gullies. Also included are areas of Panoche loam and of Metz soils.

Because the soil is stratified, permeability is moderate. Surface runoff is slow to medium, and the erosion hazard is slight to moderate. Fertility is high. The available water capacity is 7.5 to 9.0 inches, and the effective rooting depth is more than 60 inches.

This Panoche soil is used for irrigated alfalfa and sugar beets and for range. Capability unit IIe-1(17); Arid Loamy range site.

Panoche sandy loam, overflow, 0 to 2 percent slopes (PdA).--This nearly level soil is on alluvial fans. It has a profile similar to the one described as typical for the series except that it is dominantly sandy loam throughout the profile. Slopes are largely 1 percent. Runoff water from the surrounding hills and mountains flows across this soil during infrequent periods of high rainfall.

Included in mapping are some areas cut by channels and some areas that are subject to deposition. Also included are small areas of Metz soils and of Sandy alluvial land.

Permeability is moderately rapid. Surface runoff is very slow, except that overflow water from the surrounding hills runs rapidly onto the soil. The erosion hazard is moderate. Fertility is high. The available water capacity is 6.0 to 7.5 inches in the 60-inch effective rooting zone.

This soil is used mainly for alfalfa; some areas are planted to sugar beets, potatoes, and silage corn. Capability unit IIw-1(17).

Panoche sandy loam, overflow, 2 to 5 percent slopes (PdB).--This gently sloping soil occurs near the mouths of side drainageways and extends well into the foothills in small narrow valleys. It has a profile similar to the one described as typical for the series except that the texture is dominantly sandy loam throughout the profile. Water from the surrounding hills and mountains flows across this soil during infrequent periods of high rainfall.

Included in mapping are some small areas dissected by channels. Also included are areas of Metz soils and of Sandy alluvial land.

Permeability is moderately rapid. Surface runoff is slow except for flow from adjacent areas. The erosion hazard is moderate. Fertility is high. The available water capacity is 6.0 to 7.5 inches in the 60-inch effective rooting depth.

This Panoche soil is used for limited grain production and for range. Capability unit IIw-1(17); Arid Loamy range site.

Panoche loam, 0 to 2 percent slopes (PeA).--This soil is nearly level and occurs on broad flood plains in the eastern part of the Cuyama Valley. It has the profile described as representative for the series.

Included in mapping are fairly large areas of a soil that contains enough soluble salts to affect crop selection and production. These salts can be removed by leaching. Also included are small areas of Panoche sandy loam.

Because this soil is stratified, permeability is moderately slow. Surface runoff is very slow, and the erosion hazard is none to slight. Fertility is high. The available water capacity is 10 to 12 inches in the 60-inch effective root zone.

This soil is used for alfalfa, potatoes, corn silage, and sugar beets. Capability unit I-1(17).

Panoche loam, 2 to 9 percent slopes (PeC).--This soil occurs on alluvial fans at the mouths of the side drainageways that enter the Cuyama Valley west of New Cuyama.

Included in mapping are small areas of Pleasanton soils. Some areas of gravelly or cobbly soils along stream channels and areas of soils subject to overflow are also included.

Because this soil is stratified, permeability is moderately slow. Surface runoff is slow to medium, and the erosion hazard is slight to moderate. Fertility is high. The available water capacity is 10 to 12 inches in the 60-inch effective rooting depth.

This Panoche soil is used for range. Where water is available, this soil is used for irrigated alfalfa and sugar beets. Capability unit IIe-1(17); Arid Loamy range site.

Panoche loam, overflow, 0 to 2 percent slopes (PfA).--This soil occurs near the outlets of drainageways. It has a profile similar to the one described as typical for the series except that it is less stratified and the loam texture is more uniform throughout the profile. During periods of intense rainfall, floodwater flows across this soil and fresh deposits of material are laid down and removed. This damages crops.

Included in mapping are areas of Panoche sandy loam, overflow. Areas of Metz soils and Sandy alluvial land are also included.

Permeability is moderate. Surface runoff is slow, except for the water that runs in from adjacent, more sloping soils. The erosion hazard is moderate. Fertility is high. The available water capacity is 9 to 11 inches in the 60-inch root zone.

This Panoche soil is used for irrigated crops, such as alfalfa, sugar beets, and silage corn. Capability unit IIw-1(17).

Pleasanton Series

The Pleasanton series consists of well-drained sandy loams that have a cobbly clay loam subsoil. These soils formed in old alluvial deposits. The parent material is sandstone, quartzite, and Monterey Shale. Pleasanton soils occur fairly extensively on low terraces along both sides of the Sisquoc and Santa Maria Rivers in the northern part of the Area. Elevations here range from 200 to 800 feet. These soils occur more extensively on low and high terraces in the wetter, western part of the Cuyama Valley where elevations range from 1,400 to 2,200 feet. Slopes are 0 to 30 percent. The vegetation is annual grasses, forbs, and scattered oak trees. The average annual rainfall is 12 to 18 inches, the average annual air temperature is about 59° F., and the frost-free season is 180 to 260 days. Pleasanton soils are associated with Garey, Betteravia, and Botella soils.

In a representative profile, the surface layer is brown heavy sandy loam about 32 inches thick. The subsoil is yellowish-brown cobbly clay loam and very cobbly loam about 21 inches thick. Below is reddish-brown very cobbly sandy loam to a depth of 60 inches and more. In some areas the surface layer is very fine sandy loam. Many areas are nearly free of gravel or cobbles; other areas are gravelly and cobbly in the surface layer.

Pleasanton soils are used for irrigated field crops, for row crops, for dryland field crops, and for range.

Representative profile of the Pleasanton series (approximately 18 miles west of New Cuyama on Highway 166, 0.5 mile southeast of Green Valley Ranch home on ranch road, about 400 feet east of road on terrace):

A11--0 to 2 inches, brown (10YR 5/3) heavy sandy loam, dark brown (10YR 3/3) when moist; moderate, thin and medium, platy structure; hard, very friable, slightly sticky and slightly plastic; many very fine roots; few very fine tubular pores and common very fine interstitial pores; neutral (pH 6.7); abrupt, smooth boundary.

A12--2 to 15 inches, brown (10YR 5/3) heavy sandy loam, dark brown (10YR 3/3) when moist; massive; hard, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine and fine tubular pores and many very fine interstitial pores; neutral (pH 7.0); gradual, irregular boundary.

A13--15 to 32 inches, brown (10YR 5/3) heavy sandy loam, dark brown (10YR 3/3) when moist; massive; hard, very friable, slightly sticky and slightly plastic; common very fine roots; many very fine and fine tubular pores and many very fine interstitial pores; neutral (pH 7.0); abrupt, smooth boundary.

IIB2t--32 to 39 inches, yellowish-brown (10YR 5/4) cobbly heavy clay loam, dark yellowish brown (10YR 4/4) when moist; massive; very hard, friable, very sticky and plastic; few very fine roots; many very fine and fine tubular pores and common very fine interstitial pores; many thin clay films in pores; neutral (pH 7.0); gradual, wavy boundary.

IIB3t--39 to 53 inches, yellowish-brown (10YR 5/4) very cobbly loam, dark yellowish brown (10YR 4/4) when moist; massive; very hard, friable, sticky and plastic; very few very fine roots; many very fine and fine tubular pores and common interstitial pores; common thin clay films in pores; neutral (pH 7.0); gradual, wavy boundary.

IIC--53 to 66 inches, reddish-brown (5YR 4/4) very cobbly sandy loam, dark reddish brown (5YR 3/4) when moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; very few very fine roots; many very fine interstitial pores; colloid stains on mineral grains; neutral (pH 7.0).

The A horizon ranges in color from brown to dark grayish brown and in texture from sandy loam to very fine sandy loam. The A horizon is 0 to 30 percent gravel, or cobblestones, or a mixture of both. Soil reaction ranges from medium acid to neutral in the A horizon and from slightly acid to neutral in the IIB horizon. Depth to the IIB horizon averages about 30 inches, but ranges from 20 to 40 inches. Free lime is not commonly present in the IIB horizon, but in a few areas ped faces in the lower IIB horizon have lime coatings. Cobblestones or gravel make up 15 to 30 percent of the IIB2 horizon and 15 to 55 percent of the IIB3 and IIC horizons.

Pleasanton sandy loam, 0 to 2 percent slopes (PnA).--This soil is nearly level and occurs on terraces. The surface layer averages about 30 inches thick. As much as 10 percent of the surface layer is gravel or cobblestones.

Included in mapping are areas of Botella and Garey soils. Also included are small areas of Pleasanton cobbly sandy loam and Pleasanton gravelly very fine sandy loam.

Permeability is moderately slow. Surface runoff is slow, and the erosion hazard is slight. Fertility is moderate. The available water capacity is 7.5 to 8.5 inches in the 60-inch effective rooting depth.

This soil is used for some irrigated row and field crops, and for dryland hay and grain. Capability unit I-1(14).

Pleasanton sandy loam, 2 to 9 percent slopes (PnC).--This soil is gently sloping to moderately sloping and occurs on terraces. It has the profile described as representative for the series. As much

as 10 percent of the surface layer is gravel, or cobblestones, or a mixture of both.

Included in mapping are small areas of Pleasanton very fine sandy loam. Some small areas of Botella and Garey soils are also included.

Permeability is moderately slow. Surface runoff is slow to medium, and the erosion hazard is slight to moderate. Fertility is moderate. The available water capacity is 7.5 to 8.5 inches in the 60-inch effective root zone.

This soil is used for some irrigated crops, for dryland crops, and for range. Capability units IIIe-1(14) and IIIe-1(15); Loamy range site.

Pleasanton sandy loam, 9 to 15 percent slopes (PnD).--This soil is rolling and occurs on remnants of mesalike terraces in the western part of the Cuyama Valley. It has a profile similar to the one described as representative for the series except that the surface layer averages 24 inches in thickness. Gravel and cobblestones make up 5 to 15 percent of the surface layer.

Included in mapping are small areas of Pleasanton cobbly sandy loam and of Botella soils.

Permeability is moderately slow. Surface runoff is medium, and the erosion hazard is moderate. Fertility is moderate. The available water capacity is 7.5 to 8.5 inches in the 60-inch rooting zone.

This Pleasanton soil is used chiefly for range; small areas are used for dryland grain. Capability unit IVe-1(15); Loamy range site.

Pleasanton cobbly sandy loam, 5 to 30 percent slopes (PoE).--This soil is moderately sloping to moderately steep and occurs on dissected terraces in the southwestern part of the Cuyama Valley. It has a profile similar to the one described as representative for the series except that about 20 to 35 percent of the surface layer and upper subsoil is gravel and cobblestones. The gravel and cobblestones consist of water-rounded hard sandstone, quartzite, and granitic rocks. Thickness of the surface layer is about 20 inches.

Included in mapping are some severely eroded areas where the subsoil is exposed. Other included soils are 35 to 60 percent cobbles and gravel throughout the profile.

Permeability is moderately slow. Surface runoff is medium to rapid, and the erosion hazard is moderate to high. Fertility is low. Because of the gravel and cobblestones, the available water capacity is only 5 to 6 inches. The effective rooting depth is more than 60 inches.

This soil is used mainly for range. It is also used for watershed and wildlife. Capability unit VIe-1(15); Loamy range site.

Pleasanton very fine sandy loam, 0 to 2 percent slopes (PrA).--This soil is nearly level and occurs on low terraces on both sides of the Santa Maria Valley. This soil has a profile similar to the one described as representative for the series except that the surface layer tends toward grayish brown or dark grayish brown rather than brown and is very fine sandy loam.

Included in mapping are small areas of Garey soils and some areas of Pleasanton gravelly very fine sandy loam.

Permeability is moderately slow. Surface runoff is very slow, and the erosion hazard is none to slight. Fertility is moderate. The available water capacity is 8 to 9 inches in the 60-inch root zone.

This soil is used for a variety of irrigated and dryland crops. Capability unit I-1(14).

Pleasanton very fine sandy loam, 2 to 9 percent slopes (PrC).--This soil is gently sloping to moderately sloping and occurs on terraces. It has a profile similar to the one described as representative for the series except that the surface layer of this soil contains more very fine sand. Thickness of the surface layer is about 24 inches.

Included with this soil in mapping are small areas of Betteravia, Botella, and Garey soils. Small areas of gravelly Pleasanton soils are also included.

Permeability is moderately slow. Surface runoff is slow to medium, and the erosion hazard is slight to moderate. Fertility is moderate. The available water capacity is 8 to 9 inches in the 60-inch root zone.

This soil is used for a limited variety of irrigated and dryland crops and for range. Capability units IIIe-1(14) and IIIe-1(15); Loamy range site.

Pleasanton gravelly very fine sandy loam, 9 to 15 percent slopes (PsD).--This soil is strongly sloping and occurs on partly dissected terraces. It has a profile similar to the one described as representative for the series except that the surface layer is very fine sandy loam and is 15 to 35 percent gravel. The surface layer averages about 22 inches in thickness.

Included in mapping are small areas of Pleasanton sandy loam. Also included are small areas of a very gravelly Pleasanton soil.

Permeability is moderately slow. Surface runoff is slow to medium, and the erosion hazard is slight to moderate. Because of the gravel in the surface layer, the available water capacity is only 6 to 7 inches. Fertility is moderate.

This Pleasanton soil is used mainly for range; small areas are used for dryland hay and grain and for sugar beets. Capability unit IVe-1(15); Loamy range site.

Positas Series

The Positas series consists of well-drained fine sandy loams that have a clay subsoil. These soils are in the upper Santa Ynez Valley on smooth, benchlike terraces that are broken by narrow, steep-sided drainageways. Slopes are 2 to 30 percent. The vegetation is annual grasses, forbs, and scattered oak trees. Elevations range from 400 to 900

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feet. The average annual rainfall is 15 to 20 inches, the average annual air temperature is about 60° F., and the frost-free season is 300 to 320 days. Positas soils are associated with the Santa Ynez soils.

In a representative profile, the surface layer is brown fine sandy loam about 18 inches thick. The subsurface layer is pale-brown heavy fine sandy loam about 3 inches thick. The subsoil is reddish-brown and brown clay and gravelly clay about 27 inches thick, underlain by weakly consolidated very gravelly clay. In some areas the surface layer is cobbly fine sandy loam.

Positas soils are used for shallow-rooted irrigated crops, for dryland grain, and for range.

Representative profile of the Positas series (about 1/2 mile southeast of Santa Ynez on airport property, about 650 feet south of the airport office):

Ap--0 to 10 inches, brown (10YR 5/3) fine sandy loam, dark brown (10YR 3/3) when moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine interstitial pores and common very fine and few fine tubular pores; medium acid (pH 6.0); abrupt, wavy boundary.

A1--10 to 18 inches, brown (10YR 5/3) fine sandy loam, dark brown (10YR 3/3) when moist; massive; very friable, slightly sticky and slightly plastic; common very fine roots; common very fine interstitial pores and common very fine and fine tubular pores; medium acid (pH 6.0); clear, irregular boundary.

A2--18 to 21 inches, pale-brown (10YR 6/3) heavy fine sandy loam, reddish brown (5YR 5/4) when moist (some mixed brown colors giving the appearance of a degraded B horizon); massive; hard, very friable, slightly sticky and slightly plastic; few micro roots; common very fine interstitial pores, common very fine pores, and few fine and medium tubular pores; few thin clay films in interstitial pores; medium acid (pH 6.0); abrupt, smooth boundary.

B21t--21 to 26 inches, reddish-brown (5YR 4/4) clay, dark reddish brown (5YR 3/3) when moist; moderate, coarse, prismatic structure; very hard, extremely firm, very sticky and very plastic; few micro roots; very few very fine interstitial pores and very few very fine tubular pores; many thin clay films on ped faces, continuous moderately thick clay films in the tubular and interstitial pores; common, thin, prominent black stains on mineral grains and ped faces; neutral (pH 7.0); gradual,irregular boundary.

B22t--26 to 42 inches, reddish-brown (5YR 4/3) clay, dark reddish brown (5YR 3/3) when moist; reddish brown (5YR 4/4) clay films on peds, dark-brown (7.5YR 3/4, 4/4, 10YR 4/3) blotches; weak, coarse, prismatic structure; very hard, extremely firm, very sticky and very plastic; very few micro roots; very few very fine interstitial pores; continuous thin clay films on ped faces and mineral grains, common thick clay films in tubular and interstitial pores; few, fine, prominent black stains on ped faces and mineral grains; neutral (pH 7.0); gradual, irregular boundary.

B23t--42 to 48 inches, brown (10YR 5/3) gravelly clay, dark brown (10YR 4/3) when moist; massive; very hard, very firm, very sticky and very plastic; few fine tubular pores; continuous thin clay films on mineral grains, and common thick clay films in pores; medium acid (pH 6.0); gradual, irregular boundary.

IIB3--48 to 60 inches, reddish-brown (5YR 4/3) very gravelly light clay, dark reddish brown (5YR 3/3) when moist; massive; very hard, firm, sticky and plastic; few very fine interstitial pores and few very fine and fine tubular pores; many moderately thick clay bridges between mineral grains; medium acid (pH 6.0).

The color of the A1 horizon ranges from brown to grayish brown. When the soil is moist the color is dark brown, and some soils have a reddish-yellow hue. An A2 horizon is present in each of the profiles examined, but it generally is thin and, in some places indistinct. The content of gravel and cobblestones ranges from none to about 35 percent throughout the profile; however, the B horizon is typically gravelly and cobbly. Depth to the clay ranges from less than 10 inches in eroded areas to about 26 inches in uneroded areas.

Positas fine sandy loam, 2 to 9 percent slopes (PtC).--This soil is gently sloping to moderately sloping and occurs on terraces in the vicinity of Santa Ynez. This soil has the profile described as representative for the series. Depth to the clay subsoil ranges from 20 to 26 inches.

Included in mapping are some small eroded areas that are pale brown in color and are less than 16 inches deep to the clay subsoil.

Permeability is very slow. Surface runoff is slow to medium, and the erosion hazard is slight to moderate. Fertility is low. The available water capacity is 4 to 5 inches in the 20- to 26-inch root zone. Very little moisture is available from the clay subsoil, and this small amount is available very slowly.

This soil is used for irrigated sugar beets for dryland grain, and for range. Capability units IIIe-3(14) and IVe-3(15); Claypan range site.

Positas fine sandy loam, 9 to 15 percent slopes (PtD).--This strongly sloping soil is on dissected terraces. The surface layer is about 12 to 20 inches thick.

Included in mapping are some severely eroded areas and areas that have a loam surface layer.

Permeability is very slow. Surface runoff is medium, and the erosion hazard is moderate. Fertility is low. The available water capacity is 2 to 3 inches in the 12- to 20-inch root zone. Very little moisture is available from the clay subsoil, and this small amount is available slowly.

This soil is used for range. Capability unit VIe-3(15); Claypan range site.

Positas fine sandy loam, 9 to 15 percent slopes, severely eroded (PtD3).--This strongly sloping soil is on dissected terraces. It has a profile similar to the one described as representative for the series except that much of the surface layer has been eroded away. The surface layer is only 6 to 12 inches thick, and the soil is dissected by numerous gullies and rills. This soil occupies a very small acreage in the survey area.

Included in mapping are noneroded areas. Also included are areas on slopes of less than 9 percent or of more than 15 percent where erosion is severe. Some areas where less than 6 inches of surface soil remains are also included.

Permeability is very slow. Surface runoff is rapid, and the erosion hazard is high. Fertility is very low. The available water capacity is 1 to 2 inches in the 6- to 12-inch root zone. Some moisture is available very slowly from the clay subsoil.

This soil is used for range. Capability unit VIIe-1(15); Claypan range site.

Positas fine sandy loam, 15 to 30 percent slopes (PtE).--This soil is strongly sloping and occurs on terrace breaks along drainagways. The areas of this soil are long, narrow, and irregular in shape. Depth to the clay subsoil ranges from 6 to 26 inches. About 10 to 25 percent of the entire soil profile is gravel and cobblestones.

Included in mapping are small areas of very gravelly or cobbly Positas soils and areas of severely eroded Positas soils.

Permeability is very slow. Surface runoff is rapid, and the erosion hazard is high. Fertility is low. The available water capacity is 1 to 4 inches in the 6- to 26-inch root zone. Some water is available very slowly from the clay subsoil.

This soil is used for range. Capability unit VIe-3(15); Claypan range site.

Positas cobbly fine sandy loam, 2 to 15 percent slopes (PuD).--This gently sloping to strongly sloping soil occurs on old alluvial fans on the south side of the Santa Ynez River in the vicinity of Lake Cachuma. These fans are at the mouths of drainageways that originate in the Santa Ynez Mountains. This soil has a profile similar to the one described as representative for the series except that 20 to 35 percent of the entire soil profile is well-rounded sandstone cobblestones and boulders. The surface layer is 10 to 20 inches thick.

Included in mapping are fairly large areas in which 35 to 60 percent of the soil profile is cobblestones and boulders.

Permeability is very slow. Surface runoff is medium, and the erosion hazard is moderate. Fertility is very low. The available water capacity is 1 to 2 inches in the 10- to 20-inch root zone. Very little moisture is available from the clay subsoil.

This soil is used for limited range. Capability unit VIe-3(15); Claypan range site.

Riverwash

Riverwash (Rs) is a miscellaneous land type that consists of water-deposited sand, gravel, cobblestones, and stones in active stream channels. It in inundated when water flows, and fresh deposits of materials are laid down and removed as a result of streambank erosion. Little or no vegetation grows in these areas except for a few clumps of sagebrush and scattered willows.

This land type has no value for farming, but is valuable as a source of sand and gravel. Capability unit VIIIw-4(14).

Rough Broken Land

Rough broken land (RuG) consists of steep to extremely steep, shallow soil materials over soft sandstone or semiconsolidated gravelly sediments (pl. V, bottom). Materials from Arnold, Chamise, and Kettleman soils make up most of this mapping unit. Slopes range from 30 to more than 75 percent. The vegetation is mainly sparse brush, grasses, forbs, and scattered small oak trees. Surface runoff is very rapid, and the erosion hazard is very severe. This land type contributes large amounts of runoff water and sediment to lower lying areas. These sediments often cause severe damage to buildings, fences, roads, soils, and crops. Dams built in watersheds occupied by this land type fill rapidly with sediment.

The sparse vegetation is needed to slow runoff and reduce erosion and should be protected from grazing and burning. Rough broken land should be used only as watershed. Capability unit VIIIe-1(14).

Salinas Series

The Salinas series consists of well-drained silty clay loams that formed on alluvial fans and flood plains. These soils are in scattered areas in the Santa Ynez, Santa Maria, and Los Alamos Valleys. Slopes are 0 to 15 percent. The vegetation is grasses, forbs, and scattered oak trees. Elevations range from 50 to 1,000 feet. The average annual rainfall is 10 to 15 inches, the average air temperature is about 58° F., and the frost-free season is 230 to 300 days. Salinas soils are associated with Agueda soils.

In a representative profile, the surface layer is dark-gray silty clay loam about 26 inches thick. The subsoil is gray silty clay loam about 15 inches thick, and is underlain by light brownish-gray silty clay loam that extends to a depth of more than 60 inches. In some areas the texture of the surface layer is loam.

Where water is available, the Salinas soils are used for irrigated crops. Otherwise, they are used for dryland crops. Small isolated areas are used for range.

Representative profile of the Salinas series (less than 1/2 mile south of Los Olivos, 0.3 mile

south of the intersection of Santa Barbara Avenue and Alamo Pintado Avenue, 80 feet east of the center of Santa Barbara Avenue and 60 feet north of cross fence):

Ap1--0 to 4 inches, dark-gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) when moist; moderate, fine and medium, granular structure; hard, friable, sticky and plastic; many very fine and fine roots; many very fine interstitial pores; moderately alkaline (pH 8.0); abrupt, smooth boundary.

Ap2--4 to 13 inches, dark-gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) when moist; weak, medium, subangular blocky structure; hard, very firm, sticky and plastic; common very fine and fine roots; common very fine tubular pores and common very fine interstitial pores; moderately alkaline (pH 8.0); abrupt, smooth boundary.

A1--13 to 26 inches, dark-gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) when moist; weak, coarse, subangular blocky and weak, fine, granular structure; hard, friable, sticky and plastic; common very fine and fine roots; many very fine tubular pores and many very fine interstitial pores; moderately alkaline (pH 8.0); clear, wavy boundary.

B2--26 to 34 inches, gray (10YR 5/1) silty clay loam, very dark grayish brown (10YR 3/2) when moist; weak, medium, subangular blocky structure; hard, firm, sticky and plastic; common very fine roots; many very fine and few medium tubular pores and many very fine interstitial pores; very few thin clay films in pores; moderately alkaline (pH 8.0); gradual, wavy boundary.

B3ca--34 to 41 inches, gray (10YR 5/1) silty clay loam, very dark grayish brown (10YR 3/2) when moist; massive; hard, firm, sticky and plastic; few very fine roots; many very fine tubular pores and many very fine interstitial pores; very few thin clay films in pores; strongly effervescent; disseminated lime and lime in fine, irregularly shaped, soft masses; moderately alkaline (pH 8.1); gradual, wavy boundary.

C1ca--41 to 56 inches, light brownish-gray (10YR 6/2) light silty clay loam, dark grayish brown (10YR 4/2) when moist; massive; hard, friable, sticky and plastic; few very fine roots; many very fine tubular pores and many very fine interstitial pores; violently effervescent; disseminated lime and lime in medium, irregularly shaped, soft masses; moderately alkaline (pH 8.0); abrupt, smooth boundary.

C2ca--56 to 70 inches, light brownish-gray (10YR 6/2) light silty clay loam with common, fine, faint mottles of pale brown (10YR 6/3), or grayish brown (10YR 5/2) with common, fine, faint mottles of brown (10YR 5/3) when moist; massive; hard, friable, sticky and plastic; very few very fine roots; many very fine tubular pores and many very fine interstitial pores; violently effervescent; disseminated lime and lime in medium, irregular, soft masses; moderately alkaline (pH 8.1).

The A horizon ranges in color from dark gray and very dark gray to grayish brown, and in texture from loam to silty clay loam. The C horizons contain varying amounts of lime and in many areas contain numerous gypsum crystals. In a few areas, from 0 to 15 percent of the profile is fragments of Monterey Shale.

Salinas loam, 0 to 2 percent slopes (SaA).--This soil is nearly level and occurs on broad flood plains primarily in the western part of the Santa Maria Valley in the vicinity of Guadalupe. It has a profile similar to that described as typical for the series except that it has a loam surface layer 18 to 22 inches thick.

Included in mapping are small areas that have a fine sandy loam surface layer. An area that has a clay layer below a depth of 4 feet is also included. A few areas in the vicinity of Los Olivos and Santa Ynez that have varying amounts of shale gravel throughout the profile are included.

Permeability is moderately slow. Surface runoff is very slow, and the erosion hazard is none to slight. Fertility is high. The available water capacity is 10 to 12 inches in the 60-inch root zone.

This soil is used for all crops normally grown in the Area. Capability unit I-1(14).

Salinas loam, 2 to 9 percent slopes (SaC).--This soil is in small, irregularly shaped areas in small valleys and on terrace breaks between levels of alluvial flood plains. It occurs in widely scattered areas in the western part of the Santa Maria Valley, in the Santa Ynez Valley, and in the Los Alamos Valley. This soil has a profile similar to the one described as representative for the series except that the surface layer is grayish-brown loam 18 to 22 inches thick.

Included in mapping are areas dissected by meandering stream channels. Areas of Agueda soils are also included.

Permeability is moderately slow. Surface runoff is slow to medium, and the erosion hazard is slight to moderate. Fertility is high. The available water capacity is 10 to 12 inches in the 60-inch root zone.

This soil is used for irrigated alfalfa, sugar beets, and walnuts. It is also used for dryland crops and for incidental annual pasture. Capability unit IIe-1(14).

Salinas loam, overflow, 0 to 2 percent slopes (SbA).--This soil is in small valleys and on flood plains that are flooded occasionally by runoff water from steeper soils. The areas of this soil are small and irregular in shape, and are located chiefly in Los Alamos Valley and in the Santa Ynez Valley. This soil has a profile similar to the one described

as representative for the series except that the texture throughout the profile is loam. During floods, fresh deposits of alluvium are laid down and removed.

Included in mapping are some gravelly areas, areas of Salinas silty clay loam, and areas of Salinas soils that have a sandy loam surface layer. Some areas of Agueda soils are also included.

Permeability is moderate. Surface runoff is slow except where water runs in from adjacent steeper soils. The erosion hazard is slight to moderate. Fertility is high. The available water capacity is 9 to 11 inches in the 60-inch root zone.

This soil is used for irrigated and dryland crops and for incidental pasture. Capability unit IIw-1 (14).

Salinas silty clay loam, 0 to 2 percent slopes (SdA).--This nearly level soil is on alluvial fans and flood plains. It has the profile described as representative for the series.

Included in mapping are some areas in the Santa Ynez Valley that are gravelly. Some small included areas have sand below a depth of 4 feet. Also included are some Agueda soils.

Permeability is moderately slow. Surface runoff is very slow, and the erosion hazard is none to slight. Fertility is very high. The available water capacity is 11 to 13 inches in the 60-inch root zone.

This soil is used for a variety of irrigated and dryland crops. Capability unit I-1(14).

Salinas silty clay loam, 2 to 9 percent slopes (SdC).--This soil is similar to Salinas silty clay loam, 0 to 2 percent slopes, except that it is about 5 to 15 percent gravel, by volume. It occupies alluvial fans in small sloping valleys and terrace breaks between levels of alluvial terraces. The soil occurs mainly in the Santa Ynez Valley. The areas of this soil are commonly small and irregular in shape. In the narrow valley the soil is dissected by meandering channels.

Included in mapping are a few areas in the Lompoc Valley and along the ocean in Vandenberg Air Force Base that are finer textured and, as a result, are farmed with greater difficulty.

Permeability is moderately slow. Surface runoff is slow to medium, and the erosion hazard is slight to moderate. Fertility is very high. The available water capacity is 11 to 13 inches in the 60-inch root zone.

This soil is used for alfalfa, sugar beets, and walnuts. Because of the irregular shape and small size of the areas, the soil is difficult to irrigate. It is, therefore, used chiefly for dryland small grains and hay. Capability unit IIe-1(14).

Salinas and Sorrento loams, 9 to 15 percent slopes (SeD).--This complex is made up of many irregularly shaped tracts that are scattered widely throughout the survey area. It occurs on long narrow terrace breaks between different levels of alluvial flood plains and on small alluvial fans along minor drainageways. The alluvial fans are commonly dissected by deeply entrenched channels. The Sorrento and Salinas soils are intermingled in the same area or occur alone in separate areas. The complex is about 40 percent Sorrento loam and 40 percent Salinas loam.

Included in mapping are small areas of Mocho soils. Also included are Salinas and Sorrento soils that have a sandy loam or silty clay loam surface layer.

Both soils are moderately permeable. Surface runoff is medium, and the erosion hazard is moderate. Fertility is high to very high. The available water capacity is 10 to 12 inches in the 60-inch root zone.

These soils are used for dryland grain and for range. Capability unit IIIe-1(15); Loamy range site.

San Andreas Series

The San Andreas series consists of well-drained fine sandy loams that are underlain by soft sandstone bedrock at a depth of 20 to 40 inches. These soils occur on uplands, mainly in the Solomon Hills. Slopes are 5 to 75 percent. The vegetation is annual grasses and forbs along with scattered oak trees and patches of brush. Elevations range from 200 to 2,500 feet. The average annual rainfall is 13 to 18 inches, the average annual air temperature is about 58° F., and the frost-free season is 240 to 300 days.

San Andreas soils are associated with the Arnold and Tierra soils. They are so intermingled with the Tierra soils that it was impractical to map them separately; for this reason, San Andreas soils are mapped only in complexes with the Tierra soils in this survey area.

In a representative profile, the surface layer is grayish-brown and brown fine sandy loam and is about 15 inches thick. The subsoil is grayish-brown and brown very fine sandy loam. This layer extends to a depth of about 28 inches, where it is underlain by soft, medium-grained, fractured sandstone.

San Andreas soils are used only for range. Numerous oil wells have been dug in scattered areas of this soil.

Representative profile of the San Andreas series (4 miles northwest from U.S. Highway No. 101 on Cat Canyon Road to the summit, 0.5 mile north on oil well road, 35 feet west of road on hillside, 125 feet south of gas meter):

A11--0 to 1 1/2 inches, grayish-brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) when moist; moderate, medium, granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine interstitial pores; neutral (pH 7.0); abrupt, smooth boundary.

A12--1 1/2 to 15 inches, brown (10YR 5/3) fine sandy loam, dark brown (10YR 3/3) when moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine interstitial pores and many very fine tubular pores; medium acid (pH 6.0); clear, smooth boundary.

B21--15 to 24 inches, grayish-brown (10YR 5/2) very fine sandy loam, very dark grayish brown (10YR 3/2) when moist; massive; hard, friable, sticky and plastic; common very fine roots; common very fine interstitial pores and many very fine tubular pores; common thin clay films in bridges and pores; medium acid (pH 6.0); gradual, irregular boundary.

B22--24 to 28 inches, brown (10YR 5/3) very fine sandy loam, dark brown (10YR 3/3) when moist; massive; hard, friable, sticky and plastic; few very fine roots; common very fine interstitial pores and many very fine tubular pores; common thin clay films in bridges and in pores; medium acid (pH 6.0); abrupt, irregular boundary.

C--28 inches, very pale brown (10YR 8/4) soft, medium-grained sandstone with coating of reddish brown (2.5YR 5/4) and dark reddish brown (2.5YR 3/4) on joints; very pale brown (10YR 7/3) when moist; rock is fragmented in the top 6 to 8 inches and massive below. Bedrock is slightly brittle but can be broken by hand.

Texture of the A horizon is sandy loam, fine sandy loam, or very fine sandy loam. The B horizon is 12 to 20 inches below the surface. In most areas the B horizon normally is loam, very fine sandy loam, or light clay loam. Depth to bedrock ranges from 20 inches to 50 inches and averages about 28 inches. Reaction is neutral to medium acid.

San Andreas-Tierra complex, 5 to 15 percent slopes (SfD).--The gently sloping to strongly sloping soils that make up this complex are on low hills and ridgetops. They are underlain by soft, massive sandstone or deeply weathered, soft sandstone. The San Andreas soil generally is in convex rounded areas, and the Tierra soil is in concave areas where moisture is concentrated. These soils are in such intricate patterns that mapping them separately was impractical. About 50 percent of the mapping unit is San Andreas fine sandy loam and 40 percent is Tierra sandy loam. Crow Hill and Gaviota soils make up the remaining 10 percent.

The San Andreas soil has the profile described as representative for the San Andreas series. The profile of the Tierra soil is similar to the one described as representative for the series except that this soil has a sandy loam surface layer over a clay subsoil. Where the two soils merge the profiles vary widely, particularly in the amount of clay in the subsoil. In some areas the surface layer is brown sandy loam directly overlying the sandstone, and there is no subsoil. In some small areas the soil contains lime throughout the profile. In some areas the Tierra soil has a perched seasonal water table above the clay subsoil.

The San Andreas soil is well drained and moderately permeable. Surface runoff is slow to medium, and the erosion hazard is slight to moderate. Fertility is moderate. The available water capacity is 4 to 6 inches in the 24- to 40-inch root zone.

The Tierra soil is moderately well drained and very slowly permeable. Surface runoff is medium, and the erosion hazard is moderate. Fertility is low. The available water capacity is 2 to 4 inches in the 16- to 26-inch root zone.

These soils are used chiefly for range. A few scattered areas are used for dryland hay. Capability unit IVe-3(15); San Andreas soil is in Loamy range site; Tierra soil is in Claypan range site.

San Andreas-Tierra complex, 15 to 30 percent slopes (SfE).--These soils are moderately steep and occur on hills. The San Andreas and Tierra soils are in such intricate patterns that mapping them separately was impractical. San Andreas fine sandy loam makes up about 60 percent of this complex, and Tierra sandy loam, about 25 percent. The rest is severely eroded San Andreas, Tierra, Gaviota, and Crow Hill soils.

Each of the major soils has a profile that is similar to the one described as representative for its series except that the Tierra soil has a sandy loam surface layer over a clay subsoil.

The San Andreas soil is well drained and is moderately permeable. Surface runoff is medium, and the erosion hazard is moderate. Fertility is moderate. The available water capacity is 3 to 5 inches in the 22- to 30-inch root zone.

The Tierra soil is moderately well drained. Permeability is very slow. Surface runoff is rapid, and the erosion hazard is high. Fertility is low. The available water capacity is 1 inch to 3 inches in the 8- to 24-inch root zone.

These soils are used for range, wildlife, and watershed. Capability unit VIe-3(15); San Andreas soil is in Loamy range site; Tierra soil is in Claypan range site.

San Andreas-Tierra complex, 9 to 45 percent slopes, severely eroded (SfF3).--The soils that make up this complex are strongly sloping to steep and occur on uplands. They are in such intricate patterns that mapping them separately was impractical. Each soil has a profile similar to the one described as representative for its respective series, but the Tierra soil is sandy loam over a clay subsoil. These soils are severely eroded and are cut by deep gullies and rills in most areas. In some areas much of the surface layer has been removed and the subsoil is exposed. About 50 percent of the mapping unit is San Andreas fine sandy loam, and about 40 percent is Tierra sandy loam.

Included in mapping are areas of San Andreas and Tierra soils that are deeper and not so severely eroded. Also included are some areas of Crow Hill and Gaviota soils. These inclusions make up about 10 percent of the complex.

The San Andreas soil is well drained and moderately permeable. Surface runoff is rapid, and the erosion hazard is high. Fertility is low. The available water capacity is 3 to 4 inches in the 18- to 26-inch root zone.

The Tierra soil is moderately well drained and very slowly permeable. Surface runoff is very rapid,

and the erosion hazard is very high. Fertility is low. The available water capacity is 1 inch to 3 inches in the 6- to 18-inch root zone.

These soils are used for range, wildlife, and watershed. Capability unit VIIe-1(15); San Andreas soil is in Shallow Loamy range site; Tierra soil is in Claypan range site.

San Andreas-Tierra complex, 30 to 75 percent slopes (SfG).--The steep to very steep soils that make up this complex occur mainly in the vicinity of Cat and Howard Canyons. The Tierra soil commonly occupies the concave, swalelike areas and in many places has fluted gullies. The San Andreas soil occupies the steeper side slopes. About 60 percent of the mapping unit is San Andreas fine sandy loam, and about 25 percent is Tierra sandy loam. The remaining 15 percent consists of severely eroded areas and of Crow Hill and Gaviota soils. Other included soils are San Andreas and Tierra soils that have a loam surface layer. These soils are in such intricate patterns that mapping them separately was impractical.

The San Andreas soil is well drained and moderately permeable. Fertility is moderate. The available water capacity is 3 to 4 inches in the 20- to 26-inch root zone.

The Tierra soil is moderately well drained and very slowly permeable. Fertility is low. The available water capacity is 1 inch to 3 inches in the 6- to 18-inch root zone.

On both soils the surface runoff is very rapid, and the erosion hazard is very high.

These soils are used for range, wildlife, and watershed. Capability unit VIIe-1(15); San Andreas soil is in Steep Loamy range site; Tierra soil is in Claypan range site.

San Benito Series

The San Benito series consists of well-drained clay loams underlain by fractured, fine-grained shale bedrock at a depth of 20 to 48 inches. These soils are on hills and mountains where slopes range from 15 to 75 percent. The vegetation is annual grass, grass and oak trees, or a combination of grass, oak, and brush cover. Elevations range from 400 to 2,000 feet. The average annual rainfall is 12 to 18 inches, the average annual air temperature is about 59° F., and the frost-free season is 240 to 290 days. San Benito soils are associated with the Diablo and Los Osos soils. In this survey area, San Benito soils were mapped only in complexes with Los Osos or Diablo soils.

In a representative profile, the surface layer is dark-brown and brown clay loam about 26 inches thick. The underlying material is pale-brown calcareous gravelly clay loam that blends into fractured fine-grained shale at a depth of about 48 inches.

San Benito soils are used for range, wildlife, and watershed.

Representative profile of the San Benito series (on Adams Ranch, south from highway No. 166 on Buckhorn Road to summit, east of Buckhorn Road along ranch road about 3/8 mile northwest of summit):

A11--0 to 4 inches, dark-brown (10YR 4/3) clay loam, very dark grayish brown (10YR 3/2) when moist; strong, fine and coarse, granular structure; very hard, very friable, sticky and plastic; common very fine and very few coarse roots; many fine interstitial pores; few rock fragments; mildly alkaline (pH 7.5); abrupt, smooth boundary.

A12--4 to 14 inches, dark-brown (10YR 4/3) clay loam, very dark grayish brown (10YR 3/2) when moist; moderate, coarse and medium, subangular blocky structure breaking to fine granular structure; very hard, friable, sticky and plastic; few micro to medium roots; common fine and few coarse tubular pores; few rock fragments; mildly alkaline (pH 7.5); clear, irregular boundary.

A13--14 to 26 inches, brown (10YR 5/3) gravelly clay loam, dark brown (10YR 3/3) when moist; weak, coarse, subangular blocky breaking to weak, fine, granular structure; very hard, friable, sticky and plastic; few micro, medium, and coarse roots; common fine and very few medium pores and coarse tubular pores; horizon is about 20 percent rock fragments; mildly alkaline (pH 7.5); clear, irregular boundary.

C1ca--26 to 48 inches, pale-brown (10YR 6/3) gravelly clay loam, yellowish brown (10YR 5/4) when moist; weak, coarse, subangular blocky structure; hard, friable, sticky and plastic; very few fine and medium roots; few fine pores and very few very fine tubular pores; horizon is about 30 percent rock fragments; strongly effervescent; disseminated lime; moderately alkaline (pH 8.2); gradual, irregular boundary.

C2--48 to 60 inches, pale-brown (10YR 6/3) clay loam, yellowish brown (10YR 5/4) when moist; weak, medium, subangular blocky structure; hard, friable, sticky and plastic; very few fine, medium, and coarse roots; few fine and very few medium pores; horizon is about 90 percent shale fragments; strongly effervescent; moderately alkaline (pH 8.2).

R--60 inches, fractured shale.

Color of the A horizon ranges from brown to dark brown. Depth to bedrock ranges from 20 to 48 inches. The texture normally is finer slightly above the bedrock than it is in the upper layers, but clay films are rarely discernible. Lime content ranges from high concentration of disseminated lime throughout the C horizon to a few lime seams and coatings on rock fragments and on peds in the lower part of the profile. In some places stones, mostly detached, cover 1 to 2 percent of the surface. In some places there are no stones.

San Benito-Diablo complex, 30 to 45 percent slopes (SgF).--These steep soils are in mountainous areas in the vicinity of Buckhorn Road. About 55 percent of the mapping unit is San Benito clay loam and 35 percent is Diablo silty clay. These soils

are in such intricate patterns that mapping them separately was impractical. About 10 percent of the complex consists of inclusions of stony or rocky soils and of Los Osos soils.

Each of the major soils has a profile similar to the one described as representative for its series, though the Diablo soil is 20 to 36 inches deep over bedrock. Both have rapid runoff and are highly susceptible to erosion. Their fertility is high.

In the San Benito soil, permeability is moderately slow. The available water capacity is 6 to 9 inches in the 36- to 48-inch root zone.

The Diablo soil is slowly permeable, and the available water capacity is 4 to 6 inches in the 20- to 36-inch root zone.

These soils are used for range, wildlife, and watershed. Capability unit VIe-5(15); Clayey range site.

San Benito-Diablo complex, 45 to 75 percent slopes (SgG).--As much as 75 percent of this complex is San Benito clay loam, and 20 percent is Diablo silty clay. Included in mapping are some very shallow severely eroded areas and areas where rocks crop out. These inclusions make up 5 percent of the mapping unit.

Each of the major soils has a profile similar to the one described as representative for its series. The Diablo soil, however, is 20 to 30 inches deep to bedrock.

In the San Benito soil, permeability is moderately slow. The available water capacity is 6 to 8 inches in the 34- to 40-inch root zone.

The Diablo soil is slowly permeable, and the available water capacity is 4 to 5 inches in the 20- to 30-inch root zone.

Both soils have very rapid surface runoff and are very highly susceptible to erosion. Their fertility is high.

These soils are used for range, wildlife, and watershed. Capability unit VIIe-5(15); Clayey range site.

Sandy Alluvial Land

Sandy alluvial land (Sh) consists of excessively drained, coarse, stratified, river-deposited material. It occupies low, nearly level land adjacent to riverbeds. Since it is slightly higher than the river flood plains, this land type is not flooded during normal flow periods; however, it is subject to overflow during moderate and severe floods. The surface is somewhat uneven as a result of soil blowing and channelling by floodwaters. The vegetation is chiefly scattered sagebrush, small trees, and sparse annual grasses and forbs. Layers of fine sand and silt are commonly intermingled with strata of coarse sand and gravel.

This land type has limited use as range. It is generally not suitable for cultivation, although some selected areas are used for strawberries. Capability unit VIIw-4(14); Sandy Alluvial range site.

Sandy Alluvial Land, Wet

Sandy alluvial land, wet (Sk), is made up of strata of coarse or moderately coarse materials recently deposited by wind and water. It commonly contains strata of peat in the profile. In some places the profile is mottled throughout. In all areas the substrata are mottled.

This land type occurs in small areas scattered throughout large and small valleys and within areas of dune land. A water table is within 2 to 3 feet of the surface at least part of the year. A few areas are waterlogged within a foot of the surface throughout the year. In some areas the vegetation consists of willows, alders, brush, and water-tolerant grasses and forbs. In others it is willows, marshgrass, sedges, and saltgrass.

This land type has limited use for range late in summer and in fall. Forage production is low, and the quality is poor. Capability unit VIIw-9(14); Saline range site.

Santa Lucia Series

The Santa Lucia series consists of well-drained very shaly clay loams 20 to 44 inches deep over shale. They occur on hills and mountains in the northern and western coastal part of the survey area. These soils have slopes of 9 to 75 percent. The vegetation varies widely. The most typical plant cover is oak trees with annual grasses and forbs. Sagebrush covers some of the shallow, eroded, and very steep areas. A few areas are fairly open and have annual grasses, forbs, and scattered oak trees. Elevations range from 300 to 3,000 feet. The average annual rainfall is 14 to 22 inches, the average annual air temperature is about 58° F., and the frost-free season is 210 to 300 days. Santa Lucia soils are associated with Crow Hill and Lopez soils.

In a representative profile, very dark gray shaly clay loam and very shaly clay loam about 24 inches thick is underlain by fractured, hard, brittle, siliceous shale bedrock.

The Santa Lucia soils are used for range, wildlife, and watershed.

Representative profile of the Santa Lucia series (1.8 miles south of Guadalupe on Highway No. 1 to Point Sal Road, 3.9 miles southwest on Point Sal Road, 3.8 miles southeast on ranch road, NW1/4 NE1/4 sec. 5, T. 9 N., R. 35 W.):

A11--0 to 8 inches, very dark gray (10YR 3/1) shaly light clay loam, black (10YR 2/1) when moist; 10 percent, by volume, is angular shale fragments larger than 3/4 inch across; about 27 percent, by volume, is shale fragments larger than 2 millimeters; coarse and medium, subangular blocky structure; on about three-fourths of the acreage mapped, the upper 3/4 to 1 inch has medium to strong, fine, granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine

roots; many very fine interstitial pores; medium acid (pH 6.0); gradual, wavy boundary.

A12--8 to 17 inches, very dark gray (10YR 3/1) very shaly light clay loam slightly finer than A11 horizon, black (10YR 2/1) when moist; 50 percent, by volume, is angular shale fragments larger than 3/4 inch across; about 15 percent, by volume, is shale fragments larger than 2 millimeters but less than 3/4 inch across; strong, fine and medium, granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine interstitial pores; medium acid (pH 6.0); gradual, wavy boundary.

A13--17 to 24 inches, very dark gray (10YR 3/1) very shaly clay loam, black (10YR 2/1) when moist; 50 percent, by volume, is shale fragments larger than 3/4 inch across; about 15 percent, by volume, is shale fragments larger than 2 millimeters but less than 3/4 inch across; strong, fine and medium, granular structure; slightly hard, friable, sticky and plastic; many very fine roots; many very fine interstitial pores; strongly acid (pH 5.5); abrupt, irregular boundary.

R--24 inches, hard, weakly fractured Monterey shale; locally dips from 24 inches on left face of pit to 35 inches on right.

Color of the A11 horizon normally is dark gray, gray, and very dark gray. Soil reaction is slightly acid to medium acid. Texture is mostly shaly clay loam, but in some places is shaly clay. Shale fragments in the A11 horizon make up 20 to 50 percent of the soil mass and increase with depth to 60 to 90 percent of the A12 and A13 horizons. The bedrock is brittle, hard, and in some places porcelaneous, diatomaceous shale. In a few places the Santa Lucia soils have slight clay accumulation in the upper part of the fractured bedrock. Depth to bedrock ranges from 20 to 44 inches.

Santa Lucia shaly clay loam, 9 to 15 percent slopes (SmD).--This gently rolling soil is on hills. Some tracts occur in swalelike areas that are surrounded by steeper soils. This soil is 36 to 44 inches deep to bedrock.

Included in mapping are small areas of Crow Hill soils. Some small areas of steeper Santa Lucia soils are also included.

Permeability is moderate. Surface runoff is medium, and the erosion hazard is moderate. Fertility is moderate. The available water capacity is 4 to 6 inches in the 36- to 44-inch root zone.

This soil is used for range. Some areas, which were used for dryland grain or hay, have been returned to range. Capability unit IIIe-1(15); Loamy range site.

Santa Lucia shaly clay loam, 15 to 30 percent slopes (SmE).--This soil is rolling and occurs on hills and in small irregular areas in mountains. It has the profile described as representative for the series. Depth to bedrock is 20 to 36 inches.

Included in mapping are some eroded areas that have less than 20 inches of soil over the rock. Also included are some areas of Crow Hill and Lopez soils.

Permeability is moderate. Surface runoff is medium to rapid, and the erosion hazard is moderate to high. Fertility is moderate. The available water capacity is 2 to 5 inches in the 20- to 36-inch root zone.

This soil is used for range. Capability unit IVe-1(15); Loamy range site.

Santa Lucia shaly clay loam, 30 to 45 percent slopes (SmF).--This steep soil is on hills and mountains. It is about 24 to 30 inches deep over diatomaceous shale (pl. VI, top).

Included in mapping are areas of Crow Hill and Lopez soils. Also included are Santa Lucia soils that are eroded.

Permeability is moderate. Surface runoff is rapid, and the erosion hazard is high. Fertility is moderate. The available water capacity is 3 to 5 inches in the 24- to 30-inch effective root zone.

This soil is used for range, wildlife, and watershed. Capability unit VIe-1(15); Loamy range site.

Santa Lucia shaly clay loam, 15 to 45 percent slopes, eroded (SmF2).--This soil occurs in small isolated areas scattered throughout the western part of the survey area. Erosion, generally in the form of rills and gullies, is variable, and the surface is rough and uneven. Depth to rock is 20 to 30 inches.

Included in mapping are small areas of noneroded Santa Lucia soils and areas of Crow Hill and Lopez soils.

Permeability is moderate. Surface runoff is rapid, and the erosion hazard is high. Fertility is low. The available water capacity is 2 to 5 inches in the 20- to 30-inch root zone.

This soil is used for range, wildlife, and watershed. Capability unit VIIe-1(15); Shallow Loamy range site.

Santa Lucia shaly clay loam, 45 to 75 percent slopes (SmG).--This very steep soil is extensive and occurs in mountainous areas. Depth to rock is 20 to 24 inches.

Included in mapping are small areas of Crow Hill and of Lopez soils. Some areas of eroded Santa Lucia soils are also included.

Permeability is moderate. Surface runoff is very rapid, and the erosion hazard is very high. Fertility is moderate. The available water capacity is 2 to 4 inches in the 20- to 24-inch root zone.

This Santa Lucia soil is used for range, wildlife, and watershed. Capability unit VIIe-1(15); Steep Loamy range site.

Santa Ynez Series

The Santa Ynez series consists of moderately well drained gravelly fine sandy loams underlain by

gravelly clay subsoils. These soils developed on old water-laid terraces, commonly in swales, but also on higher terraces. They occur in the vicinity of Santa Ynez. Slopes are 2 to 30 percent. The vegetation is annual grasses, forbs, and scattered oak trees. Elevations range from 600 to 800 feet. The average annual rainfall is 15 to 20 inches, the average annual air temperature is about 60° F., and the frost-free season is 260 to 300 days. Santa Ynez soils are associated with Positas soils.

In a representative profile, the surface layer is gray and light brownish-gray gravelly fine sandy loam and loam about 22 inches thick. The subsurface layer is light-gray fine sandy loam about 3 inches thick. The subsoil is dark grayish-brown to light-gray gravelly clay, very gravelly clay, and very gravelly clay loam extending to a depth of more than 60 inches. In some places the texture of the surface layer is clay loam.

Santa Ynez soils are used for irrigated and dryland crops and for range.

Representative profile of the Santa Ynez series (approximately 2 miles east of Ballard, 1/2 mile east of the intersection of San Marcos Pass Road and Baseline Road, 75 feet south of Baseline Road in field, about 150 feet southeast of irrigation pump):

Ap1--0 to 4 inches, gray (10YR 5/1) gravelly fine sandy loam, very dark gray (10YR 3/1) when moist; moderate, medium, granular and weak, medium, subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine and few fine roots; many micro interstitial pores; strongly acid (pH 5.4); clear, smooth boundary.

