USDA United States Department of Agriculture

Natural Resources Conservation Service

In cooperation with the Regents of the University of California (Agricultural Experiment Station), the California Department of Conservation, and Tulare County

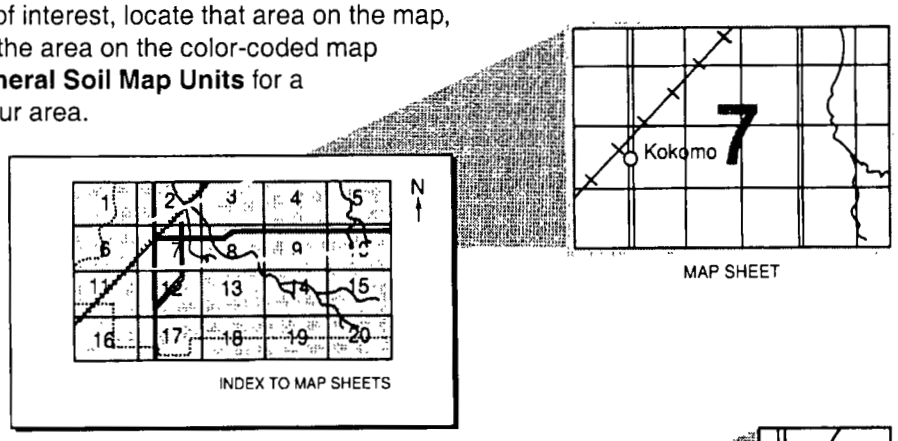
Soil Survey of Tulare County, California, Western Part

How To Use This Soil Survey

General Soil Map

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

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

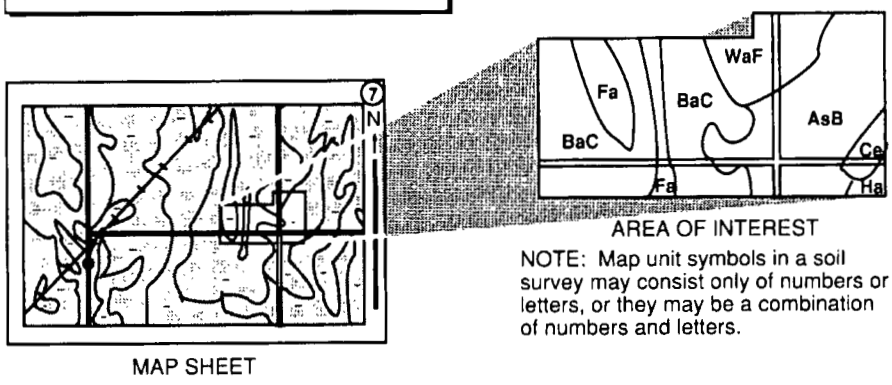


Detailed Soil Maps

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

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

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



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

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

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

Major fieldwork for this soil survey was completed in 1993. Soil names and descriptions were approved in 1999. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1993. This survey was made cooperatively by the Natural Resources Conservation Service, the Regents of the University of California (Agricultural Experiment Station), the California Department of Conservation, and Tulare County.

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

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Cover: Dryland pasture in an area of Grangeville sandy loam, drained, 0 to 2 percent slopes, along the Kaweah River.

Additional information about the Nation's natural resources is available on the Natural Resources Conservation Service homepage on the World Wide Web. The address is http://www.nrcs.usda.gov (click on "Technical Resources").

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Foreword

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

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

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

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

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

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Soil Survey of Tulare County, California, Western Part

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

Tulare County, California, western part, is south of the geographic center of California (figure 1). It is in the eastern part of the San Joaquin Valley. It is bounded on the east by the central part of Tulare County, approximated by a line connecting the towns of Seville, Exeter, Strathmore and Ducor; on the south by Kern County; on the north by Fresno County; and on the west by Kings County. The survey area has an area of 777,060 acres, or about 1,214 square miles. It ranges from 9 miles wide in the northern part to 27 miles wide in the southern part. It is 54 miles in length from north to south.

Most of the soils in the western part of Tulare County are used for irrigated agriculture. A few areas are used as sites for towns or related urban development. Elevation ranges from about 190 feet along the edge of Tulare Lake to a high of about 870 feet on top of Venice Hill.

This soil survey updates the survey of the Visalia area published in 1940 (Storie, 1940) and the survey of the Pixley area published in 1942 (Storie, 1942). It provides additional information and has larger maps, which show the soils in greater detail.

Figure 1.—Location of the survey area in California.

General Nature of the Survey Area

This section gives general information about the western part of Tulare County. It describes history and development; native vegetation; water supply; agriculture; physiography, relief and drainage; altered soils; and climate.

History and Development

Tribes of the Yokut Indians and some 30 or more subtribes of the Yokuts lived in the survey area before settlers, explorers, and miners arrived. The villages used by the Indians are still recognized by the dark

surface of the midden areas, the scattering of shells, chips of obsidian, and an occasional arrowhead. These Indians lived along the shores of Tulare Lake and in the extensive riparian areas along the major rivers, mainly the Kaweah.

Tulare County was formed in 1852 from the southern part of Mariposa County. At that time, Tulare County covered land from Mariposa County to Los Angeles County. At later dates, parts of Fresno, Kings, Inyo, and Kern Counties were made out of the original Tulare County (Michell, 1972). In 1853, Visalia, named after the Kentucky home of city founder Nathan Vise (Preston, 1981), became the county seat of Tulare County.

In 1805, Gabriel Moraga, one of the earliest known explorers, came to the survey area in search of sites for missions. He gave Spanish names to the rivers he crossed on his way through the valley, including the Kings River. The Kaweah River was given its name by early settlers, after the Gawia, a tribe of Yokuts that inhabited the region along the Kaweah River (Preston, 1981). The Tule River was named by early settlers for the rushes that flourished along its banks.

Jedediah Smith and his party were the first known trappers to come to the San Joaquin Valley in 1827. John C. Fremont, with Kit Carson as his guide, camped near the Kaweah River in 1844.

Settlement accelerated at the time of the gold rush in 1855. Mining continued in the area into the 1870s. After the gold rush, many people turned to open range grazing of cattle and sheep. Before the railroads, residents of Tulare County were dependent on wagon and stage roads. After the railroads were extended and a better market for agricultural commodities was established, more and more people turned to farming, mostly dryland wheat farming. Wheat farming prospered in the county through the 1880s, and California ranked first or second in the Nation in wheat production throughout the period. In 1884, more than 90 percent of the cropland was planted to wheat. Grain profits plummeted, reaching a low in 1894. Farmers began to turn to more profitable crops. Because of the low rainfall in the area, crudely built canals were constructed to obtain water from the Kaweah River; thus, irrigated farming developed.

According to the United States Department of Commerce, Bureau of the Census, the population of Tulare County was 149,264 in 1950 and 311,921 in 1990.

About 95 percent of the land in the survey area is privately owned. The remaining acreage is in city and county parks. National forest lands and national parklands are generally excluded from the survey area, but the Pixley National Wildlife Refuge, which makes up about 5,992 acres, is included.

Opportunities for recreation are limited because almost all of the land in the survey area is used as irrigated cropland, the great majority of which is leveled. When this survey was made, the survey area had three preserves of the Nature Conservancy—the Kaweah Oaks Preserve, along the Kaweah River (figure 2); the Creighton Ranch Preserve, along the Tule River; and the Pixley Vernal Pool Preserve. These preserves are examples of the last remaining vestiges of natural landforms and unaltered soils. Colonel Allensworth State Historic Park is in the southwestern part of the survey area (figure 3). Founded in 1908, it was the first community in the United States to be completely owned and managed by African-Americans.

Throughout the survey area, state highways and secondary roads connect the smaller communities. Trucklines, airlines, buslines, and two railroads provide shipping facilities and transportation.

Native Vegetation

The valley soils are mostly cultivated and support a variety of irrigated crops. Some native vegetation remains on alluvial fans and fan remnants and in small areas of unreclaimed saline-sodic soils. The native vegetation consisted of perennial grasses, forbs, shrubs, and California white oak on the alluvial fans and flood plains near rivers and streams (figure 4). On the alluvial fan of the Kaweah River, a continuous, dense forest of oaks originally extended from the foothills to the shore of Tulare Lake. Much of the native vegetation in the survey area has been replaced by introduced species or has been eliminated by cultivation and overgrazing.