Ap2--4 to 14 inches, gray (10YR 5/1) gravelly fine sandy loam, very dark gray (10YR 3/1) when moist; weak, medium, angular blocky structure; hard, very friable, slightly sticky and slightly plastic; common very fine and very few fine roots; many micro interstitial pores and common very fine and few fine tubular pores; medium acid (pH 5.8); clear, wavy boundary.

A1--14 to 22 inches, light brownish-gray (10YR 6/2) light loam, very dark grayish brown (10YR 3/2) when moist; about 1/5 of this horizon is light gray (10YR 7/2) when dry, dark grayish brown (10YR 4/2) when moist; moderate, medium, subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine and very few fine roots; many very fine interstitial pores and common very fine, fine, and medium tubular pores; medium acid (pH 6.0); light-gray part apparently is lumps of A2 horizon material; abrupt, smooth boundary.

A2--22 to 25 inches, light-gray (10YR 7/1) fine sandy loam, grayish brown (10YR 5/2) when moist; moderate, medium, subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine and very few fine roots; many very fine interstitial pores, many very fine pores, and common fine and medium tubular pores; slightly acid (pH 6.2); very abrupt, smooth boundary.

B21t--25 to 32 inches, dark grayish-brown and dark-gray (10YR 4/2, 4/1) gravelly clay, colors of ped exteriors and clay films mixed, very dark brown and very dark grayish brown (10YR 2/2, 3/2) when moist; ped interiors are mixed light gray and light brownish gray (2.5Y 7/2, 6/2), grayish brown and light olive brown (2.5Y 5/2, 5/4) when moist; weak, medium, prismatic and moderate, angular, blocky structure; very hard, firm, very sticky and plastic; common very fine roots on exterior of peds; few very fine interstitial pores and few very fine tubular pores; continuous moderately thick clay films line pores and many thick clay films on ped faces; medium acid (pH 5.8); gradual, wavy boundary.

B22t--32 to 44 inches, mixed light-gray (2.5Y 7/2) and pale-olive (5Y 6/3) very gravelly light clay, olive gray (5Y 5/2) and olive (5Y 5/3) when moist; clay films are dark grayish brown (10YR 4/2) and very dark brown (10YR 2/2) when moist; weak, coarse, prismatic structure; very hard, firm, very sticky and plastic; no roots; few very fine interstitial pores and few very fine closed tubular pores; continuous moderately thick clay bridges between mineral grains, common thick clay films on ped faces and pores; medium acid (pH 6.0); gradual, wavy boundary.

B31t--44 to 62 inches, light-gray (2.5Y 7/2) very gravelly light clay, grayish brown (2.5Y 5/2) when moist; dark grayish-brown (10YR 4/2) clay films in joints and pores, very dark brown (10YR 2/2) when moist; massive; very hard, friable, sticky and plastic; common very fine and few interstitial pores; many moderately thick clay bridges between mineral grains and common thick clay films in joints and pores; slightly acid (pH 6.2); gradual, smooth boundary.

B32t--62 to 72 inches, mixed light-gray and grayish-brown (10YR 7/2, 5/2) very gravelly clay loam, dark grayish brown and brown (10YR 4/2, 5/3) when moist; massive; very hard, friable, sticky and plastic; many very fine and fine interstitial pores; continuous thin clay films in bridges between mineral grains and common moderately thick clay films in joints; medium acid (pH 6.0).

Color of the A1 and Ap horizons ranges from gray to dark grayish brown and light brownish gray. The texture ranges from fine sandy loam to clay loam. From 5 to 30 percent of these horizons is gravel. The A2 horizon is 3 to 10 inches thick. In the Bt horizon, colors are mixed, ranging widely from dark grayish brown and dark gray to light gray and pale olive. Gravel content ranges from 15 to 55 percent in the Bt horizon. Soil reaction throughout the profile ranges from strongly acid to slightly acid.

Santa Ynez gravelly fine sandy loam, 2 to 9 percent slopes (SnC).--This soil is gently sloping to moderately sloping and occurs on slightly dissected low terraces. It has the profile described as representative for the series. Depth to the clay subsoil is 20 to 30 inches. On the more gentle slopes a perched water table forms above the clay subsoil for a short period after rains or irrigation.

Included in mapping are some areas of Santa Ynez soils, 0 to 2 percent slopes. This included soil is somewhat poorly drained and is less erodible than normal for this mapping unit.

Permeability is very slow. Surface runoff is slow to medium, and the erosion hazard is slight to moderate. Fertility is low. The available water capacity is 3.5 to 5.0 inches; some moisture is available slowly from the clay subsoil. The effective rooting depth is 20 to 30 inches.

This soil is used for irrigated alfalfa, sugar beets, walnuts, and pasture. It is also used for dryland crops. Capability units IIIe-3(14) and IVe-3(15); Claypan range site.

Santa Ynez gravelly fine sandy loam, 9 to 15 percent slopes (SnD).--This strongly sloping soil occurs on terrace breaks adjacent to the more gently sloping Santa Ynez soils. Depth to the clay subsoil ranges from 20 to 29 inches.

Included in mapping are small areas of a Santa Ynez soil that has a gravelly loam surface layer. Also included are some Santa Ynez soils that slope less than 9 percent. Some Positas soils are also included.

Permeability is very slow. Surface runoff is medium, and the erosion hazard is moderate. Fertility is low. The available water capacity is 3.5 to 5.0 inches in the 20- to 29-inch root zone. Some moisture is available very slowly from the clay subsoil.

This soil is used mainly for range. Very small areas are used for dryland hay. Capability unit IVe-3(15); Claypan range site.

Santa Ynez clay loam, 2 to 9 percent slopes (SoC).--This soil is gently sloping to moderately sloping and occurs on terraces. It has a profile similar to the one described as representative for the series except that this soil has a dark-gray clay loam surface layer that is 5 to 15 percent gravel. Depth to the clay subsoil is about 18 to 26 inches.

Included in mapping are small areas of Santa Ynez clay loam that are level or have slopes of less than 2 percent. This included soil is somewhat poorly drained and has a perched water table above the clay subsoil for short periods.

Permeability is very slow. Surface runoff is slow to medium, and the erosion hazard is slight to moderate. Fertility is moderate. The available water capacity is 4 to 5 inches in the 18- to 26-inch effective root zone. Some moisture is available slowly from the clay subsoil.

This soil is used for shallow-rooted irrigated and dryland crops. Capability units IIIe-3(14), IVe-3(15); Claypan range site.

Santa Ynez clay loam, 9 to 30 percent slopes (SoE).--This soil is rolling to hilly and occurs on dissected terraces. It has a profile similar to the one described as representative for the series except that the surface layer is dark-gray clay loam that is 5 to 15 percent gravel. Depth to the clay subsoil is 10 to 28 inches.

Included in mapping are some areas of Positas soils. Also included are areas of soils that have a sandy loam and loam surface layer. Other included areas of soils are eroded, and the subsoil is exposed.

Permeability is very slow. Surface runoff is medium to rapid, and the erosion hazard is moderate to high. Fertility is low. The available water capacity is 2 to 5 inches in the 10- to 28-inch root zone. Some water is available slowly from the clay subsoil.

This soil is used for range, wildlife, and watershed. Capability unit VIe-3(15); Claypan range site.

Sedimentary Rock Land

Sedimentary rock land (SpG) consists of very steep to extremely steep upland areas of shallow soil on sandstone and shale bedrock. This miscellaneous land type occurs in hills and mountains where slopes commonly range from 6 to more than 75 percent. Rock outcrops cover 30 percent or more of the surface, and the soil normally is not more than 10 inches thick over the bedrock. The vegetation is commonly chaparral, although some areas have a sparse cover of sagebrush and grass. Runoff is very rapid, and where the cover is burned or otherwise destroyed the erosion hazard is severe.

This land type is suitable for use only as watershed. In many areas the cover provides hiding areas for game and other animals. Capability unit VIIIs-1 (15).

Shedd Series

The Shedd series consists of well-drained silty clay loams underlain by calcareous shale bedrock at a depth of 18 to 50 inches. These soils occur on hills and mountains throughout all the survey area except the drier eastern part of the Cuyama Valley. Slopes are 15 to 75 percent. The vegetation is chiefly annual grasses and bur clover, although extensive steep and shallow areas are covered with purple sage. Elevations range from 200 to 2,500 feet. The average annual rainfall is 14 to 16 inches, the average annual air temperature is about 60° F., and the frost-free season is 180 to 290 days. Shedd soils are associated with Linne soils.

In a representative profile, light brownish-gray, pale-brown, and light-gray silty clay loam overlies soft, partly consolidated, fragmented shale at a depth of about 43 inches. The soils are calcareous throughout.

Shedd soils are used mainly for range, but small areas are used for dryland hay and grain.

Representative profile of the Shedd series (on the Suey Ranch, approximately 3.2 miles east on Highline Road from the Buckhorn Road and Highline Road intersection, at Buckhorn Road Summit):

A11--0 to 2 inches, light brownish-gray (10YR 6/2) silty clay loam, dark brown (10YR 4/3) when moist; strong, very fine granular structure; hard, firm, very sticky and plastic; common very fine roots; moderately alkaline (pH 8.0); strongly effervescent; clear, smooth boundary.

A12--2 to 10 inches, pale-brown (10YR 6/3) silty clay loam, dark grayish brown (10YR 4/2) when moist; weak, coarse, subangular blocky and moderate, medium, granular structure; hard, friable, very sticky and very plastic; common fine roots; moderately alkaline (pH 8.0); strongly effervescent; gradual, smooth boundary.

A13--10 to 21 inches, pale-brown (10YR 6/3) silty clay loam, dark grayish brown (10YR 4/2) when moist; moderate, medium, subangular blocky structure; hard, firm, very sticky and very plastic; common very fine roots; moderately alkaline (pH 8.0); strongly effervescent; clear, smooth boundary.

Cca--21 to 43 inches, light-gray (10YR 7/2) silty clay loam, dark grayish brown (10YR 4/2) when moist; weak, medium, subangular blocky structure; hard, firm, very sticky and very plastic; few very fine roots; strongly alkaline (pH 8.5); violently effervescent; abrupt, irregular boundary.

R--43 inches, light brownish-gray (10YR 6/2) fragmented shale; no slickensides and no clay films on the shale fragments.

The A1 horizon ranges in color from light brownish gray to grayish brown or pale brown. Depth to bedrock ranges from 18 to 50 inches. The parent material varies from brittle, fractured shale to soft, semiconsolidated, marly soil material.

Since this survey was completed, the Shedd soils defined as being normally dry in all parts of the soil profile and generally receive less than 10 inches of rainfall annually. The more moist soils classified as Shedd soils in this survey will be classified as soils of the Balcom series in future surveys.

Shedd silty clay loam, 15 to 30 percent slopes (SrE).--This soil is moderately steep and occurs on smooth rolling hills. Depth to bedrock ranges from 30 to 50 inches.

Included in mapping are small areas of long, irregular, rounded ridgetops that have slopes of 9 to 15 percent. Also included are some shallower Shedd soils.

Permeability is moderate. Surface runoff is medium, and the erosion hazard is moderate. Fertility is high. The available water capacity is 6 to 10 inches in the 30- to 50-inch root zone.

This soil is used mainly for range. Very limited areas are used for dryland hay. Capability unit IVe-1(15); Clayey range site.

Shedd silty clay loam, 30 to 45 percent slopes (SrF).--This soil is steep and occurs on smooth rounded hills. Depth to rock ranges from 24 to 40 inches.

Included in mapping are some eroded areas. Also included are some areas of Linne soils.

Permeability is moderate. Surface runoff is rapid, and the erosion hazard is high. Fertility is high. The available water capacity is 5 to 8 inches in the 24- to 40-inch root zone.

This soil is used for range, wildlife, and watershed. Capability unit VIe-1(15); Clayey range site.

Shedd silty clay loam, 45 to 75 percent slopes (SrG).--This very steep soil occurs on hills and mountains. It has the profile described as typical for the series. Depth to rock ranges from 24 to 44 inches.

Included in mapping are some areas as shallow as 15 inches over rock. Some areas that are cut by numerous shallow gullies are also included.

Permeability is moderate. Surface runoff is very rapid, and the erosion hazard is very high. Fertility is high. The available water capacity is 4 to 9 inches in the 24- to 44-inch root zone.

This soil is used for range and for wildlife habitat, and as watershed. Capability unit VIIe-1 (15); Clayey range site.

Shedd silty clay loam, 30 to 75 percent slopes, severely eroded (SrG3).--This steep to very steep soil occurs in hilly and mountainous areas. It occurs extensively in the northern part of the Santa Ynez Valley and in the southwestern part of the Cuyama Valley. There are some small areas in the northern part of the Vandenberg Air Force Base. Depth to the parent material is 18 to 28 inches. The parent material is largely marly rock. Most areas are badly gullied or rilled, and in many areas the parent material is exposed.

Included in mapping are some noneroded areas where the soil is more than 28 inches thick. Also included are some areas of Linne soils.

Permeability is moderate. Surface runoff is very rapid, and the erosion hazard is very high. Fertility is moderate. The available water capacity is 3 to 6 inches in the 18- to 28-inch root zone. Capability unit VIIe-1(15); Shallow Clayey range site.

Shedd Series, Diatomaceous Variant

The Shedd series, diatomaceous variant, consists of well-drained silty clay loams underlain by highly calcareous diatomaceous shale bedrock at a depth of 20 to 54 inches. These soils occur on hills and mountains in small, scattered areas in the southwestern part of the survey area, mainly in the vicinity of Lompoc. Slopes are 15 to 75 percent. The vegetation is annual grasses and forbs. Elevations range from 500 to 2,000 feet. The average annual rainfall is 13 to 17 inches, the average annual air temperature is about 57° F., and the frost-free

season is 275 to 300 days. Shedd soils, diatomaceous variant, are associated with Crow Hill and Santa Lucia soils.

In a representative profile, the surface layer is light-gray silty clay loam about 41 inches thick. Below is white, soft, calcareous diatomaceous shale.

Shedd soils, diatomaceous variant, are used for range, wildlife habitat, and watershed. They are also used for very limited dryland hay and grain production.

Representative profile of the Shedd series, diatomaceous variant (about 6 miles southeast of Lompoc in the NE1/4 of sec. 20, T. 6 W., R. 33 W.):

A11--0 to 6 inches, light-gray (10YR 6/1) light silty clay loam, very dark gray (10YR 3/1) when moist; very weak, coarse, prismatic structure; weak, coarse, platy structure in the top 1/2 inch to 1 inch because of cattle trampling; hard, friable, sticky and plastic; few very fine roots except in soil-filled rodent holes where there are many very fine roots; many very fine interstitial pores and few fine and few medium tubular pores; moderately alkaline (pH 8.0); strongly effervescent; disseminated lime; gradual, smooth boundary.

A12--6 to 20 inches, light-gray (10YR 6/1) light silty clay loam, very dark gray (10YR 3/1) when moist; very weak, coarse, prismatic structure parting to moderate, medium and coarse, granular structure; slightly hard, very friable, sticky and plastic; common very fine roots except in soil-filled rodent holes and vertical joints where very fine roots are abundant; many very fine interstitial pores, many very fine and few fine pores, and few medium tubular pores; moderately alkaline (pH 8.0); strongly effervescent; disseminated lime; gradual, wavy boundary.

A13--20 to 41 inches, light-gray (10YR 6/1) gravelly light silty clay loam, very dark gray (10YR 3/1) when moist; very weak, coarse, prismatic structure parting to weak, fine, granular and weak, medium, subangular blocky structure; slightly hard, very friable, sticky and plastic; few very fine roots, many very fine roots in rodent holes, on vertical joints, and on edge of rock fragments; many very fine interstitial pores, common very fine and few fine pores, and few medium tubular pores; moderately alkaline (pH 8.0); strongly effervescent; disseminated lime and lime in fine filaments; horizon is 20 percent rock fragments 2 to 14 inches in diameter; abrupt, irregular boundary.

R--41 inches, white, very lightweight (estimated volume weight 0.7) diatomaceous shale; strongly effervescent; many rodent holes in upper R horizon filled with strong, fine to coarse, granular material from the A1 horizon. Shale readily cut and broken by hand.

Color of the A horizon ranges from gray to light gray; texture ranges from light silty clay loam to silty clay loam. Depth to bedrock ranges from 54 inches on the more gentle slopes to 20 inches on the steeper slopes. There are varying amounts of resistant, flaggy, brittle shale fragments on the surface and in the profile, but they do not exceed 30 percent, by volume, of the profile.

Shedd silty clay loam, diatomaceous variant, 15 to 30 percent slopes (SsE).--This moderately steep soil occurs on rounded hilltops that are surrounded by steeper hilly land. The areas are small and scattered. Depth to parent rock ranges from 30 to 54 inches.

Included in mapping are small areas of Crow Hill and of Santa Lucia soils. Some areas in which 30 to 50 percent of the entire soil profile is shale fragments are also included.

Permeability is moderate. Surface runoff is medium to rapid, and the erosion hazard is moderate to high. Fertility is moderate. The available water capacity is 5 to 9 inches in the 30- to 54-inch root zone.

This soil is used for range, wildlife habitat, and watershed, and to a limited extent for dryland hay. Capability unit IVe-1(15); Clayey range site.

Shedd silty clay loam, diatomaceous variant, 30 to 45 percent slopes (SsF).--This steep soil occupies smooth hills. It occurs in small scattered areas within larger areas of Crow Hill soils. This soil has the profile described as representative for the variant. Depth to rock ranges from 30 to 45 inches.

Included in mapping are areas of Crow Hill soils. Some eroded areas where the soil is less than 30 inches deep are also included.

Permeability is moderate. Surface runoff is rapid, and the erosion hazard is high. Fertility is moderate. The available water capacity is 5 to 9 inches in the 30- to 45-inch effective root zone.

This soil is used for range, wildlife habitat, and watershed. Capability unit VIe-1(15); Clayey range site.

Shedd silty clay loam, diatomaceous variant, 45 to 75 percent slopes (SsG).--This soil is very steep and occurs in mountainous areas. Depth to rock ranges from 20 to 30 inches.

Included in mapping are small areas of soils that are less than 20 inches deep. Also included are small areas in which 30 to 50 percent of the entire soil profile is shale fragments. Other inclusions consist of some areas of Crow Hill and of Santa Lucia soils.

Permeability is moderate. Surface runoff is very rapid, and the erosion hazard is very high. Fertility is moderate. The available water capacity is 3.5 to 6.0 inches in the 20- to 30-inch root zone.

This soil is used for range, wildlife habitat, and watershed. Capability unit VIIe-1(15); Clayey range site.

Sorrento Series

The Sorrento series consists of well-drained sandy loams to clay loams that formed in recent water-deposited sediments. These soils occur extensively on flood plains and alluvial fans in the Santa Maria Valley, and to a lesser extent in other valleys in the survey area. The soils have slopes of 0 to 9 percent. The vegetation is annual grasses, forbs, and scattered oak trees. Elevations range from 100 to 1,800 feet. The average annual rainfall is 12 to 20 inches, the average annual air temperature is about 60° F., and the frost-free season is 190 to 300 days. Sorrento soils are associated with Mocho soils.

In a representative profile, the surface layer is grayish-brown heavy loam about 37 inches thick. Below is pale-brown and light yellowish-brown, stratified heavy loam and fine sandy loam. In some places the texture is sandy loam or clay loam throughout the profile. In places the soil is underlain by sand and gravel at a depth of 40 to 60 inches.

Where water is available, the Sorrento soils are used for irrigated crops. Some areas are used for dryland hay and grain.

Representative profile of the Sorrento series (about 4 miles west of the center of Santa Maria, 100 feet east of the center of Bonita School Road, 60 feet north of the ditch along Highway No. 166, across the road from Bonita School):

Ap1--0 to 7 inches, grayish-brown (10YR 5/2) heavy loam, very dark grayish brown (10YR 3/2) when moist; strong, fine and medium, granular structure; slightly hard, very friable, sticky and slightly plastic; common very fine roots; many very fine and fine interstitial pores; moderately alkaline (pH 8.0); clear, wavy boundary.

Ap2--7 to 19 inches, grayish-brown (10YR 5/2) heavy loam, very dark grayish brown (10YR 3/2) when moist; moderate, medium and coarse, subangular blocky structure; hard, friable, sticky and slightly plastic; common very fine roots; many very fine, fine, and medium tubular pores and many very fine interstitial pores; moderately alkaline (pH 8.0); clear, wavy boundary.

A1--19 to 26 inches, grayish-brown (10YR 5/2) heavy loam, dark grayish brown (10YR 4/2) when moist; weak, coarse, subangular blocky structure; hard, friable, sticky and slightly plastic; few very fine roots; many very fine tubular pores and many very fine interstitial pores; moderately alkaline (pH 8.0); clear, wavy boundary.

ACca--26 to 37 inches, grayish-brown (10YR 5/2) mixed with light brownish-gray (10YR 6/2) heavy loam, dark brownish gray (10YR 4/2) mixed with dark brown (10YR 4/3) when moist; massive; hard, friable, sticky and slightly plastic; few very fine roots; many very fine tubular pores and many very fine interstitial pores; strongly effervescent; disseminated lime; moderately alkaline (pH 8.1); gradual, irregular boundary.

C1ca--37 to 48 inches, pale-brown (10YR 6/3) heavy loam, dark yellowish brown (10YR 4/4) when moist; massive; hard, friable, sticky and slightly plastic; few very fine roots; many very fine tubular pores and many very fine interstitial pores; violently effervescent; disseminated lime; moderately alkaline (pH 8.2); abrupt, smooth boundary.

C2ca--48 to 60 inches, light yellowish-brown (10YR 6/4) fine sandy loam, yellowish brown (10YR 5/4) when moist; massive; slightly hard, friable, slightly sticky and slightly plastic; very few very fine roots; common very fine tubular pores and many very fine interstitial pores; violently effervescent; disseminated lime; moderately alkaline (pH 8.2); clear, wavy boundary.

The A horizon ranges in color from grayish brown to brown, and in texture from sandy loam to clay loam. Reaction of the A horizon ranges from neutral to moderately alkaline. Depth to free lime ranges from about 18 inches to 48 inches. The Sorrento soils have stratified profiles. Some areas are underlain by coarse sand and gravel within 3 to 4 feet of the surface; other areas are underlain by silty strata. Different phases of this soil series, based on depth to coarse material, are recognized.

Sorrento sandy loam, 0 to 2 percent slopes (StA).--This nearly level soil occurs on smooth flood plains in the Santa Maria Valley and less extensively in other valleys in the survey area. The profile is similar to the one described as representative for the series except that it is stratified sandy loam throughout. This soil is more stratified than the typical Sorrento soils, and has loam, silt loam, and clay loam lenses.

Included in mapping are small areas of Metz and Mocho soils and of Sorrento loam.

Permeability is moderately rapid. Surface runoff is very slow, and the erosion hazard is none to slight. Fertility is high. The available water capacity is 7.5 to 8.5 inches in the 60-inch root zone.

This soil is used for all irrigated and dryland crops normally grown in survey area (pl. VI, bottom). Capability unit I-1(14).

Sorrento sandy loam, 2 to 9 percent slopes (StC).--This gently sloping to moderately sloping soil occurs on small, long and narrow alluvial fans. It has a profile similar to the one described as representative for the series except that it is sandy loam throughout. In addition, it is somewhat more stratified, and has lenses of loam, silt loam, and clay loam.

Included in mapping are small areas of Mocho and Salinas soils.

Permeability is moderately rapid. Surface runoff is slow to medium, and the erosion hazard is slight to moderate. Fertility is high. The available water capacity is 7.5 to 8.5 inches in the 60-inch root zone.

This soil is used for irrigated alfalfa, sugar beets, and walnuts and for dryland crops. Capability unit IIe-1(14).

Sorrento sandy loam, sandy substratum, 0 to 2 percent slopes (SuA).--This soil has a profile similar to the one described as representative for the series except that it has a sandy loam surface layer underlain by sand and gravel at depths of 40 to 50 inches. It occurs on flood plains in the Santa Maria Valley.

Included in mapping are a number of areas that have sand and gravel substrata at depths of 30 to 40 inches, and in some places at more than 50 inches. Also included are areas that have some gravel throughout the profile.

Permeability is moderately rapid and rapid. Surface runoff is very slow, and the erosion hazard is none to slight. Fertility is moderate. The available water capacity is 5 to 7 inches in the 40- to 50-inch root zone.

This soil is used for a variety of irrigated crops. Capability unit IIs-0(14).

Sorrento loam, 0 to 2 percent slopes (SvA).--This soil occurs on flood plains, mainly in the Santa Maria Valley. It has the profile described as representative for the series.

Included in mapping are small areas of soils that have silty clay loam below a depth of 40 inches. Small areas of Sorrento clay loam and areas of Mocho and Salinas soils are also included.

Permeability is moderate. Surface runoff is very slow, and the erosion hazard is none to slight. Fertility is very high. The available water capacity is 10 to 12 inches in the 60-inch root zone.

This soil is used for a variety of irrigated and dryland crops. Capability unit I-1(14).

Sorrento loam, 2 to 9 percent slopes (SvC).--This soil is gently sloping to moderately sloping and occurs in small irregularly shaped areas on terrace breaks and alluvial fans.

Included in mapping are small areas of soils that are moderately or severely eroded and from which much of the surface layer has been removed. Also included are areas of Mocho soils and of Sorrento clay loam.

Permeability is moderate. Surface runoff is slow to medium, and the erosion hazard is slight to moderate. Fertility is very high. The available water capacity is 10 to 12 inches in the 60-inch root zone.

This soil is used for irrigated alfalfa, sugar beets, and walnuts and for dryland crops. Capability unit IIe-1(14).

Sorrento clay loam, 0 to 5 percent slopes, eroded (SwB2).--This gently sloping soil occurs on small, scattered, alluvial fans and flood plains. It has a profile similar to the one described as representative for the series except that this soil is clay loam throughout. In addition, this soil is subject to occasional overflow by runoff from surrounding areas.

Included in mapping are some eroded areas that are cut by shallow gullies; about half of the surface layer has been removed from these areas. Also included are some areas of Mocho and Salinas soils.

Permeability is moderately slow. Surface runoff is slow, and the erosion hazard is slight. Fertility is high. The available water capacity is 11 to 13 inches in the 60-inch root zone.

This Sorrento soil is used for dryland and irrigated crops. Capability unit IIe-1(14).

Stutzville Series

The Stutzville series consists of somewhat poorly drained silty clay loams. They occur in low basins in the Cuyama Valley, chiefly north and east of New Cuyama. Slopes are 0 to 2 percent. The vegetation is salt-tolerant forbs, shrubs, and annual grasses. Elevations range from 1,800 to 2,000 feet. Natural deepening of drainageways and pumping for irrigation have lowered the water table under these soils with the result that drainage is no longer a problem. The average annual rainfall is about 6 to 7 inches, the average annual air temperature is about 59° F., and the frost-free season is 190 to 220 days. Stutzville soils are associated with Panoche soils.

In a representative profile, dark-brown to pale-brown and light yellowish-brown silty clay loam and silty clay extend to a depth of 66 inches. In some areas the surface layer is loamy sand, sandy loam, or loam. Unless reclaimed, the soil is strongly saline throughout the profile. Most uncultivated areas have a salty crust 1/4 to 1 inch thick.

Stutzville soils are used mainly for range. Small areas have been reclaimed and are used for irrigated crops, including alfalfa, and for irrigated pasture.

Representative profile of the Stutzville series (in the Cuyama Valley, 3 miles east of Russell Brothers Ranch headquarters, approximately 650 feet north of ranch road):

C1--0 to 3/4 inch, (salty crust) pale-brown (10YR 6/3) silty clay loam, brown (10YR 5/3) when moist; weak, coarse and very coarse, platy structure; hard, friable, sticky and plastic; common fine interstitial pores; strongly effervescent, strongly saline, strongly alkaline (pH 8.5); abrupt, smooth boundary.

C2sa--3/4 inch to 7 inches, pale-brown (10YR 6/3) silty clay loam, dark brown (10YR 4/3) when moist; strong, very coarse, prismatic structure; very hard, firm, sticky and plastic; few micro roots, very few fine and many medium roots; few fine tubular pores and many medium and coarse interstitial pores; strongly effervescent; disseminated lime; thin coatings of crystalline salt on dry ped faces and faint mycelia-like salt accumulation within peds; strongly effervescent, strongly saline, strongly alkaline (pH 8.5); abrupt, wavy boundary.

C3sa--7 to 35 inches, dark-brown (10YR 4/3d, 4/3m) silty clay loam, with common fine, prominent mottles of very pale brown and very dark gray; massive; hard, friable, sticky and plastic;

many medium, coarse, and few fine roots; few fine tubular pores and few medium and coarse interstitial pores; many prominent mycelia-like salt accumulations; strongly effervescent, strongly saline, strongly alkaline (pH 8.5); gradual, irregular boundary.

C4sa--35 to 48 inches, brown (10YR 5/3) silty clay, dark brown (10YR 4/3) when moist; many medium distinct mottles of dark grayish brown, very pale brown, and reddish brown; massive; very hard, firm, sticky and plastic; many medium and coarse roots, few very fine and fine roots; many medium, fine, and very fine tubular pores; many 1/4- to 1/2-inch lime nodules and many mycelialike accumulations of soft salt crystals; strongly effervescent; strongly saline, strongly alkaline (pH 8.5); gradual, irregular boundary.

C5sa--48 to 66 inches, light yellowish-brown (10YR 6/4) silty clay, dark yellowish brown (10YR 4/4) when moist; many large, prominent mottles of grayish brown, light red, red, dark red, dark grayish brown, light gray, and yellowish brown; massive; very hard, firm, sticky and plastic; very few very fine, fine, medium, and coarse roots; few fine tubular pores; many mycelialike and nodular accumulations of salts, strongly effervescent, strongly saline, strongly alkaline (pH 8.5); abrupt, wavy boundary.

Colors are pale brown and light brownish gray to dark brown, light yellowish brown, brown, and grayish brown. All profiles are highly stratified. The texture ranges from fine sand to silty clay, but is generally silty clay loam or loam between depths of 10 and 40 inches. Most areas have a salty crust, generally 1/4 inch to 1 inch thick. Salt content throughout the profile ranges from 0.35 percent to more than 3 percent. Many areas that have been reclaimed by irrigation are nearly salt free in the upper part of the profile, but generally they contain appreciable amounts of salt in the lower part of the profile. All areas show signs of somewhat poor drainage within 1 to 2 feet of the surface, although all areas are now drained and the water table is no longer a problem.

Stutzville loamy sand (Sx).--This nearly level soil occurs on flood plains along the Cuyama River north and east of New Cuyama. Except for 6 to 20 inches of loamy sand material washed in and deposited over the silty clay loam soil, this soil has a profile similar to the one described as representative for the series. The soil has been drained, and the water table is no longer a problem. Salinity ranges from 0.4 to 2.0 percent.

Included in mapping are areas where there have been no deposits of overwash material. Areas where these deposits are more than 20 inches thick are also included.

Permeability is moderately slow. Surface runoff is very slow, and there is no erosion hazard. Where the soil is reclaimed, the available water capacity is 8 to 9 inches in the 60-inch root zone. Fertility is high.

This soil is used mainly for range. Small areas have been reclaimed and are used for alfalfa, sugar beets, and irrigated pasture. Capability unit IIIs-6(17); Saline range site.

Stutzville sandy loam (Sy).--This nearly level soil occurs on flood plains. It has a profile similar to the one described as representative for the series except that this soil has 10 to 18 inches of sandy loam over the silty clay loam. Salinity ranges from 0.35 to 2.0 percent. The soil has been drained, and the water table is no longer a problem.

Included in mapping are areas of other phases of Stutzville soils. Some areas of Panoche soils are also included.

Permeability is moderately slow. Surface runoff is very slow, and there is no erosion hazard. Fertility is high. Where the soil has been reclaimed, the available water capacity is 9 to 10 inches in the 60-inch root zone.

This soil is used chiefly for range. Small areas have been reclaimed and are used for irrigated crops, especially alfalfa, sugar beets, and irrigated pasture. Capability unit IIs-6(17); Saline range site.

Stutzville loam (Sz).--This soil is nearly level and occurs on broad flood plains. It is subject to only occasional overflow and has little active scouring or deposition. This soil has a profile similar to the one described as representative for the series except that it has a loam surface layer 10 to 20 inches thick that is underlain by silty clay loam. The content of soluble salts in this soil is less than 1 percent.

Included in mapping are small areas of other phases of Stutzville soils. Some areas of Panoche soils are also included.

Permeability is moderately slow. Drainage has been improved slightly by artificial means. Surface runoff is very slow, and the erosion hazard is none to slight. Fertility is high. Where the soil has been reclaimed, the available water capacity is 10 to 11 inches in the 60-inch root zone.

This Stutzville soil is used for range. Small areas have been reclaimed and are used for irrigated alfalfa, sugar beets, and pasture. Capability unit IIs-6(17); Saline range site.

Stutzville loam, strongly saline (Sza).--This soil is nearly level and occurs on low flood plains. It has a profile similar to the one described as representative for the series except that it has a loam surface layer about 10 to 20 inches thick. The content of soluble salts is 1 to 3 percent, and there is a salty crust 1/4 to 1 inch thick on the surface when the soil is dry.

Included in mapping are small areas of other phases of Stutzville soils. Some small areas of Panoche soils are also included.

Permeability is moderately slow. Surface runoff is very slow, and the erosion hazard is none to

slight. Fertility is high. Where the soil has been reclaimed, the available water capacity is 10 to 11 inches in the 60-inch root zone.

This soil is used for range. Capability unit IIIs-6(17); Saline range site.

Stutzville silty clay loam (Szb).--This soil occurs on low flood plains. Most areas of this soil have been reclaimed. The soil is fairly free of salts to a depth of 3 to 4 feet, although there are strong salt concentrations at depths below 3 to 4 feet.

Included in mapping are small areas of other Stutzville soils and of Panoche soils.

Permeability is slow. Surface runoff is very slow, and the erosion hazard is none to slight. Fertility is high. Where the soil has been reclaimed, the available water capacity is 11 to 13 inches in the 60-inch root zone.

This soil is used for irrigated alfalfa, sugar beets, and pasture, and for range. Capability unit IIs-6(17); Saline range site.

Stutzville silty clay loam, strongly saline (Szc).--This nearly level soil occurs on flood plains in areas where little or no attempt has been made at reclamation. It has the profile described as representative for the series. When dry, the surface has a salty crust 1/4 to 1 inch thick (pl. VII, top). The surface cracks when dry and seals over when wet.

Included in mapping are small areas of other Stutzville soils. Some small areas of Panoche soils are also included.

Permeability is slow. Surface runoff is very slow, and the erosion hazard is none to slight. Fertility is high. Where the soil is reclaimed, the available water capacity is 11 to 13 inches in the 60-inch root zone.

This Stutzville soil is used for range. Where reclaimed, it is suited to alfalfa, sugar beets, and pasture. Capability unit IIIs-6(17); Saline range site.

Swamp

Swamp (Szw) consists of very poorly drained soils that formed in low basin areas. There is very little of this land type in the survey area. It occurs in several small tracts in the Cuyama, Santa Maria, and Los Alamos Valleys. The soil profile consists of strata of mineral soils and accumulations of partly decomposed plant materials, including peat. The soil material is very strongly acid to extremely acid and is waterlogged throughout most of the year. The vegetation is willows, cattails, sedges, and other water-tolerant plants.

Swamp is suitable for grazing only in dry years. Production of forage for livestock is very low. Any attempt to improve the drainage of this land type should be preceded by onsite investigation of the area to be improved. Capability unit VIIw-9(14); Saline range site.

Tangair Series

The Tangair series consists of somewhat poorly drained sandy soils that formed in old marine terrace deposits. These soils occur on terraces and in some places are dissected by drainageways and gullies. Tangair soils are almost entirely within the Vandenberg Air Force Base. Slopes are 0 to 9 percent. The vegetation is predominantly brush and sparse annual grasses and forbs. Elevations range from 150 to 900 feet. The average annual rainfall is 14 to 18 inches, the average annual air temperature is about 57° F., and the frost-free season is 300 to 320 days. Tangair soils are associated with Narlon soils.

In a representative profile, the surface layer is light-gray sand about 24 inches thick. The subsoil is very pale brown sand that contains iron concretions. It extends to a depth of 48 inches. Below is white sand. All areas are underlain by shale or other very slowly permeable material at a depth of 4 to 12 feet. This material is not part of the described soil.

Tangair soils are used for military and other nonfarm purposes.

Representative profile of the Tangair series (Vandenberg Air Force Base, Surf quadrangle, 120° 34' 10" W., and 34° 44' 50" N.; 1/4 mile west of Missile Control Center, about 75 yards north of road):

A1--0 to 4 inches, light-gray (10YR 6/1) sand, very dark grayish brown (10YR 3/2) when moist; single grain; loose when dry or moist, nonsticky and nonplastic; common very fine and few fine roots; many very fine interstitial pores; medium acid (pH 6.0); clear, wavy boundary.

A2--4 to 24 inches, light-gray (10YR 7/2d and 10YR 7/2m) sand; single grain; loose when dry or moist, nonsticky and nonplastic; few fine and very few medium roots; many fine interstitial pores; incipient reddish brown (5YR 5/4 to 6/4m) concretions 1/16 to 1/8 inch across make up less than 0.5 percent of mass and are uniformly distributed; slightly acid (pH 6.4); gradual, wavy boundary.

B21ir--24 to 36 inches, very pale brown (10YR 7/3) sand, light gray (10YR 7/2) when moist; single grain; loose when dry or moist, nonsticky and nonplastic; very few fine roots; many very fine interstitial pores; concretions similar to those in A2 horizon make up 5 to 15 percent of mass and tend to occur in pockets 1 to 2 feet across; strongly acid (pH 5.3); gradual, smooth boundary.

B22ir--36 to 48 inches, very pale brown (10YR 7/3) sand, light gray (10YR 7/2) when moist; single grain; loose when dry or moist, nonsticky and nonplastic; very few fine roots in upper part; many very fine interstitial pores; concretions make up 15 to 35 percent of horizon and occur mostly in pockets several feet across; concretions range in size from 1/2 inch across to as large as 3 by 6 inches, and are reddish brown in color (5YR 3/4, 4/4, 5/4m and 10YR 5/4 to

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5YR 4/4d); shell of concretions is redder than the interior; small concretions and interior of larger ones have higher chromas and are softer; concretions are very hard when dry; strongly acid (pH 5.5); gradual, wavy boundary.

C--48 to 56 inches, white (10YR 8/2) sand, light gray (10YR 7/2) when moist; single grain; loose, nonsticky and nonplastic; no roots; many very fine interstitial pores; very few soft concretions similar to those in B21 and B22 horizons; strongly acid (pH 5.4).

The A1 horizon, or the darker parts of it, is generally 3 to 6 inches thick, but is 12 inches thick in a few places. Color of the A1 horizon is light brownish gray to gray and light gray. Texture of the A1 horizon is sand or loamy sand. A few small concretions are present in some places, but are more common on sloping areas that are somewhat eroded and dissected. The A2 horizon is white or light gray and in most places has a few small iron concretions. The A2 horizon grades into the B2ir horizon, which contains a larger number of concretions, and these two horizons are separated on the amount of concretions. Concretions commonly make up about 30 percent of the B2ir horizon, but the amount ranges in some places from about 15 to 20 percent to a nearly continuous sheet of connected concretions that form an irregular hardpan 6 to 20 inches thick.

All areas are underlain by shale or other very slowly permeable material at a depth of 6 to 12 feet. This material is not part of the solum. Reaction is very strongly acid to slightly acid throughout the profile.

In mapping, Tangair soils were separated from Narlon soils on the basis of lacking a clayey Bt horizon above 48 to 60 inches in depth. Thus, some areas are mapped as Tangair soil that might be classed as a very deep surface phase of Narlon soil. Tangair soils normally have enough concretions to have a gravelly, very gravelly, or impenetrable pan-like feel when augured.

Tangair sand, 0 to 2 percent slopes (TaA).--This nearly level soil occurs on terraces on the Vandenberg Air Force Base. It has the profile described as representative for the series. As a result of soil blowing, the surface has a slight hummocky relief. Depth to the very slowly permeable material is 50 to more than 60 inches. A perched water table sometimes forms above this material immediately following a rain or irrigation.

Included in mapping are small areas of Narlon, Oceano, and Marina soils.

Permeability is rapid. Surface runoff is very slow to slow, and the hazard of erosion by water is none to slight. The hazard of soil blowing is high. Fertility is very low. The available water capacity is 3 to 4 inches in the 50 to more than 60 inches of rooting depth.

This soil is used for military and for other nonfarm purposes. Capability unit VIe-4(15); Sandy range site.

Tangair sand, 2 to 9 percent slopes (TaC).--This soil is undulating to hummocky and occurs on terraces. Depth to very slowly permeable material is 50 to more than 60 inches.

Included in mapping are small areas of Narlon, Marina, and Oceano soils. Some small areas of Dune land are also included.

Permeability is rapid. Surface runoff is slow to medium, and the erosion hazard is slight to moderate. Fertility is very low. The available water capacity is 3 to 4 inches in the 50- to 60-inch root zone.

This soil is used mainly for military or other nonfarm purposes. Capability unit VIe-4(15); Sandy range site.

Terrace Escarpments, Sandy

Terrace escarpments, sandy (TcG) consists of the sloping sides of old sandy terraces that are remnants of Betteravia and Tangair soils and of the Narlon, hardpan variant. The surface layer is sand or loamy sand overlying a very slowly permeable subsoil or substratum. Slopes range from 9 to 75 percent. The escarpments below the Betteravia and Tangair terraces commonly have exposed hardpan ledges. The escarpments below the Narlon, hardpan variant, have spots of clay exposed at or near the surface. These areas are fairly well stabilized by brush, sparse annual grasses, forbs, and weeds. All areas of this land type are susceptible to gully erosion. Most areas have gullies that were caused by runoff from the terraces above.

This land type is suitable for limited grazing, but forage production is low. Capability unit VIIe-4(15); Eroded or Shallow Sandy range site.

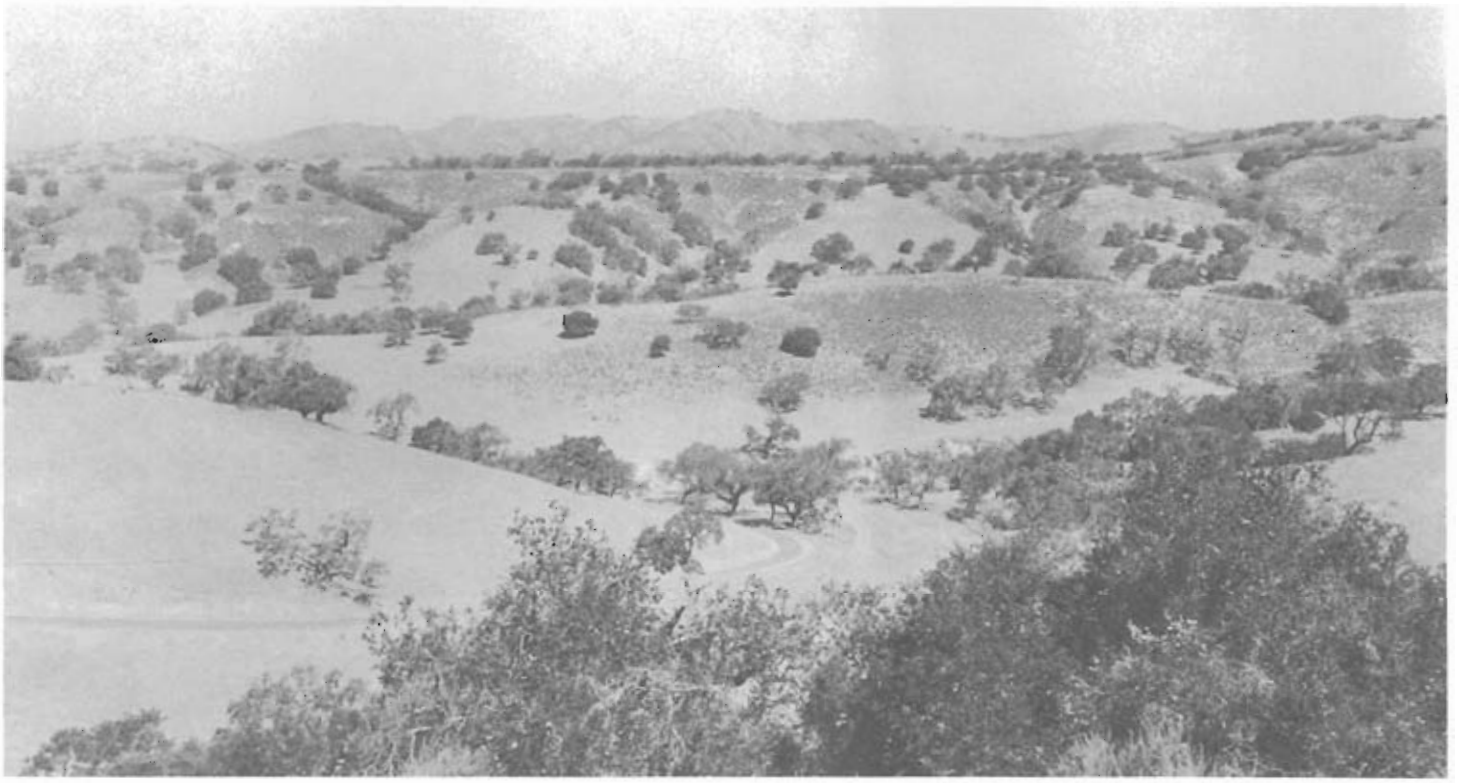
Terrace Escarpments, Loamy

Terrace escarpments, loamy (TdF) consists of the steep sides of terraces. The texture ranges from sandy loam to loam, but the profile varies from one area to another and within areas. Slopes range from 20 to 50 percent and average about 40 percent. This land type includes soil material of the Mocho, Sorrento, Salinas, and Ballard series. It also includes minor areas of soils from several other series. Areas of this land type are long, narrow, and irregular in shape. They are fairly well stabilized by brush or oak-grass cover. Runoff is rapid, and the erosion hazard is moderate to high. Some areas are deeply gullied by runoff water from the upper terraces.

This land type is suitable for grazing. Some areas are difficult to use because they occur within cultivated areas but are too steep for cultivation. On the other hand, they are too small to be separated out and used for grazing. Capability unit VIIe-1(15); Shallow Loamy range site.

Ballinger silty clay, 45 to 75 percent slopes, is nearly barren of vegetation. White lines on ridges are motorcycle trails.

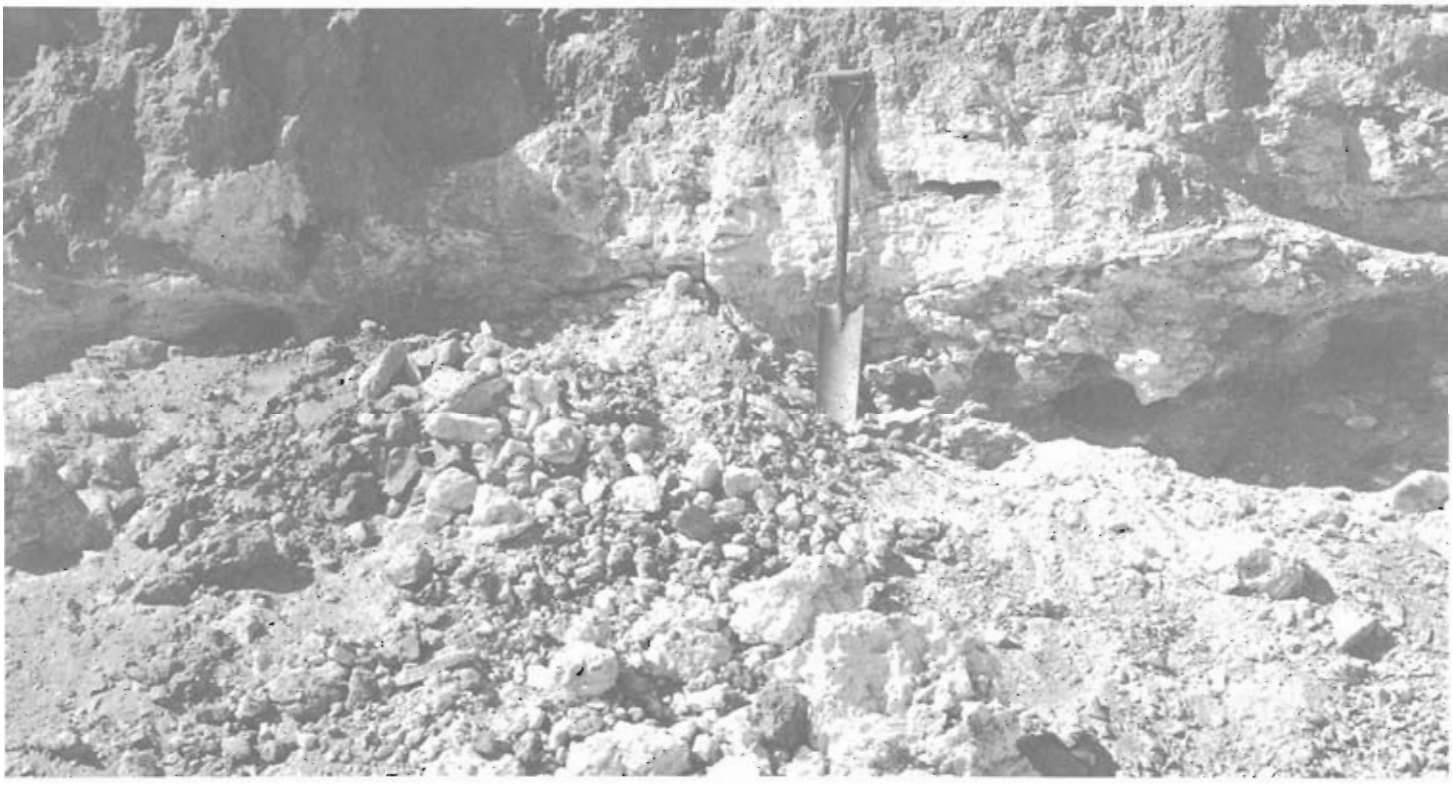
Artichokes on Bayshore loam, drained, in an area near the coast.



Chamise shaly loam. 15 to 45 percent slopes, on dissected terraces.

Climara-Toomes complex, 15 to 45 percent slopes. Climara clay has grass cover and Toomes clay loam has brush cover.

Profile of Garey sandy loam exposed in roadcut. Note the ledge formed by hardpan in the subsoil.

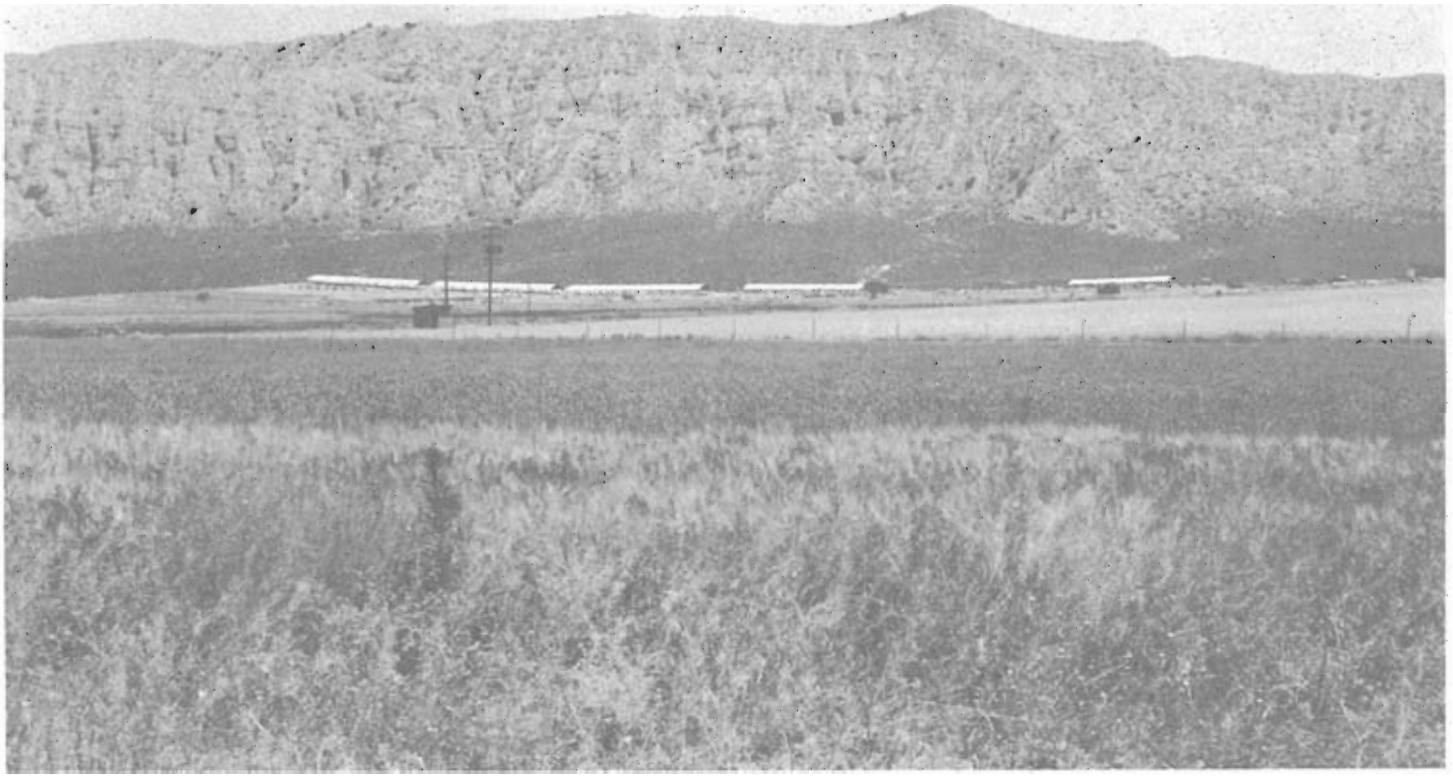


Profile of Kettleman fine sandy loam. Parent material has high lime content.

Flower seed production on Mocho silty clay loam.

Montara rocky clay loam, 30 to 75 percent slopes.

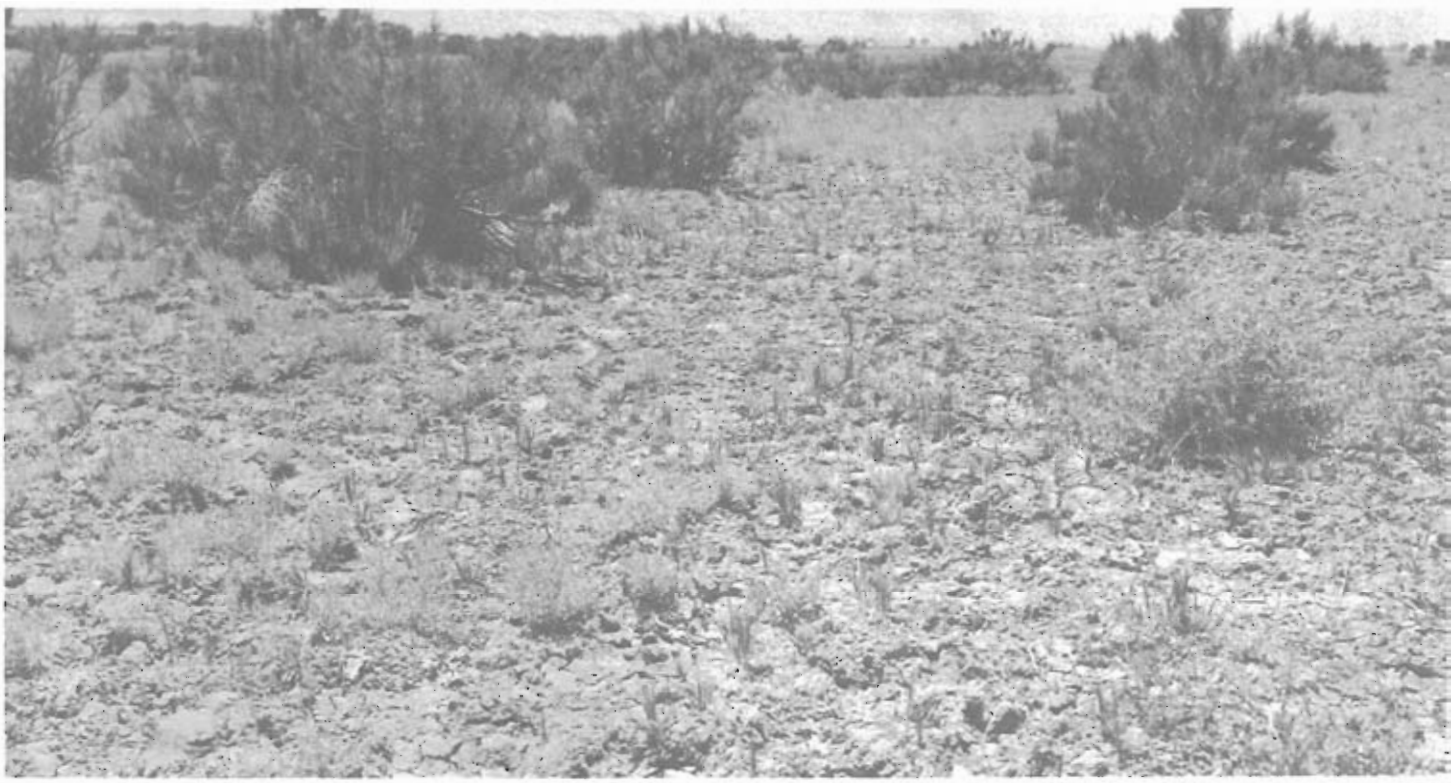
Native cover vegetation on Oceano sand, 2 to 15 percent slopes.



Rough broken land is in the background. Panoche and Metz soils are in the foreground.

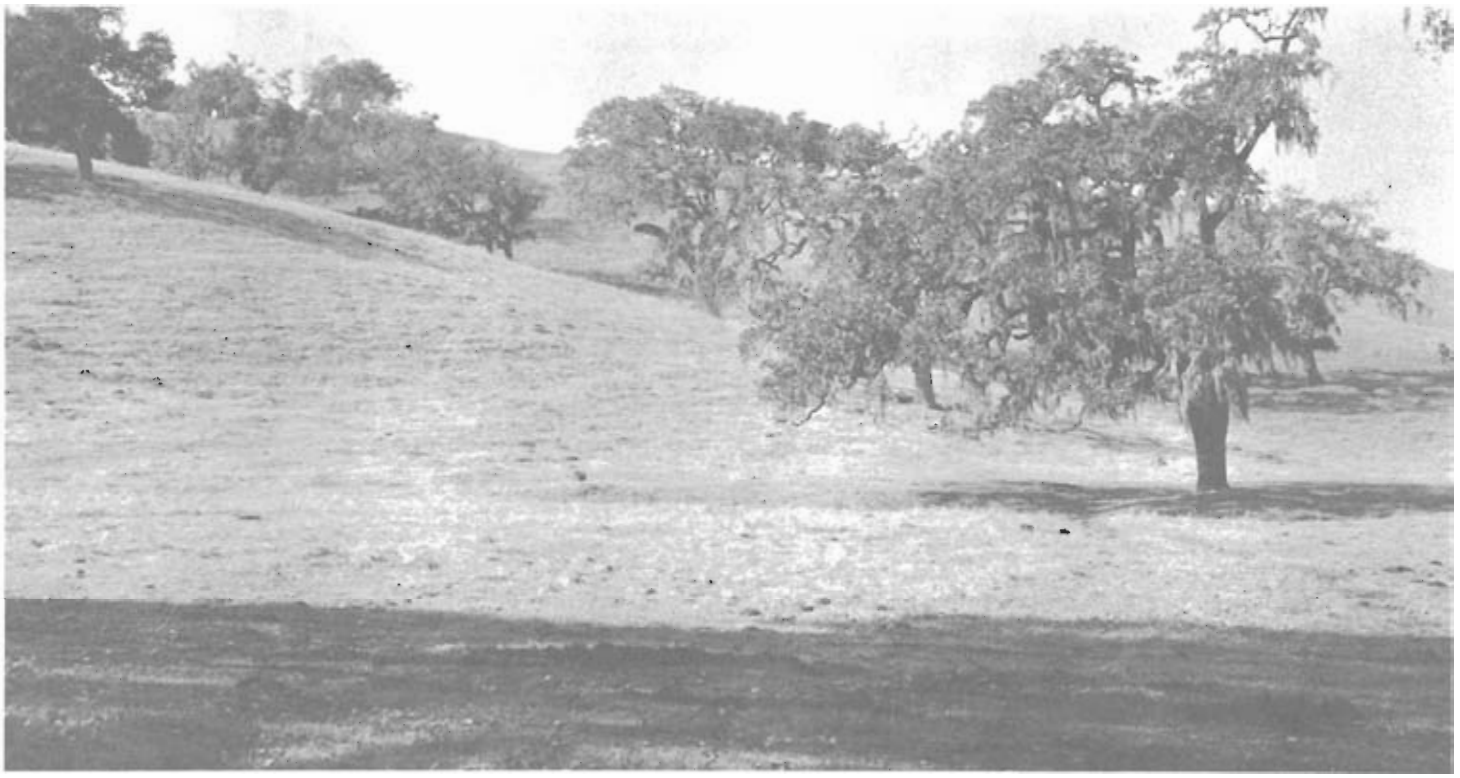
Profile of Santa Lucia shaly clay loam, 30 to 45 percent slopes.

Strawberries on Sorrento sandy loam, 0 to 2 percent slopes.



Stutzville silty clay loam, strongly saline, has sparse vegetation and a salt crust on the surface.

Green chopped corn for dairy cattle on Sorrento sandy loam, 0 to 2 percent slopes. Land Resource Area 14, Capability unit I-1.



Loamy range site has cover vegetation of annual grasses and oak trees.

Claypan range site on Tierra soils in the background. Gullies have formed because this soil was previously cultivated.

Terrace Escarpments, Cobbly

Terrace escarpments, cobbly (TeG) is a land type that occurs on steeply sloping to very steeply sloping sides of highly dissected terraces in the western part of the Cuyama Valley. This land type is variable because many strata of soil material are exposed on the deep, dissected cuts. Most areas contain large amounts of cobblestones and gravel. In many areas 50 percent or more of the surface is covered by cobblestones and gravel. Texture ranges from cobbly sandy loam to cobbly clay loam. The vegetation is mostly chaparral brush and sparse annual grasses and forbs.

Included in mapping are Pleasanton soils on old mesalike terrace remnants. Also included are areas that are severely eroded. A few scattered areas of steep, dissected Kettleman soils are also included.

The erosion hazard is very high.

This land type affords only limited grazing. The vegetation is needed to slow runoff and reduce erosion and should be protected from burning and overgrazing. Capability unit VIIe-1(15); Shallow Loamy range site.

Tierra Series

The Tierra series consists of moderately well drained loams that have a clay loam subsoil. These soils formed in old water-deposited sediments on dissected terraces in widely scattered areas in the western part of the survey area. Slopes are 2 to 45 percent. The vegetation is annual grasses, forbs, and scattered oak trees. Elevations range from 150 to 1,100 feet. The average annual rainfall is 14 to 20 inches, the average annual air temperature is about 57° F., and the frost-free season is 270 to 320 days. Tierra soils are associated with Pleasanton, San Andreas, and Chamise soils.

In a representative profile, the surface layer is grayish-brown, gray, and light-gray loam about 12 inches thick. The subsoil is very dark grayish brown, dark-brown, and light brownish-gray clay and heavy clay loam about 31 inches thick. Below is pale-brown heavy clay loam. In some areas the surface layer is loamy sand, sandy loam, or clay loam.

Tierra soils are used mainly for range, but small areas are used for dryland grains or hay.

Representative profile of the Tierra series (2 1/2 miles south of Guadalupe on California Highway No. 1, 0.9 mile west on Brown Road from intersection of California Highway No. 1 and Brown Road, 1,980 feet south on Brown Road in head of gully):

Ap--0 to 7 inches, grayish-brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) when moist; massive; hard, friable, slightly sticky and slightly plastic; many very fine roots; common very fine interstitial pores and common very fine and medium tubular pores; strongly acid (pH 5.5); gradual, smooth boundary.

A1--7 to 11 inches, gray (10YR 5/1) loam, very dark gray (10YR 3/1) when moist; massive; hard, friable, slightly sticky and slightly plastic; common very fine roots; common very fine interstitial pores and many very fine and common medium tubular pores; medium acid (pH 6.0); clear, wavy boundary.

A2--11 to 12 inches, light-gray (10YR 7/2) loam, grayish brown (10YR 5/2) when moist; weak, fine, platy structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; many very fine interstitial pores and many very fine tubular pores; medium acid (pH 6.0); very abrupt, smooth boundary.

B21t--12 to 16 inches, very dark grayish brown (10YR 3/2) clay, very dark brown (10YR 2/2) when moist; moderate, coarse, prismatic structure; very hard, very firm, very sticky and very plastic; few very fine roots concentrated along ped faces; few very fine interstitial pores and very few very fine tubular pores; many moderately thick clay films on peds; continuous thin clay films in pores; slightly acid (pH 6.5); gradual, smooth boundary.

B22t--16 to 25 inches, dark-brown (10YR 4/3) heavy clay loam, dark brown (10YR 3/3) when moist; weak, coarse, prismatic, and moderate, medium, angular blocky structure; very hard, very firm, very sticky and very plastic; few very fine roots along ped faces; few very fine interstitial pores and few very fine tubular pores; continuous thin clay films on ped faces and pores; slightly acid (pH 6.5); gradual, smooth boundary.

B3t--25 to 43 inches, light brownish-gray (10YR 6/2) heavy clay loam, grayish brown (10YR 5/2) when moist; many, large, prominent, reddish-brown (5YR 5/4 and 4/4) mottles; moderate, medium, angular blocky structure; very hard, firm, sticky and plastic; very few very fine roots; few fine interstitial pores and common very fine and fine tubular pores; many thin clay films on ped faces, few moderately thick clay films in joints and in tubular pores; moderately alkaline (pH 8.0); clear, smooth boundary.

C--43 to 62 inches, pale-brown (10YR 6/3) heavy clay loam, dark brown (10YR 4/3) when moist; many, large, prominent, reddish-brown (2.5YR 5/4) and yellowish-brown (10YR 5/4) mottles; strong, medium, angular blocky structure; very hard, firm, sticky and plastic; no roots; few very fine interstitial pores and very few very fine tubular pores; common, thin, very dark brown clay films on ped faces and joints; mildly alkaline (pH 7.5).

Texture of the A horizon ranges from loamy sand to clay loam. The A1 horizon is mostly gray or grayish brown but in some places is dark grayish brown or dark gray. Surface 1 inch is somewhat platy because of trampling by cattle. Depth to the Bt horizon is typically 6 to 26 inches. B3t and C horizons are 1 percent Monterey shale fragments. Reaction of the Bt horizon ranges from slightly acid to moderately alkaline, and of the C horizon, from neutral to moderately alkaline.

Tierra loamy sand, 2 to 9 percent slopes (TmC).--This soil occurs in scattered areas in the western part of the survey area, but mainly within the San Antonio watershed. It has a profile similar to the one described as representative for the series except that the surface layer is loamy sand 18 to 26 inches thick.

Included in mapping are some eroded fields that have been cultivated. Also included are small areas where the subsoil contains free lime. Some areas that have an acid reaction in the subsoil are also included.

Permeability is very slow. Surface runoff is slow to medium, and the erosion hazard is slight to moderate. Fertility is very low. The available water capacity is 3 to 4 inches in the 18- to 26-inch root zone. Some moisture is available slowly from the clay subsoil.

This Tierra soil is used mainly for range. Some scattered areas are used for dryland hay and grain. Capability unit VIe-3(15); Claypan range site.

Tierra loamy sand, 9 to 30 percent slopes (TmE).--This is a strongly sloping to moderately steep soil on terraces and terrace breaks. It has a profile similar to the one described as representative for the series except that the surface layer is loamy sand 10 to 26 inches thick.

Included in mapping are small, severely eroded, deeply gullied areas. Also included are some areas that have a surface layer less than 10 inches thick. Some areas of Tierra sandy loam are also included.

Permeability is very slow. Surface runoff is medium to rapid, and the erosion hazard is moderate to high. Fertility is very low. The available water capacity is 2 to 4 inches in the 10- to 26-inch root zone. Some moisture is available slowly from the clay subsoil.

This Tierra soil is used for range. Capability unit VIe-3(15); Claypan range site.

Tierra sandy loam, 2 to 9 percent slopes (TnC).--This soil is on terraces in small irregularly shaped tracts surrounded by areas of steeper Tierra soils.

Included in mapping are areas of other Tierra soils that slope more than 9 percent. Also included are small areas of soils where the subsoil contains free lime. Some areas that have an acid reaction in the subsoil are also included.

Permeability is very slow. Surface runoff is slow to medium, and the erosion hazard is slight to moderate. Fertility is low. The available water capacity is 4 to 5 inches in the 16- to 22-inch root zone. Some moisture is available slowly from the clay subsoil.

This soil is used for range, hay, and grain, and is suited to shallow-rooted irrigated crops. Capability units IIIe-3(14) and IVe-3(15); Claypan range site.

Tierra sandy loam, 9 to 15 percent slopes, eroded (TnD2).--This strongly sloping soil occupies dissected terraces. It has a profile similar to the one described as representative for the series except that the surface layer is sandy loam 12 to 26 inches thick. Many areas of this soil have deep, fluted gullies that are raw and active. Some gullies have been partly healed by vegetation.

Included in mapping are some areas that are not so severely eroded. Other included soils have a surface layer less than 16 inches thick. Also included are soils that have slopes of less than 9 percent. Small areas of Pleasanton soils are also included.

Permeability is very slow. Surface runoff is medium, and the erosion hazard is moderate. Fertility is low. The available water capacity is 3.5 to 5.0 inches in the 12- to 26-inch root zone. Some moisture is available slowly from the clay subsoil.

This soil is used for range. Small areas are used occasionally for dryland hay. Capability unit IVe-3(15); Claypan range site.

Tierra sandy loam, 15 to 30 percent slopes, eroded (TnE2).--This moderately steep soil is on dissected terraces. It has a profile similar to the one described as representative for the series except that the surface layer is sandy loam 8 to 24 inches thick. Deep gullies are common.

Included in mapping are some small areas that are not so severely eroded. Also included are some areas of Chamise soils.

Permeability is very low. Surface runoff is medium to rapid, and the erosion hazard is moderate to high. Fertility is low. The available water capacity is 2 to 4 inches in the 8- to 24-inch root zone. Some moisture is available slowly from the clay subsoil.

This soil is used for range, wildlife habitat, and watershed. Capability unit VIe-3(15); Claypan range site.

Tierra loam, 2 to 9 percent slopes (TrC).--This gently sloping to moderately sloping soil occurs on terraces. It has the profile described as representative for the series. Depth to the clay subsoil is 12 to 26 inches.

Included in mapping are areas that are cut by some deep and some shallow gullies. Also included are areas of Tierra clay loam.

Permeability is very slow. Surface runoff is slow to medium, and the erosion hazard is slight to moderate. Fertility is moderate. The available water capacity is 4 to 6 inches in the 12- to 26-inch root zone. Some moisture is available slowly from the clay subsoil.

This Tierra soil is used mainly for range; small areas are used for dryland hay or grain. Capability units IIIe-3(14) and IVe-3(15); Claypan range site.

Tierra loam, 9 to 15 percent slopes (TrD).--This soil is strongly sloping and occurs on dissected old terraces. Depth to the clay subsoil is 12 to 24 inches.

Included in mapping are some gullied areas. Also included are areas of Tierra soils that have a clay loam surface layer. Other included areas consist of Chamise and Pleasanton soils.

Permeability is very slow. Surface runoff is medium, and the erosion hazard is moderate. Fertility is low. The available water capacity is 4 to 6 inches in the 12- to 24-inch root zone. Some moisture is available slowly from the clay subsoil.

This soil is used for range. Small scattered areas are used for dryland hay. Capability unit IVe-3(15); Claypan range site.

Tierra loam, 15 to 30 percent slopes, eroded (TrE2).--This moderately steep soil is on the sloping sides of dissected terraces. Depth to the clay subsoil is 10 to 22 inches. Deep gullies are common.

Included in mapping are areas that are slightly eroded. Also included are small areas of soils that have a clay loam surface layer, small areas of Chamise soils, and areas of Tierra soils that have slopes up to 40 percent.

Permeability is very slow. Surface runoff is medium to rapid, and the erosion hazard is moderate to high. Fertility is low. The available water capacity is 2 to 4 inches in the 10- to 22-inch root zone. A little moisture is available slowly from the clay subsoil.

This soil is used for range, wildlife habitat, and watershed. Capability unit VIe-3(15); Claypan range site.

Tierra loam, 5 to 30 percent slopes, severely eroded (TrE3).--This gently sloping to moderately steep soil is severely eroded and occurs on terraces. It has a profile similar to the one described as representative for the series except that the surface layer averages 6 to 10 inches thick. Deep fluted gullies are numerous, and much of the surface layer has been removed. In some areas the clay subsoil is exposed.

Included in mapping are severely eroded areas of Tierra loamy sand and sandy loam. Also included are areas of Chamise soils.

Permeability is very slow. Surface runoff is rapid, and the erosion hazard is high. Fertility is low. The available water capacity is 1 inch to 2 inches in the 6- to 10-inch root zone. A little moisture is available slowly from the clay subsoil.

This soil is used for range, wildlife habitat, and watershed. Capability unit VIIe-1(15); Claypan range site.

Tierra clay loam, 15 to 45 percent slopes (TsF).--This moderately steep to steep soil occurs on the sloping sides of dissected terraces. It has a profile similar to the one described as representative for the series except that the surface layer is clay loam 12 to 24 inches thick.

Included in mapping are small areas of other Tierra soils and of Chamise soils.

Permeability is very slow. Surface runoff is rapid, and the erosion hazard is high. Fertility is moderate. The available water capacity is 3 to 5 inches in the 12- to 24-inch root zone. A little moisture is available slowly from the clay subsoil.

This soil is used for range, wildlife habitat, and watershed. Capability unit VIe-3(15); Claypan range site.

Toomes Series

The Toomes series consists of somewhat excessively drained clay loams that are underlain by hard basic igneous bedrock at a depth of 10 to 20 inches. These soils are in rough mountainous areas in the vicinity of Figueroa Mountain. Toomes soils are intermingled in a complex pattern with Climara soils, and in this survey area they are mapped only with those soils. Slopes range from 15 to 75 percent. Rock outcrops are very numerous, and many areas are difficult to traverse. The vegetation is purple sage, black sage, yucca, sycamore trees in the draws, and a sparse undergrowth of ripgut brome, wild oats, and filaree. Elevations range from 1,500 to 3,000 feet. The average annual rainfall is 10 to 20 inches, the average annual air temperature is about 58° F., and the frost-free season is 210 to 275 days. Toomes soils are associated with Climara and Montara soils.

In a representative profile, Toomes soils have about 16 inches of dark-brown clay loam over fractured, altered, basic igneous rock.

Toomes soils are used for range.

Representative profile of the Toomes series (about 7 miles north of Los Olivos on the Easton ranch):

A11--0 to 6 inches, dark-brown (10YR 4/3) clay loam, dark brown (10YR 3/3) when moist; strong, fine, granular structure; slightly hard, friable, sticky and plastic; many very fine, fine, and medium roots; many very fine interstitial pores; horizon is about 10 percent small rock fragments; mildly alkaline (pH 7.5); abrupt, smooth boundary.

A12--6 to 16 inches, dark-brown (10YR 4/3) clay loam, dark brown (10YR 3/3) when moist; weak, medium, subangular blocky structure parting to moderate, fine, granular structure; hard, friable, sticky and plastic; common very fine, fine, and medium roots; common very fine interstitial pores, few very fine and fine tubular pores; horizon is about 10 percent small rock fragments; neutral (pH 7.0); abrupt, wavy boundary.

R--16 inches, fractured, dark yellowish-brown, altered basic igneous bedrock, with dark reddish-brown coating on rock fragments; few pockets of soil material from the A12 horizon in the bedrock; roots in cracks of the bedrock to about 24 inches in depth. Upper part of the bedrock is highly fractured, but the rock is firmer with increasing depth.

Toomes soils range in color from dark brown to brown. Texture ranges from light clay loam to clay loam. Reaction is neutral to mildly alkaline. Depth to bedrock ranges from 10 to 20 inches.

Small differences in soil properties have led to several classifications of the Toomes soil in various survey areas. Differences center on chromas of 4 or more, or chromas less than 4, and on the amount of coarse fragments.

Toomes-Climara complex, 30 to 75 percent slopes (TxG).--The steep and very steep soils that make up this complex occur on uplands. About 70 percent of the mapping unit is Toomes clay loam, and about 30 percent is Climara clay. These soils are in such intricate patterns that mapping them separately was impractical.

Each soil has a profile similar to the one described as representative for its series. Both soils have rapid to very rapid surface runoff, and the erosion hazard is high to very high.

The Toomes soil is somewhat excessively drained and is moderately permeable. The available water capacity is 2 to 3 inches in the 10- to 20-inch root zone. Fertility is low. Slopes are 60 to 65 percent.

The Climara soil is well drained and is slowly permeable. The available water capacity is 3 to 8 inches in the 20- to 60-inch root zone. Fertility is moderate. Slopes are about 35 percent.

These soils are used for range, wildlife habitat, and watershed. Capability unit VIIe-1(15); Toomes soil is in Shallow Clayey range site, and Climara soil is in Clayey range site.

Wasioja Series

The Wasioja series consists of well-drained fine sandy loams that occupy old dissected terraces above the valley floor. These soils occur in the drier, eastern part of the Cuyama Valley. They have slopes of 2 to 45 percent. In undisturbed areas the relief is faintly "hog wallow." These soils are susceptible to gully erosion, and in many places are cut by long, deep drainageways. The vegetation is sparse annual grasses and desert shrubs. Elevations range from 2,100 to 2,600 feet. The average annual rainfall is 5 to 8 inches, the average annual air temperature is about 58° F., and the frost-free season is 190 to 260 days. Wasioja soils are associated with Panoche and Kettleman soils.

In a representative profile, the surface layer is pale-brown and light yellowish-brown fine sandy loam about 26 inches thick. The subsoil is yellowish-brown and light yellowish-brown heavy sandy clay loam, light clay loam, and heavy sandy loam, underlain at 55 inches by yellow loamy sand. The lower part of the subsoil and the substratum are calcareous. In some areas the surface layer is cobbly fine sandy loam.

Wasioja soils are used for range, for dryland small grains, and for some irrigated crops.

Representative profile of the Wasioja series (NE1/4 NW1/4 sec. 2, T. 9 N., R. 26 W., Santa Barbara County, approximately 2 3/4 miles south and 1/2 mile west of Cuyama, 1 1/2 miles east on Foothill Road from intersection with Bell Road to entrance of the 3L Ranch, then 70 yards south on ranch road entrance and 20 yards west in field):

Ap--0 to 6 inches, pale-brown (10YR 6/3) fine sandy loam, dark brown (10YR 4/3) when moist; strong, very fine and fine, granular structure; hard, friable, nonsticky and nonplastic; few very fine and common micro roots; many fine and micro interstitial pores and common medium and few very fine tubular pores; slightly acid (pH 6.5); abrupt, smooth boundary.

A11--6 to 19 inches, light yellowish-brown (10YR 6/4) fine sandy loam, dark yellowish brown (10YR 4/4) when moist; massive; hard, friable, slightly sticky and slightly plastic; common very fine roots; many micro interstitial pores and common very fine and fine tubular pores; mildly alkaline (pH 7.5); gradual, irregular boundary.

A12--19 to 26 inches, light yellowish-brown (10YR 6/4) fine sandy loam, yellowish brown (10YR 5/4) when moist; massive; very hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine and fine tubular pores and many micro interstitial pores; mildly alkaline (pH 7.8); abrupt, smooth boundary.

B21t--26 to 32 inches, yellowish-brown (10YR 5/6) heavy sandy clay loam, dark yellowish brown (10YR 4/4) when moist; weak, medium, subangular blocky structure; very hard, firm, sticky and plastic; few micro roots; common fine tubular pores; common moderately thick clay films on ped faces and continuous thin clay bridges on mineral grains; noncalcareous; moderately alkaline (pH 8.0); clear, wavy boundary.

B22t--32 to 44 inches, light yellowish-brown (10YR 6/4) light clay loam, yellowish brown (10YR 5/4) when moist; weak, medium, subangular blocky structure; very hard, firm, sticky and plastic; very few micro roots; common very fine tubular pores and few very fine interstitial pores; continuous thin clay bridges between mineral grains, and few moderately thick clay films on ped faces; thin coating of lime on most ped faces and seams (this horizon is more compact and brittle than the B21t horizon); slightly effervescent in soil mass and strongly effervescent with lime in filaments and coatings; moderately alkaline (pH 8.2); gradual, irregular boundary.

B3t--44 to 55 inches, light yellowish-brown (10YR 6/4) heavy sandy loam, yellowish brown (10YR 5/6) when moist; massive; very hard, firm, slightly sticky and slightly plastic; no roots; very few fine tubular pores and common very fine interstitial pores; many thin clay bridges between mineral grains; strongly effervescent; lime coatings in seams and slightly effervescent in soil mass; moderately alkaline (pH 8.2); gradual, irregular boundary.

IIC--55 to 72 inches, yellow (10YR 7/6) loamy sand, brownish yellow (10YR 6/6) when moist; massive; hard, very friable, nonsticky and nonplastic; no roots; many very fine interstitial pores; about 25 percent of mass is made up of yellowish-brown concretions, 1/2 inch to 2 inches in diameter, that are slightly more firm than the soil mass, are heavy loamy sand in texture, and are massive and very hard when dry; violently effervescent; lime in the entire mass; moderately alkaline (pH 8.2).

The content of gravel and cobblestones throughout the profile ranges widely. In places the B horizon is gravelly and cobbly; in some places the profile is gravelly and cobbly throughout. Texture of the A horizon normally is sandy loam or fine sandy loam, but in some places is loam. Color of the A horizon is pale brown, light brownish gray, or light yellowish brown. Depth to the B horizon is 20 to 30 inches. The B horizon typically is clay loam or sandy clay loam, but a few areas that occupy high terrace positions are sandy clay. In some lower positions the texture of the B horizon is light clay loam. The C horizon ranges from loamy sand to clay loam and contains varying amounts of gravel and cobbles. There normally is a slight degree of lime cementation in the C horizon. Chromas and values vary no more than 1 unit from those in the described profile.

Wasioja fine sandy loam, 2 to 5 percent slopes (WaB).--This gently sloping soil occurs on low terrace positions adjacent to the valley bottoms in the eastern part of the Cuyama Valley. The soil has the profile described as representative for the series. Less than 5 percent of the surface layer is gravel, but as much as 25 percent of the subsoil is gravel or cobblestones.

Included in mapping are some areas of a soil similar to Wasioja soils that contains less clay in the subsoil. Also included are some cobbly areas.

Permeability is moderately slow. Surface runoff is slow, and the erosion hazard is slight. Fertility is moderate. The available water capacity is 7 to 9 inches in the 60-inch root zone.

This soil is used for dryland grain, for range, and for irrigated alfalfa. Capability units IIe-1 (17) and VIIe-9(15); Arid Loamy range site.

Wasioja fine sandy loam, 5 to 9 percent slopes (WaC).--This moderately steep soil occurs on terraces.

Included in mapping are small areas of soil that has less clay in the subsoil but is otherwise similar to the Wasioja soils. Also included are some gravelly or cobbly areas.

Permeability is moderately slow. Surface runoff is slow to medium, and the erosion hazard is slight to moderate. Fertility is moderate. The available water capacity is 7 to 9 inches in the 60-inch root zone.

This soil is used for range. Irrigation water generally is not available for this soil. Capability unit VIIe-9(15); Arid Loamy range site.

Wasioja fine sandy loam, 9 to 15 percent slopes (WaD).--This strongly sloping soil is on partly dissected terraces.

Included in mapping are areas cut by deep gullies that are difficult or impossible to cross with machinery. Also included are some cobbly or gravelly areas.

Permeability is moderately slow. Surface runoff is medium, and the erosion hazard is moderate. Fertility is moderate. The available water capacity is 7 to 9 inches in the 60-inch root zone.

This soil is used for range. Irrigation water generally is not available. Capability unit VIIe-9 (15); Arid Loamy range site.

Wasioja cobbly fine sandy loam, 2 to 9 percent slopes (WcC).--This gently sloping to moderately sloping soil occurs on terraces that are partly dissected by drainageways. It has a profile similar to the one described as representative for the series except that the entire soil profile is 15 to 30 percent gravel and cobblestones, by volume. The gravel and cobblestones consist of hard, water-rounded sandstone or metamorphosed sandstone. They vary greatly in size.

Included in mapping are some areas in which as much as 75 percent of the entire soil profile is gravel and cobblestones. Also included are some areas cut by large, deep gullies.

Permeability is moderately slow. Surface runoff is slow to medium, and the erosion hazard is slight to moderate. Fertility is low. The available water capacity is 5 to 6 inches in the 60-inch root zone.

This Wasioja soil is used for range. Irrigation water is not now available for this soil. Capability unit VIIe-9(15); Arid Loamy range site.

Wasioja cobbly fine sandy loam, 9 to 45 percent slopes (WcF).--This soil is strongly sloping to steep and occurs on dissected terraces. The waterways are deeply entrenched, and only small remnants of the old original terraces remain. This soil has a profile similar to the one described as representative for the series except that 15 to 30 percent of the entire soil profile is gravel and cobblestones.

Included in mapping are small areas where up to 75 percent of the soil profile is gravel and cobblestones.

Permeability is moderately slow. Surface runoff is medium to rapid, and the erosion hazard is moderate to high. Fertility is low. The available water capacity is 5 to 6 inches in the 60-inch root zone.

This soil is used for range, wildlife habitat, and watershed. Capability unit VIIe-9(15); Arid Loamy range site.

USE AND MANAGEMENT OF THE SOILS[2/]

This section explains the capability classification that is used by the Soil Conservation Service, in which the soils are grouped according to their suitability for crops. It defines the Storie index numerical rating and accordingly indicates the suitability of each soil in the Area for general intensive farming. Table 2 in this section shows estimated yields of the principal crops under defined levels of management. This section also tells how the soils can be managed for range, wildlife habitat, and recreational areas.

Capability Grouping

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The groups are made according to the limitations of the soils when used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to rice, cranberries, horticultural crops, or other crops requiring special management.

Those familiar with the capability classification can infer from it much about the behavior of soils when used for other purposes, but this classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for range, for forest trees, or for engineering.

In the capability system, all kinds of soils are grouped at three levels, the capability class, the subclass, and the unit. These levels are described in the following paragraphs.

CAPABILITY CLASSES, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use, defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants, require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants, require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use largely to pasture or range, woodland, or wildlife habitat. (None in this survey area.)

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 habitat.

Class VII soils have very severe limitations that make them unsuited to cultivation and that restrict their use largely to pasture or range, woodland, or wildlife.

Class VIII soils and landforms have limitations that preclude their use for commercial crop production and restrict their use to recreation, wildlife habitat, 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 only some 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 the subclasses indicated by w, s, and c, because the soils in class V 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 are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-4 or IIIe-6. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraph; and the Arabic numeral specifically identifies the capability unit within each subclass.

Capability unit numbers generally are assigned locally but are part of a statewide system. All of the units in the system are not represented by the soils of the Northern Santa Barbara Area; therefore the numbers are not consecutive.

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

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2/ FRED COLLISON and RICHARD H. MORS, Soil Conservation Service, helped in preparing this section.

of the units within the subclasses are not numbered consecutively, and their symbols are a partial key to some of the soil features. Numerals used to designate units within the classes and subclasses indicate the following limitations.

0. Sand and gravel in the substratum.
1. Erosion hazard.
2. Wetness caused by poor drainage or flooding.
3. Slow or very slow permeability of the subsoil or substratum.
4. Coarse texture or excessive gravel.
5. Fine or very fine textured surface soil.
6. Salts or alkali.
7. Cobblestones, stones, or rocks.
8. Nearly impervious bedrock or a hardpan.
9. Low fertility or toxicity.

Land Resource Areas

Certain characteristics, such as climate, landforms, crops, and problems of soil and water management, are similar throughout fairly large geographic areas. Accordingly, practices and specifications for use and management of soils are assembled in resource guides for similar areas and each area is identified by a number and a name. For example, land resource area 14 identifies Central California Valleys, including Lompoc, Los Alamos, Santa Maria, Arroyo Grande, Salinas, Santa Clara, and Sonoma Valleys, and many other small coastal valleys. Basically many factors involving use and management of soils and water are similar in all of these valleys and certain general specifications are the same for each area.

California has 15 land resource areas, four of which are in this survey area. Resource area 14 identifies the Central California Valleys; 15, the Central California Coast Range; 17, the Sacramento and San Joaquin Valleys; and 20, the Southern California Mountains.

Resource area 20 is mainly in the Los Padres National Forest. Only fringes of it are in this survey area. These fringes are similar to resource area 15, and for the purposes of this survey, are part of resource area 15. No description, therefore, is given for resource area 20.

The resource areas of the Northern Santa Barbara Area and the capability units in each are described in the following pages, and suggestions are given for the use and management of the soils. The names of the soil series represented are mentioned in the description of each unit, but this does not mean that all the soils of a given series are in the unit. The capability unit designations for each soil in the survey area can be found in the "Guide to Mapping Units" at the back of this publication.

Resource Area 14

This resource area consists of the Santa Maria Valley, Los Alamos Valley, Lompoc Valley, upper Santa Ynez Valley, the valley floors, and the fringes of terraces and low rounded hills along these valleys. Elevations range from sea level to about 2,500 feet. The climate is characterized by cool summers and cool, rainy winters. The frost-free season is 180 to 340 days. Coastal fog and winds have a marked effect on the climate, moderating the temperature.

Is is assumed that in this area irrigation water is available for all irrigable soils and that the lack of precipitation or the length of growing season does not affect placement of soils in the capability grouping. It is also assumed that a high water table is not an extensive problem, even though it may affect the choice of crops or prevent farming in small areas.

Drainage practices are needed in some areas to improve crop production or bring other areas into production. The hazard of flooding is not generally considered a permanent soil limitation in the capability classification, even though extensive flood-control measures are needed in many areas.

Only soils that are irrigated extensively are assigned to this resource area. The fringe areas not irrigated are in resource area 15.

Capability Unit I-1(14)

This unit consists of well-drained Agueda, Botella, Elder, Mocho, Salinas, and Sorrento soils on alluvial fans and flood plains, and Ballard and Pleasanton soils on terraces. Slopes are 0 to 2 percent. The surface layer ranges from sandy loam to silty clay loam. The underlying material is similar in texture but is mostly stratified. The subsoil of Ballard and Pleasanton soils somewhat restricts root growth and water penetration. Effective rooting depth is more than 60 inches in all the soils. Permeability is moderately slow to moderately rapid, available water capacity is 7.5 to 12 inches, and natural fertility is moderate to very high.

These soils are suited to all crops adapted to the Area and require only a minimum of conservation practices. They are used intensively for vegetables, flowers, and field crops (pl. VII, bottom). Soils on terraces are best suited to field crops.

These soils can be irrigated by furrows, borders, or sprinklers with little risk of damage from erosion. The rate at which water is applied and the length of runs vary with soil texture. In leveling, cuts and fills cause little permanent damage. Deep cuts in terrace soils should be avoided. Also, deep gullies form quickly where tail water concentrates and runs off terraces, and safe disposal of excess water is needed.

Organic matter is rapidly depleted. It can be supplied by growing a green manure crop and returning all crop residue to the soil or by applying barnyard or feedlot manure. Subsoiling is needed periodically to break tillage pans. Intensely cultivated areas require adequate fertilization. Most crops need nitrogen and some need phosphorus and other fertilizers. Soil amendments, such as gypsum, are needed occasionally to improve soil structure and increase water intake.

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Capability Unit IIe-1(14)

The soils in this unit are very deep, well-drained sandy loams to silty clay loams of the Agueda, Ballard, Botella, Elder, Salinas, and Sorrento series. These soils occupy fans or terraces. Slopes are 0 to 9 percent. In some areas the soils are gravelly or shaly. In some they are subject to overflow. The risk of erosion is more serious on these soils than on those of unit I-1(14). Permeability is moderately slow to moderately rapid. The available water capacity is 6 to 12 inches in the root zone. Natural fertility is moderate to very high.

These soils are suited to a wide variety of truck and field crops. The risk of erosion is the main limitation. Sheet erosion can be controlled by tilling across the slope, by preserving good soil structure through the use of crop residue or green-manure crops, and by not leaving the soils bare during rainy periods.

Irrigation water can be applied by furrows, borders, or sprinklers. The irrigation system should provide for control of water and erosion and for disposal of tail water. Deep cuts in leveling and smoothing should be avoided in the Ballard soil because the subsoil is clayey. Deep cuts in the other soils cause no permanent damage because the soils are very deep.

Capability Unit IIe-3(14)

Garey sandy loam, 0 to 2 percent slopes, eroded, is the only soil in this unit. This soil is well drained. It has a surface layer of sandy loam and a slowly permeable subsoil. Weakly cemented lenses are at a depth of 26 to 30 inches but do not entirely restrict root or water movement. The available water capacity is 6 to 7 inches in the 60 inches of rooting depth. Natural fertility is low.

This soil is suited to a wide variety of irrigated and dryland crops. It is not so well suited to tree crops as the soils in unit I-1(14) because the subsoil is weakly cemented and slowly permeable. The water table is perched in some places after a rain or after irrigation.

Diversions or dikes are needed to protect this soil against runoff from adjacent, higher areas, and gully control is needed to protect this soil against further erosion. Irrigation water should be applied carefully to avoid runoff and a perched water table.

Capability Unit IIs-0(14)

This unit consists of moderately deep and deep, well-drained sandy loams to loams that are underlain by a rapidly or very rapidly permeable sand or gravel substratum. These soils are in the Agueda, Mocho, and Sorrento series. They are mostly on flood plains in the Santa Maria Valley. Slopes are 0 to 2 percent. The sand or gravel is at a depth of 30 inches. The available water capacity is 5 to 7 inches. Natural fertility is moderate to high.

These soils are productive of all locally grown crops, including row, truck, specialty, and field crops. They require minimum conservation practices.

These soils can be irrigated by furrows, borders, or sprinklers with little risk of damage from erosion. Because of the rapid or very rapid permeability of the substratum, they require short irrigation runs and frequent applications of irrigation water to avoid leaching out plant nutrients and wasting water. The rate of water application and the length of runs vary, depending on the texture of the surface layer. Deep cuts in leveling should be avoided.

Organic matter is rapidly depleted. It can be supplied by growing a green-manure crop and returning all crop residue to the soil or by adding barnyard or feedlot manure. Subsoiling is needed periodically to break tillage pans that develop through cultivation. Adequate fertilization is needed in areas under intensive cultivation. Nitrogen is generally needed. The amount of fertilizer to be applied should be based on the results of soil or plant-tissue tests. Soil amendments, such as gypsum, may be needed occasionally to improve soil structure and increase water intake.

Capability Unit IIs-4(14)

Ballard gravelly fine sandy loam, 0 to 2 percent slopes, is the only soil in this unit. It is well drained and very deep and is on terraces. Slopes are 0 to 2 percent. Surface runoff is very slow. Natural fertility is moderate. The available water capacity is 6 to 7.5 inches in the 60 inches of rooting depth. Permeability is moderate.

This soil is suited to irrigated field crops and pasture. It requires a minimum of conservation practices.

This soil can be irrigated by furrows or sprinklers with little risk of damage from erosion. Because of the high gravel content, it tends to be droughty and thus needs frequent light irrigations. Overirrigation wastes water and leaches nutrients. The gravel content also limits the amount of tillage used. Leveling for irrigation is no problem because the soil is deep and cuts and fills have little permanent damaging effect.

Organic matter is rapidly depleted. It can be supplied by growing a green-manure crop and returning all crop residue to the soil or by adding barnyard or feedlot manure. Subsoiling is needed periodically to break tillage pans that develop under cultivation. Adequate fertilization is needed in areas under intensive cultivation. Nitrogen is generally needed. The amount of fertilizer to be applied should be based on the results of soil or plant-tissue tests. Soil amendments, such as gypsum, are occasionally needed to improve soil structure and increase water intake.

Capability Unit IIs-5(14)

Cropley silty clay is the only soil in this unit. It is very deep and well drained. It occurs in only one area, west of Lompoc in the Lompoc Valley. This soil tends to develop wide cracks when dry. It is slowly permeable and dries out slowly. The available water capacity is 8 to 10 inches in the 60 inches of effective rooting depth. Natural fertility is high. There is little or no erosion hazard.

This soil is well suited to field crops, such as beans, corn, hay, and pasture grasses. Truck crops grow well but are sometimes difficult to harvest, particularly in winter during rainy periods.

Green-manure crops improve tilth and build up the supply of organic matter. Fertilizer should be applied according to the needs of each crop. Nitrogen is needed for practically all crops.

Little leveling is needed before irrigation because the soil is nearly level. All irrigation systems should provide for carrying away tail water to prevent ponding.

This soil is difficult to work and can be worked within only a narrow range of moisture content. If cultivated when dry, it becomes hard and compact and breaks into clods. If this soil is cultivated when wet, cultivation not only is difficult but also easily damages soil structure.

Capability Unit IIw-1(14)

The soils of this unit are very deep, well-drained sandy loams and loams of the Mocho and Salinas series. Some are underlain by sand and gravel at a depth of 30 to 60 inches. These soils are in small valleys and on flood plains and have slopes of 0 to 2 percent. They are subject to overflow from runoff of adjacent steeper soils. Permeability is moderately rapid to very rapid. The available water capacity is 5 to 11 inches in the 30 to more than 60 inches of rooting depth. Natural fertility is moderate to high.

These soils are suited to almost all crops grown in this area and require only a minimum of conservation practices. Tree crops are often adversely affected during periods of flooding.

Diversions that have an adequate water-disposal system are needed as protection against concentrated flows of runoff from canyons or from soils at higher elevations. Dikes or levees are needed along some streams or channels to protect the soils from inundation.

These soils can be irrigated by furrows, borders, or sprinklers with little risk of damage from erosion. The length of runs and the rate at which water is applied vary with the soil texture. Leveling for irrigation is no problem because the soils are deep and cuts and fills have little permanent damaging effect.

Organic matter is rapidly depleted. It can be supplied by growing a green-manure crop and returning all crop residue or by applying barnyard or feedlot manure. Subsoiling is needed periodically to break tillage pans that develop under cultivation. In areas under intensive cultivation, adequate fertilization is needed. Nitrogen is generally needed. The amount of fertilizer to be applied is based on the results of soil and plant-tissue tests. Soil amendments, such as gypsum, are occasionally needed to improve soil structure and increase water intake.

Capability Unit IIw-2(14)

The soils in this unit are very deep, moderately well drained to somewhat poorly drained sandy loams to silty clay loams of the Bayshore, Botella, Camarillo, and Garey, wet variant, series. They are on flood plains. Slopes are 0 to 5 percent. In some areas sand is at a depth of 40 to 60 inches. These soils require internal drainage, but otherwise are similar to the soils in unit I-1(14). In some places the water table is temporarily within a depth of 2 to 5 feet, and in other places it is fairly constant at a depth of 4 to 6 feet. Many areas that are artificially drained have a water table at a depth of at least 5 feet. Permeability is rapid to slow. The available water capacity is 6 to 12 inches. Natural fertility is low to high.

Crops grow nearly as well on these soils as on the well-drained soils in unit I-1(14), but the choice of crops is more restricted because of the high water table. Deep-rooted fruit trees are not suitable, and alfalfa may be adversely affected. Truck, field, and specialty crops and irrigated pasture are well suited to the well-drained soils. Pasture is most satisfactory on the undrained soils. Open ditches and tile drains are needed to control the water table.

Irrigation should be regulated to supply enough water for crops and to avoid building up the water table. Adequate leveling and provision for disposing of excess water also help in controlling the water table.

Erosion is no problem, but occasionally, overflow and ponding are hazards. Diversions or water-disposal systems may be needed. Crop rotations, green-manure crops, and fertilization maintain and improve productivity.

Capability Unit IIIe-1(14)

This unit consists of moderately deep to very deep, well-drained sandy loams to loams of the Chamise, Garey, and Pleasanton series. These soils are on terraces. Slopes are 2 to 9 percent. The subsoil is moderately slowly and slowly permeable and thus, restricts root development. The erosion hazard is moderate. Fertility is low to moderate. The available water capacity is 4 to 9 inches in the 20 to more than 60 inches of rooting depth.

These soils are well suited to close-growing crops, such as pasture or hay. Field, truck, or orchard crops can be grown if erosion can be

controlled. Only a small part of the acreage is irrigated. The management needed on dryfarmed soils is explained under the heading Capability Unit IIIe-1(15).

Sprinkler irrigation is most satisfactory if leveling is at a minimum. Deep cuts in leveling should be avoided.

Runoff should be controlled so that water does not concentrate in draws because gullies form easily. Controlling erosion is a problem during rainy periods in winter unless the surface is well protected. All tillage should be done across the slope or on the contour.

Capability Unit IIIe-3(14)

This unit consists of moderately well drained soils of the Positas, Santa Ynez, and Tierra series. These soils are mostly on terraces. Slopes are 2 to 9 percent. The surface layer is sandy loam to clay loam. It is underlain by dense clay at a depth of 16 to 30 inches. Water and root penetration is very slow in this subsoil layer. A perched water table is likely to form after excessive irrigations or after a rainfall. The available water capacity is 3.5 to 6 inches in the 16 to 30 inches of effective rooting depth. Moisture is very slowly available from the clayey subsoil. Natural fertility is low to moderate. The erosion hazard is slight. Only a small acreage is irrigated.

These soils are best suited to close-growing crops, such as pasture or hay.

Sprinkler irrigation is most satisfactory if leveling is kept at a minimum. Runoff should be controlled so that water does not concentrate in draws because gullies form easily. Provisions for efficient use and control of water are needed in areas that are row cropped and furrow irrigated. Deep cuts should be avoided because the subsoil is at or near the surface. Overirrigation should be avoided because the excess water accumulates above the subsoil and damages roots. Breaking up the clay layer is most difficult because the soil seals over soon after rewetting. Erosion is a serious problem during rainy periods in winter unless the surface is protected.

Organic matter can be supplied through the use of green-manure crops, crop rotations, and crop residue. The response to fertilization is generally better on these soils than on the deeper soils.

Capability Unit IIIs-4(14)

This unit consists of very deep, somewhat excessively drained loamy sands of the Corralitos and Metz series. These soils developed on recent alluvial fans and have slopes of 0 to 9 percent. They are rapidly to moderately permeable and are low in fertility. Their coarse texture is the most important characteristic. They are susceptible to wind erosion, particularly the Corralitos soils, and in some areas, to occasional overflow. The available water capacity is 4 to 6 inches in the 60 inches of rooting depth.

These soils can be used for most locally grown crops but are much less productive than the finer textured soils. Strawberries grow well under high level management.

These soils are droughty. Preserving fertility is difficult because plant nutrients are easily leached out. An irrigation run of about 325 feet is the maximum length for furrow irrigation. A maximum of 2 to 3 inches of water per acre should be applied at each irrigation. Frequent irrigations are important. Crops are damaged from lack of water more quickly on these soils than on the clayey soils. Overirrigation wastes water and leaches out nutrients.

Cover crops and mulches of residue help to control wind erosion. Water erosion is seldom a problem because of the high rate of infiltration, but occasional overflow is likely.

The supply of organic matter is low. Applying barnyard manure or growing a green-manure crop and returning all residue increases the amount of available water and improves fertility.

Capability Unit IIIw-2(14)

The soils in this unit are very deep, moderately well drained to poorly drained clay loams and silty clay loams of the Bayshore and Botella series. These soils are in low basin areas, generally near the coast. They are normally moderately well drained, but in this area they have a fluctuating water table, commonly 3 to 5 feet below the surface. In winter it may be within a depth of 1 foot. Permeability is moderately slow. The available water capacity is 11 to 12 inches. The soils are slightly to moderately saline and highly fertile.

These soils are suited to native grass pasture, grain, or annual crops for pasture or hay. During unusually wet periods, no cultivation is possible because the soils dry out too slowly. Tile or open ditch drainage systems are needed in irrigated areas to lower the water table and permit leaching. After drainage is established, the soils should be managed the same as those in capability unit IIw-2 (14). Drainage is difficult because of the slow permeability and the lack of drainage outlets.

Capability Unit IVe-4(14)

The soils of this unit are moderately deep to very deep, moderately well drained to excessively drained loamy sands and sands of the Betteravia, Corralitos, Marina, and Oceano series and the Betteravia, dark variant, and Narlon, hardpan variant series. These soils are on alluvial fans, terraces, and low hills. Slopes are 0 to 15 percent. The risk of erosion is very high. The Corralitos and Oceano soils are rapidly permeable, are very deep, and have little or no increase in clay content with increasing depth. Marina soils have clay bands in the subsoil and are moderately permeable. The Betteravia, Betteravia, dark variant, and Narlon,

hardpan variant, soils have a very weakly to strongly developed hardpan at a depth of 24 to 50 inches. The pan is slowly permeable to very slowly permeable and restricts root and water penetration. The available water capacity is 2 to 5 inches. Natural fertility is low to very low.

These soils are well suited to irrigated pasture or specialty crops, such as strawberries; the deep soils can be used for alfalfa. Crop growth is generally only fair. Only a small acreage is irrigated.

Adequate fertilization and well planned irrigation are more important on these soils than on finer textured soils. These soils need more frequent irrigation and less water in each run than the soils in unit IIIs-4(14). Overirrigation wastes water and leaches nutrients in the deep soils and develops a perched water table in the soils that have a slowly or very slowly permeable subsoil or pan. Erosion control is needed in irrigated areas of Betteravia, Betteravia, dark variant, and Narlon, hardpan variant, soils. All the soils are damaged by wind through plant abrasion and soil movement in exposed areas.

Capability Unit VIIw-9(14)

This unit consists of areas of Marsh, Sandy alluvial land, wet, and Swamp. These are acid organic soils, fine-textured salty soils, and wet alluvial soils along stream channels and in trapped basins surrounded by sand dunes. They are in widely scattered parts of the survey area. Some areas are occasionally inundated. The surface soil material includes fine and coarse textures and in spots is peaty. Reaction ranges from extremely acid to strongly alkaline. Most areas have little or no soluble salts, but areas of Marsh are strongly saline, particularly areas near the ocean.