The valley land originally supported large herds of elk, pronghorn antelope, and wild horses that grazed mainly on native grasses. Even as early as 1844, filaree, a forb from the Mediterranean region, was noted in the stands (Jepson, 1951). Marshes in the valley supported large areas of bulrush or tule and cattail. Trees and shrubs grew along many of the streams and rivers, as they do today. These include cottonwood, willow, western sycamore, wild rose, California blackberry, and California white oak.

In uncultivated areas on the fan remnants, the present vegetation consists mainly of red brome, soft

Figure 2.—The Kaweah Oaks Preserve of the Nature Conservancy, in an area of Grangeville and Akers soils, is one of the last remnants of native riparian habitat in the survey area.

chess, foxtail, and filaree. In places bur clover and wild oats grow on the finer textured soils in years when the supply of moisture is favorable. Many forbs, including such wildflowers as California poppy, blue lupine, brodiea, and buttercups, are conspicuous in spring.

The natural cover in areas of the saline-sodic soils consists of poor stands of red brome, soft chess, foxtail, and plants that tolerate salt and sodium, including saltgrass, alkali mallow, alkali barley, and alkali blite.

Weeds are a serious problem in cultivated areas. Bermudagrass provides good forage on irrigated pastures and makes a durable lawn in this climate, but it is a serious pest in fields of row crops and in vineyards. Other noxious weeds are starthistle, sandbur, Russian-thistle, Johnsongrass, mustard, and fiddleneck. Puncture vine is particularly troublesome in sandy soils along the shoulders of roads. Some of these weeds can be controlled by clean cultivation and introduced insects; others can be more effectively controlled by weedkillers.

Water Supply

Water of generally good to excellent quality is available in the survey area from streams, rivers, reservoirs, springs, canals, and rainfall. The natural source is runoff or accumulation of rainfall and snowfall from the Sierra Nevada. Winter accumulation of snow in the higher mountains provides a seasonal reservoir of water. The water flows to the area mainly through the Kaweah, Kings, and Tule Rivers. Water from the major rivers is stored in surface reservoirs behind dams and in subsurface aquifers. This water serves domestic, industrial, and agricultural users.

Water is diverted to the southern part of the San Joaquin Valley through the Friant-Kern Canal. This canal is along the eastern edge of the valley and is

Figure 3.—Colonel Allensworth State Historic Park, in an area of saline-sodic soils on the basin rim.

siphoned under the major rivers and larger streams. Water is diverted from the canal to irrigation districts. These irrigation districts distribute water to farmers in the central part of Tulare County.

The construction of Pine Flat, Success, and Terminus Dams, on the Kings, Tule, and Kaweah Rivers, has helped to control flooding (figure 5). The dams also help to regulate the use of surface and ground water. Regulation of water use is necessary because much of the farmland in the survey area is irrigated.

Pumping from the ground water reservoir supplies needed water during seasonal periods when surface water is unavailable or during years of below normal precipitation. The ground water is replenished by infiltration of rainfall and tailwater from irrigated fields; by seepage from streams, unlined canals, ditches, and ponds; and by underground flow of streams through permeable material in canyons (Davis et al., 1963). Because of increased development of irrigated cropland, an increasing population, and new industry, additional water supplies may be necessary.

Agriculture

Highly specialized, intensive farming that produces a wide variety of crops has developed in the survey area because of a combination of suitable soils, a plentiful supply of water for irrigation, and a long growing season.

Much of the income in Tulare County comes from the production of agricultural commodities. Tulare County often is the second or third county in the United States in total annual income from these commodities. In 1990, agricultural income totaled over $2,169 million (Tulare County, 1990). The number one commodity in the county is milk. Tulare County is the largest dairy-production county in the United States. Citrus, primarily navel and Valencia oranges, is the number two commodity in the county. Areas of citrus

are mostly along the edges of the foothills. Agricultural income from the sale of table grapes is usually third (figure 6), followed by beef cattle, almost all of which come from farmstead dairies. Cotton is the largest single crop grown, although the acreage of cotton varies widely from year to year, and usually ranks fifth in income. Plums are the most common fruit crop and are usually sixth in income. Other fruit crops of major importance include nectarines, peaches, olives, kiwi fruit, and prunes. Nut crops are also common. They include walnuts, almonds, and pistachio nuts. Alfalfa hay commonly ranks seventh in income. Other agricultural commodities include poultry, mostly turkeys; wheat, hogs, beans, barley, apples, avocados, vegetables, and seed crops. These crops can be grown on many of the soils countywide. Crop production has been enhanced by soil reclamation.

Nurseries in the county produce a wide variety of ornamental trees and shrubs, deciduous fruit and nut trees, citrus and subtropical trees, and grapes and berry vines. Large amounts of apiary products come from Tulare County, including honey and beeswax.

Physiography, Relief, and Drainage

The western part of Tulare County is entirely in the San Joaquin Valley. This valley forms the southern half of the Central Valley, which is enclosed on all sides by mountains, except where the Sacramento and San Joaquin Rivers enter San Francisco Bay. The Sierra Nevada forms a barrier on the eastern side of the valley. The western slope of the Sierra Nevada has many deep-cut river canyons. The soils in the western part of Tulare County formed dominantly in alluvial material deposited along the rivers draining the Sierra Nevada.

The western part of Tulare County is almost entirely nearly level and may be divided into three basic geomorphic units. These include the more recent alluvial fans and flood plains associated with the major drainages, the older fan remnants that occur between

Figure 4.—California white oaks on a dryland pasture in an area of Grangeville and Akers soils along the Kaweah River.

Figure 5.—Most of the soils in the survey area are very rarely or rarely flooded since the streams are controlled by upstream dams, levees, and canals. Historically, many areas were occasionally or frequently flooded.

the major drainages, and the basin rims and flood plains along the eastern edge of Tulare Lake. Two small hills occur in the northeastern part of the survey area and account for less than 1 percent of the area. All these areas slope toward the west.

The alluvial fans and flood plains along the Kings, Kaweah, Tule, and White Rivers and along Cross Creek and Deer Creek formed in the dominantly granitic alluvial material deposited as a result of runoff from the Sierra Nevada. The soils associated with these landforms account for more than half the acreage in the survey area. Most of these soils are prime farmland.

The older fan remnants occur in areas where more recent alluvial deposition has not occurred. These areas are far from the rivers and streams, either in between them and thus out of the path of recent deposition or adjacent to the basin rim and beyond the area of recent deposition.

The basin rims and flood plains along the eastern edge of Tulare Lake were at one time flooded in most wet years. Formed by the entrapped drainage of the Kings, Kaweah, Kern, White, and Tule Rivers, Tulare Lake once inundated large areas. In 1862, the lake covered 486,400 acres (Preston, 1981). Other minor streams and creeks supply runoff to Tulare Lake during very wet years, but most of these are dry in summer. The flow of water into Tulare Lake has been greatly restricted by dams and reservoirs in the Sierra Nevada and by levees, canals, and water diversions for irrigation.

The Kaweah River enters the valley through a canyon in the mountains east of Woodlake. Terminus Dam, constructed at the mouth of the canyon, impounds the waters of Lake Kaweah. The Tule River enters the valley through a canyon in the mountains east of Porterville. Success Dam impounds the waters of Lake Success.

A short distance below these dams, the Kaweah and Tule Rivers divide into a number of old stream

channels. At McKays Point, the Kaweah River divides and branches into the St. Johns River. Many of these old channels are now used to convey irrigation water during the early part of summer. Most of the surface waters of the Kaweah and Tule Rivers are diverted and used for irrigation, but a large quantity of water sinks into the sandy flood plains, replenishes the underground reservoir, and is later pumped to the surface for irrigation. At one time the water table in the delta of the Kaweah and Tule Rivers was very close to the surface. The water table favored the growth of water-tolerant grasses, willows, and cottonwood trees, but extensive pumping for irrigation has lowered the water table to a considerable depth, except in local areas where ground water is recharged from nearby streams. The smaller streams are Cottonwood Creek, south of the town of Seville; Cross Creek and Elbow Creek, north of the town of Goshen; Packwood Creek and Cameron Creek, south and east of the town of Visalia; Porter Slough, north of the town of Woodville; Deep Creek, Bates Slough, and Elk Bayou, south and west of the town of Tulare; Lewis Creek, east of the town of Lindsay; Deer Creek, east of the town of Terra Bella; and Mill Creek, west of the town of Visalia. These streams extend into the valley, but they soon dry up by seeping into the sandy creekbeds.

A distinctive and important feature that was very common on the older fan remnants and to a lesser degree on the basin rim is a mound-intermound microrelief, commonly referred to as hogwallow land (Nikiforoff, 1941; Nikiforoff and Alexander, 1942; and Page et al., 1977) or as Mima mounds (Arkley and Brown, 1954). Viewed from a distance, the relief in undisturbed areas appears fairly smooth, but closer observation brings out the hogwallow relief of low mounds and shallow depressions (figure 7). The mounds range from 5 to 30 feet in diameter and from 2 to 4 feet in height. Areas having mound-intermound microrelief are drained by channels, but water generally stands in the depressions for a considerable period following heavy rainfall. Outlets are not available, and a duripan or claypan keeps water from

Figure 6.—Grapes can be grown successfully on Exeter soils when the distinctive duripan has been mechanically "ripped."

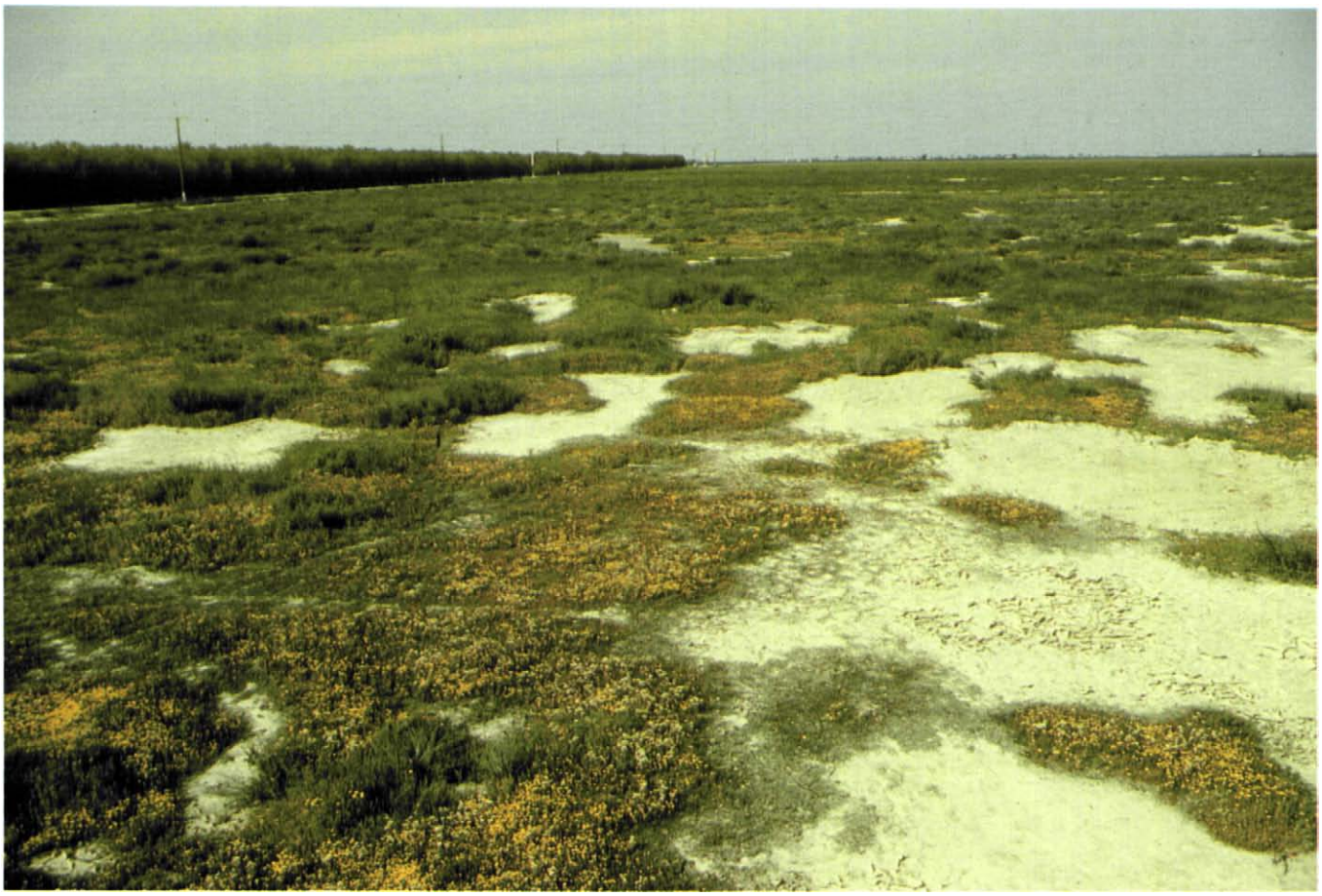

Figure 7.—An area of hogwallow relief. The saline-sodic Jerryslu soils are in the foreground. The highly productive Atesh soils are under the almond orchard in the background.

moving through the soil. One of the largest remaining areas of hogwallow land is the Pixley Vernal Pool Preserve.

Altered Soils

Human activities have had a significant influence on many soils in Tulare County. Soils have been modified by cultivation, urban development, and other activities. In many areas the soils have been highly altered. Drainage systems have lowered high water tables and thus have altered the natural wetness of many soils. Levees, which protect areas from flooding, prevent the deposition of new sediments on flood plains.

Extensive land leveling has occurred in some areas across the entire county. Almost all areas are sloping to the west. Soil material has been cut from the upslope, east side of the fields and has been filled on the downslope, west side. As a result, the surface layer in some areas has been completely removed from the upslope, east side of fields. On the downslope, west side of the fields, the fill material has buried the surface layer.

On fan remnants, the soils are commonly underlain by a duripan. In an area of approximately 71,000 acres (about 10 percent of the survey area), these duripans have been mechanically ripped to a depth of more than 40 inches. These soils are modified in such a permanent manner that in the soil classification system they are called Arents. On 23,850 acres in the survey area, the soils originally had a natric horizon and did not have a duripan. The natric horizon was so modified chemically and mechanically that it is no longer a limiting factor and the soils are Arents. These permanently modified areas have greatly improved characteristics for farming (figure 8).

Drainage systems have altered the natural wetness of soils on more than 100,000 acres in the area. A soil that is saturated for long periods has morphological features, such as redoximorphic concentrations or depletions of iron and manganese, in the zone of saturation. Where artificially drained, the soil retains

these features even though the water table may be lower or may be high for a shorter period. In the Tulare Lake basin and along the major rivers, water tables have been lowered and are managed by a system of field ditches, collector drainage ditches, and pumps that return drainage water to an adjacent channel.

Climate

Prepared by the Natural Resources Conservation Service National Water and Climate Center, Portland, Oregon.

The data for the climate tables in this survey are from climate stations at Corcoran, Porterville, and Visalia, California. Information about thunderstorm days, relative humidity, percent sunshine, and wind is estimated from data at a station in Fresno, California.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Corcoran, Porterville, and Visalia in the period 1961 to 1990. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on the length of the growing season. The extremes reported in the following paragraphs are for the respective periods of record for the three climate stations, which go back to 1948 at Corcoran and Porterville and 1928 at Visalia.

In winter, the average temperatures are 46.7, 48.3, and 47.3 degrees F and the average daily minimum

Figure 8.—An almond orchard in bloom on an Atesh soil, which is a modified Jerryslu soil. Modifications of this site include land levelling, ripping of the duripan, irrigation, and applications of fertilizer (including additions of gypsum, manure, and elemental sulfur).

temperatures are 36.6, 37.7, and 38.3 degrees at Corcoran, Porterville, and Visalia, respectively. The lowest temperatures on record are 14 degrees at Corcoran on January 2, 1960; 16 degrees at Porterville on December 23, 1990; and 20 degrees at Visalia on January 11, 1949. In summer, the average temperatures are 78.5, 79.5, and 78.2 degrees and the average daily maximum temperatures are 96.3, 95.8, and 93.6 degrees at Corcoran, Porterville, and Visalia, respectively. The highest temperatures on record are 115 degrees at Corcoran on July 21, 1960; 113 degrees at Porterville on July 16, 1972; and 115 degrees at Visalia on August 12, 1933.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The average annual precipitation is generally about 7 or 8 inches in the western part of the survey area and 10 to 12 inches in the eastern part. It is 6.94 inches at Corcoran, 11.02 inches at Porterville, and 10.08 inches at Visalia. Of the 10.08 inches at Visalia, about 6.9 inches, or 68 percent, usually falls in the period February through November. The growing season for most crops falls within this period. The heaviest 1-day rainfall during the period of record was 1.93 inches at Corcoran on January 20, 1969; 2.72 inches at Porterville on February 25, 1969; and 3.70 inches at Visalia on October 29, 1974. Thunderstorms occur on about 5 days each year and can occur in any month.