These areas are suitable for limited grazing late in summer and in fall. Production is usually very low and the quality of feed is normally poor. Occasionally grain or hay crops have been grown in selected spots, particularly during dry periods. Many areas are not suitable for cultivation.

The native vegetation in areas of Marsh consists of pickleweed, saltgrass, poison hemlock, alkali sacaton, and other salt-tolerant plants. In areas of Swamp it generally consists of sedges, cattails, willows, and other water-tolerant plants, and in areas of Sandy alluvial land, wet, of water-tolerant plants, such as alders, willows, and sedges.

A detailed onsite study is needed for each area before any attempt is made to improve the drainage.

Capability Unit VIIw-4(14)

This unit consists of Cobbly alluvial land and Sandy alluvial land, both of which are along stream channels. Both are periodically subject to floodwater that channels and scours the surface. Soil material may be removed or deposited during floods, and crops grown during flood periods are either damaged or destroyed. The soil material consists of beds of gravel, cobblestones, coarse sand, and in places strata of silt or fine sand. Wind erosion is a hazard in areas that lack vegetative cover. Slopes are mostly less than 1 percent but in small valleys are as much as 9 percent. Natural fertility is very low. The available water capacity also is very low.

These soils are suitable for limited grazing, mainly of brush and sparse annual grasses and forbs. Small wet spots are covered with willows and sedges. Forage production is very low. The soils in this unit are described in more detail under the "Sandy Alluvial range site."

Capability Unit VIIIe-1(14 and 15)

This unit consists of very steep areas of Gullied land and Rough broken land. Rough broken land, in extensive areas throughout the survey area, is made up of deep beds of softly consolidated alluvial soil material that has been deeply eroded and is now cut by sharply ridged barren hills and mountains. It has only a sparse brush cover. Consequently, lower lying areas are subject to high silt accumulations. Gullied land is mostly in small valleys. Deep gullies have formed through accelerated erosion. Some are partly stabilized by brushy cover. Others are actively eroding.

These areas are too steep and erodible to be used for grazing or other farm purposes, but they have some value as wildlife habitat. Fire protection is needed for both the vegetation and the wildlife, and all vegetation should be preserved to retard erosion and to protect lower lying areas. Dams build on streams below these areas are subject to rapid siltation.

Capability Units VIIIe-4(14) and VIIIw-4(14)

Coastal beaches, Dune land, and Riverwash are in these units. These areas are valuable for recreation or for raw materials but are not suitable for farm use. They are too sandy and unproductive for crops, and the vegetation is too sparse for grazing. Riverwash is a valuable source of sand and gravel for construction and roads.

Dune fences and special vegetation are needed to keep sand from blowing and to protect valuable cropland or rangeland. Protecting the vegetation on partly stabilized dunes keeps dunes from becoming active.

Resource Area 15

All soils outside the major valleys and those in fringes of Resource Area 20 are in this area. None are irrigated. The area is mainly hilly to mountainous but includes some low lying benches and

small valleys. Elevations range from sea level to about 3,500 feet.

In summer, the climate ranges from cool and foggy along the coast to hot and dry inland. In winter, rainfall ranges from 6 to 12 inches in the driest part of the Cuyama Valley to 30 inches in a few of the mountainous parts. It is about 14 inches near the coast.

Soils of this area vary. They are used mainly for grazing. The main crops are fruits, range forage, grain, hay, and beans. The grain and hay crops are grown in some of the more favorable locations. The dryland acreage has greatly decreased in recent years. A significant acreage is severely eroded. The rest is moderately eroded.

Capability Unit IIe-1(15)

The soils in this unit are very deep, well-drained loams to silty clay loams of the Agueda, Botella, and Elder series. In places they are shaly. They are on alluvial fans and flood plains and in long narrow valleys. Slopes range from 0 to 9 percent. They are generally less than 2 percent in eroded areas. Permeability is moderate to moderately slow. Surface runoff is mainly slow to medium, and the erosion hazard is slight to moderate. Natural fertility is moderate to high. The available water capacity is 8 to 12 inches in the 60 inches of rooting depth. Past erosion and the erosion hazard are the major limitations in management. The lack of irrigation water is a limitation also.

These soils are used for dryfarmed hay and grain and for range. They should be tilled across the slope to reduce runoff and the erosion hazard. Stubble left on or near the surface helps in controlling erosion. Gully stabilization is needed in eroded areas.

Range management for these soils is described under the headings "Clayey range site" and "Loamy range site."

Capability Unit IIIe-1(15)

The soils in this unit are well-drained, moderately deep to very deep sandy loams to clay loams of the Ballard, Botella, Elder, Garey, Linne, Pleasanton, Salinas, Sorrento, and Santa Lucia series. These soils are on alluvial fans, terraces, or low rolling hills and have slopes of 2 to 15 percent. In most areas the soils are more than 60 inches deep. Linne and Santa Lucia soils are 30 to 60 inches deep over bedrock. Garey soils have weakly cemented lenses at a depth of 20 to 36 inches, but the lenses do not prohibit root or water penetration. In a few areas where slopes are 0 to 2 percent, the soils are subject to overflow and erosion. The erosion hazard is slight to moderate in cultivated areas. Natural fertility is low to very high. Permeability is typically moderately rapid to moderately slow but is slow in Garey soils. The available water capacity is 6 to 12 inches.

Areas of these soils are small and widely scattered and are mostly surrounded by more sloping areas. They are used mainly for range, but many areas are used for small grain or hay.

Cultivating across the slope and leaving crop residue and stubble on the surface help in checking erosion and in supplying organic matter. Diversion terraces designed to intercept surface runoff are needed in many areas. Gully stabilization is frequently needed to permit safe cultivation on some of the long, narrow alluvial fans. Strip farming is advisable on long, broad alluvial fans.

Range management for these soils is described under the headings "Loamy range site" and "Clayey range site."

Capability Unit IIIe-5(15)

Diablo silty clay, 9 to 15 percent slopes, is the only soil in this unit. It is a well-drained, moderately deep soil on uplands. Mudstone is at a depth of 20 to 40 inches. Fertility is high. Permeability is slow, and the available water capacity is 4 to 6 inches. Surface runoff is medium, and the erosion hazard is moderate.

This soil is suited to dryfarmed hay and grain used for range or pasture. All tillage should be across slope. Crop residue should be returned to the soil, or a stubble left on the surface. Runoff should be diverted from adjacent areas to reduce the erosion hazard. Stubble mulching helps in conserving soil moisture and in reducing the erosion hazard.

Range management for this soil is discussed under the heading "Clayey range site."

Capability Unit IVe-1(15)

The soils in this unit are well-drained, very deep to moderately deep sandy loams to silty clay loams. They are in the Ballard, Chamise, Crow Hill, Elder, Gazos, Linne, Pleasanton, Santa Lucia, Shedd, and Shedd, diatomaceous variant, series. These soils are on alluvial fans, terraces, and uplands. Slopes range from 2 to 30 percent. The upland soils are underlain by sandstone or shale or weakly consolidated sediments at a depth of 20 to 60 inches. Fertility is low to high. Permeability is moderately rapid to moderately slow in most areas but is slow in Chamise soils. The available water capacity is 3 to 10 inches. The erosion hazard is slight to high.

These soils are in small, scattered areas throughout the survey area. They are mainly used as range. They are suitable for occasional tillage but not for more than 1 year in 5. Reseeding and fertilization improve the grass cover.

All tillage should be done on the contour. Residue from cultivated crops should be used as a surface mulch for protection against erosion. Grazing should be limited to protect the plant cover.

Range management for these soils is described under the heading "Loamy range site."

Capability Unit IVe-3(15)

The soils of this unit are well-drained to moderately well drained, shallow and moderately deep loamy sands to clay loams that have a slowly or very slowly permeable clay subsoil. They are in the Los Osos, Narlon, Positas, San Andreas, San Benito, Santa Ynez, and Tierra series. Slopes are 1 to 15 percent. Roots penetrate to a depth of only 12 to 40 inches. Natural fertility is medium to very low. Only 3.5 to 8 inches of water is available to plants. Water erosion is a hazard in cultivated or overgrazed areas. Narlon soils are also subject to wind erosion. All the soils need intensive management in cultivated areas.

These soils are used almost entirely for range. A few areas are used for dryland grain and hay, but production is generally low. Cultivation is desirable to improve stands or to establish a better variety of grass, but no oftener than 1 year in 5. The erosion hazard is high in cultivated areas. The Narlon soil is not so susceptible to water erosion as the other soils in this unit, but is susceptible to wind erosion, and in places gullies form in draws. All tillage should be done on the contour. Residue from crops and native vegetation should be used as a mulch for protection against erosion.

Range management is described under the headings "Claypan range site" and "Clayey range site."

Capability Unit IVe-4(15)

This unit consists of well-drained to somewhat excessively drained, moderately deep to very deep loamy sands of the Betteravia, dark variant, and Corralitos series. These soils are on alluvial fans or terraces and have slopes of 0 to 15 percent. The Corralitos soil is more than 60 inches deep. The Betteravia, dark variant, soil is underlain by a weakly cemented pan at a depth of 24 to 36 inches. Both soils are susceptible to wind erosion, and in places, to water erosion also. Both have low to very low natural fertility and hold 4 to 5 inches of water available to plants. Permeability is rapid in the Corralitos soil and slow in the Betteravia, dark variant.

These soils are not suitable for dryland cultivation. They are droughty and easily eroded by wind; production is very low. Many areas need extensive gully control before they can safely be cultivated. In selected areas cultivation may be needed occasionally to re-establish or improve the grass cover.

All tillage should be done on the contour or across the slope. Residue from crops or native vegetation should be used as a surface mulch for protection against erosion.

Areas used for irrigated crops are described under the heading "Resource Area 14." Range management for these soils is described under the heading "Sandy range site."

Capability Unit IVe-5(15)

Diablo silty clay, 15 to 30 percent slopes, is the only soil in this unit. It is a well-drained, moderately deep soil on uplands. Mudstone is at a depth of 20 to 40 inches. This soil is highly fertile, and if well managed, is suited to forage. It occupies small, irregularly shaped areas scattered through the survey area. The erosion hazard is moderate to high. Permeability is slow. The soil holds 4 to 6 inches of water available to plants.

This soil is suited to grazing and is moderately well suited to dryland crops. It is used almost entirely for grazing. Many areas were formerly cultivated. The erosion hazard is high in the clean-cultivated areas. Cultivated crops can be grown occasionally if management is good and erosion is controlled.

Occasional cultivation to establish new plant cover is desirable when the cover is depleted or sparse. All farming should be done on the contour. Crop residue should be used as a surface mulch for protection against erosion.

Range management for this soil is described under the heading "Clayey range site."

Capability Unit VIe-1(15)

This unit consists of well-drained sandy loams to silty clay loams that are moderately deep or deep over sandstone, shale, or mudstone and in places are very deep over alluvium. They are in the Chamise, Contra Costa, Crow Hill, Garey, Gaviota, Gazos, Linne, Lodo, Pleasanton, San Andreas, San Benito, Santa Lucia, Shedd, and Shedd, diatomaceous variant, series. The soils are on uplands and terraces. The available water capacity is 2 to 9 inches. Effective rooting depth is 10 to over 60 inches. Fertility is low to high. Permeability is moderate to moderately slow.

These soils are suitable for grazing. Reseeding grasses and legumes improves the forage in selected areas. Fertilization also is beneficial in selected areas. The vegetation is mainly annual grasses and forbs and oak trees. Areas that are fairly open are moderately productive; forage production decreases as the oak tree growth becomes denser.

Range management for these soils is described under the headings "Clayey Loamy range site" and "Shallow Loamy range site."

Capability Unit VIe-3(15)

The soils in this unit are moderately well drained and well drained sandy loams to clay loams that have a slowly or very slowly permeable clay subsoil. These soils are in the Positas, San Benito, Santa Ynez, and Tierra series. They are on terraces and have slopes of 2 to 45 percent. They are highly erodible in cultivated or overgrazed areas. Roots and

water penetrate to a depth of 10 to 36 inches. Some areas are eroded; others are only slightly eroded. The available water capacity is 1 to 7 inches.

These soils are best suited to grazing. Because of the erosion hazard, intensive management is needed in cultivated areas. Selected areas can be seeded. The response to fertilization is good. The vegetation is principally annual grasses and forbs and scattered oaks.

Range management is described under the headings "Claypan range site" and "Clayey range site."

Capability Unit VIe-4(15)

This unit consists of excessively drained to moderately well drained sands and loamy sands of the Arnold, Betteravia, Corralitos, Marina, Narlon, Oceano, Tangair, and Narlon, hardpan variant, series. These soils are on alluvial fans, terraces, and low hills. Slopes are 0 to 15 percent. Corralitos, Marina, and Oceano soils are very deep over alluvial sand. The Arnold soil is 40 to 60 inches deep over soft sandstone. Narlon, Betteravia, and Tangair soils and the Narlon, hardpan variant, are 20 to 60 inches deep over a clay subsoil or a hardpan. All the soils are droughty and have low fertility. The available water capacity ranges from 2 to 5 inches. Permeability is rapid in the Arnold, Corralitos, and Oceano soil but is moderate in the Marina soil. Betteravia, Narlon, and Tangair soils and the Narlon, hardpan variant, have a very rapidly permeable surface soil and a very slowly permeable subsoil.

The vegetation is mostly brush. If cleared, the soils can be used for cropping or grazing. Production, however, is low. Range production can be improved on selected sites by seeding grasses, such as veldtgrass. The risk of wind erosion is very high if plant cover is removed. If water is available for irrigation, selected areas can be used for specialty crops, such as strawberries, or for irrigated pasture. Production is fair if fertilization is adequate.

Range management for the soils is described under the heading "Sandy range site."

Capability Unit VIe-5(15)

The soils in this unit are moderately deep to deep, well-drained clays on uplands. They are in the Climara, Diablo, San Benito, and Toomes series. Slopes are 15 to 45 percent. The depth to shale, sandstone, or basic igneous rock ranges from 20 to more than 60 inches. Fertility is medium to high. Permeability is slow. The available water capacity is only 3 to 8 inches. The erosion hazard is moderate to high.

These soils are best suited to range. If overgrazed or cultivated, they are susceptible to erosion. Selected sites can be cultivated occasionally to establish new stands of grasses.

Range management for these soils is described under the heading "Clayey range site."

Capability Unit VIIe-1(15)

Terrace escarpments, loamy, Terrace escarpments, cobbly, and soils of the Chamise, Climara, Contra Costa, Crow Hill, Garey, Gaviota, Gazos, Linne, Lodo, Lopez, Los Osos, Positas, San Andreas, San Benito, Santa Lucia, Shedd, Tierra, Toomes, and the Shedd, diatomaceous variant, series are in this unit. These are somewhat excessively drained to moderately well drained sandy loams to silty clay loams on uplands and terraces. Slopes are dominantly 15 to 75 percent. Small, scattered, gently sloping and sloping areas are included where erosion has been severe or the soils are cobbly, stony, or rocky. The depth to sandstone, shale, igneous rock, or partly consolidated old alluvial deposits ranges from 6 to more than 60 inches. Fertility is very low to high. Permeability is moderate to very slow, and the available water capacity is 1 to 8 inches. The erosion hazard is high to very high.

These soils are suited to range. Productivity is low to fair, depending on the fertility of the soil and the kind of plant cover. The plant cover varies. On the deeper soils it consists of annual grasses and forbs and scattered oaks, or a grass-forb mixture and numerous oaks, or nearly solid oak stands and a sparse grass understory. Eroded and shallow areas are largely brush covered and produce very little forage. Controlled grazing is important in maintaining sufficient cover for maximum forage production and erosion control.

Range management for these soils is described under the headings "Steep Loamy", "Shallow", "Shallow Clayey", "Clayey", and "Claypan" range sites.

Capability Unit VIIe-4(15)

Terrace escarpments, sandy, and soils of the Arnold, Betteravia, Marina, Narlon, and Oceano series are in this unit. All are excessively drained to moderately well drained sands and loamy sands on terraces and low hills. Slopes are dominantly 9 to 45 percent. Severely eroded areas are included where slopes are less than 9 percent. The soil depth ranges from about 6 inches in eroded areas where there is a weakly cemented hardpan to more than 60 inches in areas where there are no subsoil restrictions. The soils in this unit hold 0.75 inch to 6 inches of moisture available to plants. They are very low in natural fertility. All are susceptible to wind erosion and, in most areas, to water erosion if the cover is removed. Permeability is rapid to very slow.

These soils are suitable for grazing. The native vegetation is mainly brush. In some areas of Arnold and Marina soils it is oak trees and a sparse annual grass understory. These areas provide fair grazing.

Range management for the soils is described under the headings "Sandy range site," "Eroded range site," and "Shallow Sandy range site."

Capability Unit VIIe-5(15)

This unit consists of well-drained clays in mountainous areas. These soils are in the Diablo and

San Benito series. Some areas have a cover of annual grasses and forbs, and others, a fairly open cover of oak and annual grasses and forbs. Slopes range from 15 to 75 percent. The erosion hazard is moderate to high. The eroded soils are moderately fertile, and the uneroded soils are highly fertile. The available water capacity is 4 to 5 inches in the 20 to 30 inches of rooting depth. Permeability is slow.

These soils are suitable for grazing. The moderately deep, uneroded soils are generally in areas of fairly open grassland. Burclover is abundant, and forage production is fairly high. The eroded soils are covered with sagebrush. Forage production is low. The erosion hazard is fairly high. Sufficient cover should be left after grazing to control runoff and erosion.

The eroded soils are described under the heading "Shallow Clayey range site." The uneroded soils are described under the heading "Clayey range site."

Capability Unit VIIe-9(15)

This unit consists of well-drained fine sandy loams to silty clays on dissected terraces or low hills. These are soils of the Ballinger, Kettleman, Montara, and Wasioja series. Some areas are cobbly. On the low hills the depth to sandstone, shale, mudstone, or serpentine ranges from 6 to 40 inches. On terraces it is more than 60 inches. The available water capacity ranges from 1 to 9 inches. Permeability is moderate to slow.

The Ballinger, Kettleman, and Wasioja soils are in the drier, eastern part of the Cuyama Valley where annual rainfall is only 5 to 10 inches. All are too dry for cultivated crops or for range fertilization. Ballinger soils contain large amounts of gypsum and moderate to large amounts of soluble salts. They are very low in fertility. On the best sites the vegetation is a sparse stand of low-quality annual grasses. On the poorer, drier sites it is desert trumpet.

Montara soils receive 12 to 25 inches of rainfall annually. They overlie residuum derived from serpentine rocks and have a low calcium-magnesium ratio. The vegetation is a sparse cover of annual grasses, forbs, and scattered sagebrush and juniper trees.

These soils are suitable for light grazing. Forage production is low to fair on Montara, Wasioja, and Kettleman soils and very low on Ballinger soils.

Range management for Wasioja and Kettleman soils is described under the heading "Arid Loamy range site;" Ballinger soils, "Gypsum Hills range site;" and Montara soils, "Shallow Loamy range site."

Capability Unit VIIIs-1(15)

Igneous rock land, Mine pits and dumps, Sedimentary rock land, and soils of the Lopez and Maymen steep, somewhat excessively drained stony or rocky loams. Most are in mountainous areas. Slopes range from 3 to 75 percent. The soil material is 8 to 20 inches deep and holds only 1 to 3 inches of water available to plants. Permeability is moderate.

Sedimentary rock land and Igneous rock land contain little soil material, and most of the surface is rocky. Runoff is very rapid, but little soil material is washed away. In most areas the vegetation is sparse, either chaparral or sagebrush and a few clumps of grass.

All of the land in this unit is too steep or barren to be used for grazing or other farm purposes. Part of it is valuable as recreational areas and wildlife habitat, and part for mining products. Fire prevention is needed in areas of mining operations to protect lower lying soils against runoff and sedimentation.

Resource Area 17

This area includes the Sacramento and San Joaquin Valleys, other smaller inland valleys that have similar soils and climate, and the eastern, drier part of the Cuyama Valley. The soils are nearly level or moderately sloping. All are irrigated.

Elevations range from 1,800 to 2,600 feet. The climate is characterized by cool, rainy winters and hot, dry summers. Annual rainfall ranges from 5 to 12 inches, all of which falls in winter. Occasionally, snow falls in the area.

One extensive basin area is moderately affected by salts. Erosion is a severe hazard in some areas because of flooding from side streams or the Cuyama River. Only small areas are affected by somewhat poor drainage.

All soils are deep, and fertility is low to high. Large acreages are used for alfalfa. A few small areas are used for potatoes, sugar beets, irrigated pasture, and orchards. Many areas are idle.

Capability Unit I-1(17)

This unit consists of very deep, well-drained sandy loams and loams on alluvial fans and flood plains. Slopes are 0 to 2 percent. These soils are in the Panoche series. They are stratified and more than 5 feet deep. The available water capacity is 7.5 to 11 inches. Permeability is moderately slow to moderate. There is little or no erosion hazard.

These soils are used mainly for alfalfa but are well suited to all crops commonly grown in the Area. They can be irrigated by furrows, borders, or sprinklers with little risk of damage from erosion. The

length of runs and the rate at which water is applied vary, depending on the soil texture and the degree of stratification. Cuts and fills needed in leveling have little damaging effect on the soil.

Organic matter can be supplied by growing a green-manure crop and returning all crop residue or by applying barnyard or feedlot manure. Nitrogen is needed for all crops other than alfalfa. Subsoiling is needed periodically to break tillage pans that form in cultivated areas.

Capability Unit IIe-1(17)

The soils in this unit are very deep, well-drained sandy loams to loams on flood plains and alluvial fans. Slopes are 2 to 9 percent. These are soils of the Panoche and Wasioja series. The Panoche soil is stratified. The Wasioja soil has a subsoil of sandy clay loam. Both are subject to erosion. Fertility is moderate to high. Permeability is moderate to moderately slow. The available water capacity is 7 to 11 inches.

These soils are suited to all crops commonly grown in the Area. The Wasioja soil, however, is not so well suited as the Panoche soil. It is more susceptible to erosion, and its clayey subsoil moderately restricts water and root penetration. Also, this soil is damaged by deep cuts made in leveling.

Only a small acreage is irrigated. The irrigation water soaks in if it is applied on the contour or by sprinklers. A water disposal system is needed to safely dispose of tail water.

Capability Unit IIs-6(17)

The soils in this unit are very deep, somewhat poorly drained, slightly to moderately saline sandy loams to silty clay loams on flood plains. Slopes are less than 2 percent. These soils are in the Stutzville series. They have a moderately high salt content and are mottled throughout but are otherwise similar to the soils in unit I-1(17). They are drained at present but show evidence of having formed under somewhat poor drainage conditions. They hold 9 to 13 inches of water available to plants. Permeability is slow to moderately slow; it is slower than in less stratified soils. Natural fertility is high.

Unless leached of salts, these soils should be used only for salt-tolerant crops, such as pasture grasses, sugar beets, and barley. If reclaimed, they are well suited to alfalfa and all crops commonly grown in the Area. They can be reclaimed through repeated deep flushing of water through the soil and by growing a salt-tolerant crop, such as barley. Smoothing the area and applying water uniformly are important. Provision should be made for disposing of tail water to prevent prolonged ponding at the ends of fields. No soil amendments are needed; the soils are abundantly supplied with calcium.

Furrows, borders, or sprinklers can be used for irrigation with little risk of damage from erosion. The length of runs and the rate at which water is applied vary, depending on the soil texture and the degree of stratification. Cuts and fills needed in leveling have little permanent effect on the soils.

Organic matter can be supplied by growing a green-manure crop and returning all crop residue or by applying barnyard or feedlot manure. Subsoiling is needed periodically to break tillage pans that develop in cultivated areas.

Capability Unit IIw-1(17)

The soils in this unit are very deep, well-drained sandy loams and loams on alluvial fans and in small valleys near drainageways. Slopes are 0 to 5 percent. These are soils of the Panoche series. They are subject to occasional overflow from surrounding areas. They hold 6 to 10 inches of water available to plants. Permeability is moderately rapid to moderate. Natural fertility is high.

These soils are suited to all crops commonly grown in the Area. Tree crops are likely to be damaged by overflow. All tillage should be across the slope. Terraces are needed to divert runoff water around these soils. Dikes are needed along major streams to contain floodwater. Leveling has no damaging effect.

Capability Unit IIIs-4(17)

The soils in this unit are very deep, somewhat excessively drained loamy sands on alluvial fans and flood plains. Slopes are 0 to 9 percent. These soils are in the Metz series. They are rapidly and moderately rapidly permeable. They hold 4 to 6 inches of water available to plants. Natural fertility is low, and productivity is only fair. A few spots are slightly saline but are easily leached when irrigated. In some areas the soils occasionally receive overflow from higher lying areas. In others, they are eroded.

These soils are best suited to deep-rooted crops, such as alfalfa, potatoes, and fruit. Scouring and deposition are serious problems in areas that receive runoff from higher lying side streams or floodwater from major streams. Diversions and grass waterways are needed. Levees should be installed along the major streams.

Cuts can be made in leveling for irrigation without damaging the soils. The most efficient irrigation is by sprinklers. Furrows or borders can be used if runs are less than 350 feet long. Barnyard manure increases the water-holding capacity and improves fertility.

Capability Unit IIIs-6(17)

The soils of this unit are very deep, somewhat poorly drained, and moderately to strongly saline. They are in the Stutzville series. They are on flood plains and have slopes of less than 1 percent. They show evidence of past poor drainage but are now

well drained because of the natural deepening of drainage channels. They are highly stratified. The surface layer is loamy sand to silty clay loam, and the underlying material is silty clay loam. Natural fertility is high. The salt content ranges from slightly less than 1 percent to well over 3 percent. The available water capacity is 8 to 12 inches.

The soils in this unit are finer textured throughout and have a higher salt content but are otherwise similar to those in unit IIs-6. They are suitable for crops only after they have been reclaimed. They can be reclaimed by leaching and by smoothing and bordering the fields. Growing salt-tolerant crops, such as barley and certain pasture grasses, helps in the reclamation process. After reclamation, they can be used for pasture, grain, and forage crops. Alfalfa grows fairly well but tends to be spotty. Provisions for disposal of tail water are needed to prevent ponding and crop damage.

Storie Index 3/

The Storie index rating indicates by numerical rating the relative degree of suitability, or value, of a soil for general intensive farming (11). The rating is based on soil characteristics only and is obtained by evaluating such factors as depth, texture of the surface layer, density of the subsoil, drainage, alkali content, and relief. Other factors, such as the availability of water for irrigation, the climate, and the distance to markets, any one of which might determine the desirability of growing certain plants in a given area, are not considered. The index, therefore, cannot be considered an index for land valuation.

The four general factors considered in the index rating are (A) the characteristics of the soil profile and soil depth, (B) the texture of the surface soil, (C) the slope, and (X) other factors, such as drainage, alkali, and erosion. Each of these four factors is evaluated on the basis of 100 percent. A rating of 100 percent expresses the most favorable, or ideal condition, and lower percentage ratings are given for conditions that are less favorable for crop production.

The index rating for 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 profile justifying a rating of 100 percent for factor A, excellent surface soil conditions 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 10 percent for factor X. Multiplying these four ratings gives an index rating of 10 for this soil. The high accumulation of salts would dominate the quality of the soil, render it unproductive for crops, and justify a low index rating of 10.

Soils are placed in grades according to their suitability for general intensive 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 80
Grade 3	40 to 60
Grade 4	20 to 40
Grade 5	10 to 20
Grade 6	less than 10

Soils in grade 1 are excellent, or well suited to general intensive farming. Grade 2 soils are good and also well suited to farming but are not so desirable as soils in grade 1. Grade 3 soils are fairly well suited, grade 4 soils are poorly suited, and grade 5 soils are very poorly suited. Grade 6 consists of soils and land types that are not suited to farming.

The Storie index rating for each soil is given in the "Guide to Mapping Units" at the back of this survey.

Estimated Yields 4/

Estimated yields of the major crops grown in the Northern Santa Barbara Area under high level management are shown in table 2. The estimates are for the soils now under cultivation. They are based on field trials, field observations, and farm and business records.

Yields shown in table 2 do not reflect the lower yields resulting from double cropping, that is, growing more than one crop in 1 year on a specified acreage. No entry in the yield column indicates that the actual or estimated yield is below the level necessary for a reasonable return under good management.

The climate in this Area varies considerably within distances of only a few miles and strongly affects the yield and management of some crops. Near the coast, crops in summer are affected by persistent fog and cool onshore winds. Inland, temperatures are higher in summer and lower in winter, particularly at night. For soils that occur both inland and along the coast, yields are given for the most favorable climatic conditions.

Because the climate and the soil properties are so variable, only a few management practices are common for most crops grown in this Area. These practices include proper seedbed preparation and control of insects and weeds. The high level

3/ By Dr. FRANK HARRADINE, professor of soil morphology, Department of Soils and Plant Nutrition, University of California, Davis.

4/ By WARREN E. BENDIXEN, MARVIN J. SNYDER, and GEORGE E. GOODALL, farm advisors, Agricultural Extension Service, University of California.

TABLE 2.--ESTIMATED AVERAGE ACRE YIELDS OF PRINCIPAL

[Absence of figure indicates that the crop is not suited

Soil	Alfalfa hay	Artichokes	Barley (dryland)	Dry lima beans	Green lima beans
	Tons	22-lb. boxes	Cwt.	Cwt.	Cwt.
Agueda loam, 0 to 2 percent slopes	8.5	350	24	25	35
Agueda silty clay loam, 0 to 2 percent slopes	8.5	350	24	25	35
Agueda silty clay loam, 2 to 9 percent slopes	7.5	350	22	23	35
Ballard fine sandy loam, 0 to 2 percent slopes	7.5	---	19	22	---
Ballard fine sandy loam, 2 to 9 percent slopes	6.5	---	19	20	---
Ballard fine sandy loam, 9 to 15 percent slopes	---	---	17	---	---
Ballard gravelly fine sandy loam, 0 to 2 percent slopes	8.0	---	19	21	---
Ballard gravelly fine sandy loam, 2 to 9 percent slopes	6.5	---	19	19	---
Ballard gravelly fine sandy loam, 9 to 15 percent slopes	---	---	17	---	---
Bayshore loam, drained	7.5	350	24	22	---
Bayshore loam, sandy substratum, drained	7.5	350	23	22	---
Bayshore silty clay loam	---	---	24	---	---
Bayshore silty clay loam, drained	7.5	350	24	22	---
Betteravia loamy sand, 0 to 2 percent slopes	6.5	---	---	17	---
Betteravia loamy sand, 0 to 2 percent slopes, severely eroded	---	---	---	---	---
Betteravia loamy sand, 2 to 9 percent slopes	6.5	---	---	---	---
Betteravia loamy sand, dark variant, 0 to 5 percent slopes, eroded	6.5	---	17	17	---
Betteravia loamy sand, dark variant, 5 to 15 percent slopes, eroded	---	---	16	17	---
Botella loam, 0 to 2 percent slopes	8.5	250	24	25	35
Botella loam, 0 to 2 percent slopes, eroded	7.5	250	22	22	27.5
Botella loam, 2 to 9 percent slopes	7.5	---	22	22	---
Botella loam, 2 to 15 percent slopes, eroded	---	---	19	19	---
Botella loam, slightly wet, 0 to 2 percent slopes	---	250	23	22	---
Botella clay loam, 0 to 2 percent slopes	8.5	250	24	25	25
Botella clay loam, 0 to 2 percent slopes, eroded	7.5	---	21	22	---
Botella clay loam, 2 to 9 percent slopes	7.5	---	21	22	---
Botella clay loam, 2 to 15 percent slopes, eroded	---	---	19	19	---
Botella clay loam, wet, 0 to 2 percent slopes	---	---	19	---	---
Camarillo sandy loam 1/	---	350	23	---	---
Camarillo sandy loam, drained	6.5	350	23	22	---
Camarillo very fine sandy loam 1/	---	350	23	---	---
Camarillo silty clay loam 1/	---	350	23	---	---
Chamise sandy loam, 5 to 9 percent slopes	---	---	17	---	---
Chamise shaly sandy loam, 9 to 15 percent slopes	---	---	15	---	---
Chamise loam, 2 to 9 percent slopes	---	---	19	---	---
Chamise shaly loam, 9 to 15 percent slopes	---	---	17	---	---
Corralitos sand, 0 to 2 percent slopes	6.5	---	---	15	---
Corralitos sand, 2 to 15 percent slopes	6.5	---	---	---	---
Corralitos loamy sand, 0 to 2 percent slopes	6.5	---	---	17	---
Corralitos loamy sand, 2 to 9 percent slopes	6.5	---	---	17	---
Cropley silty clay	7.5	---	24	---	---
Diablo silty clay, 9 to 15 percent slopes	---	---	22	---	---
Elder sandy loam, 0 to 2 percent slopes	8.5	---	22	25	35
Elder sandy loam, 0 to 2 percent slopes, eroded	7.5	---	21	22	---
Elder sandy loam, 2 to 9 percent slopes, eroded	---	---	19	19	---
Elder sandy loam, 9 to 15 percent slopes, eroded	---	---	19	---	---

See footnotes at end of table.

to or is not commonly grown on the soil specified]

Broccoli	Carrots	Celery	Silage corn	Lettuce	Potatoes	Strawberries	Sugar beets	Walnuts
Tons	Tons	60-lb. crates	Tons	40-lb. crates	Cwt.	12-lb. crates	Tons	Tons
3.5	21	1,000	26	500	350	-----	25	1.25
3.5	21	1,000	30	500	350	-----	25	.75
3.5	21	1,000	30	500	350	-----	23	.75
---	---	-----	30	---	---	-----	22	.75
---	---	-----	---	---	---	-----	21	.75
---	---	-----	---	---	---	-----	---	----
---	---	-----	26	---	---	-----	21	.75
---	---	-----	---	---	---	-----	21	.75
---	---	-----	---	---	---	-----	---	----
3.5	17.5	1,000	26	500	---	-----	22	----
2.5	17.5	800	26	350	---	-----	22	----
---	---	-----	---	---	---	-----	---	----
2.5	---	800	26	350	---	-----	22	----
---	17.5	-----	21	350	---	2,250	17	----
---	---	-----	---	---	---	-----	---	----
---	---	-----	---	---	---	2,250	---	----
---	---	-----	---	---	---	-----	17	1.25
---	---	-----	---	---	---	-----	---	----
2.5	---	800	30	350	250	2,750	25	1.25
2.5	---	800	30	350	250	2,750	23	1.25
---	---	-----	---	---	---	-----	23	1.25
---	---	-----	---	---	---	-----	---	1.25
---	---	-----	26	---	---	-----	22	----
3.5	---	1,000	30	350	---	-----	25	.75
---	---	-----	28	---	---	-----	24	.75
---	---	-----	---	---	---	-----	22	.75
---	---	-----	---	---	---	-----	---	.75
---	---	-----	---	---	---	-----	21	----
2.5	17.5	800	28	350	---	-----	20	----
3.5	17.5	1,000	26	500	250	-----	22	----
2.5	17.5	800	30	350	---	-----	20	----
2.5	---	800	30	350	---	-----	20	----
---	---	-----	---	---	---	-----	---	----
---	---	-----	---	---	---	-----	---	----
---	---	-----	---	---	---	-----	---	----
---	---	-----	---	---	---	-----	---	1.25
---	---	-----	---	---	---	2,250	---	1.25
---	---	-----	---	---	---	2,250	---	1.25
---	---	-----	22	---	---	2,750	---	1.25
---	---	-----	---	---	---	-----	---	1.25
2.5	---	800	28	350	---	-----	23	----
---	---	-----	---	---	---	-----	---	----
---	21	-----	30	---	350	2,750	25	1.25
---	---	-----	28	---	---	2,500	22	1.25
---	---	-----	---	---	---	-----	---	1.25
---	---	-----	---	---	---	-----	---	----

Soil	Alfalfa hay	Artichokes	Barley (dryland)	Dry lima beans	Green lima beans
	Tons	22-lb. boxes	Cwt.	Cwt.	Cwt.
Elder loam, 0 to 2 percent slopes	8.5	---	24	25	35
Elder loam, 2 to 9 percent slopes	8.5	---	22	23	35
Elder shaly loam, 0 to 2 percent slopes, eroded	7.5	---	22	24	27.5
Elder shaly loam, 2 to 9 percent slopes, eroded	---	---	20	19	---
Elder shaly loam, 9 to 15 percent slopes, eroded	---	---	19	---	---
Garey sandy loam, 0 to 2 percent slopes, eroded	6.5	---	19	19	---
Garey sandy loam, 2 to 9 percent slopes, eroded	6.5	---	17	17	---
Garey loam, wet variant, 0 to 5 percent slopes	---	---	17	---	---
Gazos clay loam, 9 to 15 percent slopes	---	---	16	---	---
Linne clay loam, 9 to 15 percent slopes	---	---	19	---	---
Marina sand, 0 to 2 percent slopes	6.5	---	---	---	---
Marina sand, 2 to 9 percent slopes	6.5	---	---	---	---
Metz loamy sand, 0 to 2 percent slopes	6.5	250	---	19	27.5
Metz loamy sand, 2 to 9 percent slopes	6.5	---	---	19	---
Metz loamy sand, 2 to 9 percent slopes, eroded	6.5	---	---	---	---
Metz loamy sand, overflow, 0 to 2 percent slopes	6.5	350	---	19	27.5
Mocho sandy loam, overflow	7.5	250	21	23	32.5
Mocho sandy loam, sandy substratum	7.5	250	20	23	32.5
Mocho sandy loam, sandy substratum, overflow	7.5	250	20	23	32.5
Mocho fine sandy loam	8.5	350	21	25	35
Mocho loam	8.5	350	24	25	35
Mocho loam, overflow	8.5	350	24	25	35
Mocho silty clay loam	8.5	350	24	25	35
Oceano sand, 0 to 2 percent slopes	6.5	---	---	---	---
Oceano sand, 2 to 15 percent slopes	6.5	---	---	---	---
Panoche sandy loam, 0 to 2 percent slopes	8.5	---	---	---	---
Panoche sandy loam, 2 to 9 percent slopes	7.5	---	---	---	---
Panoche sandy loam, overflow, 0 to 2 percent slopes	8.5	---	---	---	---
Panoche sandy loam, overflow, 2 to 5 percent slopes	8.5	---	---	---	---
Panoche loam, 0 to 2 percent slopes	8.5	---	---	---	---
Panoche loam, 2 to 9 percent slopes	7.5	---	---	---	---
Panoche loam, overflow, 0 to 2 percent slopes	8.5	---	---	---	---
Pleasanton sandy loam, 0 to 2 percent slopes	7.5	---	21	22	32.5
Pleasanton sandy loam, 2 to 9 percent slopes	7.5	---	19	---	---
Pleasanton sandy loam, 9 to 15 percent slopes	---	---	17	---	---
Pleasanton very fine sandy loam, 0 to 2 percent slopes	7.5	---	22	23	32.5
Pleasanton very fine sandy loam, 2 to 9 percent slopes	7.5	---	19	21	---
Pleasanton gravelly very fine sandy loam, 9 to 15 percent slopes	---	---	17	---	---
Positas fine sandy loam, 2 to 9 percent slopes	---	---	17	---	---
Salinas loam, 0 to 2 percent slopes	8.5	350	24	25	35
Salinas loam, 2 to 9 percent slopes	7.5	---	22	---	---
Salinas loam, overflow, 0 to 2 percent slopes	8.5	350	24	25	35
Salinas silty clay loam, 0 to 2 percent slopes	8.5	350	24	25	35
Salinas silty clay loam, 2 to 9 percent slopes	7.5	---	22	22	---
Salinas and Sorrento loams, 9 to 15 percent slopes	---	---	20	---	---
Santa Lucia shaly clay loam, 9 to 15 percent slopes	---	---	17	---	---
Santa Ynez gravelly fine sandy loam, 2 to 9 percent slopes	6.5	---	17	19	---
Santa Ynez clay loam, 2 to 9 percent slopes	6.5	---	19	29	---
Sorrento sandy loam, 0 to 2 percent slopes	8.5	350	22	25	35

See footnotes at end of table.

Broccoli	Carrots	Celery	Silage corn	Lettuce	Potatoes	Strawberries	Sugar beets	Walnuts
Tons	Tons	60-lb. crates	Tons	40-lb. crates	Cwt.	12-lb. crates	Tons	Tons
---	21	-----	30	---	---	2,500	25	1.25
---	21	-----	30	---	---	-----	22	1.25
---	---	-----	30	---	---	-----	23	1.25
---	---	-----	---	---	---	-----	---	1.25
---	---	-----	---	---	---	-----	---	----
---	---	-----	26	---	---	-----	21	.75
---	---	-----	---	---	---	-----	19	.75
---	---	-----	---	---	---	-----	---	----
---	---	-----	---	---	---	-----	---	----
---	---	-----	---	---	---	-----	---	----
---	---	-----	---	---	---	2,000	---	1.25
---	---	-----	---	---	---	-----	---	1.25
2.5	17.5	800	25	350	250	2,500	19	1.75
---	---	-----	---	---	---	-----	18	1.75
---	---	-----	---	---	---	-----	---	----
2.5	17.5	800	25	350	250	2,500	19	1.75
2.5	17.5	800	28	500	350	3,500	23	1.75
2.5	17.5	800	28	500	350	3,500	23	1.75
2.5	17.5	800	28	500	350	3,500	23	1.75
3.5	21	1,000	30	500	300	3,500	25	1.75
3.5	21	1,000	30	500	300	3,500	21	1.75
3.5	21	1,000	30	500	350	3,500	25	1.75
3.5	---	1,000	30	500	---	-----	25	1.75
---	---	-----	---	---	---	2,500	---	.75
---	---	-----	---	---	---	-----	---	.75
---	---	-----	30	---	300	-----	25	----
---	---	-----	---	---	---	-----	---	----
---	---	-----	30	---	300	-----	25	----
---	---	-----	---	---	---	-----	---	----
---	---	-----	30	---	300	-----	25	----
---	---	-----	---	---	---	-----	22	----
---	---	-----	30	---	300	-----	25	----
---	---	-----	28	---	---	2,750	22	----
---	---	-----	---	---	---	-----	20	.75
---	---	-----	---	---	---	-----	---	----
---	---	-----	28	---	---	2,750	23	.75
---	---	-----	---	---	---	-----	21	.75
---	---	-----	---	---	---	-----	18	----
---	---	-----	---	---	---	-----	21	----
3.5	21	1,000	30	500	350	3,500	25	1.75
---	---	-----	---	---	---	-----	22	1.75
3.5	21	1,000	30	500	350	3,500	25	1.25
3.5	---	1,000	30	500	---	-----	25	1.25
---	---	-----	---	---	---	-----	22	1.25
---	---	-----	---	---	---	-----	---	----
---	---	-----	---	---	---	-----	---	----
---	---	-----	---	---	---	-----	19	.75
---	---	-----	---	---	---	-----	19	.75
3.5	21	1,000	30	500	350	3,500	25	1.75

TABLE 2.--ESTIMATED AVERAGE ACRE YIELDS OF PRINCIPAL CROPS

Soil	Alfalfa hay	Artichokes	Barley (dryland)	Dry lima beans	Green lima beans
	Tons	22-lb. boxes	Cwt.	Cwt.	Cwt.
Sorrento sandy loam, 2 to 9 percent slopes	7.5	---	21	---	---
Sorrento sandy loam, sandy substratum, 0 to 2 percent slopes	8.5	350	19	25	35
Sorrento loam, 0 to 2 percent slopes	8.5	350	24	25	35
Sorrento loam, 2 to 9 percent slopes	7.5	---	22	22	---
Sorrento clay loam, 0 to 5 percent slopes, eroded	7.5	---	22	21	---
Stutzville loamy sand 2/	7.5	---	---	---	---
Stutzville sandy loam 2/	7.5	---	---	---	---
Stutzville loam 2/	7.5	---	---	---	---
Stutzville silty clay loam 2/	7.5	---	---	---	---
Tierra loamy sand, 2 to 9 percent slopes	---	---	15	---	---
Tierra loam, 2 to 9 percent slopes	---	---	19	---	---
Wasioja fine sandy loam, 2 to 5 percent slopes	6.5	---	14	---	---

1/ Yields apply only to drained soils.

Broccoli	Carrots	Celery	Silage corn	Lettuce	Potatoes	Strawberries	Sugar beets	Walnuts
Tons	Tons	60-lb. crates	Tons	40-lb. crates	Cwt.	12-lb. crates	Tons	Tons
---	---	-----	---	---	---	-----	21	1.75
3.5	21	1,000	30	500	350	3,500	25	1.75
3.5	21	1,000	30	500	350	3,500	25	1.75
---	---	-----	---	---	---	-----	22	1.75
---	---	-----	---	---	---	-----	21	----
---	---	-----	---	---	---	-----	21	----
---	---	-----	---	---	---	-----	21	----
---	---	-----	---	---	---	-----	21	----
---	---	-----	---	---	---	-----	22	----
---	---	-----	---	---	---	-----	---	----
---	---	-----	---	---	---	-----	---	----
---	---	-----	---	---	---	-----	---	----

2/ Yields apply only to reclaimed soils.

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management required to obtain the yields shown in table 2 includes planting the best adapted and most desirable crop varieties and planting, harvesting, pruning, tilling, fertilizing, and irrigating at the proper time or season. Specific information on the kind and amount of fertilizer to apply, the management required for specific soils, and the most suitable varieties of plants can be obtained from the local representatives of the Soil Conservation Service or the Agricultural Extension Service.

About 50 different crops are grown regularly or occasionally in the Area. Table 2 shows only the crops that are most extensively grown or highest in cash value. The following paragraphs describe the general management required for these major crops.

Alfalfa

Alfalfa is grown on arable soils throughout the Area. The amount of water required for alfalfa is high compared with that for other crops because the growing season is long and the growth rate is rapid. Requirements range from about 3 to 5 acre-feet in coastal areas to 5 to 8 acre-feet in the Cuyama Valley. Borders or sprinklers are used for irrigating. Sprinklers are considered more efficient.

Alfalfa requires large amounts of fertilizer. The amount of phosphorus and potassium to be applied can be determined by soil and plant analysis or by trial field strips. No nitrogen is needed if the seed is properly inoculated.

Artichokes

Artichokes are grown in the Santa Maria Valley, within a few miles of the Pacific Ocean. The cool foggy summers, relatively frost-free winters, and deep fertile soils make this area ideally suited to artichoke production. A large amount of nitrogen is needed. Nitrogen can be supplied by applying manure and commercial fertilizers. About 30 pounds per acre is commonly applied every month during the heavy growing season, May through November. Smaller amounts are usually applied in other months. Phosphorus and potassium fertilizers are needed where these elements are naturally deficient. Artichokes commonly require frequent irrigation. Usually five to eight irrigations are needed during the growing season. The soil should be wet to the root depth. Adequate surface drainage should be provided because ponding is detrimental. In areas that have a temporary or permanent high water table, artificial drainage by tile or open ditches is needed.

Barley

Barley is dryfarmed on a wide variety of soils throughout the coastal part of the Area. Yields vary widely, mainly because of differences in the amount of rainfall. A properly prepared seedbed should be friable to insure good water and root penetration and aeration. Rough tillage and surface mulching of plant residue slows runoff, improves water penetration, and helps control erosion. Because barley is grown without irrigation, practices that improve infiltration and prevent runoff help to increase yields.

Fertilization is needed in almost all areas. Most soils require nitrogen. Some soils, particularly those on terraces, respond to phosphorus or potassium or both. The amounts to be applied are best determined by soil analysis or field trial.

Lima Beans

Both dry and green lima beans are grown extensively in the Area. Green limas are harvested when the beans are grown but not mature and then they are frozen. Dry limas are allowed to mature and harden and then they are thrashed. Green limas are grown mainly on nearly level soils in Santa Maria Valley. Dry limas are grown on a wide variety of soils in valleys and on terraces in coastal areas. Lima beans require only a small amount of fertilizer. They have a low tolerance to salt, and even slight salt accumulations reduce yields. Unless winter rains have supplied adequate moisture and washed out excessive salts, the soils should be irrigated before planting to leach out the salts and insure good seed germination and good growth. The number of irrigations and amount of water required vary with soil texture and climatic conditions.

Broccoli

Broccoli is grown extensively on deep, well-drained soils in the Santa Maria Valley where the climate is favorable. A high level of fertility must be maintained. Barnyard manure is an excellent source of plant nutrients, and is often applied at rates as high as 30 tons per acre. Commonly, 10 to 15 tons per acre of manure, or a green-manure crop and 1,000 to 1,500 pounds per acre of a mixed fertilizer, are applied before planting. In addition, one or two sidedressings of 150 to 200 pounds per acre of a nitrogen fertilizer, such as ammonium nitrate or sulfate of ammonia, are applied during the growing season. Phosphorus and potassium fertilizers should be applied if response is good. Minor elements are naturally deficient in some areas and amendments are required.

Much of the broccoli is grown during the rainy season. The amount of irrigation required depends on local rainfall and the needs of the crop. Generally, about 1 acre-foot of water is required per crop.

Carrots

Carrots are grown in the Santa Maria and Lompoc Valleys where the cool summers and deep, well-drained sandy loams and loams favor carrot production. Nitrogen fertilizer is required on practically

all soils. From 60 to 100 pounds per acre is commonly applied, in split applications. Usually 30 to 60 pounds of manure or commercial fertilizer is applied before planting, and about 30 pounds is applied 4 to 6 weeks before harvest as sidedressing or as ammonia gas in irrigation water. Phosphorus and potassium are needed in places.

Carrots require about 1 1/2 to 3 acre-feet of water per crop. In cooler areas within about 10 miles of the ocean, the total amount required is 1 1/2 to 2 acre-feet; about an inch of water should be applied every 10 days to 2 weeks. In warmer inland areas, the total amount required is 2 1/2 to 3 acre-feet; about an inch should be applied every 7 to 10 days.

Celery

Celery requires a long, cool growing season, a well-drained soil, an abundant supply of water that is applied uniformly, and large amounts of fertilizer. Large amounts of manure are commonly applied before planting to add plant nutrients and improve the soil structure. For a good stand of celery, about 280 pounds of nitrogen, 72 pounds of phosphorus, and 635 pounds of potassium are required per acre. More than 45 percent of these nutrients are absorbed during the 28 days preceding harvest. Where needed, phosphorus and potassium fertilizers should be applied before planting. Where needed, nitrogen fertilizer is commonly applied as sidedressing or in the irrigation water. Celery is a shallow-rooting crop and requires frequent irrigation. It should be irrigated every 10 to 14 days until the last month of growth and then as often as every third day. Rotating crops and growing green-manure crops are suggested management practices. A celery crop is commonly grown in rotation with a summer crop, such as lima beans or tomatoes.

Corn

Corn is grown in the coastal valleys on a wide variety of soils. It is used for silage or green chop mainly for dairy cattle but also for beef cattle. A well prepared seedbed and irrigation before planting are essential for a good stand. Nitrogen fertilizer is required on almost all soils. About 200 pounds per acre is needed for a yield of 30 tons per acre, or an average of 6 to 7 pounds of nitrogen per ton of yield. Nitrogen should be applied in more than one application as sidedressing. Phosphorus and potassium are needed in places. The amounts to be applied are best determined by soil and plant tests. Zinc is commonly deficient. An application of 20 pounds of zinc sulfate per acre is sufficient for several years. Zinc sulfate can also be applied on the crop foliage at the rate of 1 pound per acre to correct the deficiencies for one crop.

About 2 to 2 1/2 acre-feet of water is needed for a good stand of corn. Frequent, light irrigations are needed when the crop is young. Heavier, less frequent irrigations are needed for the more mature crop. Shortage of water at tasseling and silking periods reduces yields.

Lettuce

Lettuce grows and matures best where the monthly mean temperature is between 52° and 62° F. Good drainage is needed for rapid growth and uniform maturity. The largest acreage is in the Santa Maria Valley between Santa Maria and Guadalupe. The harvest season is generally from April through November. Commercial fertilizer is applied, by wheel tractor, before planting and as two subsequent sidedressings. If fertilizer is needed near harvest time, it is usually applied as a liquid or gas in the irrigation water. Lettuce is grown in beds and is irrigated by furrows. It is irrigated to start germination and usually twice again between thinning and harvesting. In dry seasons, more irrigations may be needed.

Potatoes

Most of the potatoes produced in this Area are grown in the Santa Maria Valley. The growing season extends from March to October. Friable loams or sandy loams are best suited to potato production. Plant nutrients must be readily available to insure steady growth. To obtain yields of 300 sacks per acre, about 280 pounds of nitrogen, 80 pounds of phosphorus, and 160 pounds of potassium are needed. Phosphorus and potassium fertilizers are usually applied before planting. Nitrogen is applied before planting and later in the irrigation water. Water is applied on the average of every 3 days for 2 1/2 months of the growing season. Additions of organic matter, either green-manure crops or manure, improve tilth and permeability.

Strawberries

Strawberry production in this Area is limited mainly to the Santa Maria Valley, in the vicinity of and east of Santa Maria. Fertilization requirements depend on the crop variety, the soil type, and the time of year. Soil and plant analysis is desirable in order to keep the fertility level high and prevent excessive fertilization and accumulation of salts. Furrows are used for irrigating. Low beds and nearly filled furrows keep salt accumulation to a minimum. Sprinklers to leach out salts that have accumulated in the beds may be needed during periods when there are no blossoms or berries on the plants.

Sugar Beets

Sugar beets are grown throughout the Area, wherever irrigation water is available. They commonly require 2.5 to 4 acre-feet of water, depending

on soil texture, time of year, and length of growing season. They require large amounts of fertilizer. About 50 to 75 pounds of nitrogen is applied as a sidedressing after thinning, and 75 to 175 pounds 6 to 8 weeks later. Phosphorus and potassium, if needed, are applied before planting or as a sidedressing. Sugar beets usually are not grown oftener than once in 3 years because they are hosts to nematodes, disease, and insects.

Walnuts

Walnuts are grown in the Santa Ynez Valley east of Lompoc and in the vicinity of Los Olivos and Santa Ynez. Walnut trees require very deep, well-drained, fertile soils and ample water. They draw about 50 percent of the water required from the upper 3 feet of soil and only about 25 percent from the next 3 feet. Unless moisture penetrates to a depth of 9 feet in winter, supplemental irrigation is needed in spring. Irrigation water is needed to at least a depth of 3 or 4 feet to provide enough moisture to sustain the trees until August. If the trees are not sufficiently watered, the nuts are likely to be small and of poor quality. Furrows, checks, or sprinklers are used for irrigating, depending on the soil, the slope, and the water supply.

Cover crops improve infiltration and help in controlling erosion. The residue, however, occasionally interferes with harvest because walnuts are harvested by mechanical shakers. Nitrogen fertilizer is needed. Commercial fertilizer at the rate of 100 to 150 pounds per acre is commonly applied every year. Deficiency in minor elements, such as zinc, manganese, and copper, can be corrected by soil application or foliage spraying. Other fertility deficiency can be determined by soil and plant analysis.

Rodent Pests

The main destructive rodents in the Area are California ground squirrels, pocket gophers, and a variety of field mice.

California ground squirrels are to be found throughout the Area. At present their population is fairly well controlled through the use of poisons. The poisons are handled professionally; they are not suitable for use by the general public. These rodents do great damage by digging holes and eating crops. Occasionally they carry bubonic plague. Water flowing through rodent holes causes many gullies to form and washes out or otherwise damages reservoirs, levees, and ponds. Much irrigation water flows into rodent holes, seeps out below the root zone, and is wasted. Horses and livestock are in danger of breaking their legs by stepping into deep rodent holes.

Pocket gophers also are to be found throughout the Area. They are particularly active in fairly level soils. They eat practically all types of vegetation and sometimes destroy large acreages of crops. They damage earthworks and soils in much the same way as ground squirrels. The population of pocket gophers is very large and is extremely difficult to control.

Kangaroo rats, meadow mice, white-footed mice, and other field mice live throughout the Area. Their holes and burrows are less damaging to the soils and earthworks because they are smaller and shallower. Their damage to crops is often very severe. Damage to artichokes is particularly severe. The Agricultural Commissioner's office makes poison available to farmers for controlling the population of these rodents.

Eradication of rodents is not possible, but control of their population is very important. Natural rodent predators are hawks, owls, bobcats, coyotes, snakes, and badgers. Weather conditions also affect the rodent population. During prolonged rainy weather, large numbers of rodents drown. Following relatively dry winters, however, the population increases considerably.

Range[5/]

About 590,000 acres in the Northern Santa Barbara Area is used as range. The principal rangeland soils in the western part of the Area are in the Arnold, Ballard, Chamise, Contra Costa, Crow Hill, Diablo, Gaviota, Gazos, Linne, Lodo, Los Osos, Marina, Oceano, Pleasanton, San Andreas, Santa Lucia, Shedd, and Tierra series. The principal rangeland soils in the eastern part of the Cuyama Valley, the northeastern part of the Area, are in the Ballinger, Kettleman, Metz, Panoche, Stutzville, and Wasioja series. These soils are less productive than those in the western part because the climate is more arid.

The range vegetation is almost entirely annual-grass type, part open grassland or oak savannah and part brush, either coastal sagebrush or chaparral. In the more arid parts of the survey area, the 6- to 10-inch precipitation zone of the Cuyama Valley, it is open grassland or shrub.

Range Sites

Range sites are kinds of soils that produce significantly different kinds or amounts of vegetation. Each site has a different potential for production of forage and presents different management problems. The original range forage plants were perennials and annuals. As a result of prolonged overgrazing and drought, these plants have been replaced largely by grasses and forbs introduced from the mediterranean region during Spanish colonization. These introduced plants are mostly cool-weather growing annuals. They take full advantage of the soil moisture while it is available in order to produce and mature seed before

5/ Prepared by IRVIN L. SEALANDER, range conservationist, Soil Conservation Service.

the moisture is depleted. They furnish highly nutritious feed in spring when they are green and growing, but their nutritional value is low after they mature.

The forage-producing plants of the Area are grouped into three classes: desirable, less desirable, and undesirable. Livestock graze selectively. They seek out the more palatable and nutritious plants. If grazing is not carefully regulated, the better, more desirable plants are weakened or eliminated because they are not allowed to produce seed. Less desirable plants then increase. If grazing pressure is continued, even the less desirable plants are thinned out or eliminated, and the undesirable, unpalatable plants take their place, or the soil is left bare.

Estimates of the total annual yield per acre are given for each range site in the following descriptions. Yields are given for favorable and unfavorable years. The total annual yield is the total annual production of all plant species of a plant community, including grasslike plants, grasses, broadleaf herbs, shrubs, and trees, whether or not they are forage plants.

Stocking rates and carrying capacities cannot be accurately computed from total annual yields or from forage plant yields because annual yields vary greatly from year to year, depending on rainfall and previous use and management. Local Soil Conservation Service conservationists or farm advisors can assist in determining initial stocking rates, which should be made only after onsite investigation.

The soils of the Area have been grouped into 13 range sites. This grouping is determined partly by soil characteristics and partly by climate. Sites in the eastern part of the Cuyama Valley have different plant cover and are less productive than those in the rest of the survey area because the climate is more arid. The soil series represented in each site are named, but this does not mean that all the soils of a given series are in the site. The "Guide to Mapping Units" at the back of this publication designates the range site for each soil in the survey area.

Clayey Range Site

The soils of this site are moderately permable to slowly permeable, moderately deep to very deep clay loams to clays. They are in the Botella, Chamise, Climara, Diablo, Linne, Los Osos, San Benito, and Shedd series. They formed in material weathered from basic igneous rock and sandstone or shale, or in alluvium. Slopes are 9 to 75 percent. The available water capacity is moderate to very high. Fertility is moderate to high. This site has the highest productive potential of any in the survey area. It occurs throughout the western part of the survey area, except along the coast.

The plant cover is grass and a few scattered oaks. This site produces heavy stands of wild oats and burclover, smaller amounts of soft chess, ryegrass, and filaree, and patches of needlegrass and other perennial grasses.

Under heavy grazing the desirable grasses decrease and are replaced by less desirable grasses such as ripgut brome, poverty fescue, red brome, and weedy annuals. Brush is seldom a problem. Infestations of wild mustard occur in some years, even on well-managed range.

Molybdenum poisoning of livestock may occur during lush growth periods on some soils that have high lime content, particularly those of the Shedd series.

All except the very steep soils of the Diablo, Linne, Los Osos, San Benito, and Shedd series respond to range seeding with adapted grasses and legumes and to fertilization.

The estimated total annual yield per acre is 2,500 pounds air-dry weight in favorable years and 1,200 pounds in unfavorable years. Range seeding and fertilization can increase these yields from two to two and a half times this amount.

Shallow Clayey Range Site

Landslides and soils of the Diablo, Shedd, and Toomes series are in this site. The soils are moderately permeable to slowly permeable clay loams to clays that formed in material weathered from shale, sandstone, and basic igneous rock. They are shallow or moderately deep to shallow and severely eroded. Slopes are 15 to 75 percent. The available water capacity is low to moderate. Fertility is low to moderate.

The plant cover is open to moderately dense brush. The understory and some open grassy areas consist of soft chess, red brome, nitgrass, wild barley, filaree, and other annual grasses and forbs. Burclover and needlegrass grow in places but are not abundant. California sagebrush and purple sage are dominant in the brushy stands; there are a few ceanothus shrubs and other shrubs.

This site is not productive because it is eroded. Herbaceous cover is sparse. It is dominantly red brome, nitgrass, weedy annuals and other less desirable and undesirable plants.

The soils do not respond to management. Range seeding and fertilization are desirable only for controlling erosion.

The estimated total annual yield per acre is 600 pounds air-dry weight in favorable years and 100 pounds in unfavorable years.

Loamy Range Site

The soils of this site are moderately rapidly permeable to slowly permeable, moderately deep to very deep sandy loams to clay loams. They are in the Ballard, Botella, Camarillo, Chamise, Contra Costa, Crow Hill, Elder, Garey, Gazos, Pleasanton, Salinas, San Andreas, Santa Lucia, and Sorrento series. They formed on old alluvial terraces, in material weathered from sandstone or shale or in medium-textured to coarse-textured alluvium. Slopes are 0 to 45 percent. Fertility is low to very high.

The available water capacity is low to high. This site occurs throughout the western and central parts of the survey area.

The plant cover is open grassland or woodland grass, scattered oaks, and patches of open to dense stands of oak (pl. VIII, top). The dominant species are soft chess, wild oats, ryegrass, filaree, annual clovers, and other desirable plants. Needlegrass, creeping wildrye, and other perennial grasses are abundant in places. Less desirable plants are present in small amounts.

If depleted by heavy grazing the desirable plants are replaced by ripgut brome, red brome, nitgrass, lupine, weedy annuals, and other less desirable and undesirable plants. Tarweed infests the site in some years, especially where vegetation is depleted. Bush lupine, chamise, purple sage, California sagebrush, and other brush invade sites that are depleted by heavy use or are damaged by fire. Infestations of wild mustard occur in some years, even on well-managed range, but are seldom as heavy as on the Clayey range site.

The soils of this site respond to range seeding, fertilization and brush control, except where slopes are too steep for the use of machinery.

The estimated total annual yield per acre is 2,100 pounds air-dry weight in favorable years and 1,000 pounds in unfavorable years. Range seeding and fertilization can increase forage production to about twice this amount.

Shallow Loamy Range Site

Terrace escarpments and soils of the Chamise, Crow Hill, Garey, Gaviota, Lodo, Lopez, Montara, San Andreas, and Santa Lucia series are in this site. All are moderately rapidly permeable to slowly permeable sandy loams to clay loams that formed in material weathered from shale or sandstone, or in alluvium. They are shallow or shallow to very deep and are severely eroded. Slopes are 5 to 75 percent. Fertility is low to very low. The available water capacity is low. The productivity of this site is much lower than that of the Loamy range site.

The plant cover is an open to dense stand of brush. California sagebrush, flattop buckwheat, and purple sage are dominant at lower elevations. As elevation increases, these shrubs are mixed with and replaced by ceanothus, scrub oak, manzanita, and other chaparral species. The understory is soft chess, wild oats, ryegrass, filaree, and other annuals, and needlegrass and other perennial grasses. The herbaceous understory is sparse.

If depleted by heavy grazing or by fire, the desirable species in the understory are replaced by red brome, nitgrass, popcornflower, annual lupines, and other less desirable and undesirable plants.

Only the Lodo and Gaviota soils respond to brush control, range seeding, and fertilization. On all other soils in this site, brush control and seeding are desirable only for erosion control and fire protection.

The estimated total annual yield per acre is 800 pounds air-dry weight in favorable years and 200 pounds in unfavorable years.

Steep Loamy Range Site

The soils of this site are moderately permeable to slowly permeable, moderately deep or shallow sandy loams to clay loams that formed in material weathered from sandstone, shale, or semiconsolidated material. They are in the Contra Costa, Crow Hill, Gazos, Lodo, San Andreas, and Santa Lucia series. Slopes are 30 to 75 percent. Fertility and the available water capacity are low to moderate. This site is less productive than the Loamy range site but is more productive than the Shallow Loamy range site.

The plant cover is open grass and grass-oak. There are fairly extensive dense stands of oak and brush on north-facing slopes. Soft chess, wild oaks, filaree, and annual clover are dominant, and there are patches of needlegrass and other perennial grasses.

Under heavy grazing, the desirable plants are replaced by ripgut brome, red brome, poverty fescue, popcornflowers, fiddleneck, and other less desirable and undesirable plants.

The soils of this site do not respond to range seeding. Brush control and range seeding are desirable only for erosion control and fire protection.

The estimated total annual yield per acre is 1,200 pounds air-dry weight in favorable years and 500 pounds in unfavorable years.

Claypan Range Site

The soils of this site are shallow to moderately deep sandy loams to clay loams that have a very slowly permeable claypan or hardpan. They are in the Positas, Santa Ynez, and Tierra series. Slopes are dominantly 2 to 45 percent. The available water capacity is low to moderate. Fertility is low. Some areas are severely eroded (pl. VIII, bottom). This site occurs in the western part of the survey area. It is commonly intermingled with the Clayey and the Loamy range sites.

The plant cover is grass, dominantly soft chess, wild oats, ripgut brome and other desirable and less desirable annuals, and a few patches of needlegrass, creeping wildrye, and other perennial grasses. In places filaree is abundant. Burclover occurs, but not as extensively as on the Clayey range site. This site is similar to the Loamy range site in plant composition but is not so productive.

Under heavy grazing, the desirable grasses are replaced by less desirable grasses and ripgut brome, poverty fescue, and weedy annuals. In some years, tarweed is dominant on well-managed sites; it grows abundantly on heavily grazed and depleted areas.

All except the severely eroded and cobbly soils of the Positas and Tierra series are suitable for

range seeding, fertilization, and brush control. They do not respond to management so well as soils of the Clayey and the Loamy range sites.

The estimated total annual yield per acre is 1,300 pounds air-dry weight in favorable years and 800 pounds in unfavorable years. Range seeding and fertilization can increase forage production from two and a half to three times this amount.

Sandy Range Site

The soils of this site are rapidly permeable to very slowly permeable loamy sands and sands that formed in material weathered from sandstone or in alluvial or eolian sand. They are in the Arnold, Betteravia, Corralitos, Marina, Metz, Narlon, Oceano, and Tangair series. Slopes are 0 to 45 percent. The available water capacity is low to moderate. Fertility is low to very low. Some of the soils have a claypan or hardpan. This site occurs mainly in the western part of the survey area on sandy mesas, hills, and valleys.

The plant cover is dominantly scattered to dense brush consisting of California sagebrush, purple sage, scrub oak, chamise, ceanothus, and other shrubs. The understory is soft chess, ryegrass, wild oats, and filaree, and in some areas, needlegrass, deergrass, junegrass, and other perennial grasses. There are a few dense stands of oak that have a sparse herbaceous understory.

If depleted by grazing or fire, the desirable grasses are replaced by less desirable and undesirable plants such as red brome, nitgrass, poverty fescue, annual and perennial lupines, and other weeds.

All except the steep soils of the Arnold, Marina, and Narlon series are suitable for brush control and for seeding to adapted annual and perennial grasses and legumes. Because the soils are droughty and have low fertility, response to management is not so good as on the Clayey and Loamy range sites.

The estimated total annual yield per acre is 1,200 pounds air-dry weight in favorable years and 300 pounds in unfavorable years. Range seeding and fertilization can increase forage production from one and a half to two times this amount.

Eroded or Shallow Sandy Range Site

Terrace escarpments and soils of the Arnold, Betteravia, Marina, and Oceano series are in this site. All are rapidly permeable to very slowly permeable sands and loamy sands that are shallow to very deep and are severely eroded. Some of the soils have a claypan or a hardpan. Slopes are 0 to 75 percent. The available water capacity is very low to low. Fertility is low.

The plant cover is a scattered to open stand of California sagebrush, purple sage, and other shrubs, and a sparse understory of red brome, nitgrass, annual lupine, and other weedy species. There are also patches of soft chess and filaree.

Because the soils of this site are low in potential productivity, they do not respond to management. Range seeding and brush control are desirable only for erosion control and fire protection.

The estimated total annual yield per acre is 600 pounds air-dry weight in favorable years and 100 pounds in unfavorable years.

Sandy Alluvial Range Site

This site consists of very coarse textured alluvial land that is gravelly or cobbly in places. It occurs on flood plains adjacent to active stream channels that are subject to overflow. The alluvial land is very droughty and has very low fertility. Generally slopes are nearly level, but are as much as 9 percent in places.

The plant cover is a scattered to dense stand of sagebrush, goldenbush, and other shrubs and a sparse understory of red brome, nitgrass, filaree, and other annual grasses and forbs. There are a few live oaks, sycamores, and other trees.

The soils of this site do not respond to management. Brush control and range seeding are desirable only for erosion control and fire protection.

The estimated total annual yield per acre is 700 pounds air-dry weight in favorable years and 100 pounds in unfavorable years.

Arid Loamy Range Site

The soils of this site are moderately rapidly permeable to moderately slowly permeable sandy loams to loams that formed on terraces, in material weathered from soft calcareous sandstone or shale or in recent alluvium. They are in the Kettleman, Panoche, and Wasioja series. They are moderately deep to very deep or are shallow and severely eroded. Slopes are 2 to 75 percent. The available water capacity is low to high. Fertility is low to high. This site is low in productivity because it is in the zone of low and erratic rainfall in the Cuyama Valley.

The plant cover is annual grasses and forbs, mainly red brome and cutleaf filaree, and scattered juniper, flatop buckwheat, and other shrubs. The original plant cover was bunchgrass, dominantly needlegrass. Recurring drought and heavy grazing have almost completely destroyed the original plant cover.

Response to range seeding generally is unreliable because rainfall is low and erratic. In places seeding is successful on the less sloping soils of the Panoche series.

The estimated total annual yield per acre is 500 pounds air-dry weight in favorable years and 50 pounds in unfavorable years.

Arid Sandy Range Site

The soils of this site are rapidly permeable, very deep loamy sands of the Metz series. They

formed in coarse, stratified, calcareous alluvium. Slopes are 0 to 9 percent. The available water capacity is low. Fertility is low to moderate. This site occurs in the low rainfall zone of the Cuyama Valley.

The plant cover is sparse stands of red brome and filaree and very small amounts of other annual grasses and forbs. Big sagebrush, rabbitbrush, and ephedra are abundant in places. The original plant cover was probably bunchgrass, needlegrasses, and other perennials; these have been replaced by annuals through drought and heavy grazing.

Response to range seeding is unreliable because rainfall is low and erratic and potential productivity is low.

The estimated total annual yield per acre is 400 pounds air-dry weight in favorable years and 50 pounds in unfavorable years.

Gypsum Hills Range Site

The soils of this site are slowly permeable, moderately deep to shallow silty clays of the Ballinger series that formed in material weathered from soft shale and mudstone. They are calcareous and have a high salt and gypsum content. Slopes are 15 to 75 percent. The available water capacity is moderately high. Fertility is low. This site occurs in the low rainfall zone of the Cuyama Valley.

The plant cover is dominantly sparse stands of desert trumpet, red brome, filaree, and other forbs. The original plant cover probably was desert bluegrass and other bunchgrasses. These grasses have been depleted through drought and heavy grazing.

The soils of this site do not respond to range seeding because of low and erratic rainfall, high salt and gypsum content, and low potential productivity.

The estimated total annual yield per acre is 300 pounds air-dry weight in favorable years and 50 pounds in unfavorable years.

Saline Range Site

Marsh, Sandy alluvial land, and soils of the Stutzville series are in this site. All are moderately slowly permeable and slowly permeable, very deep, saline, stratified loamy sands and silty clay loams. They are on valley floors and flood plains subject to occasional overflow. Slopes are 0 to 2 percent. This site is in the Cuyama Valley.

The dominant plant cover is saltgrass, saltbush, pickleweed, alkali heath, iodinebush, and other alkali-tolerant plants. There are also stands of red brome and other annuals that are abundant in years of high rainfall.

Response to range seeding is unreliable because rainfall is low and erratic.

The estimated total annual yield per acre is 500 pounds air-dry weight in favorable years and 100 pounds in unfavorable years.

Wildlife Habitat and Recreational Areas

This section describes the wildlife in the Northern Santa Barbara Area, the opportunities for hunting and fishing, and the use of the soils for recreation.

Wildlife

Wildlife is an important resource for every community. Game animals, game birds, and fish provide opportunities for hunting and fishing, and wildlife generally is enjoyed by people interested in nature. The Area has habitat well suited to a variety of wild animals. In order to thrive, these animals require a reliable supply of food and water and a habitat where they are reasonably safe from predators. Nearly all game animals in the Area are protected by law so that they can maintain or increase their population. Nongame animals generally are not protected by law unless they are in danger of becoming extinct. Some wild, destructive, or dangerous animals may be destroyed when necessary to protect crops, livestock, and other animals.

The important game animals and birds in the Area are deer, wild hogs, rabbits, quail, pigeons, doves, and ducks.

Deer.--California mule deer are the only deer that inhabit the Area. Suitable habitat grows in many areas, and the population is large. Deer thrive on oak and grass vegetation and need brushy areas nearby for cover and protection. Santa Lucia, Chamise, Arnold, Gaviota, Contra Costa, and Crow Hill soils provide suitable habitat. Also, the nearby Linne and Diablo soils provide grass and browse. Many parts of the Area have 10 to 20 deer per square mile, and the hunting is excellent. The average annual kill for the Area is 400 to 500. Deer often damage crops near their habitat, especially bean crops, and controlled killing is sometimes necessary.

Wild hogs.--Wild hogs thrive in isolated areas near Santa Ynez in the vicinity of Cachuma Lake. They find cover in sagebrush, oak trees, grasses, and chaparral that grow on Chamise, Toomes, and Climara soils. The population of wild hogs is fairly small but is increasing.

Rabbits.--Hunting rabbits is a popular sport in the Area. Brush rabbits live in the coastal areas, and cottontails live in the Cuyama Valley. Rabbits live in widely scattered areas but rarely in areas of dense chaparral. They are numerous in areas of Riverwash and Sandy alluvial land. At times they destroy bean and grain crops and damage apple trees by eating the bark.

California Valley quail.--This is the major game bird in the Area. Quail do not favor open grassland, oak-grassland, or cultivated areas, but they live in most other areas. They especially favor the fringe between open areas and chaparral. They eat the seeds of grass and weeds, the tender green leaves of grasses and annual plants, and insects.

Areas north and east of New Cuyama provide excellent food and cover for quail. The vegetation in these areas is atriplex or sagebrush and open grassy areas, mainly on Stutzville soils. Quail can be attracted to the Area by constructing guzzlers or providing springs where water is not normally available and by planting shrubs and bushes for cover in open areas. Newly hatched chicks cannot range more than a few hundred yards from their nest or source of water, and adult quail seldom range more than a mile from their source of water. Watering places should be widely distributed and, preferably, not more than a half mile apart (4).

Pigeons.--Pigeons migrate southward through the Area late in fall and early in winter. They prefer to stop in mountainous areas. The best areas for hunting pigeons are between the Santa Ynez Valley and Figueroa Mountain and in the vicinity of Nojoqui Park and Tepesquet Creek. Pigeons feed mainly on acorns, and the number that stop depends on the number of acorns available. Oaks that grow on Santa Lucia, Chamise, Gaviota, and Arnold soils provide food for pigeons.

Mourning doves.--Doves also migrate through the Area in fall. They prefer the valleys, whereas pigeons prefer the mountains. Doves feed on small seeds of weeds, grass, vetch, herbs, and grain, and they usually stay fairly close to streams, ponds, or reservoirs.

Ducks.--Ducks are migratory birds that provide limited hunting in areas near the coast. They stop very briefly, and few are killed. Suitable food and habitat for ducks generally is lacking in the Area. They stop mainly in low marshlands at the mouth of San Antonio Creek, and in a few low marshy areas near the mouth of the Santa Maria and Santa Ynez Rivers. Occasionally ducks land on reservoirs or ponds throughout the Area. Lake Twitchell and Lake Cuyama attract flights, but hunting is restricted because these areas are used for other recreational activities. The development of commercial facilities for duck hunting is limited in coastal areas by the high cost of land and in the Cuyama Valley by the shortage of water.

Predators.--Coyote, fox, bobcat, and mountain lion are the main predatory animals in the Area. They kill game animals, many destructive rodents, and, occasionally, domestic animals. Predators are trapped or shot by the Fish and Wildlife Service only where they threaten livestock.

Badgers.--Badgers are fairly numerous. They cause considerable damage by digging deep holes.

Beavers.--Beavers live in the Sisquoc, Cuyama, and Santa Ynez Rivers and in San Antonio Creek. The population is small. In most areas beavers are beneficial because they help store water, but occasionally they damage manmade structures.

Nongame birds.--A fairly large number of scavenger turkey vultures range throughout the Area. About 60 condors live in the condor refuge of Los Padres National Forest, one of the few places in the United States they inhabit. The condors range into the Cuyama Valley and, occasionally, into coastal areas. Both the vultures and the condors are protected by law. Many kinds of hawks, golden eagles, and songbirds live throughout the Area.

Fish.--A few places provide fresh-water fishing. Rainbow trout are stocked in the Salispuedes Creek and in the Santa Ynez River near Solvang. Most are caught during the year that they are stocked. The Sisquoc River also has rainbow trout but is not accessible to the public for fishing. Cachuma Lake, a warm-water fishery, has bass, bluegills, crappies, channel catfish, and walleyed pike. The coast provides surf and rock fishing.

Recreation

The population of the Area is increasing rapidly, and more recreational facilities are needed. Beaches, forests, lakes, rivers, and other public areas furnish much recreation, but the demand for private recreational facilities is increasing as well. Generally, deep, well-drained soils in valleys, such as Sorrento, Salinas, Agueda, Mocho, Panoche, and Metz soils, are too valuable for farming to be used for recreation. However, soils on terraces and low hills, such as Garey, Betteravia, Oceano, Marina, and Tierra soils, are not so valuable for farming and are well suited to the development of dude ranches, hunt clubs, golf courses, picnic areas and playgrounds, and many other recreational facilities. Ranches on uplands inhabited by deer and game birds can be developed for private hunt clubs. In many cases, technical and financial assistance is available for developing land for recreational uses.

USE OF THE SOILS IN ENGINEERING[6/]

Some soil properties are of special interest to engineers because they affect the construction and maintenance of roads, airports, pipelines, building foundations, facilities for water storage, erosion control structures, drainage systems, and sewage disposal systems. Among the properties most important to engineers are permeability, strength, consolidation characteristics, texture, plasticity, and soil reaction. Depth to unconsolidated materials and topography are also important.

Information concerning these and related soil properties is given in tables 3, 4, and 5. The estimates and interpretations in these tables can be used to--

1. Make studies that will aid in selecting and developing industrial, commercial, residential, and recreational sites.
2. Make preliminary estimates of the engineering properties of soils in planning drainage systems, farm ponds, irrigation systems, terraces, waterways, and diversion terraces.
3. Make preliminary evaluations of soil conditions that will aid in selecting sites for highways, airports, pipelines, and cables and in planning detailed investigations at selected locations.
4. Locate probable sources of gravel, sand, and other construction material.
5. Correlate performance of soil mapping units to develop information that will be useful in planning engineering practices and in designing and maintaining engineering structures.
6. Determine the suitability of soils for cross-country movement of vehicles and construction equipment.
7. Supplement other publications, such as maps, reports, and aerial photographs, that are used in preparation of engineering reports for a specific area.
8. Develop other preliminary estimates for construction purposes pertinent to the particular area.

The engineering interpretations reported here do not eliminate the need for sampling and testing at the site of specific engineering works involving heavy loads or excavations deeper than the depth reported (ordinarily about 5 feet). Even in these situations, however, the soil map is useful in planning more detailed field investigations and in indicating the kinds of problems that may be expected.

Some of the terms used by soil scientists have special meanings in soil science that may not be familiar to engineers. These terms are defined in the Glossary.

6/ Prepared by WILLIAM H. PAYNE, civil engineer, Soil Conservation Service.

Engineering Test Data

Shown in table 3 are test results on samples taken from selected layers in four soil profiles in the Area. Classifications shown are based on mechanical analyses, made by the sieve and hydrometer methods, and on laboratory tests to determine liquid and plastic limits. Such tests measure the effect of water on consistence of the soil material. As the moisture content of clayey soils increases from a very dry state, the material changes from semisolid to plastic, and then from plastic to liquid. Plastic limit is the moisture content at which the soil material passes from a semisolid to a plastic state.

Engineering Classification Systems

The two systems most commonly used in classifying soils for engineering are the systems approved by the American Association of State Highway Officials (AASHO) and the Unified system.

The AASHO system (1) is used to classify soils according to those properties that affect use in highway construction. In this system all soil material is classified in seven principal groups. The groups range from A-1, which consists of soils that have the highest bearing strength and are the best soils for subgrade, to A-7, which consists of soils that have the lowest strength when wet. Within each group, the relative engineering value of the soil material is indicated by a group index number. The numbers range from 0, for the best material, to 20, for the poorest. The group index number is shown in parentheses following the soil group system (see table 3).

In the Unified system (18) soils are classified according to their texture and plasticity and their performance as engineering construction material. Soils are grouped in 15 classes. There are eight classes of coarse-grained soils, six classes of fine-grained soils, and one class of highly organic soils.

Soil scientists use the USDA textural classification (14). In this, the texture of the soil is determined according to the proportion of soil particles smaller than 2 millimeters in diameter, that is, the proportion of sand, silt, and clay. Textural modifiers, such as gravelly, stony, shaly, and cobbly, are used as needed.

Table 3 shows the AASHO and Unified classification of specified soils in the Area, as determined by laboratory tests. Table 4 shows the estimated classification of all the soils in the Area according to all three systems of classification.

Table 3 also shows the maximum dry density and optimum moisture content of the soils. Dry density is determined by compacting soil material at successively higher moisture contents, using constant compactive effort, until the maximum dry density is determined. The moisture content is optimum at the point of maximum dry density.

Soil Properties Significant in Engineering

Table 4 gives estimates of soil properties and classifications important in engineering. Estimates are based on laboratory tests, experience with similar soils in other areas, and information in other sections of this survey. Some of the terms used in the table are defined in the following paragraphs.

Permeability was estimated for soils as they occur in place. The intake of water is sometimes slower than the permeability because of crusting or sealing on the surface.

Available water capacity is the capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil.

Reaction is the degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. Acid soils have lower values and alkaline soils have higher values.

Salinity, or the content of soluble salts in a soil, affects the growth of plants. A saline soil contains soluble salts in amounts that impair the growth of plants.

Shrink-swell potential indicates the change in volume caused by variations in moisture content. Some soils expand as moisture is added and then shrink and crack as they dry. Generally, soils containing large amounts of clay have a high shrink-swell potential and coarser textured soils have a low potential. The type of clay, as well as the amount, affects the shrink-swell behavior of a soil. High shrink-swell potential adversely affects road construction, building foundations, and other structures.

Corrosivity of untreated steel pipe is affected mainly by the electrical resistivity or resistance to flow of current in the soil and the acidity, drainage, and texture of the soil. It is rated low, moderate, or high. Structural materials, such as metal and concrete, corrode when buried in soil, and a given material corrodes more rapidly in some soils than in others. Corrosion is a greater hazard for extensive installations that intersect soil boundaries or soil horizons than for installations in one kind of soil or soil horizon. Some soils have a wide range of characteristics within the profile. Therefore, the depth at which pipes or materials are buried can determine the degree of corrosivity. For example, in a soil that has a clay subsoil, the corrosivity in the surface layer will differ from that in the clay layer. Bayshore, Betteravia, Camarillo, Narlon, Positas, Santa Ynez, Tangair, and Tierra soils have strongly contrasting, stratified layers within the profile.

The ratings for corrosivity are based only on natural soil properties. Buildings, paving, fill and compaction, and surface additions that alter the soil permeability, and mechanical agitation or excavation that results in nonuniform mixing of soil horizons, can increase the corrosion hazard. Other factors that may increase corrosivity, particularly for steel pipes or structures, are electrical leaks from underground cables, electrical charges resulting from dissimilar metals or metal composition, the quality of water in the soil, differences in water content along conduits or structures, and additions of fertilizers and large quantities of organic matter.

Engineering Interpretations

Table 5 indicates the suitability of soils for various engineering uses. The table also lists soil features that affect road construction, reservoir sites, drainage, irrigation, and sewage disposal. Some terms used in the table are defined in the following paragraphs.

Suitability of soils for use as topsoil is rated because topsoil is needed to establish vegetation on excavated areas, fill slopes, highway embankments, and other important construction sites. Suitability as a source of sand and gravel and road fill is rated because these are important construction materials.

Four hydrologic soil groups are used for estimating the runoff potential of soils. Groupings are based on soil properties that influence runoff. The potential is calculated on water intake at the end of a long-duration storm that occurs after prior wetting and opportunity for swelling of a soil not protected by vegetation.

Group A. Soils have high infiltration rate when thoroughly wetted: chiefly deep, well-drained to excessively drained sand, gravel, or both. Rate of water transmission is high; thus, runoff potential is low.

Group B. Soils have moderate infiltration rate when thoroughly wetted: chiefly soils that are moderately deep to deep, moderately well drained to well drained, and moderately coarse textured. Rate of water transmission is moderate.

Group C. Soils have slow infiltration rate when thoroughly wetted: chiefly soils that have layer impeding downward movement of water, or moderately fine textured to fine textured soils that have slow infiltration rate when dry. Rate of water transmission is slow.

TABLE 3.--ENGINEERING

[Tests performed by District V, California Division of Highways in accordance with procedures

Soil name and location	Parent material	Calif. report No. V-62-	Depth from surface	Moisture-density 1/		Mechanical analysis 2/			
				Maximum dry density	Optimum moisture content	Percentage passing sieve--			
						2-in.	1½-in.	1-in.	3/4-in.
			In.	Lb./cu. ft.	Pct.				
Oceano sand: NW¼ sec. 36, T. 10 N., R. 34 W.	Eolian sand.	5045	20-39	122	9	---	---	---	---
Garey sandy loam: SW¼ sec. 9, T. 9 N., R. 33 W.	Eolian material.	5047	8-16	126	10	---	---	---	---
		5048	36-47	131	9	---	---	---	---
Santa Lucia shaly clay loam: NW¼ NE¼ sec. 5, T. 9 N., R. 35 W.	Monterey shale.	5051	0-8	66	41	100	97	91	85
Linne clay loam: 11 mi. SE. of Santa Maria, lat. 34° 48'62" N., long. 120°21'06" W.	Mudstone that breaks to very fine sandy loam.	5052	0-9	100	18	---	---	---	---

1/ Based on tests of relative compaction of untreated and treated soils and aggregates, method No. Calif. 216 E.

2/ Mechanical analyses by California Division of Highways. Results by this procedure 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-size 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 material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analysis data used in this table are not suitable for use in naming textural classes for soils.

TEST DATA

given in California Materials Manual for Testing and Control Procedures (5)]

Mechanical analysis 2/--Cont.									Liquid limit	Plasticity index	Classification	
Percentage passing sieve--Cont.					Percentage smaller than--						3/ AASHO	4/ Unified
3/8-in.	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.				
									Pct.			
---	---	100	60	17	16	8	4	3	5/ NP	NP	A-2-4(0)	SM
---	---	100	76	58	56	29	14	10	NP	NP	A-4(5)	ML
---	---	100	90	41	39	21	11	3	NP	NP	A-4(1)	SM
78	73	6/ 68	57	43	42	28	15	10	81	4	A-5(3)	SM
---	---	100	98	73	69	51	36	29	45	18	A-7-6 (12)	ML-CL

3/ Based on Standard Specifications for Highway Materials and Methods of Sampling and Testing. AASHO Designation M 145-49.

4/ SCS and BPR (Bureau of Public Roads) have agreed to consider that all soils having plasticity indexes within two points of A-line are to be given a borderline classification. An example of a borderline classification obtained by this use is ML-CL.

5/ NP = Nonplastic.

6/ Many shale fragments, pulverized and dispersed.

[An asterisk in the first column indicates that at least one mapping unit in this series is made up or two or this reason it is necessary to follow carefully the instructions for referring to other series that appear

Soil series and map symbols	Depth to--		Depth from surface (typical profile)	Classification			Percentage greater than 3 inches in diameter	Percentage passing sieve--	
	Bedrock	Seasonal high water table		Dominant USDA texture	Unified	AASHO		No. 4	No. 10
	Ft.	Ft.	In.						
Agueda:									
Ada	>5	(1/)	0-36	Loam	ML	A-4	0	100	95-100
			36-60	Fine sand.	SM	A-2	0	100	95-100
AgA, AgC	>5	(1/)	0-72	Silty clay loam.	CL	A-6	0	100	95-100
Arnold: ArD, ArF, ArF3.	1½-5	(1/)	0-55	Sand	SM	A-2	0	95-100	90-95
			55-65	Soft sandstone.					
Ballard:									
BaA, BaC, BaD	>5	(1/)	0-18	Fine sandy loam.	SM	A-4	0	80-95	75-90
			18-44	Gravelly loam.	SC	A-4	0-5	55-80	50-75
			44-72	Very gravelly sandy loam.	GM	A-1	0-10	35-55	30-50
BbA, BbC, BbD	>5	(1/)	0-18	Gravelly fine sandy loam.	SM	A-2 or A-4	0-5	55-80	50-75
			18-44	Gravelly loam.	SC	A-4	0-5	55-80	50-75
			44-72	Very gravelly sandy loam.	GM	A-1	0-10	35-55	30-50
Ballinger: BcE, BcF, BcG.	1½-3½	(1/)	0-36	Silty clay.	CH	A-7	0	100	100
			36	Soft mudstone.					
Bayshore:									
Bd	>5	4-5	0-40	Loam	CL, ML	A-4, A-6	0	100	100
			40-60	Silty clay.	CH	A-7	0	100	100
Be	>5	2-3	0-40	Loam	CL, ML	A-4, A-6	0	100	100
			40-60	Fine sand.	SM	A-2	0	100	100

See footnotes at end of table.

more kinds of soil. The soils in such mapping units may have different properties and limitations, and for in the first column of this table. The symbol > means more than. The symbol < means less than]

Percentage passing sieve--Continued		Atterberg values		Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential	Corrosivity of uncoated steel
No. 40	No. 200	Liquid limit	Plastic limit						
		Pct.		In./hr.	In./in. of soil	pH	Mmhos./cm. at 25° C.		
80-90	55-65	15-35	5-10	0.63-2.00	0.16-0.18	7.9-8.4	0-1	Moderate--	Low.
60-70	10-20	-----	2/NP	6.3-20.0	0.05-0.07	7.9-8.4	0-1	Low-------	Low.
90-100	85-95	30-40	10-20	0.63-2.00	0.19-0.21	7.9-8.4	0-1	Moderate--	Moderate.
50-70	10-15	-----	NP	6.3-20.0	0.05-0.07	5.1-6.0	0-1	Low-------	Low.
50-75	35-50	-----	NP	2.0-6.30	0.13-0.15	5.6-6.5	0-1	Low-------	Low.
50-70	35-50	10-20	0-10	0.63-2.00	0.12-0.14	5.6-6.5	0-1	Low-------	Low.
20-35	10-20	-----	NP	2.0-6.30	0.05-0.07	5.6-6.5	0-1	Low-------	Low.
35-60	20-40	-----	NP	2.0-6.30	0.10-0.12	5.6-6.5	0-1	Low-------	Low.
50-70	35-50	10-20	0-10	0.63-2.00	0.12-0.14	5.6-6.5	0-1	Low-------	Low.
20-35	10-20	-----	NP	2.0-6.30	0.05-0.07	5.6-6.5	0-1	Low-------	Low.
95-100	90-100	50-60	30-40	0.06-0.20	0.14-0.16	7.9-8.4	3-15	High------	High.
80-90	60-70	25-35	5-15	0.63-2.00	0.16-0.18	7.9-8.4	4-8	Moderate--	Moderate.
95-100	90-100	50-60	30-40	0.2-0.63	0.15-0.17	7.9-8.4	4-8	High------	High.
80-90	60-70	25-35	5-15	0.63-2.00	0.16-0.18	7.9-8.4	4-8	Moderate--	Moderate.
65-75	20-30	-----	NP	6.3-20.0	0.06-0.08	7.9-8.4	4-8	Low-------	Moderate.

TABLE 4.--SOIL PROPERTIES SIGNIFICANT

Soil series and map symbols	Depth to--		Depth from surface (typical profile)	Classification			Percentage greater than 3 inches in diameter	Percentage passing sieve--	
	Bedrock	Seasonal high water table		Dominant USDA texture	Unified	AASHO		No. 4	No. 10
	Ft.	Ft.	In.						
Bayshore: (Cont.)									
Bg----------	>5	1-4	0-24	Silty clay loam.	CL	A-6	0	100	100
			24-72	Loam----	CL, ML	A-4, A-6	0	100	100
Bh----------	>5	(1/)	0-24	Silty clay loam.	CL	A-6	0	100	100
			24-72	Loam----	CL, ML	A-4, A-6	0	100	100
Betteravia: BmA, BmA3, BmC.	>5	(1/)	0-36	Loamy sand.	SM	A-2	0	100	100
			36-50	Weakly cemented sandy loam.	SM	A-2, A-4	0	100	100
			50-56	Sandy clay loam.	SC, CL	A-6	0	100	100
Betteravia, dark variant: BnB2, BnD2.	>5	(1/)	0-26	Loamy sand.	SM	A-2	0	95-100	90-95
			26-50	Weakly cemented sandy loam.	SM	A-2, A-4	0	95-100	95-100
			50-60	Loamy sand.	SM	A-2	0	95-100	95-100
Botella: BoA, BoA2, BoC, BoD2, BtA, BtA2, BtD2, BtC, BtD2.	>5	(1/)	0-72	Clay loam, silty clay loam, and sandy clay loam.	CL or ML	A-6 or A-7	0	95-100	95-100
BsA----------	>5	3-5	0-72	Clay loam, silty clay loam, and sandy clay loam.	CL or ML	A-6 or A-7	0	95-100	95-100

See footnotes at end of table.

Percentage passing sieve--Continued		Atterberg values		Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential	Corrosivity of uncoated steel
No. 40	No. 200	Liquid limit	Plastic limit						
		Pct.		In./hr.	In./in. of soil	pH	Mmhos./cm. at 25° C.		
95-100	85-90	30-40	10-20	0.2-0.63	0.19-0.21	7.9-8.4	4-15+	Moderate--	High.
80-90	60-70	25-35	5-15	0.63-2.00	0.16-0.18	7.9-8.4	4-15+	Moderate--	High.
95-100	85-90	30-40	10-20	0.2-0.63	0.19-0.21	7.9-8.4	4-15+	Moderate--	High.
80-90	60-70	25-35	5-15	0.63-2.00	0.16-0.18	7.9-8.4	4-15+	Moderate--	High.
50-60	15-30	-----	NP	6.3-20.0	0.06-0.08	5.1-5.5	0-1	Low-------	Low.
60-70	30-40	-----	NP	<0.06	---------	6.6-7.3	0-1	Low-------	Low.
80-90	45-55	30-40	10-20	0.06-0.20	0.14-0.16	6.6-7.3	0-1	Moderate--	Moderate.
50-60	15-30	-----	NP	6.3-20.0	0.06-0.08	5.6-6.5	0-1	Low-------	Low.
75-85	30-40	10-25	0-10	0.06-0.20	0.04-0.06	5.6-7.3	0-1	Low-------	Low.
50-60	15-30	-----	NP	6.3-20.0	0.06-0.08	5.6-6.0	0-1	Low-------	Low.
85-95	70-80	35-45	10-30	0.2-0.63	0.19-0.21	5.6-7.3	0-1	Moderate--	Moderate.
85-95	70-80	35-45	10-30	0.2-0.63	0.19-0.21	5.6-7.3	0-1	Moderate--	High.

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Soil series and map symbols	Depth to--		Depth from surface (typical profile)	Classification			Percentage greater than 3 inches in diameter	Percentage passing sieve--	
	Bedrock	Seasonal high water table		Dominant USDA texture	Unified	AASHO		No. 4	No. 10
	Ft.	Ft.	In.						
Botella: (Cont.)									
BwA	>5	1-5	0-72	Clay loam, silty clay loam, and sandy clay loam.	CL or ML	A-6 or A-7	0	95-100	95-100
Camarillo:									
Ca	>5	3-6	0-60	Sandy loam--	SM	A-2 or A-4	0	95-100	95-100
Cb	>5	(1/)	0-60	Sandy loam--	SM	A-2 or A-4	0	95-100	95-100
Cc	>5	3-6	0-60	Very fine sandy loam and some finer and coarser strata.	ML	A-4	0	95-100	95-100
Cd	>5	2-5	0-60	Stratified silty clay loam.	CL	A-6	0	95-100	95-100
Chamise: CeC, CeE2, CfD, CgC, ChD, ChF, ChG, ChG2, CkH.	>5	(1/)	0-18	Shaly loam (sandy loam, shaly sandy loam, loam, or clay loam in some places).	SC, CL or SM	A-4	0-5	55-95	50-95
			18-37	Shaly clay and very shaly heavy clay loam.	GC or SC	A-2 or A-4	0-5	40-70	35-65
			37-60	Very shaly clay loam.	CC	A-1 or A-2	5-15	20-55	15-50
*Climara: CmF For Toomes part, refer to Toomes series.	1½-5	(1/)	0-24	Clay	CH	A-7	0	95-100	95-100
			24-37	Silty clay loam.	CL	A-6	0	90-100	85-95
			37	Serpentine rock.					

See footnotes at end of table.

IN ENGINEERING--Continued

Percentage passing sieve--Continued		Atterberg values		Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential	Corrosivity of uncoated steel
No. 40	No. 200	Liquid limit	Plastic limit						
		Pct.		In./hr.	In./in. of soil	pH	Mmhos./cm. at 25° C.		
85-95	70-80	35-45	10-30	0.2-0.63	0.19-0.21	5.6-7.3	0-1	Moderate--	High.
60-70	30-40	-----	NP	2.0-6.30	0.11-0.13	7.9-8.4	0-4	Low-------	Moderate.
60-70	30-40	-----	NP	2.0-6.30	0.11-0.13	7.9-8.4	0-4	Low-------	Low.
85-95	50-60	15-25	0-10	0.63-2.00	0.15-0.17	7.9-8.4	0-4	Low-------	High.
90-100	75-85	30-40	20-30	0.2-0.63	0.18-0.20	7.9-8.4	0-4	Moderate--	High.
40-90	35-70	15-35	5-10	0.63-2.00	0.10-0.14	5.6-6.0	0-1	Low-------	Low.
30-60	25-50	40-50	20-30	0.2-0.63	0.08-0.12	5.1-5.5	0-1	Low-------	Low.
10-45	5-35	30-40	10-20	0.2-0.63	0.06-0.10	5.1-5.5	0-1	Low to moderate.	Moderate.
90-100	75-85	50-60	30-40	0.06-0.20	0.14-0.16	7.4-8.4	0-1	High------	High.
80-90	70-80	30-40	20-30	0.2-0.63	0.18-0.20	7.9-8.4	0-1	Moderate--	Moderate.

TABLE 4.--SOIL PROPERTIES SIGNIFICANT

Soil series and map symbols	Depth to--		Depth from surface (typical profile)	Classification			Percentage greater than 3 inches in diameter	Percentage passing sieve--	
	Bedrock	Seasonal high water table		Dominant USDA texture	Unified	AASHO		No. 4	No. 10
	Ft.	Ft.	In.						
Coastal beaches:									
CnB. No valid estimates can be made.									
Cobbly alluvial land:									
CoB. No valid estimates can be made.									
*Contra Costa:									
CrE, CrF, CrG-----	1½-3	(1/)	0-11	Loam------	CL	A-6	0	90-100	85-95
			11-26	Gravelly clay loam.	CL	A-6	0	70-90	65-85
			26	Altered shale.					
CsG---------- For Lodo part, refer to Lodo series.	1½-3	(1/)	0-11	Stony loam.	CL	A-6	5-20	70-100	65-95
			11-26	Stony clay loam.	CL	A-6	5-20	70-90	65-85
			26	Altered shale.					
Corralitos:									
CtA, CtD, CtD2-----	>5	(1/)	0-72	Sand------	SP-SM or SM	A-3, A-2	0	95-100	90-95
CuA, CuC, CuD------	>5	(1/)	0-72	Loamy sand.	SM	A-2	0	95-100	90-95
Cropley: Cv---------	>5	(1/)	0-20	Silty clay.	CH, MH	A-7	0	95-100	95-100
			20-60	Silty clay loam.	CL	A-6	0	100	100
Crow Hill:									
CwE, CwF, CwG------	2-3½	(1/)	0-36	Loam, silt loam and silty clay loam.	ML	A-4	0	90-100	85-95
			36	Soft diatomaceous shale.					

See footnotes at end of table.

Percentage passing sieve--Continued		Atterberg values		Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential	Corrosivity of uncoated steel
No. 40	No. 200	Liquid limit	Plastic limit						
		Pct.		In./hr.	In./in. of soil	pH	Mmhos./cm. at 25° C.		
70-90	50-70	15-25	5-15	0.63-2.00	0.16-0.18	6.1-7.3	0-1	Moderate--	Low.
60-80	50-70	30-40	15-25	0.2-0.63	0.15-0.17	5.6-7.3	0-1	Moderate--	Moderate.
55-85	40-60	15-25	5-15	0.63-2.00	0.12-0.14	6.1-7.3	0-1	Moderate--	Low.
60-80	50-70	30-40	15-25	0.2-0.63	0.15-0.17	5.6-7.3	0-1	Moderate--	Moderate.
50-70	0-15	-----	NP	6.3-20.0	0.04-0.06	5.6-6.0	0-1	Low-------	Low.
60-70	15-30	-----	NP	6.3-20.0	0.06-0.08	5.6-6.0	0-1	Low-------	Low.
90-100	85-95	50-60	20-30	0.06-0.20	0.14-0.16	7.9-8.4	0-1	High------	High.
95-100	85-95	30-40	20-30	0.2-0.63	0.19-0.21	7.9-8.4	0-1	Moderate--	Moderate.
75-85	70-80	25-35	5-10	0.2-0.63	0.18-0.20	4.5-6.5	0-1	Low-------	Moderate.

Soil series and map symbols	Depth to--		Depth from surface (typical profile)	Classification			Percentage greater than 3 inches in diameter	Percentage passing sieve--	
	Bedrock	Seasonal high water table		Dominant USDA texture	Unified	AASHO		No. 4	No. 10
	Ft.	Ft.	In.						
Crow Hill: (Cont.)									
CwG3----------	½-2	(1/)	0-18	Loam, silt loam and silty clay loam.	ML	A-4	0	90-100	85-95
			18	Soft diatomaceous shale.					
Diablo: DaD, DaE, DaF, DaF3, DaG.	1½-3½	(1/)	0-35	Silty clay.	CH, MH	A-7	0	95-100	90-95
			35	Mudstone on shale bedrock.					
Dune land: DuE. No valid estimates can be made.									
Elder:									
EdA, EdA2, EdC2, EdD2.	>5	(1/)	0-35	Sandy loam.	SM	A-2 or A-4.	0	90-100	85-95
			35-60	Fine sandy loam.	SM or ML	A-4	0	90-100	85-95
EmA, EmC----------	>5	(1/)	0-60	Loam------	ML	A-4	0	90-100	85-95
EnA2, EnC2, EnD2--	>5	(1/)	0-60	Shaly loam.	SM, SC or ML	A-2 or A-4	0	55-85	50-80
Garey: CaA2, CaC2, CaE2, CaE3.	>5	(1/)	0-27	Sandy loam to loam.	SM or ML	A-4	0	95-100	95-100
			27-47	Heavy sandy loam that has indistinct bands.	SM or SC	A-4	0	95-100	95-100
			47-72	Loamy sand.	SM	A-2	0	95-100	95-100
Garey, wet variant: GbB.	>5	2-5	0-33	Loam------	ML	A-4	0	95-100	95-100
			33-72	Loam that has indistinct bands.	CL or ML	A-6	0	95-100	95-100

See footnotes at end of table.

IN ENGINEERING--Continued

Percentage passing sieve--Continued		Atterberg values		Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential	Corrosivity of uncoated steel
No. 40	No. 200	Liquid limit	Plastic limit						
		Pct.		In./hr.	In./in. of soil	pH	Mmhos./cm. at 25° C.		
75-85	70-80	25-35	5-10	0.2-0.63	0.18-0.20	4.5-6.5	0-1	Low------	Moderate.
85-90	80-90	50-60	20-30	0.06-0.20	0.15-0.17	7.4-8.4	0-1	High-----	High.
60-70	30-40	-----	NP	2.0-6.30	0.11-0.13	5.6-7.3	0-1	Low------	Low.
70-80	45-55	-----	NP	2.0-6.30	0.13-0.15	6.1-7.3	0-1	Low------	Low.
75-85	60-70	25-35	5-10	0.63-2.00	0.16-0.18	5.6-7.3	0-1	Low------	Low.
40-70	30-60	25-35	5-10	0.63-2.00	0.12-0.14	5.6-7.3	0-1	Low------	Low.
60-80	40-60	-----	NP	2.0-6.30	0.10-0.12	5.1-6.5	0-1	Low------	Low.
80-90	40-50	-----	NP	0.06-0.20	0.10-0.12	6.1-7.3	0-1	Low------	Low.
50-70	15-30	-----	NP	0.63-2.00	0.06-0.08	6.1-7.3	0-1	Low------	Low.
80-90	60-70	15-25	5-10	0.2-0.63	0.16-0.18	5.1-6.0	0-1	Low------	High.
80-90	60-70	20-30	10-20	0.06-0.20	0.10-0.12	5.6-6.5	0-1	Moderate-	High.