The average seasonal snowfall is near 0 inches throughout the survey area. Only three snows were ever recorded in over 70 years of record. The greatest snow depth at any one time on record was 3 inches at Corcoran and Porterville and 2 inches at Visalia on January 25, 1999.

The average relative humidity in midafternoon ranges from nearly 70 percent in January to about 20 percent in July. Humidity is higher at night, and the average at dawn is about 92 percent in December and just 60 percent in July. The sun shines 96 percent of the time possible in summer and 53 percent in winter. The prevailing wind is usually from the northwest but is from the southeast in December and January. Average windspeed is highest, around 8 miles per hour, in May and June.

How This Survey Was Made

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

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

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

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic

class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the survey area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists.

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

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

Table 1.—Temperature and Precipitation

(Recorded in the period 1961-90)

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days*	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	*Units*	*In*	*In*	*In*	*Days*	*In*
	Corcoran Irrigation District, CA2012										
January-----	54.1	35.6	44.9	71	22	24	1.30	0.32	2.16	3	0.1
February----	62.1	39.1	50.6	76	27	71	1.35	0.27	2.19	3	0.0
March-------	67.9	42.0	54.9	84	30	169	1.07	0.38	1.71	3	0.0
April-------	75.9	45.6	60.7	96	34	325	0.65	0.11	1.18	1	0.0
May---------	85.4	51.6	68.5	103	39	574	0.16	0.06	0.52	0	0.0
June--------	93.2	58.1	75.7	109	47	770	0.05	0.03	0.24	0	0.0
July--------	98.8	62.2	80.5	110	51	945	0.01	0.01	0.06	0	0.0
August------	96.9	61.5	79.2	108	51	905	0.01	0.03	0.07	0	0.0
September---	90.7	56.5	73.6	104	44	707	0.25	0.04	0.73	0	0.0
October-----	81.1	48.7	64.9	98	34	462	0.29	0.11	0.66	0	0.0
November----	65.9	40.0	52.9	83	26	126	0.83	0.28	1.39	2	0.0
December----	54.2	35.1	44.6	72	21	20	0.96	0.32	1.55	2	0.0
Yearly:											
Average---	77.2	48.0	62.6	---	---	---	---	---	---	---	---
Extreme---	114	15	---	110	20	---	---	---	---	---	---
Total-----	---	---	---	---	---	5,098	6.94	4.22	9.11	14	0.1

See footnote at end of table.

Table 1.--Temperature and Precipitation--Continued

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days*	Average	Less than--	More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In	Days	In
	Porterville, CA7077										
January-----	56.4	36.4	46.4	75	24	34	1.90	0.55	2.99	4	0.0
February----	63.7	40.4	52.1	80	28	99	1.83	0.45	2.92	4	0.0
March-------	68.8	43.8	56.3	86	32	207	1.83	0.87	2.78	4	0.0
April-------	75.9	47.7	61.8	96	36	355	1.09	0.28	1.87	2	0.0
May---------	84.7	53.7	69.2	104	40	596	0.37	0.11	0.86	1	0.0
June--------	92.8	60.2	76.5	108	45	794	0.06	0.04	0.22	0	0.0
July--------	98.3	65.2	81.8	109	53	985	0.02	0.02	0.10	0	0.0
August------	96.8	63.8	80.3	107	53	940	0.03	0.06	0.16	0	0.0
September---	91.2	58.3	74.7	105	46	741	0.40	0.08	1.09	0	0.0
October-----	81.8	50.5	66.2	98	38	499	0.61	0.18	1.42	1	0.0
November----	67.5	42.0	54.7	85	30	164	1.43	0.58	2.23	3	0.0
December----	56.6	36.2	46.4	74	24	33	1.45	0.70	2.29	3	0.0
Yearly:											
Average---	77.9	49.9	63.9	---	---	---	---	---	---	---	---
Extreme---	113	16	---	110	22	---	---	---	---	---	---
Total-----	---	---	---	---	---	5,447	11.02	7.88	13.92	22	0.0

See footnote at end of table.

Table 1.--Temperature and Precipitation--Continued

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days*	Average	Less than--	More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In	Days	In
	Visalia, CA9367										
January-----	53.8	37.0	45.4	72	26	27	1.77	0.53	2.88	4	0.0
February----	61.5	41.2	51.3	77	29	86	1.80	0.39	2.90	4	0.0
March-------	66.9	44.6	55.8	83	33	190	1.63	0.55	2.62	4	0.0
April-------	73.9	48.4	61.1	94	37	336	1.02	0.22	1.78	2	0.0
May---------	82.6	54.1	68.4	101	41	568	0.29	0.10	0.76	0	0.0
June--------	90.6	60.3	75.4	106	48	763	0.07	0.09	0.40	0	0.0
July--------	96.0	64.7	80.4	106	54	940	0.01	0.01	0.11	0	0.0
August------	94.3	63.3	78.8	104	53	894	0.02	0.03	0.14	0	0.0
September---	88.5	58.8	73.6	102	47	709	0.22	0.07	0.72	0	0.0
October-----	79.3	51.5	65.4	95	38	477	0.59	0.15	1.30	1	0.0
November----	65.1	42.9	54.0	82	31	148	1.25	0.49	1.98	3	0.0
December----	53.9	36.7	45.3	71	25	24	1.41	0.56	2.20	3	0.0
Yearly:											
Average---	75.5	50.3	62.9	---	---	---	---	---	---	---	---
Extreme---	111	21	---	108	24	---	---	---	---	---	---
Total-----	---	---	---	---	---	5, 162	10.08	6.97	12.68	21	0.0

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minumum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 degrees F).

Table 2.--Freeze Dates in Spring and Fall

(Recorded in the period 1961-90)

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
	Corcoran Irrigation District, CA2012		
Last freezing temperature in spring:			
1 year in 10 later than--	January 27	February 24	April 6
2 years in 10 later than--	January 16	February 12	March 25
5 years in 10 later than--	December 21	January 19	March 2
First freezing temperature in fall:			
1 year in 10 earlier than--	November 27	November 11	November 1
2 years in 10 earlier than--	December 8	November 19	November 7
5 years in 10 earlier than--	January 1	December 4	November 17
	Porterville, CA7077		
Last freezing temperature in spring:			
1 year in 10 later than--	January 22	February 14	March 21
2 years in 10 later than--	January 5	February 3	March 8
5 years in 10 later than--	---	January 12	February 14
First freezing temperature in fall:			
1 year in 10 earlier than--	December 17	November 29	November 12
2 years in 10 earlier than--	December 29	December 6	November 18
5 years in 10 earlier than--	---	December 19	November 29

Table 2.--Freeze Dates in Spring and Fall--Continued

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
	Visalia, CA9367		
Last freezing temperature in spring:			
1 year in 10 later than--	January 10	February 8	March 5
2 years in 10 later than--	December 22	Janary 27	February 24
5 years in 10 later than--	---	January 1	February 5
First freezing temperature in fall:			
1 year in 10 earlier than--	December 24	December 5	November 12
2 years in 10 earlier than--	January 12	December 13	November 19
5 years in 10 earlier than--	---	December 29	December 2

Table 3.--Growing Season

(Recorded for the period 1961-90)

Probability	Daily minimum temperature during growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	Days	*Days*	*Days*
	Corcoran Irrigation District, CA2012		
9 years in 10	317	270	218
8 years in 10	339	287	232
5 years in 10	>365	318	258
2 years in 10	>365	350	284
1 year in 10	>365	>365	298
	Potterville, CA7077		
9 years in 10	357	299	246
8 years in 10	>365	313	260
5 years in 10	>365	343	288
2 years in 10	>365	>365	315
1 year in 10	>365	>365	329
	Visalia, CA9367		
9 years in 10	>365	312	260
8 years in 10	>365	330	274
5 years in 10	>365	>365	301
2 years in 10	>365	>365	328
1 year in 10	>365	>365	342

General Soil Map Units

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

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

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

Soil Descriptions

1. Hanford-Calgro-Flamen

Very deep, deep, and moderately deep, well drained and moderately well drained soils that formed in alluvium derived mainly from granitic rocks; on flood plains and alluvial fans surrounding fan remnants

Composition

Extent of the map unit in the survey area: 8 percent
Extent of the components in the map unit:
Hanford soils—32 percent
Calgro soils—24 percent
Flamen soils—9 percent
Minor components—35 percent

Soil Properties and Qualities

Hanford

Texture of the surface layer: Sandy loam
Depth class: Very deep
Drainage class: Well drained
Slope: 0 to 2 percent
Landform: Flood plains and alluvial fans

Calgro

Texture of the surface layer: Sandy loam
Depth class: Moderately deep to a duripan
Drainage class: Moderately well drained
Slope: 0 to 2 percent
Landform: Fan remnants

Flamen

Texture of the surface layer: Loam
Depth class: Deep to a duripan
Drainage class: Moderately well drained
Slope: 0 to 2 percent
Landform: Fan remnants

Minor Components

- Exeter and San Joaquin soils and the saline-sodic Calgro soils on fan remnants
- Delhi, Yettem, and Nord soils on alluvial fans and flood plains
- Tujunga soils on flood plains

Use and Management

Major uses: Irrigated crops

Cropland

Management concerns:
- Depth to the duripan and restricted permeability in the duripan of the Calgro and Flamen soils
- Low or moderate available water capacity in the Calgro soils
- Moderately rapid permeability in the Hanford soils
- Rapidly permeable layers below the duripan in the Calgro soils

Management measures:
- The duripan limits the rooting depth in the Calgro and Flamen soils. Ripping and shattering the duripan increase the rooting depth and improve permeability, the available water capacity, and internal drainage.
- Because of the moderately rapid permeability in the Hanford soils and the rapidly permeable layers below the duripan in the Calgro soils, careful

management is needed to prevent the pollution of ground water resulting from the leaching of pesticides and nitrates.

2. Exeter-Flamen

Moderately deep and deep, moderately well drained soils that formed in alluvium derived mainly from granitic rocks; on fan remnants

Composition

Extent of the map unit in the survey area: 16 percent
Extent of the components in the map unit:
Exeter soils—50 percent
Flamen soils—18 percent
Minor components—32 percent

Soil Properties and Qualities

Exeter

Texture of the surface layer: Loam
Depth class: Moderately deep to a duripan
Drainage class: Moderately well drained
Slope: 0 to 2 percent
Landform: Fan remnants

Flamen

Texture of the surface layer: Loam
Depth class: Deep to a duripan
Drainage class: Moderately well drained
Slope: 0 to 2 percent
Landform: Fan remnants

Minor Components

- San Joaquin, Colpien, and Crosscreek soils, Calgro soils (including the saline-sodic Calgro soils), and Centerville, Kai, and Seville soils on fan remnants
- Wutchumna soils on hills

Use and Management

Major uses: Irrigated crops

Cropland

Management concerns:
- Depth to the duripan and restricted permeability in the duripan
- Low or moderate available water capacity in the Exeter soils

Management measures:
- The duripan limits the rooting depth. Ripping and shattering the duripan increase the rooting depth and improve permeability, the available water capacity, and internal drainage.

3. Centerville

Very deep, well drained soils that formed in alluvium derived mainly from granitic rocks; on fan remnants

Composition

Extent of the map unit in the survey area: 1 percent
Extent of the components in the map unit:
Centerville soils—74 percent
Minor components—26 percent

Soil Properties and Qualities

Centerville

Texture of the surface layer: Clay
Depth class: Very deep
Drainage class: Well drained
Slope: 0 to 5 percent
Landform: Fan remnants

Minor Components

- Delvar, San Joaquin, Exeter, and Flamen soils on fan remnants

Use and Management

Major uses: Irrigated crops

Cropland

Management concerns:
- Sodicity, slow permeability

Management measures:
- Crops that are tolerant of sodic conditions should be selected for planting.
- Because of the sodicity, intensive management is required to maintain productivity.
- Because of the restricted permeability, the application of irrigation water should be regulated so that the water does not stand on the surface and damage crops.

4. Hanford-Akers-Nord

Very deep, well drained soils that formed in alluvium derived mainly from granitic rocks; on flood plains and alluvial fans associated with major rivers and streams and surrounding fan remnants

Composition

Extent of the map unit in the survey area: 11 percent
Extent of the components in the map unit:
Hanford soils—33 percent
Akers soils—28 percent
Nord soils—9 percent

Minor components—30 percent

Soil Properties and Qualities

Hanford

Texture of the surface layer: Sandy loam
Depth class: Very deep
Drainage class: Well drained
Slope: 0 to 2 percent
Landform: Flood plains and alluvial fans

Akers

Texture of the surface layer: Fine sandy loam
Depth class: Very deep
Drainage class: Well drained
Slope: 0 to 2 percent
Landform: Fan remnants

Nord

Texture of the surface layer: Fine sandy loam
Depth class: Very deep
Drainage class: Well drained
Slope: 0 to 2 percent
Landform: Alluvial fans and flood plains

Minor Components

- Colpien, Crosscreek, and Calgro soils and the saline-sodic Akers soils on fan remnants
- Yettem and Wasco soils on flood plains and alluvial fans
- Tujunga soils on flood plains

Use and Management

Major uses: Irrigated crops

Cropland

Management concerns:
- Few limitations affect irrigated crops. Moderately rapid permeability in the Hanford soils is the main limitation.

Management measures:
- Because of the moderately rapid permeability in the Hanford soils, careful management is needed to prevent the pollution of ground water resulting from the leaching of pesticides and nitrates.

5. Nord-Tagus-Grangeville

Very deep, well drained and somewhat poorly drained soils that formed in alluvium derived mainly from granitic rocks; on flood plains and alluvial fans associated with major rivers and streams and surrounding fan remnants

Composition

Extent of the map unit in the survey area: 24 percent
Extent of the components in the map unit:
Nord soils—42 percent
Tagus soils—19 percent
Grangeville soils—12 percent
Minor components—27 percent

Soil Properties and Qualities

Nord

Texture of the surface layer: Fine sandy loam
Depth class: Very deep
Drainage class: Well drained
Slope: 0 to 2 percent
Landform: Alluvial fans and flood plains

Tagus

Texture of the surface layer: Loam
Depth class: Very deep
Drainage class: Well drained
Slope: 0 to 2 percent
Landform: Fan remnants

Grangeville

Texture of the surface layer: Sandy loam
Depth class: Very deep
Drainage class: Somewhat poorly drained (artificially drained because of protection from flooding, pumping from the water table, the use of tile and interceptor drains, and the filling and leveling of sloughs)
Flooding: Rare in years of abnormally high precipitation
Slope: 0 to 2 percent
Landform: Alluvial fans and flood plains

Minor Components

- Akers, Colpien, and Flamen soils on fan remnants
- Yettem soils on flood plains and alluvial fans
- Tujunga soils on flood plains

Use and Management

Major uses: Irrigated crops and building site development

Cropland

Management concerns:
- Few or no limitations affect irrigated crops.

Building site development

Management concerns:
- Rare flooding on the Grangeville soils

• High corrosivity to steel
Management measures:
• Buildings can be constructed above the expected level of flooding on the Grangeville soils.
• Corrosion-resistant materials should be used.