Soil series and map symbols	Depth to--		Depth from surface (typical profile)	Classification			Percentage greater than 3 inches in diameter	Percentage passing sieve--	
	Bedrock	Seasonal high water table		Dominant USDA texture	Unified	AASHO		No. 4	No. 10
	Ft.	Ft.	In.						
Gaviota: GmD, GmE, GmG.	1-1½	(1/)	0-20 20	Sandy loam-- Hard sandstone.	SM	A-2	0	90-95	85-95
Gazos: GsD, GsE, GaF, GsG.	1½-3	(1/)	0-30 30	Clay loam--- Soft shale.	CL or ML	A-6	0	95-100	95-100
Gullied land: GuE. No valid estimates can be made.									
Igneous rock land: IrG. No valid estimates can be made.									
Kettleman: KeT, KeT3, KtG.	½-2½	(1/)	0-24 24	Fine sandy loam. Soft sandstone.	SM	A-4	0	90-100	85-95
Landslides: LaF. No valid estimates can be made.									
Linne: LcD, LcE, LcF, LcG.	1½-5	(1/)	0-36 36	Clay loam--- Soft marly mudstone.	ML or CL	A-7	0	95-100	95-100
Lodo: LdG---------	½-1½	(1/)	0-11 11	Loam-------- Shale.	ML	A-4	0	90-100	85-95
Lopez: LkG, LmG---	½-1	(1/)	0-14 14	Shaly clay loam (loam in places). Shale.	SM	A-5	0-10	55-75	50-70
*Los Osos: LoE, LoG, LsE, LsF, LsG3. For San Benito part of LsE, LsF, and LsG3, refer to San Benito series.	1½-3½	(1/)	0-12 12-25 25	Clay loam--- Light clay-- Shale.	CL CH or MH	A-6 or A-7 A-7	0 0	95-100 90-95	95-100 85-95

See footnotes at end of table.

Percentage passing sieve--Continued		Atterberg values		Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential	Corrosivity of uncoated steel
No. 40	No. 200	Liquid limit	Plastic limit						
		Pct.		In./hr.	In./in. of soil	pH	Mmhos./cm. at 25° C.		
60-70	25-35	-----	NP	0.63-2.00	0.11-0.13	6.1-6.5	0-1	Low-------	Low.
85-95	70-80	30-40	15-25	0.2-0.63	0.19-0.21	5.6-6.5	0-1	Moderate--	Moderate.
70-85	35-50	15-25	0-10	0.63-2.00	0.13-0.15	7.9-8.4	0-2	Low-------	Low.
90-100	65-75	40-50	15-25	0.2-0.63	0.15-0.17	7.4-8.4	0-1	Moderate--	Moderate.
75-85	50-60	15-35	5-10	0.63-2.00	0.16-0.18	5.6-7.3	0-1	Low-------	Low.
50-60	40-50	75-85	0-10	0.63-2.00	0.08-0.10	5.6-7.3	0-1	Low-------	Low.
80-90	70-80	35-45	10-20	0.2-0.63	0.19-0.21	5.6-6.5	0-1	Moderate--	Moderate.
80-90	75-85	50-60	20-30	0.06-0.20	0.14-0.16	6.1-7.8	0-1	High------	High.

Soil series and map symbols	Depth to--		Depth from surface (typical profile)	Classification			Percentage greater than 3 inches in diameter	Percentage passing sieve--	
	Bedrock	Seasonal high water table		Dominant USDA texture	Unified	AASHO		No. 4	No. 10
	Ft.	Ft.	In.						
Marina: MaA, MaC, MaE, MaE3.	>5	(1/)	0-72	Loamy sand and sand having thin clay bands.	SM	A-2	0	100	100
Marsh: Mh. No valid estimates can be made.									
Mayman: MmG--------	1-1½	(1/)	0-10	Stony loam and gravelly clay loam.	SM or SC	A-4	10-30	65-75	60-70
			10	Shale.					
Metz:									
MnA, MnC, MnC2----	>5	(1/)	0-60	Loamy sand--	SM	A-2	0	95-100	90-95
MoA----------	>5	(1/)	0-60	Loamy sand--	SM	A-2	0	95-100	90-95
Mine pits and dumps: MpG. No valid estimates can be made.									
Mocho:									
Mr, Mu----------	>5	(1/)	0-72	Stratified sandy loam, fine sandy loam and loam.	SM	A-4	0	100	100
Ms, Mt----------	>5	(1/)	0-40	Sandy loam.	SM	A-2, A-4	0	100	100
			40-60	Coarse sand and gravel.	GP	A-1	0-10	50-60	30-40
Mv, Mw----------	>5	(1/)	0-60	Loam-------	ML	A-4	0	100	100
Mx----------	>5	(1/)	0-60	Silty clay loam.	CL	A-6	0	100	100

See footnotes at end of table.

Percentage passing sieve--Continued		Atterberg values		Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential	Corrosivity of uncoated steel
No. 40	No. 200	Liquid limit	Plastic limit						
		Pct.		In./hr.	In./in. of soil	pH	Mmhos./cm. at 25° C.		
50-75	15-30	-----	NP	0.63-2.00	0.06-0.08	5.1-6.5	0-1	Low-------	Low.
50-60	40-50	15-25	0-10	0.63-2.00	0.12-0.14	5.6-6.0	0-1	Low-------	Low.
50-70	15-30	-----	NP	6.3-20.0	0.06-0.08	7.9-8.4	0-2	Low-------	Low.
50-70	15-30	-----	NP	2.0-6.30	0.06-0.08	7.9-8.4	0-2	Low-------	Low.
70-80	35-50	-----	NP	2.0-6.30	0.13-0.15	7.9-8.4	0-2	Low-------	Low.
60-70	30-40	-----	NP	2.0-6.30	0.11-0.13	7.9-8.4	0-2	Low-------	Low.
20-30	0-5	-----	NP	< 20	0.03-0.05	7.9-8.4	0-2	Low-------	Low.
85-95	60-70	20-35	0-10	0.63-2.00	0.16-0.18	7.9-8.4	0-2	Moderate--	Low.
95-100	80-90	30-40	20-30	0.2-0.63	0.19-0.21	7.9-8.4	0-2	Moderate--	Moderate.

Soil series and map symbols	Depth to--		Depth from surface (typical profile)	Classification			Percentage greater than 3 inches in diameter	Percentage passing sieve--	
	Bedrock	Seasonal high water table		Dominant USDA texture	Unified	AASHO		No. 4	No. 10
	Ft.	Ft.	In.						
Montara: MyC--------	1-1½	(1/)	0-13	Gravelly clay loam or gravelly light clay.	CL or GC	A-6 or A-7	0	60-75	55-70
			13	Serpentine.					
Narlon: NrB, NsA, NsC, NsD.	>4	(1/)	0-32	Loamy sand--	SM	A-2	0	95-100	95-100
			32-67	Clay, sandy clay.	CH	A-7	0	100	100
Narlon, hardpan variand: NvA, NvC.	>5	(1/)	0-26	Sand--------	SM	A-2	0	100	100
			26-38	Sandy clay--	CL	A-7	0	95-100	90-95
			38-72	Weakly cemented loamy sand hardpan.	-----	-----	----	------	------
Oceano: OcA, OcD, OcD3.	>5	(1/)	0-72	Sand--------	SM	A-2	0	100	100
Panoche: PdA, PdB----------	>5	(1/)	0-72	Sandy loam--	SM	A-2 or A-4	0	95-100	95-100
PcA, PcC, PeA, PeC, PfA.	>5	(1/)	0-72	Highly stratified loam.	CL or ML	A-4, A-6	0	95-100	95-100
Pleasanton: PnA, PnC, PnD------	>5	(1/)	0-32	Sandy loam--	SM	A-2	0-5	90-100	85-95
			32-39	Cobbly clay loam.	CL	A-6	15-30	90-95	85-95
			39-66	Very cobbly loam and very cobbly sandy loam.	SM	A-4	15-35	70-80	60-70
PoE----------	>5	(1/)	0-22	Cobbly sandy loam.	SM	A-2	15-25	75-85	70-80
			22-30	Cobbly clay loam.	CL	A-6	15-30	90-95	85-95
			30-60	Very cobbly loam, and very cobbly sandy loam.	SM	A-4	15-35	70-80	60-70

See footnotes at end of table.

Percentage passing sieve--Continued		Atterberg values		Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential	Corrosivity of uncoated steel
No. 40	No. 200	Liquid limit	Plastic limit						
		Pct.		In./hr.	In./in. of soil	pH	Mmhos./cm. at 25° C.		
50-65	40-55	35-45	15-25	0.2-0.63	0.14-0.16	6.6-7.8	0-1	Moderate--	Moderate.
50-65	15-30	-----	NP	6.3-20.0	0.06-0.0	5.1-6.0	0	Low-------	Moderate.
90-100	80-90	50-60	30-40	<0.06	0.04-0.06	4.5-5.5	0	High------	High.
50-70	10-20	-----	NP	>20	0.05-0.07	5.6-6.0	0-1	Low-------	Low.
85-95	60-70	40-50	20-30	<0.06	0.04-0.06	4.5-5.5	0-1	High------	High.
-----	-----	-----	-----	<0.06	---------	4.5-5.5	---	----------	--------
50-60	15-25	-----	NP	6.3-20.0	0.05-0.07	5.0-6.0	0-1	Low-------	Low.
50-70	60-70	-----	NP	2.0-6.30	0.11-0.13	7.9-8.4	0-4	Low-------	Low to moderate.
85-95	50-60	20-40	5-15	0.2-2.00	0.16-0.18	7.9-8.4	0-4	Moderate--	Low to moderate.
55-65	25-35	-----	NP	0.63-2.00	0.10-0.12	5.6-7.3	0-1	Low-------	Low.
70-80	60-70	30-40	20-30	0.2-0.63	0.15-0.17	6.1-7.3	0-1	Moderate--	Moderate.
50-60	40-50	20-30	0-10	0.63-2.00	0.08-0.10	6.1-7.3	0-1	Low-------	Low.
45-55	15-25	-----	NP	0.63-2.00	0.08-0.10	5.6-7.3	0-1	Low-------	Low.
70-80	35-50	30-40	20-30	0.2-0.63	0.15-0.17	6.1-7.3	0-1	Moderate--	Moderate.
50-60	40-50	20-30	0-10	0.63-2.00	0.08-0.10	6.1-7.3	0-1	Low-------	Low.

Soil series and map symbols	Depth to--		Depth from surface (typical profile)	Classification			Percentage greater than 3 inches in diameter	Percentage passing sieve--	
	Bedrock	Seasonal high water table		Dominant USDA texture	Unified	AASHO		No. 4	No. 10
	Ft.	Ft.	In.						
Pleasanton: (Cont.)									
PrA, PrC, PsD-----	>5	(1/)	0-22	Very fine sandy loam (gravelly in places).	ML or SM	A-4 or A-2	0	55-100	50-95
			28-36	Cobbly clay loam.	CL	A-6	15-30	90-95	85-95
			36-60	Very cobbly loam. and very cobbly sandy loam.	SM	A-4	15-35	70-80	60-70
Positas:									
PtC, PtD, PtD3, PtE.	>5	(1/)	0-21	Fine sandy loam.	SM	A-4	0	95-100	90-95
			21-48	Clay------	CH	A-7	5-10	90-100	85-95
			48-60	Very gravelly clay.	GC	A-2	10-20	35-55	30-50
PuD----------	>5	(1/)	0-14	Cobbly fine sandy loam.	SM	A-4	5-15	95-100	90-95
			14-50	Cobbly clay.	CH	A-7	10-20	70-80	60-70
			50-60	Very gravelly clay.	GC	A-2	10-20	35-55	30-50
Riverwash: Rs. No valid estimates can be made.									
Rough Broken land: RuG. No valid estimates can be made.									
*Salinas:									
SaA, SaC, SeD------ For Sorrento part of SeD, refer to SvA and SvC, Sorrento series.	>5	(1/)	0-20	Loam-------	ML	A-4	0	90-100	85-100
			20-70	Silty clay loam.	CL	A-6 or A-7	0	90-100	85-100
SbA----------	>5	(1/)	0-60	Loam-------	ML	A-4	-----	90-100	85-100
SdA, SdC----------	>5	(1/)	0-70	Silty clay loam.	CL	A-6 or A-7	0	90-100	85-100

See footnotes at end of table.

IN ENGINEERING--Continued

Percentage passing sieve--Continued		Atterberg values		Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential	Corrosivity of uncoated steel
No. 40	No. 200	Liquid limit	Plastic limit						
		Pct.		In./hr.	In./in. of soil	pH	Mmhos./cm. at 25° C.		
45-90	25-60	15-25	0-10	0.63-2.00	0.15-0.17	5.6-7.3	0-1	Low-----	Low.
70-80	60-70	30-40	20-30	0.2-0.63	0.15-0.17	6.1-7.3	0-1	Moderate-	Moderate.
50-60	40-50	20-30	0-10	0.63-2.00	0.08-0.10	6.1-7.3	0-1	Low------	Low.
75-85	40-50	15-25	0-10	2.0-6.30	0.13-0.15	5.6-6.0	0-1	Low------	Low.
75-85	60-70	50-60	30-40	<0.06	0.04-0.06	5.6-7.3	0-1	High-----	High.
20-40	15-30	40-50	10-20	0.06-0.20	0.05-0.07	5.6-6.0	0-1	Low------	Low.
75-85	40-50	15-25	0-10	2.0-6.30	0.10-0.13	5.6-6.0	0-1	Low------	Low.
55-65	50-60	50-60	30-40	<0.06	0.04-0.06	5.6-7.3	0-1	High-----	High.
20-40	15-30	40-50	10-20	0.06-0.20	0.05-0.07	5.6-6.0	0-1	Low------	Low.
85-95	60-70	30-40	0-10	0.63-2.00	0.16-0.18	7.9-8.4	0-2	Moderate-	Low.
90-100	80-90	35-45	20-30	0.2-0.63	0.19-0.21	7.9-8.4	0-2	Moderate-	Moderate.
85-95	60-70	30-40	0-10	0.63-2.00	0.16-0.18	7.9-8.4	0-2	Moderate-	Low.
90-100	80-90	35-45	20-30	0.2-0.63	0.19-0.21	7.9-8.4	0-2	Moderate-	Moderate.

Soil series and map symbols	Depth to--		Depth from surface (typical profile)	Classification			Percentage greater than 3 inches in diameter	Percentage passing sieve--	
	Bedrock	Seasonal high water table		Dominant USDA texture	Unified	AASHO		No. 4	No. 10
	Ft.	Ft.	In.						
*San Andreas: SfD, SfE, SfF3, SfG. For Tierra part of these units, refer to TnC, TnD2, and TnE2, Tierra series.	1½-3½	(1/)	0-28	Fine sandy loam and very fine sandy loam.	SM or ML	A-4	0	95-100	95-100
			28	Soft sandstone.					
*San Benito: SgF, SgG. For Diablo part of these units, refer to Diablo series.	1½-4	(1/)	0-48	Clay loam.	CL	A-6 or A-7	0	90-100	85-100
			48	Fractured shale.					
Sandy alluvial land: Sh, Sk. No valid estimates can be made.									
Santa Lucia: SmD, SmE, SmF, SmF2, SmG.	1½-3½	(1/)	0-24	Very shaly clay loam.	CC	A-1 or A-2	0-10	25-55	20-50
			24	Shale.					
Santa Ynez:									
SnC, SnD----------	>5	(1/)	0-25	Gravelly fine sandy loam.	SM	A-2	0	75-95	70-95
			25-32	Gravelly clay.	CH	A-7	0	75-90	70-85
			32-62	Very gravelly clay.	GC	A-2	5-15	40-55	35-50
SoC, SoE----------	>5	(1/)	0-20	Clay loam.	CL	A-6	0	90-95	85-95
			20-40	Gravelly clay.	CH	A-7	0	75-90	70-85
			40-60	Very gravelly clay.	GC	A-2	0-10	45-55	40-50
Sedimentary rock land: SpG. No valid estimates can be made.									

See footnotes at end of table.

Percentage passing sieve--Continued		Atterberg values		Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential	Corrosivity of uncoated steel
No. 40	No. 200	Liquid limit	Plastic limit						
		Pct.		In./hr.	In./in. of soil	pH	Mmhos./cm. at 25° C.		
75-85	40-60	10-25	0-10	0.63-2.00	0.14-0.16	5.6-7.3	0-1	Low------	Low.
80-90	70-80	35-45	15-25	0.2-0.63	0.17-0.19	7.4-8.4	0-1	Moderate-	Moderate.
20-45	15-35	75-85	0-10	0.63-2.00	0.10-0.13	5.6-6.5	0-1	Low------	Moderate to high.
40-50	25-35	-----	NP	2.0-6.30	0.10-0.13	5.1-6.5	0-1	Low------	Low.
65-75	60-70	50-60	30-40	<0.06	0.04-0.06	5.6-6.0	0-1	High-----	High.
30-40	20-30	30-40	15-25	0.06-0.20	0.05-0.07	5.6-6.5	0-1	Low------	Moderate.
75-85	50-60	30-40	10-30	0.2-0.63	0.17-0.19	5.1-6.5	0-1	Moderate-	Moderate.
65-75	60-70	50-60	30-40	<0.06	0.04-0.06	5.6-6.0	0-1	High-----	High.
30-40	20-30	30-40	20-30	0.06-0.20	0.05-0.07	5.6-6.5	0-1	Low------	Moderate.

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Soil series and map symbols	Depth to--		Depth from surface (typical profile)	Classification			Percentage greater than 3 inches in diameter	Percentage passing sieve--	
	Bedrock	Seasonal high water table		Dominant USDA texture	Unified	AASHO		No. 4	No. 10
	Ft.	Ft.	In.						
Shedd: SrE, SrF, SrG, SrG3.	1½-4	(1/)	0-43	Silty clay loam.	CL	A-6	0	95-100	90-95
			43	Shale.					
Shedd, diatomaceous variant: SsE, SsF, SsG.	1½-4½	(1/)	0-41	Silty clay loam.	CL	A-6	0-5	75-100	70-95
			41	Diatomaceous shale.					
Sorrento: StA, StC----------	>5	(1/)	0-60	Sandy loam stratified with lenses of loam, silt loam, and clay loam.	SM	A-2, A-4	0	95-100	90-95
SuA----------	>5	(1/)	0-40	Sandy loam--	SM	A-2, A-4	0	95-100	90-95
			40-60	Sand and gravel.	GP	A-1	0	40-50	35-40
SvA, SvC----------	>5	(1/)	0-60	Heavy loam.	CL	A-6	0	100	100
SwB2----------	>5	(1/)	0-60	Clay loam--	CL	A-6 or A-7	0	100	100
Stutzville: Sx, Sy, Sz, Sza, Szb, Szc.	>5	(1/)	0-66	Silty clay loam and silty clay (loamy sand, sandy loam, or loam to a depth of 20 inches in places.)	CL	A-6 or A-7	0	100	100
Swamp: Szw. No valid estimates can be made.									
Tangair: TaA, TaC---	>4	(1/)	0-56	Sand having some concretions.	SM-SP or SM	A-3 or A-2	0	90-100	85-100
Terrace escarpments: TcG, TdF, TeG. No valid estimates can be made.									

See footnotes at end of table.

Percentage passing sieve--Continued		Atterberg values		Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential	Corrosivity of uncoated steel
No. 40	No. 200	Liquid limit	Plastic limit						
		Pct.		In./hr.	In./in. of soil	pH	Mmhos./cm. at 25° C.		
85-90	75-85	30-40	20-30	0.63-2.00	0.19-0.21	7.9-9.0	0-4	Moderate--	Moderate.
65-90	60-70	30-40	10-30	0.63-2.00	0.18-0.20	7.9-8.4	0-4	Moderate--	Moderate.
60-70	30-40	-----	NP	2.0-6.30	0.13-0.15	6.6-8.4	0-2	Low-------	Low.
60-70	30-40	-----	NP	2.0-6.30	0.13-0.15	6.6-8.4	0-2	Low-------	Low.
20-30	0-5	-----	NP	6.3-20.0	0.03-0.05	7.9-8.4	0-2	Low-------	Low.
85-95	60-70	20-30	10-20	0.63-2.00	0.17-0.19	6.6-8.4	0-2	Moderate--	Low.
90-100	70-80	35-45	20-30	0.2-0.63	0.19-0.21	6.6-7.4	0-2	Moderate--	Moderate.
95-100	80-90	35-45	10-20	0.2-0.63	0.19-0.21	8.5-9.0	4-15+	Moderate to high	High.
50-60	5-15	-----	NP	6.3-20.0	0.05-0.07	4.5-6.0	0-1	Low-------	Low.

Soil series and map symbols	Depth to--		Depth from surface (typical profile)	Classification			Percentage greater than 3 inches in diameter	Percentage passing sieve--	
	Bed-rock	Seasonal high water table		Dominant USDA texture	Unified	AASHO		No. 4	No. 10
	Ft.	Ft.	In.						
Tierra: TmC, TmE, TnC, TnD2, TnE2, TrC, TrD, TrE2, TrE3, TsF.	> 5	(1/)	0-12	Loam (loamy sand, sandy loam, or clay loam in places).	CL or ML	A-4, A-6	0	95-100	95-100
			12-62	Clay and heavy clay loam.	CH or CL	A-7	0	95-100	95-100
*Toomes: TxG--------- For Climara part, refer to Climara series.	1-1½	(1/)	0-16	Clay loam--	CL	A-6	0	80-95	85-95
			16	Basic igneous rock.					
Wasioja: WaB, WaC, WaD-------	> 5	(1/)	0-26	Fine sandy loam.	SM	A-4	0	95-100	90-95
			26-44	Clay loam--	CL	A-6	0-5	80-95	75-90
			44-72	Sandy loam and loamy sand.	SM	A-2	0-5	75-95	65-75
WcC, WcF----------	> 5	(1/)	0-26	Cobbly fine sandy loam.	SM	A-4	10-20	80-90	75-85
			26-44	Cobbly clay loam.	CL	A-6	10-20	80-95	75-90
			44-72	Cobbly sandy loam.	SM	A-2	10-20	75-95	65-75

1/ No seasonal high water table within a depth of 5 feet.

IN ENGINEERING--Continued

Percentage passing sieve--Continued		Atterberg values		Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential	Corrosivity of uncoated steel
No. 40	No. 200	Liquid limit	Plastic limit						
		Pct.		In./hr.	In./in. of soil	pH	Mmhos./cm. at 25° C.		
85-95	50-60	15-25	5-15	0.63-2.00	0.16-0.18	5.1-6.0	0-1	Moderate--	Low.
90-95	80-90	40-60	20-40	< 0.06	0.04-0.06	6.1-8.4	0-1	High------	High.
70-80	60-70	30-40	20-30	0.63-2.00	0.18-0.20	6.6-7.8	0-1	Moderate--	Moderate.
70-80	35-50	-----	NP	2.0-6.30	0.13-0.15	6.1-7.8	0-2	Low-------	Moderate.
70-80	50-60	30-40	20-30	0.2-0.63	0.17-0.19	7.9-8.4	0-2	Moderate--	Moderate.
50-60	25-35	-----	NP	2.0-6.30	0.08-0.10	7.9-8.4	0-2	Low-------	Moderate.
60-70	35-50	-----	NP	0.63-2.00	0.10-0.12	6.1-7.8	0-2	Low-------	Moderate.
70-80	50-60	30-40	20-30	0.2-0.63	0.15-0.17	7.9-8.4	0-2	Moderate--	Moderate.
50-60	25-35	-----	NP	2.0-6.30	0.06-0.08	7.9-8.4	0-2	Low-------	Moderate.

2/ Nonplastic.

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or this reason it is necessary to follow carefully the instructions for referring to

Soil series and map symbols	Suitability as source of--			Hydrologic soil group
	Topsoil	Sand and gravel	Road fill	
Agueda:				
AdA----------	Surface layer good. Other layers poor: sandy.	Unsuitable: more than 50 percent fines.	Surface layer fair: A-4; moderate shrink swell. Good below a depth of 36 inches: A-2.	B
AgA, AgC----------	Fair: silty clay loam.	Unsuitable: more than 50 percent fines.	Poor: moderate shrink swell; A-6.	B
Arnold: ArD, ArF, ArF3------	Poor: sandy------	Fair for sand: 10 to 15 percent fines. Unsuitable for gravel: less than 25 percent gravel.	Good: A-2--------	B
Ballard:				
BaA, BaC, BaD----------	Surface layer good. Other layers poor: gravelly.	Poor for sand: 35 to 50 percent fines. Poor for gravel: less than 50 percent gravel.	Fair to a depth of 44 inches: A-4. Good below a depth of 44 inches: A-1.	B
BbA, BbC, BbD----------	Fair: gravelly---	Fair to poor for sand: 20 to 50 percent fines. Fair to good for gravel: more than 50 percent gravel below a depth of 44 inches.	Fair to good to a depth of 44 inches: A-2 and A-4. Good below a depth of 44 inches: A-1.	B
Ballinger: BcE, BcF, BcG----	Poor: silty clay-	Unsuitable: more than 50 percent fines.	Poor: high shrink swell; A-7.	C

more kinds of soil. The soils in such mapping units may have different properties and limitations, and for the other series that appear in the first column of this table]

Road location	Soil features affecting--		Agricultural drainage	Irrigation	Soil limitations for--
	Water retention				Septic tank filter field
	Embankments	Reservoir area			
Fine sand below a depth of 36 inches; subject to wind erosion.	Medium to low shear strength; high piping hazard.	Moderate permeability.	No drainage needed.	Moderately rapid intake; low water-holding capacity below a depth of 30 inches.	Slight.
Most features favorable.	Medium to low shear strength; medium to low piping hazard.	Moderate permeability.	No drainage needed.	Most features favorable.	Slight for AgA. Moderate for AgC: slope.
Some steep slopes; soft sandstone below a depth of 20 to 60 inches.	Medium shear strength; medium to high piping hazard.	Soft sandstone bedrock below a depth of 20 to 60 inches; rapid permeability.	No drainage needed.	Some steep slopes; very rapid intake; low water-holding capacity.	Moderate if slope is 5 to 10 percent; severe if more than 10 percent.
Most features favorable.	Medium shear strength; low to medium piping hazard.	Moderate permeability.	No drainage needed.	Moderately rapid intake; low water-holding capacity.	Slight for BaA. Moderate for BaC: slope. Severe for BaD: slope.
Most features favorable.	Medium shear strength; low to medium piping hazard.	Moderate permeability.	No drainage needed.	Moderately rapid intake; low water-holding capacity.	Slight for BbA. Moderate for BbC: slope. Severe for BbD: slope.
Moderate to very steep slopes; soft mudstone below a depth of 18 to 40 inches; high shrink swell; 8 to 22 percent gypsum.	Low shear strength; high compressibility; low piping hazard.	Slow permeability; soft fractured mudstone below a depth of 18 to 40 inches.	No drainage needed.	Some steep slopes; slow intake; moderate soil depth.	Severe: slope; slow permeability.

Soil series and map symbols	Suitability as source of--			Hydrologic soil group
	Topsoil	Sand and gravel	Road fill	
Bayshore: Bd	Good	Unsuitable: more than 50 percent fines.	Fair to poor: moderate to high shrink-swell; A-4, A-6, and A-7.	B
Be	Surface layer good. Other layers poor: sandy.	Unsuitable for sand and gravel: more than 50 percent fines. Good for sand below a depth of 40 inches.	Surface layer fair to poor: moderate shrink swell; A-4 and A-6. Other layers good: A-2.	C
Bg, Bh	Surface layer fair: water table at a depth of 1 to 4 feet in Bg; slight to moderate salinity.	Unsuitable: more than 50 percent fines.	Fair to poor: moderate shrink swell; A-4 and A-6.	C
Betteravia: BmA, BmA3, BmC	Poor: sandy surface layer; weakly cemented subsoil.	Poor for sand: 15 to 30 percent fines. Unsuitable for gravel: less than 25 percent gravel.	Good to fair: A-2 and A-4.	C
Betteravia, dark variant: BnB2, BnD2.	Poor: sandy surface layer; weakly cemented subsoil.	Fair for sand: 15 to 40 percent fines. Unsuitable for gravel: less than 25 percent gravel.	Good to fair: A-2 and A-4.	C
Botella: BoA, BoA2, BoC, BoD2, BsA, BtA, BtA2, BtC, BtD2, BwA.	Fair: sandy clay loam to silty clay loam.	Unsuitable: more than 50 percent fines.	Poor: moderate shrink swell; A-6 and A-7.	B

Soil features affecting--					Soil limitations for--
Road location	Water retention		Agricultural drainage	Irrigation	Septic tank filter field
	Embankments	Reservoir area			
Occasional water table at a depth of 4 to 5 feet.	Low to medium shear strength; low to medium piping hazard.	Moderately slow permeability.	Occasional high water table; somewhat poor drainage.	Most features favorable.	Severe: moderately slow permeability; high water table.
Occasional water table at a depth of 2 to 3 feet; fine sand below a depth of 40 inches.	Medium to low shear strength; medium to high piping hazard.	Moderate permeability.	Occasional high water table; somewhat poor drainage.	Low water-holding capacity below a depth of 40 inches.	Severe: high water table.
Water table at a depth of 1 to 4 feet in Bg.	Medium to low shear strength; medium piping hazard.	Moderately slow permeability.	Occasional high water table in Bg; somewhat poor drainage. Bh is drained.	Most features favorable.	Severe: high water table in Bg. Moderate permeability in Bh.
Perched water table during rainy periods.	Medium shear strength; medium to high piping hazard.	Very slow permeability below a depth of 36 inches.	Perched water table during rainy periods.	Rapid intake; low water-holding capacity.	Severe: very slow permeability.
Most features favorable.	Medium shear strength; medium to high piping hazard.	Slow permeability--	No drainage needed.	Moderately rapid intake; low water-holding capacity.	Severe: slow permeability.
BsA has an occasional water table at a depth of 3 to 5 feet. BwA has an occasional water table at a depth of 1 to 5 feet. Most other features favorable.	Medium to low shear strength; medium piping hazard.	Moderately slow permeability.	No drainage needed. BsA and BwA have occasional high water table.	Slow intake----	Severe: moderately slow permeability.

Soil series and map symbols	Suitability as source of--			Hydrologic soil group
	Topsoil	Sand and gravel	Road fill	
Camarillo: Ca, Cb	Good	Poor for sand: 30 to 40 percent fines. Unsuitable for gravel: less than 25 percent gravel.	Good to fair: low shrink swell; A-2 and A-4.	C
Cc	Good	Unsuitable: more than 50 percent fines.	Fair: A-4	C
Cd	Fair: silty clay loam.	Unsuitable: more than 75 percent fines.	Poor: moderate shrink swell; A-6.	C
Chamise: CeC, CeE2, CfD, CgC, ChD, ChF, ChG, ChG2, CkF.	Surface layer fair: shaly. Other layers poor: very shaly.	Unsuitable: poor quality material.	Good to fair: low to moderate shrink swell; A-2 and A-4.	B
*Climara: CmF. For Toomes part, see Toomes series.	Poor: clay	Unsuitable: more than 50 percent fines.	Poor: high shrink swell; A-7 and A-6.	D
Coastal beaches: CnB. No interpretations. Properties too variable.				
Cobbly alluvial land: CoB. No interpretations. Properties too variable.				
*Contra Costa: CrE, CrF, CrG, CsG. For Lodo part, see Lodo series.	Poor: gravelly clay loam subsoil; stony in places.	Unsuitable: more than 50 percent fines.	Poor: moderate shrink swell; A-6.	C

Soil features affecting--					Soil limitations for--
Road location	Water retention		Agricultural drainage	Irrigation	Septic tank filter field
	Embankments	Reservoir area			
Water table fluctuates between a depth of 3 and 6 feet. Cb in drained.	Medium shear strength; medium to high piping hazard.	Moderately rapid permeability.	High water table; somewhat poor drainage.	Most features favorable.	Severe for Ca: drainage; water table. Slight for Cb: drainage.
Water table fluctuates between a depth of 3 to 6 feet.	Low to medium shear strength; high piping hazard.	Moderate permeability.	High water table; somewhat poor drainage.	Most features favorable.	Severe: drainage; water table.
Water table fluctuates between a depth of 2 to 5 feet.	Medium to low shear strength; low to medium piping hazard.	Moderately slow permeability.	High water table; somewhat poor drainage.	Most features favorable.	Severe: drainage; water table.
Gentle to very steep slopes.	Medium shear strength; low to medium piping hazard.	Moderately slow permeability.	No drainage needed.	Gentle to very steep slopes; moderately rapid intake; low water-holding capacity.	Severe: moderately slow permeability; slope.
Moderately steep and steep slopes; bedrock at a depth of 20 to 60 inches; high shrink swell in surface layer.	Low to medium shear strength; high to medium compressibility; low to medium piping hazard.	Slow permeability; decomposed serpentine rock at a depth of 20 to 60 inches.	No drainage needed.	Mostly steep slopes; slow intake; moderate soil depth.	Severe: slope; slow permeability.
Moderately steep to very steep slopes; fractured shale at a depth of 18 to 36 inches; moderate shrink swell.	Medium to low shear strength; low to medium piping hazard.	Moderately slow permeability; fractured shale bedrock at a depth of 18 to 36 inches.	No drainage needed.	Moderately steep to very steep slopes; moderate soil depth.	Severe: slope; moderately slow permeability.

Soil series and map symbols	Suitability as source of--			Hydrologic soil group
	Topsoil	Sand and gravel	Road fill	
Corralitos: CtA, CtD, CtD2, CuA, CuC, CuD.	Poor: sand and loamy sand.	Fair to good for sand: 0 to 30 percent fines. Unsuitable for gravel: less than 25 percent gravel.	Good: A-2, A-3-----	A
Cropley: Cv----------	Poor: silty clay--	Unsuitable: more than 50 percent fines.	Poor: moderate to high shrink swell; A-7 and A-6.	D
Crow Hill: CwE, CwF, CwG, CwG3.	Surface layer good. Shale at a depth of 7 to 42 inches.	Unsuitable: more than 50 percent fines.	Fair: A-4----------	C
Diablo: DaD, DaE, DaF, DaF3, DaG.	Poor: silty clay--	Unsuitable: more than 50 percent fines.	Poor: high shrink swell; A-7.	D
Dune land: DuE. No interpretations. Properties too variable.				
Elder: EdA, EdA2, EdC2, EdD2, EmA, EmC, EnA2, EnC2, EnD2.	Good to fair: sandy loam, loam, and shaly loam.	Poor to unsuitable for sand: 30 to 70 percent fines. Poor to unsuitable for gravel: less than 50 percent gravel.	Good to fair: A-2 and A-4.	B

Soil features affecting--					Soil limitations for--
Road location	Water retention		Agricultural drainage	Irrigation	Septic tank filter field
	Embankments	Reservoir area			
Most features favorable.	Moderate shear strength; medium to high piping hazard.	Rapid permeability.	No drainage needed.	Very rapid intake; low water-holding capacity.	Slight for CtA, CuA. Moderate for CuC: slope. Severe for CtD, CtD2, CuD: slope.
Moderate to high shrink swell.	Low to medium shear strength; medium to low compressibility; low to medium piping hazard.	Slow permeability.	No drainage needed.	Slow intake-----	Severe: slow permeability.
Some steep slopes; shale at a depth of 7 to 42 inches.	Medium to low shear strength; medium compressibility; high piping hazard.	Moderately slow permeability; fractured shale bedrock at a depth of 7 to 42 inches.	No drainage needed.	Some steep slopes; moderate soil depth.	Severe: slope; moderately slow permeability.
Moderate to steep slopes; bedrock at a depth of 20 to 40 inches; high shrink swell.	Low shear strength; high compressibility; low piping hazard.	Slow permeability; hard shale bedrock or mudstone at a depth of 20 to 40 inches.	No drainage needed.	Some steep slopes; slow intake; moderate soil depth.	Severe: slope; slow permeability.
Most features favorable.	Low to medium shear strength; medium to high piping hazard.	Moderately rapid to moderate permeability.	No drainage needed.	Moderately rapid intake.	Slight for EdA, EdA2, EmA, EmA2. Moderate for EdC2, EmC, EnC2. Severe for EdD2, EnD2: slope; moderate permeability.

Soil series and map symbols	Suitability as source of--			Hydrologic soil group.
	Topsoil	Sand and gravel	Road fill	
Garey: GaA2, GaC2, GaE2, GaE3.	Fair: compact subsoil.	Unsuitable: mostly more than 40 percent fines.	Fair to a depth of 47 inches. Good below a depth of 47 inches.	C
Garey, wet variant: GbB--	Fair: compact subsoil.	Unsuitable: more than 60 percent fines.	Fair to poor: A-4 and A-6.	C
Gaviota: GmD, GmE, GmG---	Poor: shallow to bedrock.	Poor for sand: 25 to 35 percent fines. Unsuitable for gravel: less than 15 percent gravel.	Good: A-2----------	D
Gazos: GsD, GsE, GsF, GsG.	Fair: clay loam; shale at a depth of 18 to 36 inches.	Unsuitable: more than 50 percent fines.	Poor: moderate shrink swell; A-6.	B
Gullied land: GuE. No interpretations. Properties too variable.				
Igneous rock land: IrG. No interpretations. Properties too variable.				
Kettleman: KtE, KtE3, KtG.	Fair: soft sandstone at a depth of 6 to 30 inches.	Poor for sand: 35 to 50 percent fines. Unsuitable for gravel: less than 15 percent gravel.	Fair: A-4----------	C
Landslides: LaF. No interpretations. Properties too variable.				

Soil features affecting--					Soil limitations for--
Road location	Water retention		Agricultural drainage	Irrigation	Septic tank filter field
	Embankments	Reservoir area			
Some moderately steep slopes.	Medium shear strength; medium to high piping hazard.	Slow permeability.	No drainage needed.	Some steep slopes; low water-holding capacity.	Severe: slow permeability.
Occasional inundation; perched water table between depths of 2 and 5 feet in winter and early in summer.	Medium to low shear strength; high piping hazard.	Slow permeability.	Occasional inundation; somewhat poor drainage; needs surface drainage.	Occasional ponding.	Severe: drainage; slow permeability.
Some very steep slopes; bedrock at a depth of 10 to 20 inches.	Medium shear strength; medium to high piping hazard.	Moderate permeability; hard sandstone at a depth of 10 to 20 inches.	No drainage needed.	Some steep slopes; moderately rapid intake; shallow soil depth.	Severe: slope; 10 to 20 inches deep over bedrock.
Some steep slopes; soft shale at a depth of 18 to 36 inches.	Medium to low shear strength; low to medium piping hazard.	Moderately slow permeability; fractured shale at a depth of 18 to 36 inches.	No drainage needed.	Some steep slopes; slow intake; moderate soil depth.	Severe: slope; moderately slow permeability.
Some steep slopes; soft sandstone at a depth of 6 to 30 inches.	Medium shear strength; medium to high piping hazard.	Moderate permeability; soft sandstone at a depth of 6 to 30 inches.	No drainage needed.	Some steep slopes; moderate intake; moderate soil depth.	Severe: slope; 6 to 30 inches deep over bedrock.

Soil series and map symbols	Suitability as source of--			Hydrologic soil group
	Topsoil	Sand and gravel	Road fill	
Linne: LcD, LcE, LcF, LcG.	Poor: clay loam; mudstone at a depth of 20 to 60 inches.	Unsuitable: more than 50 percent fines.	Poor: moderate shrink swell; A-7.	C
Lodo: LdG----------	Poor: shallow--------	Unsuitable: more than 50 percent fines.	Fair: A-4---------	D
Lopez: LkG, LmG----------	Poor: shallow--------	Unsuitable: more than 40 percent fines.	Fair: A-5---------	D
*Los Osos: LoE, LoG, LsE, LsF, LsG3. For San Benito part of LsE, LsF, and LsG3, see San Benito series.	Poor: clay subsoil---	Unsuitable: more than 50 percent fines.	Poor: high shrink swell; A-6 and A-7.	C
Marina: MaA, MaC, MaE, MaE3.	Poor: loamy sand-----	Fair for sand: 5 to 30 percent fines. Unsuitable for gravel: less than 25 percent gravel.	Good: A-2---------	B
Marsh: Mh. No interpretations. Properties too variable.				
Maymen: MmG----------	Poor: shallow--------	Poor for sand: 40 to 50 percent fines. Poor to unsuitable for gravel: less than 35 percent gravel.	Fair: A-4---------	D

Soil features affecting--					Soil limitations for--
Road location	Water retention		Agricultural drainage	Irrigation	Septic tank filter field
	Embankments	Reservoir area			
Some steep slopes; mudstone at a depth of 20 to 60 inches.	Medium to low shear strength; medium piping hazard.	Moderately slow permeability; marly mudstone at a depth of of 20 to 60 inches.	No drainage needed.	Some steep slopes; moderate soil depth.	Severe: slope; moderately slow permeability.
Steep slopes; fractured shale at a depth of 8 to 20 inches.	Medium to low shear strength; high piping hazard.	Moderate permeability; fractured shale at a depth of 8 to 20 inches.	No drainage needed.	Steep slopes; shallow soil depth.	Severe: shallow depth; slope.
Steep slopes; Monterey shale at a depth of 8 to 20 inches.	Medium shear strength; medium to high piping hazard.	Moderate permeability; fractured shale at a depth of 8 to 20 inches.	No drainage needed.	Steep slopes; low water-holding capacity; shallow soil depth.	Severe: shallow depth; slope.
Some steep slopes; subject to land slips; bedrock at a depth of 20 to 40 inches; high shrink swell.	Low shear strength; low piping hazard.	Slow permeability; shale at a depth of 20 to 40 inches.	No drainage needed.	Some steep slopes; moderate soil depth.	Severe: slope; slow permeability.
Sand below a depth of 50 inches; subject to wind erosion.	Medium shear strength; medium to high piping hazard.	Moderate permeability in subsoil.	No drainage needed.	Some moderately steep slopes; rapid intake; low water-holding capacity.	Slight for MaA. Moderate for MaC: slope. Severe for MaE, MaE3: slope.
Very steep slopes; fragmented shale at a depth of 10 to 20 inches.	Medium shear strength; medium piping hazard.	Moderate permeability; fragmented shale at a depth of 10 to 20 inches.	No drainage needed.	Very steep slopes; shallow soil depth.	Severe: shallow depth; slope.

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Soil series and map symbols	Suitability as source of--			Hydrologic soil group
	Topsoil	Sand and gravel	Road fill	
Metz: MnA, MnC, MnC2, MoA-	Poor: loamy sand--	Poor for sand: 15 to 30 percent fines. Unsuitable for gravel: less than 25 percent gravel.	Good: A-2----------	A for MnA, MnC, MnC2. B for MoA.
Mine pits and dumps: MpG. No interpretations. Properties too variable.				
Mocho:				
Mr, Mu----------	Good----------	Poor for sand: 35 to 50 percent fines. Unsuitable for gravel: less than 25 percent gravel.	Fair: A-4----------	B
Ms, Mt----------	Surface layer good. Other layers poor: sand and gravel.	Poor for sand: 30 to 40 percent fines. Unsuitable for gravel: less than 25 percent gravel. Good for sand and gravel below a depth of 40 inches.	Good to fair: A-1, A-2, and A-4.	B
Mv, Mw----------	Good----------	Unsuitable: more than 50 percent fines.	Fair: moderate shrink swell; A-4.	B
Mx----------	Fair: silty clay loam.	Unsuitable: more than 50 percent fines.	Poor: moderate shrink swell; A-6.	B
Montara: MyG----------	Poor: shallow-----	Poor for sand: 40 to 55 percent fines. Poor to unsuitable for gravel: less than 50 percent gravel.	Poor: moderate shrink swell; A-6 and A-7.	D
Narlon: NrB, NsA, NsC, NsD.	Poor: loamy sand over clay.	Poor for sand to a depth of 32 inches: 15 to 30 percent fines. Unsuitable for sand below a depth of 32 inches; more than 50 percent fines. Unsuitable for gravel: less than 25 percent gravel.	Surface layer good: A-2. Other layers poor: high shrink swell; A-7.	C

Soil features affecting--					Soil limitations for--
Road location	Water retention		Agricultural drainage	Irrigation	Septic tank filter field
	Embankments	Reservoir area			
Most features favorable.	Medium shear strength; medium to high piping hazard.	Rapid permeability in MnA, MnC, MnC2. Moderately rapid permeability in MoA.	No drainage needed.	Rapid intake; low water-holding capacity.	Slight for MnA. Moderate for MnC, MnC2: slope. Moderate for MoA: overflow.
Most features favorable.	Medium shear strength; medium to high piping hazard.	Moderately rapid permeability.	No drainage needed.	Most features favorable.	Slight for Mu. Moderate for Mr: overflow.
Most features favorable.	Medium to high shear strength; low to medium piping hazard.	Moderately rapid permeability to a depth of 40 inches; very rapid permeability below a depth of 40 inches.	No drainage needed.	Moderately rapid intake; low water-holding capacity.	Slight for Ms. Moderate for Mt: overflow.
Most features favorable.	Medium to low shear strength; high piping hazard.	Moderate permeability.	No drainage needed.	Most features favorable.	Slight for Mv. Moderate for Mw: overflow.
Most features favorable.	Medium to low shear strength; low to medium piping hazard.	Moderately slow permeability.	No drainage needed.	Most features favorable.	Severe: moderately slow permeability.
Steep slopes; bedrock at a depth of 10 to 20 inches.	Medium to low shear strength; medium piping hazard.	Moderately slow permeability; serpentine bedrock at a depth of 10 to 20 inches.	No drainage needed.	Steep slopes; shallow soil depth.	Severe: shallow depth; slope.
Perched water table during rainy season; high shrink swell.	Medium to low shear strength; medium piping hazard.	Very slow permeability.	Perched water table during rainy season; very slow permeability below a depth of 32 inches; somewhat poor drainage.	Rapid intake; low water-holding capacity.	Severe: very slow permeability.

Soil series and map symbols	Suitability as source of--			Hydrologic soil group
	Topsoil	Sand and gravel	Road fill	
Narlon, hardpan variant: NvA, NvC.	Poor: sand over clay.	Surface layer good for sand. Unsuitable for sand below a depth of 26 inches: more than 50 percent fines. Unsuitable for gravel: less than 25 percent gravel.	Surface layer good: A-2. Substratum poor: high shrink swell; A-7.	C
Oceano: OcA, OcD, OcD3---	Poor: sand-------	Fair for sand: 15 to 25 percent fines. Unsuitable for gravel: less than 25 percent gravel.	Good: A-2----------	A
Panoche: PcA, PcC, PdA, PdB------	Good----------	Poor for sand: 30 to 40 percent fines. Unsuitable for gravel: less than 25 percent gravel.	Fair to good: moderate shrink swell; A-2 and A-4.	B
PeA, PeC, PfA----------	Good----------	Unsuitable: more than 50 percent fines.	Fair to poor: moderate shrink swell; A-4 and A-6.	B
Pleasanton: PnA, PnC, PnD----------	Good to a depth of 32 inches. Poor below a depth of 32 inches: cobbly clay loam.	Fair to poor for sand: 25 to 50 percent fines. Poor to unsuitable for gravel: 5 to 40 percent gravel.	Fair: moderate shrink swell; dominantly A-4.	B
PoE----------	Poor: cobbly------	Fair to poor for sand: 15 to 50 percent fines. Fair for gravel: 30 to 40 percent gravel.	Fair: dominantly A-4.	B
PrA, PrC, PsD----------	Good to a depth of 28 inches. Poor below a depth of 28 inches: cobbly clay loam.	Poor for sand: 25 to 70 percent fines. Unsuitable to poor for gravel: 5 to 50 percent gravel.	Fair: moderate shrink swell; dominantly A-4.	B

Soil features affecting--					Soil limitations for--
Road location	Water retention		Agricultural drainage	Irrigation	Septic tank filter field
	Embankments	Reservoir area			
Mostly fine sand in surface layer; somewhat poor drainage; high shrink swell.	Medium to low shear strength; medium piping hazard.	Very slow permeability.	Very slow permeability below a depth of 26 inches; somewhat poor drainage.	Very rapid intake; low water-holding capacity.	Severe: very slow permeability.
Sand----------	Medium shear strength; medium to high piping hazard.	Rapid permeability.	No drainage needed.	Very rapid intake; low water-holding capacity.	Slight for OcA. Moderate to severe for OcD, OcD3: slope.
Most features favorable.	Medium shear strength; medium to high piping hazard.	Moderately rapid permeability.	No drainage needed.	Moderately rapid intake.	Slight for PcA. Moderate for PcC: slope. Moderate for PdA, PdB: overflow.
Most features favorable.	Medium to low shear strength; medium piping hazard.	Moderately slow to moderate permeability.	No drainage needed.	Most features favorable.	Severe: moderately slow to moderate permeability.
Most features favorable.	Medium shear strength; medium piping hazard.	Moderately slow permeability.	No drainage needed.	Most features favorable.	Severe: moderately slow permeability.
Considerable number of cobblestones.	Medium shear strength; medium piping hazard.	Moderately slow permeability.	No drainage needed.	Some steep slopes; low water-holding capacity.	Severe: moderately slow permeability.
Most features favorable.	Medium to low shear strength; medium to high piping hazard.	Moderately slow permeability.	No drainage needed.	Most features favorable.	Severe: moderately slow permeability.

Soil series and map symbols	Suitability as source of--			Hydrologic soil group
	Topsoil	Sand and gravel	Road fill	
Positas: PtC, PtD, PtD3, PtE, PuD.	Surface layer good. Other layers poor: clay and cobble-stones.	Unsuitable: more than 50 percent fines.	Fair to poor: high shrink swell; A-4 and A-7.	D
Riverwash: Rs. No interpretations. Properties too variable.				
Rough broken land: RuG. No interpretations. Properties too variable.				
*Salinas: SaA, SaC, SbA, SeD, SdA, SdC. For Sorrento part of SeD, see Sorrento series.	Good in SaA, SaC, SbA, and SeD. Fair in SdA and SdC: silty clay loam.	Unsuitable: more than 50 percent fines.	Fair to poor: moderate shrink swell; A-4, A-6, and A-7.	B
*San Andreas: SfD, SfE, SfF3, SfG. For Tierra part, see Tierra series.	Good----------	Unsuitable: 40 to 60 percent fines.	Fair: A-4---------	C
*San Benito: SgF, SgG----- For Diablo part, see Diablo series.	Fair: clay loam----	Unsuitable: more than 50 percent fines.	Poor: moderate shrink swell; A-6 and A-7.	B
Sandy alluvial land: Sh. No interpretations. Properties too variable.				
Sandy alluvial land, wet: Sk. No interpretations. Properties too variable.				

Soil features affecting--					Soil limitations for--
Road location	Water retention		Agricultural drainage	Irrigation	Septic tank filter field
	Embankments	Reservoir area			
Perched water table during rainy season; high shrink swell.	Low to medium shear strength; medium piping hazard.	Very slow permeability.	Perched water table during rainy season; very slow permeability.	Moderately rapid intake; low water-holding capacity.	Severe: very slow permeability.
Most features favorable.	Medium to low shear strength; medium to high piping hazard.	Moderately slow and moderate permeability.	No drainage needed.	Most features favorable.	Severe: moderately slow permeability.
Some very steep slopes; soft sandstone at a depth of 20 to 40 inches.	Medium to low shear strength; medium to high piping hazard.	Moderate permeability; fractured sandstone at a depth of 20 to 40 inches.	No drainage needed.	Some very steep slopes; moderately rapid intake; moderate soil depth.	Severe: slope; bedrock at a depth of 20 to 40 inches.
Some very steep slopes; bedrock at a depth of 20 to 48 inches.	Medium to low shear strength; low to medium piping hazard.	Moderately slow permeability; fractured or hard sandstone at a depth of 20 to 48 inches.	No drainage needed.	Some very steep slopes; variable intake; moderate soil depth.	Severe: slope; moderately slow permeability.