6. Colpien-Biggriz

Very deep, moderately well drained and somewhat poorly drained soils that formed in alluvium derived mainly from granitic rocks; on fan remnants

Composition

Extent of the map unit in the survey area: 10 percent
Extent of the components in the map unit:
Colpien soils—78 percent
Biggriz soils—11 percent
Saline-sodic Biggriz soils—5 percent
Minor components—6 percent

Soil Properties and Qualities

Colpien

Texture of the surface layer: Loam
Depth class: Very deep
Drainage class: Moderately well drained
Flooding: Rare in years of abnormally high precipitation
Slope: 0 to 2 percent
Landform: Fan remnants

Biggriz

Texture of the surface layer: Loam
Depth class: Very deep
Drainage class: Somewhat poorly drained (artificially drained because of protection from flooding, pumping from the water table, the use of tile and interceptor drains, and the filling and leveling of sloughs)
Flooding: Rare in years of abnormally high precipitation
Slope: 0 to 2 percent
Landform: Fan remnants

Biggriz, saline-sodic

Texture of the surface layer: Loam
Depth class: Very deep
Drainage class: Somewhat poorly drained (artificially drained because of protection from flooding, pumping from the water table, the use of tile and interceptor drains, and the filling and leveling of sloughs)
Flooding: Rare in years of abnormally high precipitation
Slope: 0 to 2 percent
Landform: Fan remnants

Minor Components

• Akers soils on fan remnants
• Nord soils on flood plains and alluvial fans

Use and Management

Major uses: Irrigated crops

Cropland

Management concerns:
• In most areas few limitations affect irrigated crops. The main limitations are the salinity and sodicity of the saline-sodic Biggriz soils.
Management measures:
• The saline-sodic Biggriz soils are best suited to crops that are tolerant of saline and sodic conditions. Intensive management is required to maintain the productivity of these soils.

Building site development

Management concerns:
• Rare flooding
Management measures:
• Buildings can be constructed above the expected level of flooding.

7. Crosscreek-Quonal-Calgro

Deep and moderately deep, well drained and moderately well drained soils that formed in alluvium derived mainly from granitic rocks when soils were reclaimed by high-intensity farming; on fan remnants

Composition

Extent of the map unit in the survey area: 11 percent
Extent of the components in the map unit:
Crosscreek soils—28 percent
Quonal soils—25 percent
Calgro soils—10 percent
Minor components—37 percent

Soil Properties and Qualities

Crosscreek

Texture of the surface layer: Loam
Depth class: Deep to a duripan
Drainage class: Well drained
Slope: 0 to 2 percent
Landform: Fan remnants

Quonal

Texture of the surface layer: Silty clay

Depth class: Deep to a duripan
Drainage class: Moderately well drained
Slope: 0 to 2 percent
Landform: Fan remnants

Calgro

Texture of the surface layer: Sandy loam
Depth class: Moderately deep to a duripan
Drainage class: Moderately well drained
Slope: 0 to 2 percent
Landform: Fan remnants

Minor Components

• Flamen, Remnoy, Youd, Kai, and Lewis soils and the saline-sodic Calgro soils on fan remnants

Use and Management

Major uses: Irrigated crops

Cropland

Management concerns:
• The Crosscreek and Quonal soils are the products of the long-term reclamation of the native Kai and Lewis soils, respectively. The Kai and Lewis soils were highly saline-sodic before reclamation.
• The main limitations are depth to the duripan and restricted permeability in the duripan.
• A low available water capacity in the Quonal soils and a low or moderate available water capacity in the Calgro soils
• Sodicity of the Quonal soils
• Rapidly permeable layers below the duripan in the Calgro soils
Management measures:
• Ripping and shattering the duripan increase the rooting depth and improve permeability, the available water capacity, and internal drainage.
• Quonal soils are best suited to salt-tolerant crops. Intensive management is required to reduce salinity and maintain productivity.
• Because of the rapidly permeable layers below the duripan in the Calgro soils, careful management is needed to prevent the pollution of ground water resulting from the leaching of pesticides and nitrates.

8. Gareck-Atesh-Kimberlina

Deep and very deep, well drained and moderately well drained soils that formed in alluvium derived mainly from granitic rocks when soils were reclaimed by high-intensity farming; on fan remnants and basin rims with insets of flood plains

Composition

Extent of the map unit in the survey area: 5 percent
Extent of the components in the map unit:
Gareck soils—47 percent
Atesh soils—20 percent
Kimberlina soils—17 percent
Minor components—16 percent

Soil Properties and Qualities

Gareck

Texture of the surface layer: Sandy loam
Depth class: Very deep
Drainage class: Well drained
Flooding: Rare in years of abnormally high precipitation
Slope: 0 to 2 percent
Landform: Fan remnants

Atesh

Texture of the surface layer: Sandy loam
Depth class: Deep to a duripan
Drainage class: Moderately well drained
Flooding: Rare in years of abnormally high precipitation
Slope: 0 to 2 percent
Landform: Fan remnants and basin rims

Kimberlina

Texture of the surface layer: Fine sandy loam
Depth class: Very deep
Drainage class: Well drained
Flooding: Rare in years of abnormally high precipitation
Slope: 0 to 2 percent
Landform: Flood plains

Minor Components

• Garces, Jerryslu, and Lethent soils on fan remnants

Use and Management

Major uses: Irrigated crops

Cropland

Management concerns:
• The Gareck and Atesh soils are the products of the long-term reclamation of the native Garces and Jerryslu soils, respectively. The Garces and Jerryslu soils were highly saline-sodic before reclamation. The Gareck soils have some residual sodicity.
• The Atesh soils are limited mainly by the depth to a duripan and very slow permeability in the duripan.

• The Kimberlina soils are saline-sodic and have a low available water capacity.
• Rare flooding
Management measures:
• Depth to the duripan in the Atesh soils limits the rooting depth. Ripping and shattering the duripan increase the rooting depth and improve permeability, the available water capacity, and internal drainage.
• Thé Kimberlina and Gareck soils are best suited to crops that are tolerant of saline-sodic conditions. Intensive management is required to reduce salinity and maintain productivity.
• Applications of irrigation water should be adjusted to the low available water capacity on Kimberlina soils.

Building site development

Management concerns:
• Rare flooding
Management measures:
• Buildings can be constructed above the expected level of flooding.

9. Nahrub-Lethent-Posochanet

Very deep, somewhat poorly drained and moderately well drained soils that formed in mixed alluvium; on basin rims, fan remnants, and fan skirts

Composition

Extent of the map unit in the survey area: 5 percent
Extent of the components in the map unit:
Nahrub soils—59 percent
Lethent soils—17 percent
Posochanet soils—13 percent
Minor components—11 percent

Soil Properties and Qualities

Nahrub

Texture of the surface layer: Silt loam
Depth class: Very deep
Drainage class: Somewhat poorly drained (artificially drained because of protection from flooding, pumping from the water table, the use of tile and interceptor drains, and the filling and leveling of sloughs)
Flooding: Rare in years of abnormally high precipitation
Slope: 0 to 1 percent
Landform: Basin rims

Lethent

Texture of the surface layer: Silt loam
Depth class: Very deep
Drainage class: Moderately well drained
Flooding: Rare in years of abnormally high precipitation
Slope: 0 to 1 percent
Landform: Fan remnants

Posochanet

Texture of the surface layer: Silt loam
Depth class: Very deep
Drainage class: Moderately well drained
Flooding: Rare in years of abnormally high precipitation
Slope: 0 to 2 percent
Landform: Fan skirts

Minor Components

• Excelsior soils on alluvial fans
• Houser soils on basin rims

Use and Management

Major uses: Irrigated crops

Cropland

Management concerns:
• Rare flooding
• Salinity and sodicity
• Very slow or slow permeability
• These soils are best suited to crops that are tolerant of saline-sodic conditions. Intensive management is required to reduce salinity and maintain productivity.
• Because of the very slow or slow permeability, applications of irrigation water should be regulated so that the water does not stand on the surface and damage crops.

Building site development

Management concerns:
• Rare flooding
Management measures:
• Buildings can be constructed above the expected level of flooding.

10. Gambogy-Biggriz

Very deep, poorly drained and somewhat poorly drained soils that formed in alluvium derived mainly from granitic rocks; on fan remnants with insets of flood plains and alluvial fans

The major soils in this map unit are artificially drained because of protection from flooding, pumping from the water table, the use of tile and interceptor drains, and the filling and leveling of sloughs.