Soil series and map symbols	Suitability as source of--			Hydrologic soil group
	Topsoil	Sand and gravel	Road fill	
Santa Lucia: SmD, SmE, SmF, SmF2, SmG.	Poor: shaly clay loam.	Poor: 15 to 35 percent fines.	Good: A-1 or A-2---	C
Santa Ynez: SnC, SnD----------	Fair: gravelly fine sandy loam over gravelly clay.	Poor to unsuitable for sand: 20 to 70 percent fines. Unsuitable to fair for gravel: 5 to 65 percent gravel.	Good to poor: high shrink swell; A-2 and A-7.	C
SoC, SoE----------	Fair: clay loam and gravelly clay.	Unsuitable: more than 50 percent fines.	Poor: high shrink swell; A-6 and A-7.	C
Sedimentary rock land: SpG. No interpretations. Properties too variable.				
Shedd: SrE, SrF, SrG, SrG3.	Fair: silty clay loam.	Unsuitable: more than 50 percent fines.	Poor: moderate shrink swell; A-6.	C
Shedd, diatomaceous variant: SsE, SsF, SsG.	Fair: silty clay loam.	Unsuitable: more than 50 percent fines.	Poor: moderate shrink swell; A-6.	C

Soil features affecting--					Soil limitations for--
Road location	Water retention		Agricultural drainage	Irrigation	Septic tank filter field
	Embankments	Reservoir area			
Some very steep slopes; Monterey shale at a depth of 20 to 44 inches.	Medium shear strength; medium to low piping hazard.	Moderate permeability; fractured shale at a depth of 20 to 44 inches.	No drainage needed.	Some very steep slopes; moderate soil depth.	Severe: slope; shale at a depth of 20 to 44 inches.
Perched water table during rainy season; high shrink swell.	Low to medium shear strength; low to medium piping hazard.	Very slow permeability.	Perched water table; very slow permeability.	Low water-holding capacity.	Severe: very slow permeability.
Some moderately steep slopes; perched water table during rainy season; high shrink swell.	Low to medium shear strength; low to medium piping hazard.	Very slow permeability.	Very slow permeability; gravelly clay; perched water table.	Some moderately steep slopes; low water-holding capacity below a depth of 20 inches.	Severe: very slow permeability.
Some very steep slopes; shale or mudstone at a depth of 18 to 50 inches.	Medium to low shear strength; low to medium piping hazard.	Moderate permeability; brittle shale or marly mudstone at a depth of 18 to 50 inches.	No drainage needed.	Some very steep slopes; moderate soil depth.	Severe: slope; shale at a depth of 18 to 50 inches.
Some very steep slopes; diatomaceous shale at a depth of 20 to 54 inches.	Medium to low shear strength; low to medium piping hazard.	Moderate permeability; diatomaceous shale at a depth of 20 to 54 inches.	No drainage needed.	Some very steep slopes; moderate soil depth.	Severe: slope; shale at a depth of 20 to 54 inches.

Soil series and map symbols	Suitability as source of--			Hydrologic soil group
	Topsoil	Sand and gravel	Road fill	
Sorrento: StA, StC	Good	Poor for sand: 30 to 40 percent fines. Unsuitable for gravel: less than 10 percent gravel.	Good to fair: A-2 and A-4.	B
SuA	Surface layer good. Other layers poor: sand and gravel.	Poor for sand: 30 to 40 percent fines. Unsuitable for gravel: less than 10 percent gravel. Good for sand and gravel below a depth of 40 inches.	Good to fair: A-2, A-4, and A-1.	B
SvA, SvC	Good	Unsuitable: more than 50 percent fines.	Poor: moderate shrink swell; A-6.	B
SwB2	Fair: clay loam	Unsuitable: more than 50 percent fines.	Poor: moderate shrink swell; A-6 and A-7.	B
Stutzville: Sx, Sy, Sz, Sza, Szb, Szc.	Poor: slight to high salinity.	Unsuitable: more than 50 percent fines.	Poor: moderate to high shrink swell; A-6 and A-7.	B
Swamp: Szw. No interpretations. Properties too variable.				
Tangair: TaA, TaC	Poor: sand	Good for sand. Unsuitable for gravel: less than 15 percent gravel.	Good: A-2 or A-3	C
Terrace escarpments, sandy: TcG. No interpretations. Properties too variable.				
Terrace escarpments, loamy: TdF. No interpretations. Properties too variable.				

Soil features affecting--					Soil limitations for--
Road location	Water retention		Agricultural drainage	Irrigation	Septic tank filter field
	Embankments	Reservoir area			
Most features favorable.	Medium shear strength; medium to high piping hazard.	Moderately rapid permeability.	No drainage needed.	Moderately rapid intake.	Slight for StA. Moderate for StC: slope.
Most features favorable.	Medium to high shear strength; medium piping hazard.	Rapid permeability.	No drainage needed.	Moderately rapid intake; low water-holding capacity.	Slight.
Most features favorable.	Medium to low shear strength; low to medium piping hazard.	Moderate permeability.	No drainage needed.	Most features favorable.	Moderate: moderate permeability.
Most features favorable.	Medium to low shear strength; low to medium piping hazard.	Moderately slow permeability.	No drainage needed.	Most features favorable.	Severe: moderately slow permeability.
Somewhat poor drainage.	Medium to low shear strength; low to medium piping hazard.	Moderately slow permeability.	Somewhat poor drainage.	Moderately rapid intake.	Severe: drainage; moderately slow permeability.
Sand subject to wind erosion; rapid permeability.	Medium shear strength; medium to high piping hazard.	Rapid permeability.	Somewhat poor drainage; rapid permeability.	Very rapid intake; low water-holding capacity.	Severe: somewhat poor drainage.

Soil series and map symbols	Suitability as source of--			Hydrologic soil group
	Topsoil	Sand and gravel	Road fill	
Terrace escarpments, cobbly: TeG. No interpretations. Properties too variable.				
Tierra: TmC, TmE, TnC, TnD2, TnE2, TrC, TrD, TrE2, TrE3, TsF.	Poor: loamy sand, sandy loam, loam, and clay loam over clay.	Unsuitable: mostly more than 50 percent fines.	Poor: high shrink swell; A-6 and A-7.	D
*Toomes: TxG---------- For Climara part, see Climara series.	Poor: shallow-----	Unsuitable for sand: more than 50 percent fines.	Poor: moderate shrink swell; A-6.	D
Wasioja: WaB, WaC, WaD, WcC, and WcF.	Good for WaB, WaC, and WaD to a depth of 26 inches. Fair below a depth of 26 inches: clay loam. Poor for WcC and WcF: cobbly.	Poor to unsuitable: 25 to 60 percent fines.	Fair to poor: moderate shrink swell; A-4 and A-6.	B

Soil features affecting--					Soil limitations for--
Road location	Water retention		Agricultural drainage	Irrigation	Septic tank filter field
	Embankments	Reservoir area			
Some steep slopes; very slow permeability; high shrink swell.	Low to medium shear strength; low to medium piping hazard.	Very slow permeability.	Very slow permeability; perched water table during rainy season.	Some steep slopes; rapid intake; low water-holding capacity.	Severe: very slow permeability.
Moderate to very steep slopes; bedrock at a depth of 10 to 20 inches.	Medium to low shear strength; low to medium piping hazard.	Moderate permeability; fractured basic igneous rock at a depth of 10 to 20 inches.	No drainage needed.	Some very steep slopes; shallow soil depth.	Severe: shallow depth, slope.
Most features favorable for WaB, WaC, WaD. Cobblestones in WcC and WcF.	Medium to low shear strength; medium piping hazard.	Moderately slow permeability.	No drainage needed.	Most features favorable for WaB, WaC, WaD. Some steep slopes and low water-holding capacity for WcC and WcF.	Severe: moderately slow permeability.

Group D. Soils have very slow infiltration rate when thoroughly wetted: chiefly clays that have high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near surface, or soils that are shallow over nearly impervious material. Rate of water transmission is very slow.

Road location is affected by the characteristics of the entire profile of undisturbed soil. Among the important factors are depth to water table, shrink-swell potential, and slopes. Also important is the hazard of landslides in areas where roads are constructed. Landslide areas are shown on the soil map. Landslides occur on Shedd, Santa Lucia, Linne, Los Osos, Climara and Toomes soils. The largest acreage is on Los Osos soils. These soils are moderately fine textured or fine textured and moderately deep over rock. Landslides occur when soil shear strength is weakened along the substratum boundary by the presence of free water in the soil. They generally occur on 30 to 50 percent slopes, but may occur on gentler or steeper slopes. Roads or structures on soils where landslides are a hazard require stabilization.

The factors considered for embankments are those features of disturbed soils that affect their stability for constructing earth fills. Among these features are compressibility, susceptibility to piping, stability, and compaction. Compressibility indicates the volume change produced by application of a static external load. Piping is the movement of water through the soil that causes removal of soil particles by internal erosion. Stability of a soil generally is most important for excavation and fill slopes. It is defined as the resistance to sloughing and eroding. The stability of a slope is affected by its height and by the presence of water. Soils that have low stability should be carefully inspected before excavation or constructing fill slopes. Compaction is important for most types of earthfill construction. The degree of compaction and the type of equipment to use vary with the type of soil. Fine-grained soils having a low liquid limit have poor to good compaction. Sheepsfoot rollers should be used on these soils, and close controls are essential. Fine-grained soils having a high liquid limit have very poor to fair compaction, and sheepsfoot rollers should be used. Organic soils have very poor compaction and are considered unsuitable for fills.

Reservoirs are affected by soil permeability. In soils that have rapid permeability, seepage losses will be large unless the reservoir is lined with impervious material.

Irrigation of soils that have rapid water intake and permeability generally results in overirrigation at the upper end of runs and inefficient use of water. Irrigation of soils that have very slow permeability may cause a perched water table. Soils having low available water capacity generally are coarse textured and are difficult to irrigate because they require frequent applications of small amounts of water.

A septic tank filter field is a subsurface tile system for distributing effluent from a septic tank into the natural soil. Some important factors in determining the limitation of a soil for filter fields are permeability, depth to consolidated rock or other impervious layers, hazard of flooding, ground water level, and slope. Local experience and records of performance of existing filter fields are also important considerations. Rank vegetation, seepage, or odor near a filter field indicates that the system is not working properly. Slopes of less than 10 percent are the most desirable for the construction and successful operation of a filter field. Large rocks, boulders, or rock outcrops increase construction costs, particularly on sloping land. Detergents in solution are readily transmitted through very rapidly permeable soils and may contaminate ground water. Sodium salts derived from water softeners and other sources tend to disperse the clay in the soil and reduce the effectiveness of the filter field.

FORMATION AND CLASSIFICATION OF THE SOILS[7/]

This section describes the major factors of soil formation and tells how these factors have affected the soils of the Northern Santa Barbara Area. It also defines the current system for classifying soils and shows the classification of the soils by series and higher categories.

Factors of Soil Formation

The main factors of soil formation are: (1) the physical and mineral composition of the parent material; (2) the climate under which the soil material accumulated and formed; (3) the relief, slope, and position of the soil; (4) the living organisms on and in the soil; and (5) the length of time the soil material has been acted upon by these factors. Changes in the soil mantle caused by man are not considered here as one of the factors of soil formation.

All of these five factors have played some part in the formation of soils. The main features of some soils may be determined by only two or three of these factors. For example, the features of the Oceano soils are largely determined by the sandy parent material and the relative youth of the soil. The effects of slope, living organisms, and climate are not strongly expressed. Where parent material similar to that of Oceano soils has been acted upon over a longer period, Garey soils formed, and in

7/ Prepared by LEWIS C. LEIFER, soil scientist, Soil Conservation Service.

areas where drainage is restricted by lack of slope, soils of the Tangair series formed.

Parent Material

Among the main features of the parent material that strongly affect the kind of soil that forms are mineralogical composition, hardness and degree of consolidation, grain size, and presence or absence of salts. The age of the parent material is generally of secondary importance. The kinds of parent material in the survey area are described in the following paragraphs (6).

Coarse acid sediments.--These coarse sediments are mostly sands. They range in age from Pliocene to recent Dune land. Oceano, Marina, Garey, Betteravia, Narlon, Tangair, and Arnold soils formed in these deposits. The effect of parent material is reflected in the coarse textured to moderately coarse textured, thick surface layer and the acid reaction in nearly all horizons of these soils. The effect of water soaking through the material has caused changes to a considerable depth, and the lower part of the subsoil extends to a depth of 4 to 8 feet in places.

Diatomaceous shale.--This shale is very light gray to white or shades of yellow, brown, or red. The consolidation, or hardness, of the shale varies considerably. Soils that formed in this shale are gray to dark gray, have no brownish or yellowish hues, are granular and permeable, and have little or no clay accumulation in the subsoil. Soils that formed over hard shale are shallow. The less diatomaceous the shale is, the more the soils are similar to brownish soils that formed in nondiatomaceous shale. Gazos soils, for example, formed in soft shale low in content of diatom skeletons. Crow Hill soils formed in soft, acid, lightweight shale high in content of diatom skeletons. Santa Lucia soils formed in medium to hard, brittle shale in which the siliceous deposits are somewhat cemented. They are examples of soils that have been strongly influenced by their diatomaceous parent material (see laboratory data, table 7). Shedd soils, diatomaceous variant, are underlain by lightweight, highly calcareous shale that is high in content of diatom skeletons. Soils that formed in alluvial material derived mainly from diatomaceous shale have a gray surface layer similar to that of soils that formed in place in this parent material. Most of the diatomaceous shale is of the middle Miocene age, but some impure members are of the middle Pliocene.

Unconsolidated mixed sediments.--This parent material coincides with the Paso Robles Formation of the late Pliocene and early Pleistocene. This formation consists of gravelly and shaly deposits derived mainly from diatomaceous shale, beds of medium-acid sand, and beds of calcareous white marl to soft light-brown shale. Each of these strata within the formation determines to a large extent the characteristics of the soils. Some of the soils in this group are like those that formed in other parent material. Chamise soils formed in the gravelly and shaly beds. These soils are similar to soils that formed in diatomaceous shale, but generally have more clay accumulation in the subsoil than those soils. Arnold soils formed in the sandy beds, which are no different from the formations of coarse acid sediments. Linne soils formed in the marly deposits, and the steep, shallow Shedd soils formed in the brown, calcareous beds.

Soft fine sandstone.--This parent material coincides rather well with local upper Pliocene marine deposits. The formation consists of fine-grained, very soft sandstone that is generally acid and contains varying amounts of clay. Where the clay content is low, or where other factors retard clay accumulation in the subsoil, the San Andreas soils have formed. The Tierra soils that have a marked clay accumulation in the subsoil also occur on this formation. These two soils are mapped together, as a complex, only where they occur over this formation.

Brown shale and fine sandstone.--This parent material consists of brownish shale and rather fine-grained, argillaceous, interbedded sandstone. The material weathers deeply. Soils derived from this material are moderately deep to deep. They are moderately fine textured to fine textured, and some have a marked clay accumulation in the subsoil. The texture reflects the fairly fine initial grain size and the presence of readily weatherable minerals. Diablo, Los Osos, San Benito, Lodo, and Contra Costa soils occur extensively over these formations. The marine and nonmarine formations range in age from Cretaceous, through Eocene and Oligocene, to lower Miocene.

Hard sandstone and shale.--These formations are well consolidated, and some are considerably metamorphosed. The material weathers slowly, which results in the formation of shallow soils. The material is of the Cretaceous or Knoxville and Eocene ages. Soils of the Maymen and Gaviota series and Sedimentary rock land overlie these formations.

Basic igneous rock formations.--Soils that formed on basic igneous rock formations commonly have redder colors or finer textures than adjacent soils on other formations. The material consists of old, Franciscan metavolcanics or ultrabasic intrusives of the Mesozoic age. The shallow rocky Montara soils formed in the metamorphosed ultrabasic material, and the Toomes and Climara soils formed in the more weatherable material. Soil colors range from dark brown to dark gray, and textures range from moderately fine to fine.

Soft calcareous sandstone and shale.--These formations are only along the edges of the Cuyama Valley. They consist of soft, nonmarine sediments of the Pliocene age. They contain large amounts of lime and gypsum but are otherwise similar to the hard sandstone and shale formations. The lime and gypsum content has significantly affected the Ballinger and Kettleman soils, which overlie these formations.

Young alluvial deposits.--These deposits have been in place for so short a time that living

organisms and weathering have had little time to affect the soils. Many soils that formed in these deposits are deeper than, but otherwise similar to, soils in the surrounding watersheds. For example, the deep sandy surface layer of the Corralitos soils is similar to that of soils that formed in coarse acid sediments. Panoche soils are similar to Kettleman soils that formed in soft, calcareous sandstone and shale. Sorrento soils represent a recent mixture of all the upland parent materials and do not resemble any particular one. Alluvial soils are similar to soils that formed in certain upland parent materials. Most are classified according to their drainage, texture, and reaction. Their features are determined by the sequence in which parent materials were laid down. Agueda, Bayshore, Botella, Camarillo, Cropley, Corralitos, Elder, Metz, Mocho, Panoche, Salinas, Sorrento, and Stutzville soils formed in young alluvial deposits; drainage, weathering, and plant and animal life have had a significant effect on some of these soils.

Terrace deposits.--Terrace deposits generally are moderately coarse textured and medium textured. Some are gravelly. Of all the parent materials, the direct effect of terrace deposits on the soils is, perhaps, the most obscure because most of the deposits were derived from several sources. Also, the factors of weathering, climate, and vegetation have had time to alter considerably the parent material. Ballard, Chamise, Pleasanton, Positas, Santa Ynez, Tierra, and Wasioja soils formed in these terrace deposits.

Climate

The climate of the Area is typical of the coastal part of central California. In summer, temperatures are mild or even cool near the ocean and somewhat warmer inland. At Lompoc, about 10 miles inland, the mean temperature in July is about 61.5° F.; at Cachuma Dam, about 37 miles inland, it is about 70° F. In winter, temperatures are not greatly influenced by the ocean, though they are slightly warmer nearer the ocean. At Lompoc, the mean temperature in January is 51.8° F.; at Cachuma Dam, it is 49.9° F. Temperature generally decreases with increasing elevation. In July, temperatures inland would be considerably warmer were it not for the higher elevations.

Rainfall generally increases with increasing elevation. However, areas that are screened by mountain ranges from rainstorms that blow off the ocean have considerably lower rainfall than other areas at the same elevation. For example, Cuyama is sheltered by mountain ranges and has an average annual rainfall of 5.47 inches. At Lompoc and Cachuma Dam annual rainfall is 12.65 and 17.12 inches, respectively.

Generally, differences in climate within the Area account for three rather broad groups of soils. Soils in coastal areas have a gray to very dark gray surface layer and a dull-colored subsoil. Nearly all are deeply leached. About 30 to 40 miles inland, the soils generally have a brown surface layer. Those in which clay has accumulated have bright or reddish colors in the subsoil. Rainfall is similar in these two areas, but inland there is little fog and temperatures are higher in summer. Soils in the eastern part of the Area generally have a pale-brown surface layer, and little leaching or removal of lime has occurred because rainfall is low.

Areas along the immediate coast and the valleys that open toward the ocean have much fog in summer and generally lower temperatures. In foggy areas, humidity is higher, transpiration rates are lower, and rainwater is conserved more readily. Low summer temperatures, fairly high humidity, fog, and modest levels of rainfall combine to produce soils that are gray, dark gray, grayish brown, or dark brownish gray, such as Agueda and Botella soils. Under poor drainage conditions, these soils are not brown or reddish brown to a significant degree, even in the subsoil.

In the eastern part of the Santa Ynez Valley, where summer temperatures are higher, and in parts of the Cuyama Valley, where rainfall ranges from 12 to 17 inches, the vegetation is similar to that near the coast. Except where the influence of parent material is strong, the surface layer generally is brown or grayish brown rather than dull gray, and the subsoil is bright or reddish in color. Examples of this type of soil are the Positas soils that occur in warmer areas near Cachuma Dam.

In the drier areas near Cuyama, the rainfall is so low that little organic matter has been produced to stain the mineral soils. Soils in these areas are generally pale in color, such as Panoche or Kettleman soils. Because rainfall is low, free lime is not readily leached, and most of the soils are calcareous from the surface layer downward.

Relief

Relief determines the elevation, slope, and position of the soil on the landscape. Elevation influences soil formation mainly through its effect on climate. Elevations in the Area range from sea level to about 3,000 feet. Slope and the position of the soil on the landscape affect soil formation through their influence on the movement of water.

Very steep soils generally have rapid runoff. Material is rapidly eroded from the surface, and only a small amount of water passes through the soil to cause leaching and weathering. Plants do not grow well, and the effect of plants and animals on the soils is slight. In general, steeper soils have less soil material available for forming a distinct surface layer and subsoil, are less affected by leaching, and are shallow. Very steep soils erode rapidly and are considered young, even if the parent material is old. These soils strongly reflect the features of the parent material. For example, the characteristics of the Maymen soils have been determined by their very steep slopes. These soils are only 10 to 20 inches deep, the organic-matter enriched surface layer is only about 3 inches thick, and little clay has accumulated in the

subsoil. Soil material is lost through erosion nearly as fast as it forms through weathering of the parent sandstone and shale. Shedd silty clay loam, 30 to 75 percent slopes, severely eroded, is another soil whose features have been almost entirely determined by steep slopes and the resulting high rate of erosion.

Soils that have moderate to gentle slopes are considered average, or normal, soils. Generally, the effect of living organisms and climate on gently sloping soils is strongly evident. The features of most moderately sloping soils are affected equally by all the factors of soil formation.

Where soils are very gently sloping or level, all rainfall soaks into the soil or evaporates. Additional water from higher soils flows onto some of these soils. Little soil material is lost through erosion, and in places new soil material is deposited. If level soils are permeable and well drained, relatively large amounts of water pass through the soil and much leaching occurs. Where level soils are not excessively drained and leached, but are moist for long periods, grass and grasslike plants grow abundantly; the surface layer is commonly dark gray and has high organic-matter content. In some soils that have a high water table, the subsoil is mottled or has light-gray or bluish colors caused by reduced iron. If the water is high in lime content, the subsoil may be light gray to white because it contains residue of finely divided lime. Wet soils generally have little or no clay accumulation in the subsoil because little water moves downward through these soils.

The Bayshore soil is a nearly level, moist soil whose main features are a result of its position on the landscape and slow drainage. Its surface layer is dark gray and has a fairly high organic-matter content. The substratum has high lime content and is mottled. Camarillo soils are similar to Bayshore soils, but they have not had time to become so dark colored and limy and they are mottled in the substratum. Stutzville soils occupy basins in the drier parts of the Cuyama Valley. Floodwater and seepage entering the basins have deposited salts that have been concentrated by evaporation and transpiration. These soils are salty and mottled. Tangair soils are more permeable, but are somewhat poorly drained. Originally they were not high in content of bases, but water passing through the profile has made these soils acid. Through long periods of saturation, some iron has been concentrated into hard, concretionary lumps.

Living Organisms

The most extensive type of vegetation in the Area is annual grasses (8). Some forbs and a few perennial grasses grow in places. Most cultivated areas were originally grass. Live oak (Quercus agrifolia) and valley oak (Quercus lobota) grow throughout the grassland. In some places the oaks are very sparse and grow only on north-facing slopes or along drainageways. In others, oaks grow in sparse stands or in open parklike stands. Dense stands, generally dwarf thickets, are uncommon and are mainly on steep north-facing slopes. In areas of grass or grass-oak vegetation, grass has been the dominant biological influence on the soil. Where grass has grown for long periods of time, the soils are dominantly gray to grayish brown to a depth of 10 to 25 inches. On north-facing slopes, where the soils are moist for longer periods and the vegetation is more abundant, gray colors extend deeper into the soil. Soils on dry, exposed, south-facing slopes have less vegetation and are lighter in color; gray organic residues do not extend to as great a depth in these soils. In the dry parts of the Cuyama Valley, grasses are very sparse and the soils have pale colors.

Areas of brush are common and extensive. There are two kinds of brush. One kind is dominantly California sagebrush (Artemisia californica) and black sage (Salvia mellifera). These species generally grow in patches; dense stands are not common or extensive. In most places the brush has an understory of grasses and forbs and a few perennial grasses, and the soils generally have characteristics similar to those of grassland soils.

The other kind of brush is called "hard" brush, or chaparral. It is characterized by chamise (Adenostoma fasciculatum) commonly mixed with manzanita (Arctostaphylos species), buckbrush (Ceanothus cuneatus), jimbrush (Ceanothus sorediatus) and scrub oaks (Quercus agrifolia, Quercus dumosa, Quercus wislizenii, and others). Stands of chaparral generally are extensive and do not have an understory of open patches of grass. The surface layer of soils under this brush cover generally is only 1 to 3 inches thick; in mineral soils, it is darkened by organic matter. In this Area, soils under chaparral are generally more acid than those under grass, but it is not certain that the brush causes the greater acidity.

The effect of animals on soils in the Area is less apparent. No distinct or major soil features are attributable solely to animal activity. Ground squirrels and pocket gophers prefer to burrow and nest in calcareous soils. The Linne and Shedd soils have two to ten times more burrows than neighboring soils. Differences between horizons in these soils are only weakly defined. These soils are relatively soft and calcareous throughout, features inherited from the parent material, and small pieces of soft shale are commonly scattered throughout the profile. A large volume of soil material is brought to the surface each year and many burrows collapse. The similarity of horizons and lack of usual profile development in these soils may be caused partly by animal activity.

Time

The degree of alteration of parent material by the interacting forces of climate, living organisms, and relief is determined by the length of time these factors have acted on the soils. The oldest

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geological formations are of the Jurassic age, but the oldest soils occur on the relatively young Orcutt Formation of the Pleistocene and on the slightly older Paso Robles Formation of the upper Pliocene and lower Pleistocene. The soil material originally weathered from the older formations has long since been removed, and material may have been weathered and replaced a number of times.

The oldest soils generally are those in which the parent material has been most altered. Soils are considered to be old if their horizons differ in color, texture, reaction, structure, or other features. Generally, distinct boundaries between horizons characterize older soils. Soils having few or indistinct horizon differences are considered to be intermediate in age. Soils having few or no horizon differences are considered to be young. Differences between horizons or layers caused by accidents in the placement of the parent material are not considered in determining the age of a soil. Also, soils having the greatest horizon differences are not necessarily the oldest in time. In some soils the dominant influence of some other factor, such as highly resistant parent material, may largely determine the features of the soil.

Young soils are divided into two groups. One group is made up of soils that formed in young alluvial deposits, such as Corralitos and Salinas soils. These soils range from very recent soils to those that have been in place long enough to accumulate organic matter. Their organic-matter content is determined by natural additions and decomposition. Free lime may or may not be leached from the profile. The second group consists of soils that are constantly being eroded nearly as fast as new soil material is weathered from the underlying material. In this group are the Gaviota soils.

Somewhat older soils have undergone changes other than the addition of organic matter and the loss of some bases. Clay has been leached from the surface layer and accumulated in the subsoil. Where moisture favors longer periods of decomposition, additional clay may be formed through weathering of minerals in the subsoil. Older soils that have clay accumulation in the subsoil, such as Pleasanton and Santa Ynez soils, occur on terrace deposits, soft sediments, shale, and sandstone that weather rather deeply and also provide clay minerals subject to translocation. As clay accumulates in the subsoil, pores become fewer or finer and the permeability is reduced. The differences between the surface layer and subsoil become greater, and the horizon boundaries become more distinct. Water may accumulate just above the clay subsoil causing temporary saturation in the lower part of the surface layer. The Positas soils are classified as Palexeralfs and represent the oldest or most mature soils. The development of hard layers or hardpan-like horizons is generally associated with mature soils, such as Narlon sands, hardpan variant, that have prominent clay accumulations above or below the hard layer. Hard layers generally indicate the great age of a soil.

The oldest soils in the Area are hardpan soils that occur only in small areas on narrow, gently sloping ledges or on the caps of low rounded hills. The indurated layer generally is a few feet to 10 feet below the surface, but in many places it is at the surface (20). It consists of layers cemented with opaline silica to form a single "layer" of varying hardness. The cementing process is analogous to that involved in the formation of a hardpan. This "layer" is harder than the underlying and overlying strata. It appears to be parallel to the surface layer of a former soil profile developed on a surface having less relief. These hardpan soils are not extensive in the Area and are mapped as inclusions within areas of other soils. Some of these remnants are included in the mapping unit Terrace escarpments, sandy. Most commonly these remnants occur in areas of Arnold or Chamise soils. The hardpan is quite similar to, though commonly harder than, the very hard sandy layer in Betteravia soils and the hardpan-like layer in Narlon sands, hardpan variant. Similar, very hard horizons that are not so sandy occur below the clayey subsoil of the Chamise and Tierra soils.

Classification of the Soils

Classification consists of an orderly grouping of soils according to a system designed to make it easier to remember soil characteristics and interrelationships. Classification is useful in organizing and applying the results of experience and research. Soils are placed in narrow classes for discussion in detailed soil surveys and for application of knowledge within farms and fields. The many thousands of narrow classes are then grouped into progressively fewer and broader classes in successively higher categories, so that information can be applied to large geographic areas.

Two systems of classifying soils have been used in the United States in recent years. The older system was adopted in 1938 (3) and revised later (12). The system currently used by the National Cooperative Soil Survey was developed in the early sixties (10) and adopted in 1965 (16). It is under continual study.

The current system of classification has six categories. Beginning with the most inclusive, these categories are the order, the suborder, the great group, the subgroup, the family, and the series. The criteria for classification are soil properties that are observable or measurable, but the properties are selected so that soils of similar genesis are grouped together. The placement of some soil series in the current system of classification, particularly in families, may change as more precise information becomes available.

Table 6 shows the classification of each soil series of the Northern Santa Barbara Area by family, subgroup, and order, according to the current system. The classes in the current system are briefly defined in the following paragraphs.

TABLE 6.--SOIL SERIES CLASSIFIED ACCORDING TO THE CURRENT SYSTEM OF CLASSIFICATION

Series	Family	Subgroup	Order
Agueda 1/	Fine-loamy, mixed, thermic,	Calcic Pachic Haploxeroll--	Mollisols.
Arnold	Mixed, thermic	Typic Xeropsamment	Entisols.
Ballard	Fine-loamy, mixed, thermic	Typic Argixeroll	Mollisols.
Ballinger	Fine, montmorillonitic, calcareous, thermic--	Vertic Torriorthent	Entisols.
Bayshore	Fine-loamy, mixed, thermic	Typic Calciaquoll	Mollisols.
Betteravia	Sandy, mixed, thermic	Haplic Durixeralf	Alfisols.
Betteravia, dark variant--	Coarse-loamy, mixed, thermic	Typic Argixeroll	Mollisols.
Botella	Fine-loamy, mixed, thermic	Pachic Argixeroll	Mollisols.
Camarillo	Fine-loamy, mixed, calcareous, thermic	Aquic Xerofluvent	Entisols.
Chamise	Clayey-skeletal, mixed, thermic	Ultic Argixeroll	Mollisols.
Climara	Fine, montmorillonitic, thermic	Chromic Pelloxerert	Vertisols.
Contra Costa	Fine, montmorillonitic, thermic	Mollic Haploxeralf	Alfisols.
Corralitos	Mixed, thermic	Typic Xeropsamment	Entisols.
Cropley	Fine, montmorillonitic, thermic	Chromic Pelloxerert	Vertisols.
Crow Hill 2/	Fine-silty, mixed, thermic	Pachic Haploxeroll	Mollisols.
Diablo	Fine, montmorillonitic, thermic	Chromic Pelloxerert	Vertisols.
Elder	Coarse-loamy, mixed, thermic	Pachic Haploxeroll	Mollisols.
Garey	Coarse-loamy, mixed, thermic	Typic Xerochrept	Inceptisols.
Gaviota	Loamy, mixed, nonacid, thermic	Lithic Xerorthent	Entisols.
Gazos	Fine-loamy, mixed, thermic	Pachic Haploxeroll	Mollisols.
Kettleman	Fine-loamy, mixed, nonacid, thermic	Xeric Torriorthent	Entisols.
Linne	Fine-loamy, mixed, thermic	Calcic Pachic Haploxeroll--	Mollisols.
Lodo	Loamy, mixed, thermic	Lithic Haploxeroll	Mollisols.
Lopez	Loamy-skeletal, mixed, thermic	Lithic Haploxeroll	Mollisols.
Los Osos	Fine, montmorillonitic, thermic	Typic Argixeroll	Mollisols.
Marina	Mixed, thermic	Alfic Xeropsamment	Entisols.
Maymen	Loamy, mixed, mesic	Dystric Lithic Xerochrept--	Inceptisols.
Metz	Sandy, mixed, thermic	Typic Xerorthent	Entisols.
Mocho	Fine-loamy, mixed, thermic	Calcic Entic Haploxeroll---	Mollisols.
Montara	Loamy, serpentinitic, thermic	Lithic Haploxeroll	Mollisols.
Narlon	Clayey, montmorillonitic, mesic	Aeric Ochraqualt	Ultisols.
Narlon, hardpan variant---	Clayey, montmorillonitic, mesic	Aquic Haploxerult	Ultisols.
Oceano	Mixed, thermic	Alfic Xeropsamment	Entisols.
Panoche	Fine-loamy, mixed, calcareous, thermic	Xeric Torriorthent	Entisols.
Pleasanton	Fine-loamy, mixed, thermic	Mollic Haploxeralf	Alfisols.
Positas	Fine, montmorillonitic, thermic	Mollic Palexeralf	Alfisols.
Salinas	Fine-loamy, mixed, thermic	Calcic Pachic Haploxeroll--	Mollisols.
San Andreas	Coarse-loamy, mixed, thermic	Typic Haploxeroll	Mollisols.
San Benito	Fine-loamy, mixed, thermic	Calcic Pachic Haploxeroll--	Mollisols.
Santa Lucia	Clayey-skeletal, mixed, thermic	Pachic Ultic Haploxeroll---	Mollisols.
Santa Ynez	Fine, montmorillonitic, thermic	Ultic Palexeralf	Alfisols.
Shedd 3/	Fine-loamy, mixed, calcareous, thermic	Typic Xerorthent	Entisols.
Shedd, diatomaceous variant.	Fine-loamy, siliceous, calcareous, thermic---	Typic Xerorthent	Entisols.
Sorrento	Fine-loamy, mixed, thermic	Calcic Haploxeroll	Mollisols.
Stutzville	Fine-loamy, mixed, thermic	Typic Salorthid	Aridisols.
Tangair	Mixed, mesic	Typic Psammaquent	Entisols.
Tierra	Fine, montmorillonitic, thermic	Mollic Palexeralf	Alfisols.
Toomes 4/	Loamy, mixed, thermic	Lithic Haploxeroll	Mollisols.
Wasioja	Fine-loamy, mixed, thermic	Typic Haploxeralf	Alfisols.

1/ Agueda loam, 0 to 2 percent slopes, is a taxadjunct to the Agueda series because fine sand is at a depth of 30 to 40 inches.

2/ Crow Hill loam, 15 to 75 percent slopes, severely eroded, is a taxadjunct to the Crow Hill series because the depth to bedrock is 7 to 22 inches.

3/ Shedd soils mapped in this Area are more moist than is appropriate to the range defined for the Shedd series. Their classification has been changed to Balcom series.

4/ Toomes soils mapped in this Area are taxadjuncts to the Toomes series because they lack a cambic horizon and have chromas less than 4.

Order

Ten soil orders are recognized in the current system. The properties used to differentiate the orders are those that tend to give broad climatic groupings of soils.

Table 6 shows the six soil orders in the Northern Santa Barbara Area: Entisols, Inceptisols, Vertisols, Aridisols, Mollisols, and Alfisols.

Entisols are recent soils. They do not have genetic horizons or have only the beginning of such horizons. Inceptisols are soils that occur most commonly on young but not recent land surfaces. Vertisols are clay soils that swell when wet and shrink when dry causing large, deep cracks to form. Aridisols are soils of dry areas. Mollisols are soils that have a dark-colored, thick surface layer relatively high in organic-matter content and have high base saturation throughout the profile. Alfisols have been in place for a sufficient length of time for the movement and accumulation of silica clay. They have a light-colored, massive, and hard surface layer and accumulation of clay in the subsoil.

Suborder

Each order is divided into suborders based primarily on those characteristics that seem to produce classes with the greatest genetic similarity. The suborders narrow the broad climatic range permitted in the orders. The soil properties used to distinguish the suborders are mainly those that reflect the presence or absence of waterlogging or differences in climate or vegetation. The name of each suborder has two syllables. The last syllable indicates the order. An example is Xerolls, Xer meaning dry, or annual dry season, and olls from Mollisols.

Great Group

Each suborder is divided into great groups on the basis of the uniformity in the kinds and sequence of major soil horizons and features. The horizons used to distinguish great groups are those in which clay, iron, or humus have accumulated; those that have pans that interfere with the growth of roots and the movement of water; and dark-colored surface horizons. Among the features used are soil temperature and moisture, major differences in chemical composition, and color. The name of each great group is made by adding a prefix to the name of the suborder. An example is Argixeroll, Argi meaning an argillic horizon, or a horizon of accumulated illuvial clay, and the suborder Xeroll.

Subgroup

Each group is divided into subgroups. One subgroup represents the central (typic) segment of the group. Others, called intergrades, have properties of the group and also one or more properties of another great group, subgroup, or order. Extragrades have properties that are not in any known order, suborder, or great group. The name of each subgroup is derived by placing one or more adjectives before the name of the great group. An example is Typic Argixeroll.

Family

Families are established within each subgroup primarily on the basis of properties important to the growth of plants or the behavior of soils when used for engineering purposes. Among the properties considered are texture, mineralogy, reaction, and soil temperature. A family name consists of a series of adjectives preceeding the subgroup name. The adjectives are the class names for texture, mineralogy, and so on, that are used to differentiate families. An example is the Fine-loamy, mixed, thermic family of Typic Argixerolls.

Laboratory Data

Table 7 shows the results of laboratory analyses of samples from five representative soils in the Northern Santa Barbara Area. The samples were analyzed at the Soil Survey Laboratory, Soil Conservation Service, Riverside, California. Only material less than three-fourths inch in size was removed from the field. The volume of larger fragments, if any, was estimated. The samples were air dried, rolled or crushed by hand, and then passed through a 2-millimeter, round-hole sieve. The percentage of particles larger than 2-millimeters in size was estimated. The material that passed the sieve was thoroughly mixed and then analyzed. Unless otherwise indicated, data are for ovendry material. The methods used for obtaining the data in table 13 are described in the following paragraphs.

Size class and diameter of particles.--The particle-size distribution was determined by pipette and sieve analyses. After treatment of the sample to remove organic matter and soluble salts, the particles were dispersed with sodium hexametaphosphate and by mechanical shaking (17).

Bulk density.--The bulk density for one-third bar water content and for oven dryness was determined on saran-coated natural soil clods (17). The clods were equilibrated to one-third bar water content on a pressure plate apparatus, and the volume of the clods was determined by the displacement of water. If the clods contained gravel-size particles, corrections were made for weight and volume and the data were reported for the soil particles less than 2-millimeters in size. The bulk density that was determined on core samples is an estimate that is assumed to be equal to the density of the horizon at field moisture (13). Core samples were taken with a modified Uhland sampler and a core container 4.7 by 3.5 centimeters in size.

Water content.--The water content at one-tenth bar was determined on soil cores. The water content at 15 bars was determined on fragmented soil material by means of a pressure membrane apparatus (15).

Extensibility.--Extensibility is an estimate of the change in dimension that occurs in a natural soil clod if the water content changes. The coefficient of linear extensibility (COLE) of the soil particles less than 2 millimeters in size was estimated from the bulk density of the clod at one-third bar and when ovendry (17).

Reaction.--Soil reaction, expressed as a pH value, was determined in a 1:1 soil-water solution using a glass electrode (15, 17).

Organic carbon.--The percent of organic carbon was determined by acid-dichromate digestion and ferrous-sulfate titration using a modification of the Walkley-Black method (17).

Nitrogen.--The total nitrogen content in the soil sample was determined by Kjeldahl analysis. A modification of the method described by the Association of Official Agricultural Chemists was used (2).

Carbonate.--The percent of carbonate in the soil sample was determined by measuring the volume of carbon-dioxide gas that was evolved when hydrochloric acid was added to the sample. The percent reported is that amount equivalent to calcium carbonate. (9, 19)

Electrical conductivity.--Electrical conductivity was determined by estimating the content of soluble salts in a saturation extract using a Wheatstone bridge. The conductivity is reported in millimhos per centimeter at 25° C. (15).

Extractable iron.--To reduce and extract the iron, the soil sample was treated with a citrate-buffered, sodium-dithionite solution. The extractable iron was measured colormetrically (17).

Cation-exchange capacity.--The cation-exchange capacity for Carey, Oceano, Santa Lucia, and Tangair soils was determined by summation. The cation-exchange capacity (NaOAc) for Linne clay loam, was determined after the sample had been saturated with sodium by mixing it with a solution of sodium acetate. The amount of exchangeable sodium that was later extracted using ammonium acetate represented the cation-exchange capacity (15,17).

Extractable bases.--Calcium, magnesium, sodium, and potassium were extracted with neutral, normal, ammonium acetate. Calcium was precipitated as an oxalate and titrated with permanganate; magnesium was determined gravimetrically as magnesium pyrophosphate (17); sodium and potassium were analyzed by flame photometer (7). The extractable sodium and potassium reported for Linne clay loam is corrected data (17). It represents the difference between the amount of the soluble cations in the saturation extract and the amount that was extracted by ammonium acetate. Calculations were made on the basis of milliequivalents per 100 grams of soil.

Extractable hydrogen.--The extractable hydrogen, or exchange acidity, was determined using triethanolamine and barium chloride at pH 8.2 (17).

Base saturation.--The percent base saturation was determined by dividing the sum of the extractable bases by the sum of the extractable bases and the extractable hydrogen and multiplying the result by one hundred.

TABLE 7.--LABORATORY

[Analyses were made at the Soil Survey Laboratory, Soil Conservation Service,

Soil name and sample number	Horizon	Depth from surface	Particle-size distribution							Bulk density (clods)	
			Very coarse sand (2 to 1 mm.)	Coarse sand (1 to 0.5 mm.)	Medium sand (0.5 to 0.25 mm.)	Fine sand (0.25 to 0.10 mm.)	Very fine sand (0.10 to 0.05 mm.)	Silt (0.05 to 0.002 mm.)	Clay (less than 0.002 mm.)	Oven-dry	1/3 bar
		In.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Gm./cc.	Gm./cc.
Garey sandy loam	Ap1	0-4	0	5.3	24.3	12.2	9.4	42.1	6.7	1.44	1.42
S62 Calif-42-3.	Ap2	4-8	0	5.5	23.7	11.9	7.8	43.2	7.9	1.64	1.64
	A1	8-16	0.1	4.6	23.2	11.8	7.8	42.5	10.0	1.50	1.49
	A3	16-27	.1	5.0	22.8	11.9	7.9	42.6	9.7	1.61	1.58
	B21	27-36	0	5.4	27.3	13.7	6.6	39.1	7.9	1.66	1.64
	B22	36-47	0	6.1	23.4	16.7	5.8	40.3	7.7	1.89	1.85
	B31	47-58	0	7.8	38.2	18.5	4.3	25.0	6.2	-----	-----
	B32	58-70	0	8.3	40.3	22.4	4.4	19.9	4.7	-----	-----
	C	70-72	.1	9.2	48.5	23.5	3.1	12.3	3.3	1.61	1.61
	Band 1/	47	-----	----	----	----	----	----	----	-----	1/ 1.95
Linne clay loam	Ap	0-9	.2	1.1	3.0	19.3	12.5	31.4	32.5	1.42	1.19
S62 Calif-42-11.	A11	9-14	.2	1.1	3.1	23.7	14.6	27.3	30.0	1.45	1.26
	A12	14-29	.2	1.0	2.9	24.3	15.4	26.7	29.5	1.43	1.21
	AC	29-32	.3	1.0	2.6	26.1	17.2	24.7	28.1	1.42	1.32
	C1ca	32-36	1.0	2.8	2.7	30.6	20.1	24.6	18.2	1.40	1.38
Oceano sand	A11	0-1½	.2	29.1	39.7	13.5	2.4	11.9	3.2	-----	3/ 1.44
S62-Calif-42-1.	A12	1½-4	.1	24.8	36.5	14.2	3.7	17.0	3.7	-----	1.53
	A13	4-15	.3	29.3	39.9	15.0	2.7	9.8	3.0	-----	1.58
	AC	15-20	0	27.3	40.4	15.2	2.8	11.4	2.9	-----	1.56
	C1	20-39	.2	24.0	38.5	16.1	4.7	13.0	3.5	-----	1.54
	C2	39-55	.2	22.6	37.0	17.0	4.1	15.0	4.1	-----	1.56
	C3	55-75	.3	25.0	40.3	17.2	3.2	9.4	3.9	-----	1.55
	Band 1/	75	-----	----	----	----	----	----	----	-----	1/ 1.87
Santa Lucia shaly clay loam 4/	A11	0-8	5.8	8.0	3.8	5.8	3.4	35.3	37.9	5/ .95	5/ .89
S62-Calif-42-10.	A12	8-17	4.1	6.3	3.4	5.8	4.3	35.8	40.3	1.06	1.02
	A13	17-24	4.7	5.8	3.2	5.6	3.9	34.0	42.8	1.18	1.16
Tangair sand	A1	0-4	.7	23.8	36.2	24.2	2.9	10.1	2.1	-----	-----
S62-Calif-42-7.	A2	4-24	.7	19.8	36.9	27.4	3.5	10.4	1.3	-----	-----
	B21ir	24-36	.3	16.2	37.5	30.5	3.4	7.2	4.9	1.78	1.78
	B22ir	36-48	.9	24.4	37.1	23.8	2.8	8.0	3.0	-----	-----
	C	48-60	1.1	26.9	38.5	24.5	2.4	5.2	1.4	-----	-----

1/ A band horizon; the bulk density is for an air-dry clod and the water content is for a sieved sample.

2/ Trace.

3/ The bulk density is for a core sample at field moisture and the water content is for one-tenth bar.

DATA

Riverside, California. Dashes indicate the value was not determined]

Water content		Extensibility (COLE)	Reaction	Organic carbon	Total nitrogen	Carbonate as $CaCO_3$	Electrical conductivity	Extractable iron (Fe)	Cation exchange capacity	Extractable bases (milliequivalents per 100 grams of soil)				Extractable hydrogen	Base saturation
1/3 bar (clods)	15 bar (fragmented)									Ca	Mg	Na	K		
Pct.	Pct.	In./in.	pH	Pct.	Pct.	Pct.	Mmhos./cm.	Pct.	Meq./100 gm. of soil					Meq./100 gm. of soil	Pct.
10.6	3.2	0.003	5.9	0.43	0.048	-----	-----	0.6	7.1	2.1	0.9	0.1	0.2	2.9	59
10.4	3.5	0	5.5	.34	-----	-----	-----	.7	6.6	1.8	.8	.2	.2	3.6	45
10.0	4.2	.003	5.6	.25	-----	-----	-----	.8	7.3	2.6	1.1	.2	.1	3.3	55
12.1	4.1	.007	6.2	.16	-----	-----	-----	.8	7.3	2.8	1.8	.4	.1	2.2	70
10.1	3.5	.003	6.5	.08	-----	-----	-----	.7	6.4	2.4	2.2	.4	.1	1.3	80
9.3	3.6	.007	6.8	.03	-----	-----	-----	.7	5.9	2.3	2.3	.6	.1	.6	90
-----	3.0	-----	6.3	.01	-----	-----	-----	.6	4.9	1.5	1.7	.4	(2/)	.6	86
-----	2.3	-----	7.0	.01	-----	-----	-----	.4	3.3	1.3	1.2	.4	(2/)	.4	88
3.5	1.5	0	7.3	0	-----	-----	-----	.3	2.2	.9	.8	.3	(2/)	.2	91
1/ 16.6															
29.5	18.6	.056	7.3	1.90	.175	2	0.69	.5	39.8	44.0	2.0	.3	.4	-----	-----
26.3	16.3	.045	7.5	.97	.100	4	.45	.5	34.0	41.2	1.6	.3	.3	-----	-----
29.4	16.3	.053	7.6	.72	.072	5	.40	.3	31.6	38.3	1.5	.3	.2	-----	-----
27.0	16.3	.024	7.8	.56	.060	16	.46	.1	24.0	32.3	1.6	.3	.2	-----	-----
24.7	7.7	.007	7.8	.35	-----	27	.38	.1	14.1	25.3	1.2	.3	.1	-----	-----
3/ 13.3	4.5	-----	5.8	1.62	.136	-----	-----	.3	8.1	3.4	.8	.1	.5	3.3	59
12.2	1.9	-----	5.6	.62	.059	-----	-----	.2	5.3	1.4	.5	.2	.4	2.8	47
6.7	1.7	-----	5.5	.32	-----	-----	-----	.3	4.2	.6	.3	.1	.2	3.0	29
6.0	1.8	-----	5.3	.26	-----	-----	-----	.3	3.8	.4	.3	.2	.1	2.8	26
5.7	1.8	-----	5.0	.10	-----	-----	-----	.2	3.3	.4	.3	.2	.2	2.2	33
6.1	2.1	-----	5.0	.04	-----	-----	-----	.3	3.5	.6	.5	.1	.1	2.2	37
5.0	2.0	-----	5.2	.03	-----	-----	-----	.3	3.3	.7	.5	.2	.1	1.8	45
1/ 11.6	----	-----													
5/ 47.9	5/40.7	5/ .020	6.0	9.43	.743	-----	-----	---	70.0	29.6	9.2	.5	5.6	24.1	66
54.4	38.0	.014	5.9	6.54	.494	-----	-----	---	69.1	30.0	10.9	.9	2.8	24.5	64
43.0	40.7	.007	5.8	5.55	.443	-----	-----	---	66.9	25.1	12.4	1.0	1.9	26.5	60
----	2.7	-----	6.0	1.06	.061	-----	-----	.1	6.0	2.3	1.0	.2	.2	2.3	62
----	.9	-----	6.4	.20	-----	-----	-----	.1	1.6	.4	.4	.4	.1	.3	81
6.4	1.7	0	5.3	.18	-----	-----	-----	.6	3.6	.4	.6	.3	.1	2.2	32
----	1.0	-----	5.5	0	-----	-----	-----	.2	1.7	.3	.5	.2	.1	.6	65
----	.9	-----	5.4	.04	-----	-----	-----	.1	1.5	.3	.5	.2	.1	.4	73

4/ Individual particles were not completely dispersed. Gravel content is 25 percent in the A11 horizon, 19 percent in the A12 horizon, and 26 percent in the A13 horizon. Fragments larger than three-fourths inch made up 10 percent of the field volume of the A11 horizon and 50 percent of the A12 and A13 horizons.

5/ Data are not from this profile but from a similar profile.

The original inhabitants in the Northern Santa Barbara Area were Chumash Indians. This tribe lived primarily by fishing, hunting small game, and gathering wild plants. Because they depended especially on ocean shellfish for food, they have been called Digger Indians. Kitchen middens in the Area indicate that shellfish made up a large part of their diet.

The Area was first settled late in the 17th century. Spanish padres and soldiers established the La Purisma Mission near Lompoc and the Santa Ynez Mission at Solvang. They introduced sheep and cattle and began limited cultivation. In 1833, after the change to Mexican rule, the missions were divided into large holdings, or ranchos, that were given to prominent Spanish families. These ranchos were used mostly for sheep and cattle, and only a small acreage was cultivated. In 1847, California became a possession of the United States, and the ranchos eventually were divided and sold to settlers that migrated into the Area. The cultivation of barley, wheat, hay, and beans became an important part of the economy.

Extensive irrigation since the 1920's has made the Area one of the most diversified farmlands in the country. Efficient production and the latest types of machinery and operating techniques are necessary for profitable farming. As a result, farms are becoming larger and more specialized. Small family farms are rapidly disappearing, and many owners now lease their land.

During the last few years, urbanization of the coastal part of the Area has increased rapidly. Activity at Vandenberg Air Force Base has accelerated this change.

Climate[8/]

As a rule, temperatures are mild throughout the Northern Santa Barbara Area, although inland, particularly in some of the mountain valleys, they vary considerably more than in coastal areas. The average maximum temperature in July is in the 60's along the coast and in the 90's inland. In January, the average minimum temperature is in the 40's along the coast and in the 30's inland.

Precipitation is concentrated in the 6-month period November through April; very little falls during the rest of the year. The average annual precipitation ranges from 11 inches in some inland areas to 30 inches or more in the higher mountains. Snow falls infrequently and only in a few areas at high elevation.

Sunshine is abundant over most of the Area. Most coastal areas and the western valleys are affected by low cloudiness from the ocean during the night in summer. In winter, migrant storms bring general cloudiness to the Area, but in most places an average of only 60 to 80 days each year are cloudy. Winds are usually light and blow most often from the west.

Much of the western half of the Area is at relatively low elevation and is influenced by the Pacific Ocean. Most of the eastern half, however, is mountainous and has a more continental climate.

Differences in elevation and in distance from the ocean affect both precipitation and temperature. Marked local variations in temperature and precipitation are caused by the channeling of air flow, cold-air drainage, and orographic factors. Table 8 shows data on temperature and precipitation for Cuyama and Santa Maria.

Temperature.--Because the terrain is rugged, temperature patterns vary throughout the Area. In general, temperatures are mild near the coast, and the daily and annual range is slight. Inland, particularly in the higher mountain valleys, the range is much greater.

Along much of the coast and in the coastal valleys, the average maximum temperature in July is in the upper 60's or low 70's. In the mountain valleys, it is in the low 90's. Data are not available for higher elevations, but it appears likely that most mountain areas have temperatures in the 80's in July. The highest temperatures are more than 100 degrees in all parts of the Area, and more than 110 degrees in some of the inland valleys. Nighttime temperatures in July are in the low 50's in most of the Area.

In January, the average low temperature is in the 40's along the coast and in the 30's in most inland valleys. In some of the higher mountain areas, the average low in January is below freezing. Freezing temperatures have been recorded in all parts of the Area at one time or another, and in some cold inland areas temperatures have dropped to 10° F. or lower. In January, even in these cold inland areas, daytime temperatures are comfortable, and the average maximum is in the high 50's or low 60's throughout the Area.

Growing Season.--In a narrow zone along the coast, freezing temperatures are relatively infrequent due to the effect of the ocean. The last 32° F. temperature generally occurs in January near the coast and at successively later dates farther inland. Some mountain areas have a 32° temperature in May in at least half of the years. The first freezing temperature generally occurs after December 31 along the coast and late in October at higher elevations inland. The average length of the growing season based on temperatures of 32° or lower is about 175 days in the mountains and 340 days or more along the coast.

8/ By C. ROBERT ELFORD, climatologist for California, National Weather Service, U.S. Department of Commerce.

TABLE 8.--TEMPERATURE AND PRECIPITATION DATA FROM TWO WEATHER STATIONS

Cuyama, Santa Barbara County (elevation 2,255 feet)

Month	Temperature					Precipitation
	Maximum	Average maximum	Average	Average minimum	Minimum	Average
	° F.	° F.	° F.	° F.	° F.	In.
January------	79	57.8	43.5	29.2	7	1.04
February-----	81	60.3	45.9	31.5	14	.74
March--------	85	62.8	48.8	33.9	19	.92
April--------	92	71.3	55.1	38.9	22	.52
May----------	102	77.6	60.0	42.3	27	.26
June---------	108	87.1	67.8	48.4	30	.02
July---------	110	95.6	74.8	54.1	38	(1/)
August-------	108	93.2	72.9	52.6	36	.02
September----	109	89.0	68.9	48.8	31	.23
October------	98	77.0	58.3	39.6	21	.19
November-----	89	67.3	50.5	33.6	15	.73
December-----	79	60.3	46.7	31.0	11	.80
Year-------	110	74.9	57.6	40.3	7	5.47
Santa Maria, Santa Barbara County (elevation 220 feet)						
January------	82	62.3	50.2	38.1	21	2.84
February-----	87	63.1	51.8	40.4	24	2.50
March--------	88	64.6	53.3	41.9	29	2.06
April--------	97	66.4	55.6	44.7	31	1.19
May----------	93	68.1	57.6	47.1	34	.22
June---------	95	69.5	59.6	49.7	36	.14
July---------	104	71.6	62.2	52.8	43	.03
August-------	93	71.9	62.4	52.9	43	.03
September----	102	74.1	62.8	51.5	36	.16
October------	103	73.3	60.4	47.5	30	.60
November-----	93	70.4	56.1	41.8	25	1.02
December-----	90	65.0	52.4	39.8	26	2.58
Year-------	104	68.4	57.0	45.7	21	13.37

1/ Trace.

Figure 2 shows the average length of the growing season throughout the Area.

In the mountain areas, temperatures of 28° F. or lower occur as late as April in spring and as early as November in fall. Along the coast, they occur only very late in December or early in January. The growing season based on temperatures of 28° or lower generally is 200 to 225 days in the mountain areas and 365 days along the coast.

Precipitation.--Precipitation in the Area falls mostly in winter. About 90 percent falls during the 6-month period November through April. Thundershowers sometimes occur in the mountains during the summer, but they do not account for any substantial part of the annual rainfall.

Annual precipitation ranges from considerably less than 10 inches in the Cuyama Valley to more than 30 inches in some areas at high elevations in the mountains. It is generally 20 to 25 inches in the mountains of the southeastern part of the Area, 11 to 15 inches in most of the western half of the Area, and as much as 20 inches or more in some areas at high elevation in the Santa Ynez Mountains and in parts of the San Rafael Mountains. Figure 3 shows the average precipitation throughout the Area.

Precipitation varies considerably from year to year. At low elevations in the western part of the Area, for example, as little as 5 inches falls in the driest years, and as much as 25 inches in the wettest years. In areas of heavy rainfall in the

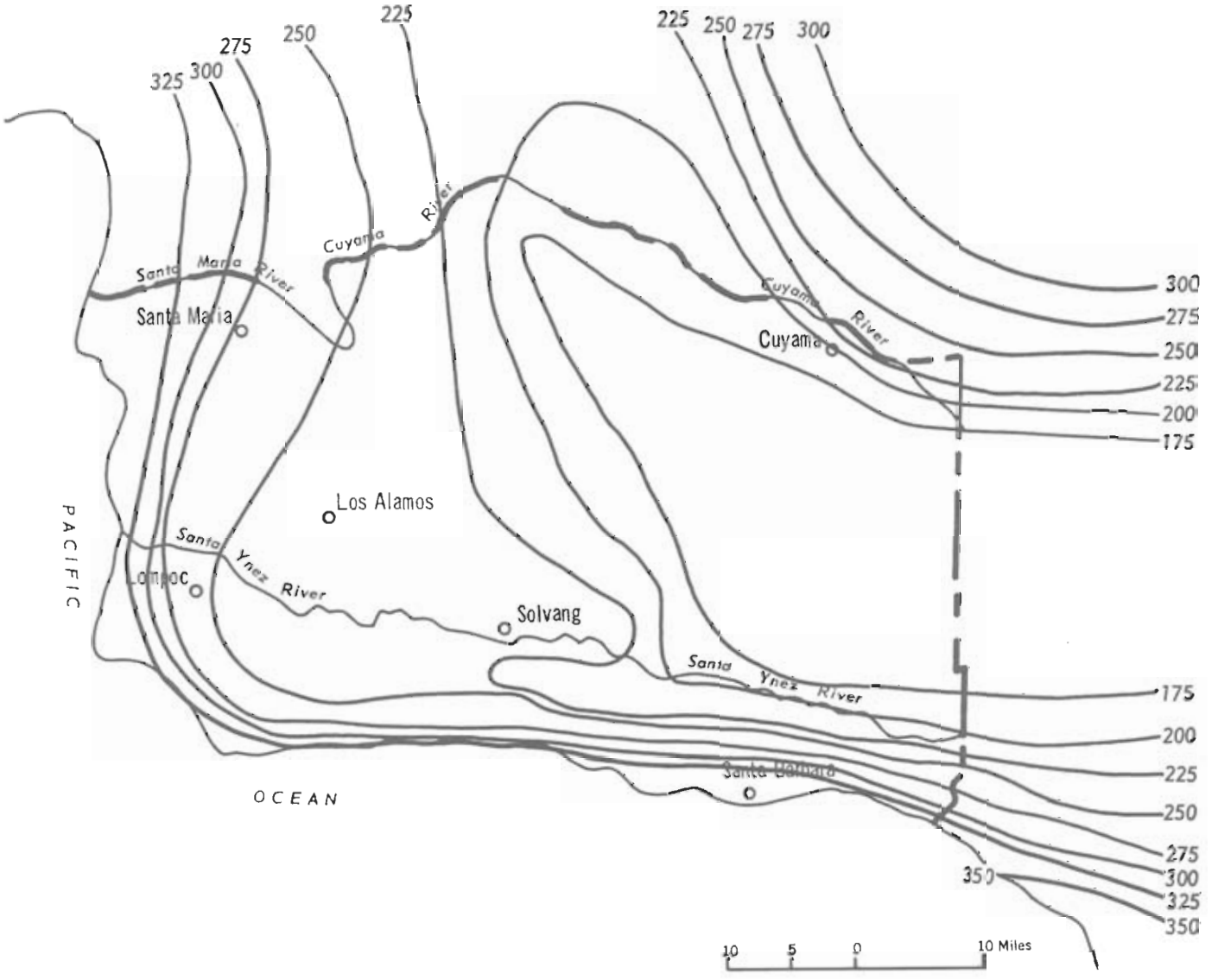

Figure 2.--Average length of the growing season based on 32° F.

mountains of the eastern part of the Area, annual precipitation ranges from a low of 15 inches to a high of 55 inches within a 20-year period. The western parts of the Area have 10 to 18 inches of precipitation in half the years, whereas mountain areas farther inland have 25 to 40 inches.

The intensity of rainfall also varies considerably from season to season and with location, especially in the mountain areas in the southeastern part of the Area, in the western half of the Area, and the low-rainfall zone in the northeastern corner of the Area.

Relative Humidity.--At Santa Maria, the average relative humidity during the night is 80 percent late in fall and early in winter and 90 percent or more in summer. During the afternoon it is about 60 to 65 percent during most of the year. The range in relative humidity is much greater inland. Occasionally dry winds lower relative humidity below 10 percent.

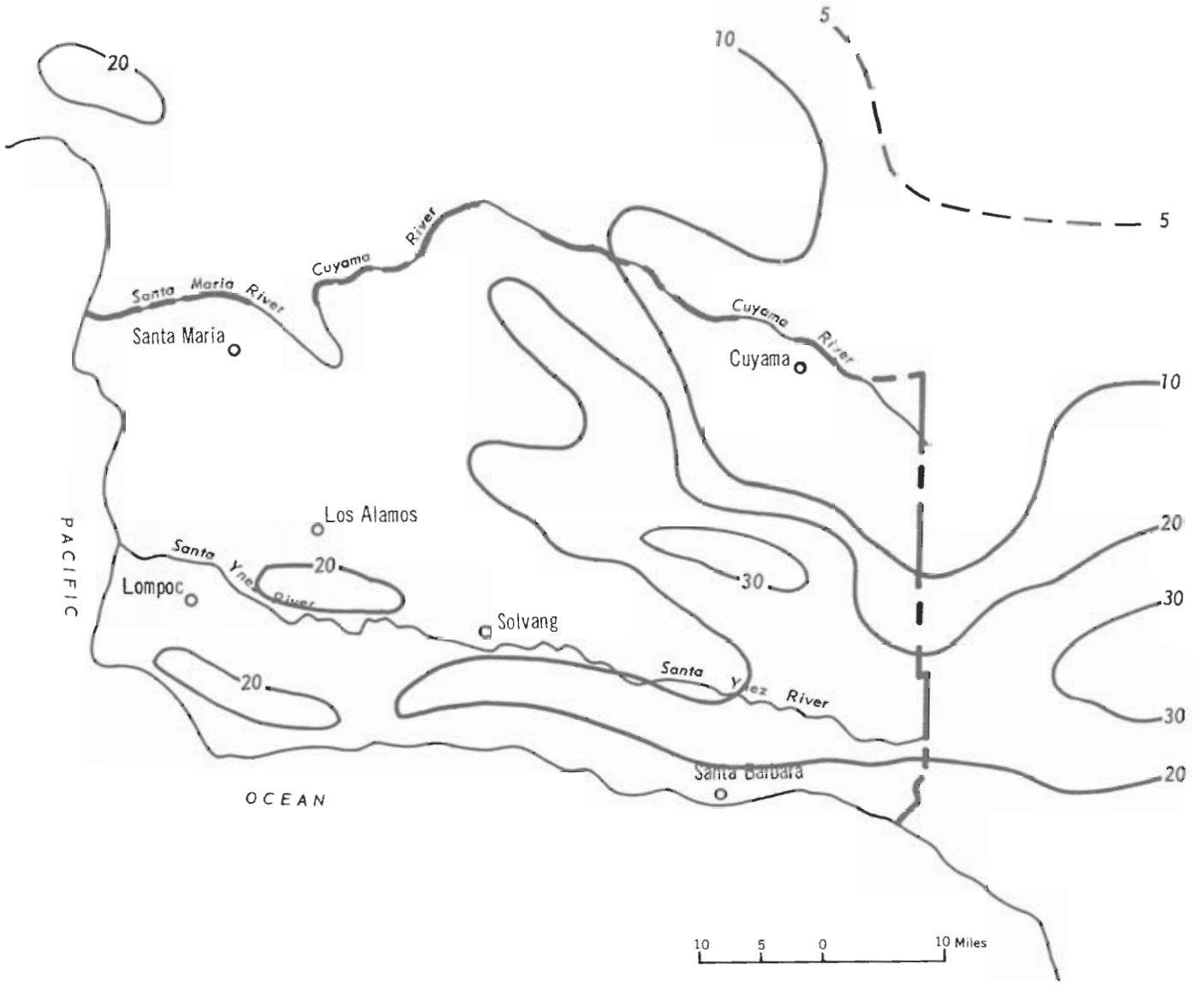

Figure 3.--Average annual precipitation

Wind.--On the coast, winds blow rather steadily from the northwest during most of the year. The intensity of the northwest wind varies with changes in the weather. During storms in winter, winds usually are from the south. The prevailing wind direction at any given point is considerably affected by local topography.

High winds are infrequent. Available records indicate that, in most of the Area, winds of 60 miles per hour occur once in 50 years. Once in 100 years, winds are 65 miles per hour inland and about 80 miles per hour along the coast.

Sunshine and Cloudiness.--Cloudiness caused by migrating storms is uncommon in the Area, but there is a considerable amount of stratus cloudiness along the coast and in the coastal valleys. Annually, the sun shines about 60 to 70 percent of the possible time at Santa Maria, and nearly 80 percent of the time during the fall. Somewhat more sunshine is likely inland.

About 60 to 80 days each year are cloudy. The rest are partly cloudy or clear, and the sun shines approximately half or more of the day.

Water Supply

Because summers are long and dry and winter rains are erratic and unreliable, irrigation is required for most crops grown in the Area. All specialty crops, such as vegetables and flowers, need irrigation from May through October, and most crops grown in winter need supplemental irrigation.

Practically all irrigation water in the Area is pumped from wells. Increased use of water on farms and in urban areas has lowered the level of ground water. To counteract this trend, Twitchell Dam was built in the Cuyama River for storing water that is released during the summer to replenish the ground water in the Santa Maria Valley. Cachuma Dam was built on the Santa Ynez River for storing water that is used partly for replenishing groundwater in the Lompoc Valley and partly for supplying the city of Santa Barbara. Lake Cachuma has an area of 2,890 acres.

These dams have helped to arrest the gradual drop in the pumping level of wells in the Santa Maria and Lompoc Valleys. More storage dams are needed throughout the Area, and particularly in Cuyama Valley, to supply additional water for irrigation and urban uses. In the Cuyama Valley, the pumping level of wells is dropping, and some previously irrigated land has been abandoned because the wells no longer operate efficiently.

Most of the water pumped in the Area is suitable for irrigation. The water is rather hard for household use, but is satisfactory if water softeners are used.

Physiography, Relief, and Drainage

The Area is drained through three watersheds. The Santa Maria River and its tributaries, the Cuyama and Sisquoc Rivers, drain the northern part; San Antonio Creek drains the central part; and the Santa Ynez River drains the southern part. All empty into the Pacific Ocean. Floodwater from the Cuyama River is controlled by Twitchell Dama and is released periodically to replenish the ground water in the Santa Maria Valley. Floodwater from the Santa Ynez River is controlled by Cachuma Dam. The water is supplied to coastal areas in the vicinity of Santa Barbara and is released periodically to replenish the ground water in the Lompoc Valley.

Four fairly large valleys are in the Area. Each has fairly extensive areas of nearly level alluvial soils. The Cuyama Valley is along the Cuyama River in the northeastern part of the Area, the Santa Maria Valley is along the Santa Maria and Sisquoc Rivers in the northwestern part, the Los Alamos Valley is in the west-central part, and the Lompoc Valley is in the southern part. Adjacent to the nearly level valleys are terraces that occur at elevations above the valleys but below the hills and mountains. The terrace deposits are older and more sloping than the valleys and are commonly dissected by deep drainageways. Between the valleys are uplands that vary considerably in topography, soils, and parent material.

The Cuyama Valley is bounded on the north by the Caliente Mountains. These mountains are made up of sediments that are very erodible and unstable. They are very steep, have very rapid runoff, and are highly dissected. The Cuyama Valley is bounded on the south by low foothills of the Sierra Madre Mountains. These foothills consist of fairly soft shale and sandstone or dissected high alluvial terraces. They are well vegetated and fairly stable. The Cuyama Valley is bounded on the east by the Sierra Madre Mountains. These mountains consist of hard sandstone and have steep slopes, but are well vegetated and are fairly stable.

The larger, coastal part of the Area is bounded on the east by the San Rafael Mountains, which are very steep and consist of a wide variety of bedrock. The uplands in the coastal part of the Area consist of lower hills and mountains. South and southwest of the Santa Maria Valley are the fairly stable, rolling Casmalia Hills that extend from Casmalia to Point Sal. South and southeast of the Santa Maria Valley are the erodible Solomon Hills that extend to the Los Alamos Valley. South of the Los Alamos Valley are the rolling to steep, erodible Purisima and Santa Rita Hills that extend to the Santa Ynez and Lompoc Valleys. South of the Lompoc Valley are the rolling to steep Santa Ynez Mountains that consist of a variety of marine and nonmarine sediments, have rapid runoff, and are moderately erodible.

Between Casmalia and the Lompoc Valley, within a few miles of the ocean, are sand dunes and older sandy marine sediments that have a rolling, hummocky and mesalike topography. Burton mesa, in the Vandenberg Air Force Base, is the largest of these areas. It is a nearly level or rolling sandy mesa that is dissected on all sides by deeply entrenched drainages. Rolling sand dunes occur along the coast in the Vandenberg Air Force Base and west of Guadalupe. Older sand dunes occur along the coast in the Vandenberg Air Force Base west of the Lompoc Valley.

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GLOSSARY

Acre-foot. The quantity of water, soil, or other material that will cover 1 acre to a depth of 1 foot.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates such as crumbs, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or other disturbances.

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern.

Available water capacity. The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil.

Bedrock. The solid rock underlying soils.

Calcareous soil. A soil containing enough calcium carbonate (often with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of clay on the surface of a soil aggregate. Synonyms: clay coat, clay skin.

Claypan. A compact, very slowly permeabile 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.

Color, soil. Color is usually related to the content of organic matter. As a rule, the darker the surface soil, the more organic matter it contains. Streaks and spots of gray, yellow, and red in the lower layers generally indicate pore drainage and poor aeration. Uniformly coorred layers generally indicate good drainage and aeration.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are--

Loose.--Noncoherent when dry or moist; does not hold together in a mass.

Friable.--When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.--When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.--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, and tends to stretch somewhat and pull apart, rather than to pull free from other material.

Hard.--When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.--When dry, breaks into powder or individual grains under very slight pressure.

Cemented.--Hard and brittle; little affected by moistening.

Drainage class (natural). Refers to the conditions of frequency and duration of periods of saturation or partial saturation that existed during the formation 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 classes of natural soil drainage are recognized.

Excessively drained soils are commonly very porous and very rapidly permeable and have a low water-holding capacity.

Somewhat excessively drained soils are also rapidly permeable and are free from mottling throughout their profile.

Well-drained soils are nearly free from mottling and are commonly of intermediate texture.

Moderately well drained soils commonly have a slowly permeable layer in or immediately beneath the solum. They have uniform color in the A and upper B horizons and have mottling in the lower B and the C horizons.

Somewhat poorly drained soils are wet for significant periods but not all the time, and commonly have mottlings in the B and C horizons. In places mottles are present in the lower part of a very thick A horizon.

Poorly drained soils are wet for long periods and are light gray and generally mottled from the surface downward, although mottling may be absent of nearly so in some soils.

Very poorly drained soils are wet nearly all the time. They have a dark-gray or black surface layer and are gray or light gray, with or without mottling, in the deeper parts of the profile.

Effective rooting depth. The depth to which a soil is readily penetrated by roots and utilized for extraction of water and plant nutrients. Approximate depth classes are:

	Inches
Very deep	More than 60
Deep	40 to 60
Moderately deep	20 to 40
Shallow	10 to 20
Very shallow	Less than 10

Erosion. The wearing away of the land surface by wind (sandblast), running water, and other geological agents.

Fertility, soil. The quality of a soil that enables it to provide compounds, in adequate amounts and in proper balance, for the growth of specified plants, when other growth factors such as light, moisture, temperature, and the physical condition of the soil are favorable.

Forb. Any herbaceous plant, neither a grass nor a sedge, that is grazed on western ranges.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rains. The distinction between gully and rill is one of depth. A gully generally is on obstacle to farm machinery and is too deep to be obliterated by normal tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage. V-shaped gullies result if the material is more difficult to erode with depth; whereas U-shaped gullies result if the lower material is more easily eroded than that above it.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material may be sandy to clayey, and it may be cemented by iron

oxide, silica, calcium carbonate, or other substance.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. These are the major horizons:

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 one in which living organisms are most active and therefore is 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 (1) by accumulation of clay, sesquioxides, humus, or some combination of these; (2) by prismatic or blocky structure; (3) by redder or stronger colors than A horizon; or (4) by 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.

Intake rate. The rate at which water enters the soil.

Leaching. The removal of soluble materials from soils or other material by percolating water.

Leveling (of land). The reshaping of the soil surface to make for a more uniform application of irrigation water.

Mottling, soil. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of drainage. Descriptive terms are as follows: Abundance--few, common, and many; size--fine, medium, and coarse; and contrast--faint, distinct, and prominent. The size measurements are these: fine, less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; medium, ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimension; and coarse, more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

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.

Parent material. Disintegrated and partly weathered rock from which soil has formed.

Permeability. The quality of a soil horizon that enables water or air to more through it. Terms used to describe permeability are as follows: very slow, slow, moderately slow, moderate, moderately rapid, rapid, and very rapid.

Plowpan. A compacted layer formed in the soil immediately below the plowed layer.

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material.

Range site. An area of range where climate, soil, and relief are sufficiently uniform to produce a distinct kind of vegetation.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is neutral in reaction because it is neither acid no alkaline. An acid, or "sour," soil is one that gives an acid reaction; an alkaline soil is one that is alkaline in reaction. In words, the degrees of acidity or alkalinity are expressed thus:

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Rill. A steep-sided channel resulting from accelerated erosion. A rill normally is a few inches in depth and width and is not large enough to be an obstacle to farm machinery.

Runoff, surface. External soil drainage or rate at which water flows over the surface of the soil. Six classes are ponded, very slow, slow, medium, rapid, and very rapid.

Saline soil. A soil that contains soluble salts in amounts that impair growth of plants but htat does not contain excess exchangeable sodium.

Sand. Individual rock or mineral fragments in soils having diameters ranging from 0.05 to 2.0 millimeters. Most sand grains consist of quartz, but they may be of any mineral composition. The textural class name of any soil that contains 85 percent or more sand and not more than 10 percent clay.

Sedimentary rock. A rock composed or particles deposited from suspension in water. The chief

sedimentary rocks are: conglomerate, from gravel; sandstone, from sand; shale, from clay; and limestone, from soft masses of calcium carbonate. There are many intermediate types. some wind-deposited sands have been consolidated into sandstone.

Silt. Individual mineral particles in a soil that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). Soil of the silt textural class is 80 percent of more silt and less than 12 percent clay.

Soil. A natural, three-dimensional formation on the earth's surface that supports plants and that has properties resulting from the effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles, less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes 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). The separates recognized by the International Society of Soil science are as follows: I (2.0 to 0.2 millimeter); II (0.2 to 0.02 millimeter); III (0.02 to 0.002 millimeter); IV (less than 0.002 millimeter).

Solum. The upper part of a 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 plant and animal life characteristic of the soil are largely confined to the solum.

Structure, soil. The arrangement of primary soil particles into compound particles of 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) or (2) massive (the particles adhering together without any regular cleavage, as in some claypans and hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the soil below plow depth.

Subsoiling. Tillage of a soil below normal depth ordinarily to shatter a hardpan or claypan.

Substratum. Technically the part of the soil below the subsoil.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness. The plowed layer.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surplus runoff so that it may soak into the soil or flow slowly to a prepared outlet without harm. Terraces in fields are generally built so they can be farmed. Terraces intended mainly for drainage have a deep channel that is maintained in permanent sod.

Terrace (geological). An old alluvial plain, ordinarily nearly level or undulating, bordering a river, lake, or the sea. Stream terraces are frequently called second bottoms, as contrasted to flood plains, and are seldom subject to overflow. Marine terraces were deposited by the sea and are generally wide.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, and clay. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or " very fine."

Tilth, soil. The condition of the soil in relation to the growth of plants, especially soil structure. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable, granular structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Topsoil. A presumed fertile soil or soil material, or one that responds to fertilization, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

Variant, soil. A soil having properties sufficiently different from those of other known soils to suggest establishing a new soil series, but a soil of such limited known area that creation of a new series is not justified.

Water table. The highest part of the soil or underlying rock material that is wholly saturated with water. In some places an upper, or perched, water table may be separated from a lower one by a dry zone.

Workability, soil. The ralative amount of work required to till the soil and the relative difficulty in using farm machinery.

GUIDE TO MAPPING UNITS

For complete information about a mapping unit, read both the description of the mapping unit and that of the soil series to which the mapping unit belongs. Soils that are used mainly for crops are not assigned to a range site. Information on crop management is given in the descriptions of the capability units. Other information is given in tables, as follows:

Acreage and extent, table 1.
Estimated yields, table 2.

Use of soils in engineering, tables 3, 4, and 5, pages 114 through 163.

Map symbol	Mapping unit	Page	Capability unit		Range site		Storie index rating
			Symbol	Page	Name	Page	Number
AdA	Agueda loam, 0 to 2 percent slopes	13	IIs-0(14)	88	---	---	95
AgA	Agueda silty clay loam, 0 to 2 percent slopes	14	I-1(14)	87	---	---	90
AgC	Agueda silty clay loam, 2 to 9 percent slopes	14	IIe-1(14), IIe-1(15)	88 92	Clayey	107	81
ArD	Arnold sand, 5 to 15 percent slopes	15	VIe-4(15)	94	Sandy	109	20
ArF	Arnold sand, 15 to 45 percent slopes	15	VIIe-4(15)	94	Sandy	109	15
ArF3	Arnold sand, 9 to 45 percent slopes, severely eroded	15	VIIe-4(15)	94	Eroded or Shallow Sandy	109	15
BaA	Ballard fine sandy loam, 0 to 2 percent slopes	16	I-1(14)	87	Loamy	107	80
BaC	Ballard fine sandy loam, 2 to 9 percent slopes	16	IIe-1(14), IIIe-1(15)	88 92	Loamy	107	72
BaD	Ballard fine sandy loam, 9 to 15 percent slopes	16	IVe-1(15)	92	Loamy	107	53
BbA	Ballard gravelly fine sandy loam, 0 to 2 percent slopes	16	IIs-4(14)	88	Loamy	107	64
BbC	Ballard gravelly fine sandy loam, 2 to 9 percent slopes	16	IIe-1(14), IIIe-1(15)	88 92	Loamy	107	58
BbD	Ballard gravelly fine sandy loam, 9 to 15 percent slopes	17	IVe-1(15)	92	Loamy	107	45
BcE	Ballinger silty clay, 15 to 30 percent slopes	18	VIIe-9(15)	95	Gypsum Hills	110	17
BcF	Ballinger silty clay, 30 to 45 percent slopes	18	VIIe-9(15)	95	Gypsum Hills	110	14
BcG	Ballinger silty clay, 45 to 75 percent slopes	18	VIIe-9(15)	95	Gypsum Hills	110	11
Bd	Bayshore loam, drained	19	IIw-2(14)	89	---	---	95
Be	Bayshore loam, sandy substratum, drained	19	IIw-2(14)	89	---	---	95
Bg	Bayshore silty clay loam	19	IIIw-2(14)	90	---	---	86
Bh	Bayshore silty clay loam, drained	19	IIw-2(14)	89	---	---	86
BmA	Betteravia loamy sand, 0 to 2 percent slopes	20	IVe-4(14), VIe-4(15)	90 93	Sandy	109	50
BmA3	Betteravia loamy sand, 0 to 2 percent slopes, severely eroded	21	VIIe-4(15)	94	Eroded or Shallow Sandy	109	34
BmC	Betteravia loamy sand, 2 to 9 percent slopes	21	IVe-4(14), VIe-4(15)	90 94	Sandy	109	38
BnB2	Betteravia loamy sand, dark variant, 0 to 5 percent slopes, eroded	22	IVe-4(14), IVe-4(15)	90 93	Sandy	109	47
BnD2	Betteravia loamy sand, dark variant, 5 to 15 percent slopes, eroded	22	IVe-4(14), IVe-4(15)	90 93	Sandy	109	39
BoA	Botella loam, 0 to 2 percent slopes	23	I-1(14)	87	---	---	95
BoA2	Botella loam, 0 to 2 percent slopes, eroded	23	IIe-1(14), IIe-1(15)	88 92	Loamy	107	71
BoC	Botella loam, 2 to 9 percent slopes	23	IIe-1(14), IIe-1(15)	88 92	Loamy	107	77
BoD2	Botella loam, 2 to 15 percent slopes, eroded	23	IIIe-1(15)	92	Loamy	107	48
BsA	Botella loam, slightly wet, 0 to 2 percent slopes	24	IIw-2(14)	89	---	---	67
BtA	Botella clay loam, 0 to 2 percent slopes	24	I-1(14)	87	---	---	73

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Map symbol	Mapping unit	Page	Capability unit Symbol	Page	Range site Name	Page	Storie index rating Number
BtA2	Botella clay loam, 0 to 2 percent slopes, eroded	24	IIe-1(14), IIe-1(15)	88 92	Clayey	107	57
BtC	Botella clay loam, 2 to 9 percent slopes	24	IIe-1(14), IIe-1(15)	88 92	Clayey	107	65
BtD2	Botella clay loam, 2 to 15 percent slopes, eroded	24	IIIe-1(15)	92	Clayey	107	48
BwA	Botella clay loam, wet, 0 to 2 percent slopes	24	IIIw-2(14)	90	Clayey	107	56
Ca	Camarillo sandy loam	25	IIw-2(14)	89	Loamy	107	72
Cb	Camarillo sandy loam, drained	26	IIw-2(14)	89	----------	---	72
Cc	Camarillo very fine sandy loam	26	IIw-2(14)	89	Loamy	107	76
Cd	Camarillo silty clay loam	26	IIw-2(14)	89	----------	---	72
CeC	Chamise sandy loam, 5 to 9 percent slopes	27	IIIe-1(14), IVe-1(15)	89 92	Loamy	107	58
CeE2	Chamise sandy loam, 5 to 30 percent slopes, eroded	27	VIe-1(15)	93	Loamy	107	37
CfD	Chamise shaly sandy loam, 9 to 15 percent slopes	27	IVe-1(15)	92	Loamy	107	45
CgC	Chamise loam, 2 to 9 percent slopes	28	IIIe-1(14), IVe-1(15)	89 92	Loamy	107	65
ChD	Chamise shaly loam, 9 to 15 percent slopes	28	IVe-1(15)	92	Loamy	107	48
ChF	Chamise shaly loam, 15 to 45 percent slopes	28	VIe-1(15)	93	Loamy	107	36
ChG	Chamise shaly loam, 45 to 75 percent slopes	28	VIIe-1(15)	94	Steep Loamy	108	18
ChG2	Chamise shaly loam, 30 to 75 percent slopes, eroded	28	VIIe-1(15)	94	Shallow Loamy	108	15
CkF	Chamise clay loam, 30 to 45 percent slopes	28	VIe-1(15)	93	Clayey	107	27
CmF	Climara-Toomes complex, 15 to 45 percent slopes	29					
	Climara	--	VIe-5(15)	94	Clayey	107	26
	Toomes	--	VIe-5(15)	94	Shallow Loamy	108	26
CnB	Coastal beaches	29	VIIIw-4(14)	91	----------	---	5
CoB	Cobbly alluvial land	29	VIIw-4(14)	91	Sandy Alluvial	109	17
CrE	Contra Costa-Lodo loams, 15 to 30 percent slopes	30					
	Contra Costa	--	VIe-1(15)	93	Loamy	107	25
	Lodo	--	VIe-1(15)	93	Shallow Loamy	108	25
CrF	Contra Costa-Lodo loams, 30 to 45 percent slopes	31					
	Contra Costa	--	VIe-1(15)	93	Loamy	107	18
	Lodo	--	VIe-1(15)	93	Shallow Loamy	108	18
CrG	Contra Costa-Lodo loams, 45 to 75 percent slopes	31	VIIe-1(15)	94	Steep Loamy	108	13
CsG	Contra Costa-Lodo stony loams, 30 to 75 percent slopes	31	VIIe-1(15)	94	Steep Loamy	108	11
CtA	Corralitos sand, 0 to 2 percent slopes	32	IVe-4(14), VIe-4(15)	90 94	Sandy	109	48
CtD	Corralitos sand, 2 to 15 percent slopes	32	IVe-4(14), VIe-4(15)	90 94	Sandy	109	38
CtD2	Corralitos sand, 9 to 15 percent slopes, eroded	32	VIe-4(15)	94	Sandy	109	29
CuA	Corralitos loamy sand, 0 to 2 percent slopes	32	IIIs-4(14), IVe-4(15)	90 93	Sandy	109	64
CuC	Corralitos loamy sand, 2 to 9 percent slopes	32	IIIs-4(14), IVe-4(15)	90 93	Sandy	109	58
CuD	Corralitos loamy sand, 9 to 15 percent slopes	32	IVe-4(14), VIe-4(15)	90 93	Sandy	109	45
Cv	Cropley silty clay	33	IIs-5(14)	89	----------	---	67
CwE	Crow Hill loam, 15 to 30 percent slopes	34	IVe-1(15)	92	Loamy	107	31
CwF	Crow Hill loam, 30 to 45 percent slopes	34	VIe-1(15)	93	Loamy	107	24

Map symbol	Mapping unit	Page	Capability unit Symbol	Page	Range site Name	Page	Storie index rating Number
CwG	Crow Hill loam, 45 to 75 percent slopes	35	VIIe-1(15)	94	Steep Loamy	108	13
CwG3	Crow Hill loam, 15 to 75 percent slopes, severely eroded	35	VIIe-1(15)	94	Shallow Loamy	108	18
DaD	Diablo silty clay, 9 to 15 percent slopes	36	IIIe-5(15)	92	Clayey	107	34
DaE	Diablo silty clay, 15 to 30 percent slopes	36	IVe-5(15)	93	Clayey	107	32
DaF	Diablo silty clay, 30 to 45 percent slopes	36	VIe-5(15)	94	Clayey	107	23
DaF3	Diablo silty clay, 15 to 45 percent slopes, severely eroded	36	VIIe-5(15)	94	Shallow Clayey	108	17
DaG	Diablo silty clay, 45 to 75 percent slopes	36	VIIe-5(15)	94	Clayey	107	13
DuE	Dune land	36	VIIIe-4(14)	91	----------	---	5
EdA	Elder sandy loam, 0 to 2 percent slopes	37	I-1(14)	87	----------	---	95
EdA2	Elder sandy loam, 0 to 2 percent slopes, eroded	37	IIe-1(14), IIIe-1(15)	88 92	Loamy	107	90
EdC2	Elder sandy loam, 2 to 9 percent slopes, eroded	37	IIIe-1(15)	92	Loamy	107	77
EdD2	Elder sandy loam, 9 to 15 percent slopes, eroded	38	IVe-1(15)	92	Loamy	107	56
EmA	Elder loam, 0 to 2 percent slopes	38	I-1(14)	87	----------	---	100
EmC	Elder loam, 2 to 9 percent slopes	38	IIe-1(14), IIe-1(15)	88 92	Loamy	107	86
EnA2	Elder shaly loam, 0 to 2 percent slopes, eroded	38	IIe-1(14), IIe-1(15)	88 92	Loamy	107	67
EnC2	Elder shaly loam, 2 to 9 percent slopes, eroded	38	IIe-1(15)	92	Loamy	107	55
EnD2	Elder shaly loam, 9 to 15 percent slopes, eroded	38	IIIe-1(15)	92	Loamy	107	43
GaA2	Garey sandy loam, 0 to 2 percent slopes, eroded	39	IIe-3(14)	88	Loamy	107	45
GaC2	Garey sandy loam, 2 to 9 percent slopes, eroded	40	IIIe-1(14), IIIe-1(15)	89 92	Loamy	107	41
GaE2	Garey sandy loam, 9 to 30 percent slopes, eroded	40	VIe-1(15)	93	Loamy	107	30
GaE3	Garey sandy loam, 5 to 30 percent slopes, severely eroded	40	VIIe-1(15)	94	Shallow Loamy	108	18
GbB	Garey loam, wet variant, 0 to 5 percent slopes	41	IIw-2(14)	89	Loamy	107	38
GmD	Gaviota sandy loam, 5 to 15 percent slopes	42	VIe-1(15)	93	Shallow Loamy	108	31
GmE	Gaviota sandy loam, 15 to 30 percent slopes	42	VIe-1(15)	93	Shallow Loamy	108	25
GmG	Gaviota sandy loam, 30 to 75 percent slopes	42	VIIe-1(15)	94	Shallow Loamy	108	14
GsD	Gazos clay loam, 9 to 15 percent slopes	43	IVe-1(15)	92	Loamy	107	33
GsE	Gazos clay loam, 15 to 30 percent slopes	43	IVe-1(15)	92	Loamy	107	30
GsF	Gazos clay loam, 30 to 45 percent slopes	43	VIe-1(15)	93	Loamy	107	19
GsG	Gazos clay loam, 45 to 75 percent slopes	43	VIIe-1(15)	94	Steep Loamy	108	11
GuE	Gullied land	43	VIIIe-1(14)	91	----------	---	5
IrG	Igneous rock land	43	VIIIs-1(15)	95	----------	---	5
KtE	Kettleman fine sandy loam, 9 to 30 percent slopes	44	VIIe-9(15)	94	Arid Loamy	109	35
KtE3	Kettleman fine sandy loam, 15 to 30 percent slopes, severely eroded	44	VIIe-9(15)	95	Arid Loamy	109	27
KtG	Kettleman fine sandy loam, 30 to 75 percent slopes	44	VIIe-9(15)	95	Arid Loamy	109	17
LaF	Landslides	45	VIIe-5(15)	94	Shallow Clayey	107	12
LcD	Linne clay loam, 9 to 15 percent slopes	46	IIIe-1(15)	92	Clayey	107	36
LcE	Linne clay loam, 15 to 30 percent slopes	46	IVe-1(15)	92	Clayey	107	33
LcF	Linne clay loam, 30 to 45 percent slopes	46	VIe-1(15)	93	Clayey	107	26
LcG	Linne clay loam, 45 to 75 percent slopes	46	VIIe-1(15)	94	Clayey	107	15
LdG	Lodo loam, 30 to 75 percent slopes	47	VIIe-1(15)	94	Shallow Loamy	108	14
LkG	Lopez rocky loam, 75 to 100 percent slopes	47	VIIIs-1(15)	95	----------	---	6

Map symbol	Mapping unit	Page	Capability unit Symbol	Page	Range site Name	Page	Storie index rating Number
LmG	Lopez shaly clay loam, 15 to 75 percent slopes-	48	VIIe-1(15)	94	Shallow Loamy	108	13
LoE	Los Osos clay loam, 15 to 30 percent slopes----	48	IVe-3(15)	93	Clayey	107	30
LoG	Los Osos clay loam, 30 to 75 percent slopes----	49	VIIe-1(15)	94	Clayey	107	16
LsE	Los Osos-San Benito clay loams, 15 to 30 percent slopes----------	49	IVe-3(15)	93	Clayey	107	30
LsF	Los Osos-San Benito clay loams, 30 to 45 percent slopes----------	49	VIe-3(15)	93	Clayey	107	22
LsG3	Los Osos-San Benito clay loams, 30 to 75 percent slopes, severely eroded----------	49	VIIe-1(15)	94	Clayey	107	14
MaA	Marina sand, 0 to 2 percent slopes----------	50	IVe-4(14), VIe-4(15)	90 94	Sandy	109	51
MaC	Marina sand, 2 to 9 percent slopes----------	50	IVe-4(14), VIe-4(15)	90 94	Sandy	109	46
MaE	Marina sand, 9 to 30 percent slopes----------	50	VIIe-4(15)	94	Sandy	109	30
MaE3	Marina sand, 9 to 30 percent slopes, severely eroded----------	50	VIIe-4(15)	94	Eroded or Shallow Sandy	109	22
Mh	Marsh----------	51	VIIw-9(14)	91	Saline	110	5
MmG	Maymen stony loam, 45 to 75 percent slopes-----	51	VIIIs-1(15)	95	----------	---	7
MnA	Metz loamy sand, 0 to 2 percent slopes---------	52	IIIs-4(14), IIIs-4(17)	90 96	Sandy, Arid Sandy	109 109	72
MnC	Metz loamy sand, 2 to 9 percent slopes---------	52	IIIs-4(14)	90	Sandy	109	65
MnC2	Metz loamy sand, 2 to 9 percent slopes, eroded-	52	IIIs-4(17)	96	Arid Sandy	109	52
MoA	Metz loamy sand, overflow, 0 to 2 percent slopes----------	53	IIIs-4(14), IIIs-4(17)	90 96	Sandy, Arid Sandy	109 109	65
MpG	Mine pits and dumps----------	53	VIIIs-1(15)	95	----------	---	2
Mr	Mocho sandy loam, overflow----------	54	IIw-1(14)	89	----------	---	76
Ms	Mocho sandy loam, sandy substratum----------	54	IIs-0(14)	88	----------	---	86
Mt	Mocho sandy loam, sandy substratum, overflow---	54	IIw-1(14)	89	----------	---	68
Mu	Mocho fine sandy loam----------	54	I-1(14)	87	----------	---	100
Mv	Mocho loam----------	54	I-1(14)	87	----------	---	100
Mw	Mocho loam, overflow----------	54	IIw-1(14)	89	----------	---	80
Mx	Mocho silty clay loam----------	55	I-1(14)	87	----------	---	90
MyG	Montara rocky clay loam, 30 to 75 percent slopes----------	55	VIIe-9(15)	95	Shallow Loamy	108	12
NrB	Narlon sand, 0 to 5 percent slopes----------	56	VIe-4(15)	94	Sandy	109	27
NsA	Narlon loamy sand, 0 to 2 percent slopes-------	57	IVe-3(15)	93	Sandy	109	43
NsC	Narlon loamy sand, 2 to 9 percent slopes-------	57	IVe-3(15)	93	Sandy	109	34
NsD	Narlon loamy sand, 9 to 15 percent slopes------	57	VIIe-4(15)	94	Sandy	109	27
NvA	Narlon sand, hardpan variant, 0 to 2 percent slopes----------	58	IVe-4(14), VIe-4(15)	90 94	Sandy	109	29
NvC	Narlon sand, hardpan variant, 2 to 9 percent slopes----------	58	IVe-4(14), VIe-4(15)	90 94	Sandy	109	26
OcA	Oceano sand, 0 to 2 percent slopes----------	59	IVe-4(14), VIe-4(15)	90 94	Sandy	109	48
OcD	Oceano sand, 2 to 15 percent slopes----------	59	IVe-4(14), VIe-4(15)	90 94	Sandy	109	38
OcD3	Oceano sand, 2 to 15 percent slopes, severely eroded----------	60	VIIe-4(15)	94	Eroded or Shallow Sandy	109	25
PcA	Panoche sandy loam, 0 to 2 percent slopes------	60	I-1(17)	95	----------	---	95
PcC	Panoche sandy loam, 2 to 9 percent slopes------	61	IIe-1(17)	96	Arid Loamy	109	86
PdA	Panoche sandy loam, overflow, 0 to 2 percent slopes----------	61	IIw-1(17)	96	----------	---	68

Map symbol	Mapping unit	Page	Capability unit: Symbol	Capability unit: Page	Range site: Name	Range site: Page	Storie index rating: Number
PdB	Panoche sandy loam, overflow, 2 to 5 percent slopes	61	IIw-1(17)	96	Arid Loamy	109	76
PeA	Panoche loam, 0 to 2 percent slopes	61	I-1(17)	95	----------	---	100
PeC	Panoche loam, 2 to 9 percent slopes	61	IIe-1(17)	96	Arid Loamy	109	90
PfA	Panoche loam, overflow, 0 to 2 percent slopes	61	IIw-1(17)	96	----------	---	80
PnA	Pleasanton sandy loam, 0 to 2 percent slopes	62	I-1(14)	87	----------	---	76
PnC	Pleasanton sandy loam, 2 to 9 percent slopes	62	IIIe-1(14), IIIe-1(15)	89, 92	Loamy	107	62
PnD	Pleasanton sandy loam, 9 to 15 percent slopes	63	IVe-1(15)	92	Loamy	107	44
PoE	Pleasanton cobbly sandy loam, 5 to 30 percent slopes	63	VIe-1(15)	93	Loamy	107	31
PrA	Pleasanton very fine sandy loam, 0 to 2 percent slopes	63	I-1(14)	87	----------	---	76
PrC	Pleasanton very fine sandy loam, 2 to 9 percent slopes	63	IIIe-1(14), IIIe-1(15)	89, 92	Loamy	107	72
PsD	Pleasanton gravelly very fine sandy loam, 9 to 15 percent slopes	63	IVe-1(15)	92	Loamy	107	45
PtC	Positas fine sandy loam, 2 to 9 percent slopes	64	IIIe-3(14), IVe-3(15)	90, 93	Claypan	108	49
PtD	Positas fine sandy loam, 9 to 15 percent slopes	64	VIe-3(15)	93	Claypan	108	38
PtD3	Positas fine sandy loam, 9 to 15 percent slopes, severely eroded	65	VIIe-1(15)	94	Claypan	108	29
PtE	Positas fine sandy loam, 15 to 30 percent slopes	65	VIe-3(15)	93	Claypan	108	31
PuD	Positas cobbly fine sandy loam, 2 to 15 percent slopes	65	VIe-3(15)	93	Claypan	108	27
Rs	Riverwash	65	VIIIw-4(14)	91	----------	---	2
RuG	Rough broken land	65	VIIIe-1(14)	91	----------	---	5
SaA	Salinas loam, 0 to 2 percent slopes	66	I-1(14)	87	----------	---	90
SaC	Salinas loam, 2 to 9 percent slopes	66	IIe-1(14)	88	----------	---	73
SbA	Salinas loam, overflow, 0 to 2 percent slopes	66	IIw-1(14)	89	----------	---	72
SdA	Salinas silty clay loam, 0 to 2 percent slopes	67	I-1(14)	87	----------	---	86
SdC	Salinas silty clay loam, 2 to 9 percent slopes	67	IIe-1(14)	88	----------	---	73
SeD	Salinas and Sorrento loams, 9 to 15 percent slopes	67	IIIe-1(15)	92	Loamy	107	57
SfD	San Andreas-Tierra complex, 5 to 15 percent slopes	68					
	San Andreas	--	IVe-3(15)	93	Loamy	107	36
	Tierra	--	IVe-3(15)	93	Claypan	108	36
SfE	San Andreas-Tierra complex, 15 to 30 percent slopes	68					
	San Andreas	--	VIe-3(15)	93	Loamy	107	29
	Tierra	--	VIe-3(15)	93	Claypan	108	29
SfF3	San Andreas-Tierra complex, 9 to 45 percent slopes, severely eroded	68					
	San Andreas	--	VIIe-1(15)	94	Shallow Loamy	108	25
	Tierra	--	VIIe-1(15)	94	Claypan	108	25
SfG	San Andreas-Tierra complex, 30 to 75 percent slopes	69					
	San Andreas	--	VIIe-1(15)	94	Steep Loamy	108	16
	Tierra	--	VIIe-1(15)	94	Claypan	108	16
SgF	San Benito-Diablo complex, 30 to 45 percent slopes	69	VIe-5(15)	94	Clayey	107	19
SgG	San Benito-Diablo complex, 45 to 75 percent slopes	70	VIIe-5(15)	94	Clayey	107	14
Sh	Sandy alluvial land	70	VIIw-4(14)	91	Sandy Alluvial	109	24
Sk	Sandy alluvial land, wet	70	VIIw-9(14)	91	Saline	110	24

Map symbol	Mapping unit	Page	Capability unit Symbol	Page	Range site Name	Page	Storie index rating Number
SmD	Santa Lucia shaly clay loam, 9 to 15 percent slopes	71	IIIe-1(15)	92	Loamy	107	30
SmE	Santa Lucia shaly clay loam, 15 to 30 percent slopes	71	IVe-1(15)	92	Loamy	107	28
SmF	Santa Lucia shaly clay loam, 30 to 45 percent slopes	71	VIe-1(15)	93	Loamy	107	24
SmF2	Santa Lucia shaly clay loam, 15 to 45 percent slopes, eroded	71	VIIe-1(15)	94	Shallow Loamy	108	17
SmG	Santa Lucia shaly clay loam, 45 to 75 percent slopes	71	VIIe-1(15)	94	Steep Loamy	108	16
SnC	Santa Ynez gravelly fine sandy loam, 2 to 9 percent slopes	73	IIIe-3(14), IVe-3(15)	90 93	Claypan	108	34
SnD	Santa Ynez gravelly fine sandy loam, 9 to 15 percent slopes	73	IVe-3(15)	93	Claypan	108	23
SoC	Santa Ynez clay loam, 2 to 9 percent slopes	73	IIIe-3(14), IVe-3(15)	90 93	Claypan	108	37
SoE	Santa Ynez clay loam, 9 to 30 percent slopes	73	VIe-3(15)	93	Claypan	108	23
SpG	Sedimentary rock land	73	VIIIs-1(15)	95	----------	---	2
SrE	Shedd silty clay loam, 15 to 30 percent slopes	74	IVe-1(15)	92	Clayey	107	32
SrF	Shedd silty clay loam, 30 to 45 percent slopes	74	VIe-1(15)	93	Clayey	107	24
SrG	Shedd silty clay loam, 45 to 75 percent slopes	74	VIIe-1(15)	94	Clayey	107	18
SrG3	Shedd silty clay loam, 30 to 75 percent slopes, severely eroded	74	VIIe-1(15)	94	Shallow Clayey	107	15
SsE	Shedd silty clay loam, diatomaceous variant, 15 to 30 percent slopes	75	IVe-1(15)	92	Clayey	107	35
SsF	Shedd silty clay loam, diatomaceous variant, 30 to 45 percent slopes	75	VIe-1(15)	93	Clayey	107	24
SsG	Shedd silty clay loam, diatomaceous variant, 45 to 75 percent slopes	75	VIIe-1(15)	94	Clayey	107	19
StA	Sorrento sandy loam, 0 to 2 percent slopes	76	I-1(14)	87	----------	---	95
StC	Sorrento sandy loam, 2 to 9 percent slopes	76	IIe-1(14)	88	----------	---	86
SuA	Sorrento sandy loam, sandy substratum, 0 to 2 percent slopes	77	IIs-0(14)	88	----------	---	86
SvA	Sorrento loam, 0 to 2 percent slopes	77	I-1(14)	87	----------	---	100
SvC	Sorrento loam, 2 to 9 percent slopes	77	IIe-1(14)	88	----------	---	86
SwB2	Sorrento clay loam, 0 to 5 percent slopes, eroded	77	IIe-1(14)	88	----------	---	65
Sx	Stutzville loamy sand	78	IIIs-6(17)	96	Saline	110	61
Sy	Stutzville sandy loam	78	IIs-6(17)	96	Saline	110	73
Sz	Stutzville loam	78	IIs-6(17)	96	Saline	110	76
Sza	Stutzville loam, strongly saline	78	IIIs-6(17)	96	Saline	110	72
Szb	Stutzville silty clay loam	79	IIs-6(17)	96	Saline	110	65
Szc	Stutzville silty clay loam, strongly saline	79	IIIs-6(17)	96	Saline	110	57
Szw	Swamp	79	VIIw-9(14)	91	Saline	110	5
TaA	Tangair sand, 0 to 2 percent slopes	80	VIe-4(15)	94	Sandy	109	24
TaC	Tangair sand, 2 to 9 percent slopes	80	VIe-4(15)	94	Sandy	109	19
TcG	Terrace escarpments, sandy	80	VIIe-4(15)	94	Eroded or Shallow Sandy	109	2
TdF	Terrace escarpments, loamy	80	VIIe-1(15)	94	Shallow Loamy	108	8
TeG	Terrace escarpments, cobbly	81	VIIe-1(15)	94	Shallow Loamy	108	5
TmC	Tierra loamy sand, 2 to 9 percent slopes	82	VIe-3(15)	93	Claypan	108	29
TmE	Tierra loamy sand, 9 to 30 percent slopes	82	VIe-3(15)	93	Claypan	108	18
TnC	Tierra sandy loam, 2 to 9 percent slopes	82	IIIe-3(14), IVe-3(15)	90 93	Claypan	108	34
TnD2	Tierra sandy loam, 9 to 15 percent slopes, eroded	82	IVe-3(15)	93	Claypan	108	23
TnE2	Tierra sandy loam, 15 to 30 percent slopes, eroded	82	VIe-3(15)	93	Claypan	108	18

Map symbol	Mapping unit	Page	Capability unit		Range site		Storie index rating
			Symbol	Page	Name	Page	Number
TrC	Tierra loam, 2 to 9 percent slopes	82	IIIe-3(14), IVe-3(15)	90 93	Claypan	108	36
TrD	Tierra loam, 9 to 15 percent slopes	82	IVe-3(15)	93	Claypan	108	25
TrE2	Tierra loam, 15 to 30 percent slopes, eroded	83	VIe-3(15)	93	Claypan	108	19
TrE3	Tierra loam, 5 to 30 percent slopes, severely eroded	83	VIIe-1(15)	94	Claypan	108	17
TsF	Tierra clay loam, 15 to 45 percent slopes	83	VIe-3(15)	93	Claypan	108	18
TxG	Toomes-Climara complex, 30 to 75 percent slopes	84					
	Toomes	--	VIIe-1(15)	94	Shallow Clayey	107	13
	Climara	--	VIIe-1(15)	94	Clayey	107	13
WaB	Wasioja fine sandy loam, 2 to 5 percent slopes	85	IIe-1(17) VIIe-9(15)	95 95	Arid Loamy	109	68
WaC	Wasioja fine sandy loam, 5 to 9 percent slopes	85	VIIe-9(15)	95	Arid Loamy	109	58
WaD	Wasioja fine sandy loam, 9 to 15 percent slopes	85	VIIe-9(15)	95	Arid Loamy	109	39
WcC	Wasioja cobbly fine sandy loam, 2 to 9 percent slopes	85	VIIe-9(15)	95	Arid Loamy	109	38
WcF	Wasioja cobbly fine sandy loam, 9 to 45 percent slopes	85	VIIe-9(15)	95	Arid Loamy	109	23