Composition

Extent of the map unit in the survey area: 6 percent
Extent of the components in the map unit:
Gambogy soils—71 percent
Saline-sodic Biggriz soils—17 percent
Other Biggriz soils—5 percent
Minor components—7 percent

Soil Properties and Qualities

Gambogy

Texture of the surface layer: Loam
Depth class: Very deep
Drainage class: Poorly drained
Flooding: Rare in years of abnormally high precipitation
Slope: 0 to 1 percent
Landform: Alluvial fans and flood plains

Biggriz, saline-sodic

Texture of the surface layer: Loam
Depth class: Very deep
Drainage class: Somewhat poorly drained
Flooding: Rare in years of abnormally high precipitation
Slope: 0 to 2 percent
Landform: Fan remnants

Biggriz

Texture of the surface layer: Loam
Depth class: Very deep
Drainage class: Somewhat poorly drained
Flooding: Rare in years of abnormally high precipitation
Slope: 0 to 2 percent
Landform: Fan remnants

Minor Components

- The saline-sodic Grangeville on flood plains and alluvial fans
- Colpien soils on fan remnants

Use and Management

Major uses: Irrigated crops

Cropland

Management concerns:
- In most areas few limitations affect irrigated crops. The main limitations are salinity and sodicity in the saline-sodic Biggriz soils and slight sodicity in the Gambogy soils.

Management measures:
- The saline-sodic Biggriz soils are best suited to crops that are tolerant of saline-sodic conditions. Intensive management is required to reduce salinity and maintain productivity.

Building site development

Management concerns:
- Rare flooding

Management measures:
- Buildings can be constructed above the expected level of flooding.

11. Gepford-Houser-Armona

Very deep, somewhat poorly drained and poorly drained soils that formed in alluvium derived mainly from granitic rocks; on basin rims and flood plains

The major soils in this map unit are artificially drained because of protection from flooding, pumping from the water table, the use of tile and interceptor drains, and the filling and leveling of sloughs.

Composition

Extent of the map unit in the survey area: 3 percent
Extent of the components in the map unit:
Gepford and similar soils—33 percent
Houser soils—29 percent
Armona soils—25 percent
Minor components—13 percent

Soil Properties and Qualities

Gepford

Texture of the surface layer: Silty clay
Depth class: Very deep
Drainage class: Poorly drained
Flooding: Rare in years of abnormally high precipitation
Slope: 0 to 1 percent
Landform: Basin rims and flood plains

Houser

Texture of the surface layer: Silty clay
Depth class: Very deep
Drainage class: Somewhat poorly drained
Flooding: Rare in years of abnormally high precipitation
Slope: 0 to 1 percent
Landform: Basin rims

Armona

Texture of the surface layer: Sandy loam
Depth class: Very deep
Drainage class: Poorly drained

Flooding: Rare in years of abnormally high precipitation
Slope: 0 to 1 percent
Landform: Basin rims and flood plains

Minor Components

- Westcamp soils on basin rims
- Miscellaneous areas, including areas of water

Use and Management

Major uses: Irrigated crops

Cropland

Management concerns:
- Salinity and sodicity
- A high water table in the Gepford and Armona soils
- Very low, low, or moderate available water capacity
- Very slow or slow permeability.

Management measures:
- These soils are best suited to crops that are tolerant of saline-sodic conditions. Intensive management is required to reduce salinity and maintain productivity.
- Reducing salinity is difficult unless a drainage system is installed to lower the high water table in the Gepford and Armona soils.
- Because of the very low, low, or moderate available water capacity, applications of irrigation water should be adjusted to the needs of the crop.
- Because of the very slow or slow permeability, applications of irrigation water should be regulated so that the water does not stand on the surface and damage crops.

Building site development

Management concerns:
- Rare flooding

Management measures:
- Buildings can be constructed above the expected level of flooding

Detailed Soil Map Units

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

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

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

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

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

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

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Exeter loam, 2 to 5 percent slopes, is a phase of the Exeter series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes or associations.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Akers-Akers, saline-sodic, complex, 0 to 2 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous

areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Atesh-Jerryslu association, 0 to 2 percent slopes, is an example.

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

Table 4 gives the acreage and proportionate extent of each map unit. Other tables give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils or miscellaneous areas.

Table 4.--Acreage and Proportionate Extent of the Soils

Map symbol	Soil name	Acres	Percent
101	Akers-Akers, saline-sodic, complex, 0 to 2 percent slopes	57,560	7.4
102	Armona sandy loam, partially drained, 0 to 1 percent slopes	5,420	0.7
103	Atesh-Jerryslu association, 0 to 2 percent slopes	10,550	1.4
104	Biggriz-Biggriz, saline-sodic, complex, 0 to 2 percent slopes	17,070	2.2
105	Calgro-Calgro, saline-sodic, complex, 0 to 2 percent slopes	36,910	4.7
106	Centerville clay, 0 to 2 percent slopes	3,430	0.4
107	Centerville clay, 2 to 5 percent slopes	5,530	0.7
108	Colpien loam, 0 to 2 percent slopes	85,100	11.0
109	Crosscreek-Kai association, 0 to 2 percent slopes	36,210	4.7
110	Delhi loamy sand, 0 to 2 percent slopes	2,810	0.4
111	Delvar clay loam, 2 to 9 percent slopes	770	*
112	Dumps	310	*
113	Excelsior fine sandy loam, 0 to 1 percent slopes	2,030	0.3
114	Exeter loam, 0 to 2 percent slopes	66,250	8.5
115	Exeter loam, 2 to 5 percent slopes	2,030	0.3
116	Flamen loam, 0 to 2 percent slopes	41,140	5.3
117	Gambogy loam, drained, 0 to 1 percent slopes	20,620	2.7
118	Gambogy-Biggriz, saline-sodic, association, drained, 0 to 2 percent slopes	21,250	2.7
119	Gareck-Garces association, 0 to 2 percent slopes	23,850	3.1
120	Gepford silty clay, partially drained, 0 to 1 percent slopes	3,450	0.4
121	Gepford silty clay, partially drained, sandy substratum , 0 to 1 percent slopes	3,710	0.5
122	Grangeville sandy loam, drained, 0 to 2 percent slopes	3,050	3.0
123	Grangeville fine sandy loam, saline-sodic, 0 to 1 percent slopes	1,750	0.2
124	Hanford sandy loam, 0 to 2 percent slopes	50,820	6.5
125	Houser fine sandy loam, drained, 0 to 1 percent slopes	890	0.1
126	Houser silty clay, drained, 0 to 1 percent slopes	6,050	0.8
127	Kimberlina fine sandy loam, 0 to 2 percent slopes	7,720	1.0
128	Lethent silt loam, 0 to 1 percent slopes	7,400	1.0
129	Nahrub silt loam, overwashed, 0 to 1 percent slopes	23,530	3.0
130	Nord fine sandy loam, 0 to 2 percent slopes	87,970	11.3
131	Pits	360	*
132	Quonal-Lewis association, 0 to 2 percent slopes	24,420	3.1
133	Remnoy silt loam, 0 to 2 percent slopes	5,020	0.6
134	Riverwash	3,370	0.4
135	San Joaquin loam, 0 to 2 percent slopes	15,200	2.0
136	Seville clay, 0 to 2 percent slopes	1,320	0.2
137	Tagus loam, 0 to 2 percent slopes	34,600	4.5
138	Tujunga loamy sand, 0 to 2 percent slopes	5,770	0.7
139	Wasco sandy loam, 0 to 2 percent slopes	1,240	0.2
140	Westcamp silt loam, partially drained, 0 to 2 percent slopes	2,630	0.3
141	Posochanet silt loam, 0 to 2 percent slopes	5,560	0.7
142	Wutchumna-Rock outcrop association, 5 to 50 percent slopes	2,200	0.3
143	Yettem sandy loam, 0 to 2 percent slopes	13,350	1.7
144	Youd loam, 0 to 1 percent slopes	4,590	0.6
145	Water, perennial	2,250	0.3
	Total	777,060	100.0

* Less than 0.1 percent.

101—Akers-Akers, saline-sodic, complex, 0 to 2 percent slopes

Setting

Landform: Fan remnants
Description of area: Irrigated cropland that has been leveled and reclaimed with soil amendments; includes the Kaweah Oaks Preserve of the Nature Conservancy
Elevation: 225 to 350 feet
Major use: Irrigated cropland
Mean annual precipitation: 8 to 12 inches
Mean annual temperature: 62 to 65 degrees F
Frost-free period: 225 to 300 days

Map Unit Composition

Akers soil and similar soils: 60 percent
Saline-sodic Akers soil and similar soils: 25 percent
Minor components: 15 percent

Characteristics of the Akers Soil

Parent material: Alluvium derived from granitic rock sources

Typical profile

0 to 16 inches—light brownish gray fine sandy loam
16 to 60 inches—pale brown fine sandy loam

Component properties and qualities

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: High
Shrink-swell potential: Low
Salinity: 0 to 4 dS/m
Sodicity (SAR): 1 to 12
Surface runoff: Negligible
Flooding: Very rare in years of abnormally high precipitation
Corrosivity to steel: High
Corrosivity to concrete: Low

Characteristics of the Saline-Sodic Akers Soil

Parent material: Alluvium derived from granitic rock sources

Typical profile

0 to 15 inches—light brownish gray fine sandy loam
15 to 60 inches—pale brown fine sandy loam

Component properties and qualities

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: High
Shrink-swell potential: Low
Salinity: 2 to 8 dS/m in the upper part of the profile; 4 to 8 dS/m in the lower part
Sodicity (SAR): 1 to 13 in the upper part of the profile; 13 to 30 in the lower part
Surface runoff: Negligible
Flooding: Very rare in years of abnormally high precipitation
Corrosivity to steel: High
Corrosivity to concrete: High

Inclusions

Contrasting inclusions:
- Tujunga soils on flood plains—3 percent
- Colpien soils in slightly concave areas on fan remnants—3 percent
- Hanford soils on flood plains and alluvial fans—2 percent
- Tagus soils in concave areas on fan remnants—2 percent
- Grangeville soils on flood plains and alluvial fans—2 percent
- Yettem soils on flood plains and alluvial fans—2 percent
- Soils in depressions that are ponded more than 14 days each year—1 percent

Similar inclusions:
- Soils that have a surface layer of loam or sandy loam

Use and Management

Land uses: Irrigated crops, building site development, and farmstead dairies

Irrigated crops

Commonly grown crops: Cotton, wheat, alfalfa hay, corn silage, table grapes, plums, and walnuts
Major management factors: Akers—few or none; saline-sodic Akers—salinity and sodicity
Management considerations:
- The kinds of crops that can be grown are limited in areas of the saline sodic Akers soil.
- Reclamation of the saline-sodic Akers soil requires a long-range program that includes ongoing monitoring of salinity and sodicity.
- The content of salts and sodium can be reduced by applying proper soil amendments, such as gypsum; leaching to a depth below the root zone; and returning crop residue to the soil.
- Careful irrigation helps to prevent an increase in the concentration of salts and sodium.

Building site development

Major management factors: High corrosivity—steel and concrete
Management considerations:
• Using corrosion-resistant material and coatings and using cathodic protectors help to prevent the corrosion of steel.
• Using sulfate-resistant material helps to prevent the corrosion of concrete.

Farmstead dairies

Major management factors: Pollution of ground water
Management considerations:
• Few limitations affect the use of these soils as sites for dairy waste lagoons. Onsite investigation is needed to determine whether the area under consideration is underlain by unsuitable material below a depth of 60 inches. If the underlying material has moderately rapid, rapid, or very rapid permeability, special measures for sealing the surface of the lagoon may be needed.
• Pollution of the ground water is a major concern in included areas that have layers with moderately rapid, rapid, or very rapid permeability.

Interpretive Groups

Land capability classification: Akers—1, irrigated, and 4c, nonirrigated; saline-sodic Akers—2s-6, irrigated, and 4s-6, nonirrigated
MLRA: 17
Prime farmland: Yes in the areas that are not saline-sodic, are protected from flooding, and are irrigated

102—Armona sandy loam, partially drained, 0 to 1 percent slopes

Setting

Landform: Basin rims and flood plains
Description of area: Irrigated cropland that has been leveled, partially drained, and reclaimed with soil amendments
Elevation: 190 to 250 feet
Major use: Irrigated cropland
Mean annual precipitation: 7 to 8 inches
Mean annual temperature: 63 to 66 degrees F
Frost-free period: 250 to 275 days

Map Unit Composition

Armona soil and similar soils: 85 percent
Minor components: 15 percent

Characteristics of the Armona Soil

Parent material: Mixed alluvium derived mainly from granitic rock sources

Typical profile

0 to 11 inches—olive gray sandy loam
11 to 53 inches—stratified light olive gray and light gray sandy loam, sandy clay loam, and loam
53 to 60 inches—stratified light olive gray sandy loam

Component properties and qualities

Depth class: Very deep
Drainage class: Poorly drained (partly drained artificially because of protection from flooding, pumping from the water table, the use of tile and interceptor drains, and the filling and leveling of sloughs)
Permeability: Slow because of stratification and high sodicity
Available water capacity: Low or moderate
Shrink-swell potential: Moderate
Salinity: 2 to 8 dS/m in the upper part of the profile; 2 to 30 dS/m in the lower part
Sodicity (SAR): 2 to 13 in the upper part of the profile; 13 to 80 in the lower part
Surface runoff: Negligible
Flooding: Rare in years of abnormally high precipitation
Depth to the seasonal high water table: 3 to 5 feet
Kind of water table: Perched
Months with high water table: January to December
Corrosivity: Steel—high; concrete—high

Inclusions

Contrasting inclusions:
• Westcamp soils on basin rims—5 percent
• Houser soils on basin rims—5 percent
• Gepford soils that have a sandy substratum; in basins and on flood plains—3 percent
• Posochanet soils on fan skirts—2 percent

Similar inclusions:
• Soils with a surface layer of fine sandy loam or loam

Use and Management

Land uses: Irrigated crops and building site development

Irrigated crops

Commonly grown crops: Cotton, alfalfa hay, corn silage, and wheat

Major management factors: Salinity and sodicity, high water table, low or moderate available water capacity, and slow permeability
Management considerations:
• The salinity and sodicity of the soil limit the kinds of crops that can be grown.
• Reclamation of this soil requires a long-range program that includes ongoing monitoring of salinity and sodicity.
• The content of salts and sodium can be reduced by applying proper soil amendments, such as gypsum; leaching below the root zone; and returning crop residue to the soil.
• Careful irrigation helps to prevent an increase in the concentration of salts and sodium.
• The water table limits the suitability for deep-rooted crops. A surface drainage system and open drainage ditches are needed to remove excess water and lower the water table.
• Applications of irrigation water should be adjusted to the available water capacity, the slow permeability, and the needs of the crop.
• Because of the restricted permeability, applications of irrigation water should be regulated so that the water does not stand on the surface and damage crops.

Building site development

Major management factors: Rare flooding, high corrosivity to steel and concrete, high water table, and slow permeability
Management considerations:
• The risk of flood damage can be reduced by locating structures above the expected level of flooding.
• The corrosion of steel can be minimized by using corrosion-resistant material and coatings and cathodic protectors.
• The corrosion of concrete can be minimized by using sulfate-resistant material.
• The high water table and slow permeability increase the likelihood that improperly designed septic tank absorption fields will fail. Onsite investigation is needed when septic tank systems are designed.

Interpretive Groups

Land capability classification: 3w-6, irrigated, and 7w, nonirrigated
MLRA: 17
Prime farmland: No

103—Atesh-Jerryslu association, 0 to 2 percent slopes

Setting

Landform: Atesh—fan remnants; Jerryslu—fan remnants and basin rims
Description of area: Atesh—on irrigated cropland that has been leveled, ripped, and reclaimed with soil amendments; Jerryslu—in native areas
Elevation: 225 to 325 feet
Major use: Irrigated cropland
Vegetation: Annual grasses and forbs in the native areas
Mean annual precipitation: 6 to 8 inches
Mean annual temperature: 63 to 65 degrees F
Frost-free period: 250 to 275 days

Map Unit Composition

Atesh soil and similar soils: 65 percent
Jerryslu soil and similar soils: 20 percent
Minor components: 15 percent
Note: Component percentages vary from place to place, depending on the amount of native land versus the amount of reclaimed farmland.

Characteristics of the Atesh Soil

Parent material: Formed through the chemical and mechanical alteration of the Jerryslu soil

Typical profile

0 to 14 inches—very pale brown sandy loam
14 to 36 inches—very pale brown sandy loam and coarse sandy loam
36 to 43 inches—light yellowish brown loamy coarse sand
43 to 49 inches—a duripan that is 85 percent weakly silica cemented and 15 percent strongly silica cemented
49 to 92 inches—pale brown and very pale brown coarse sandy loam and sandy loam
92 to 99 inches—very pale brown coarse sand

Component properties and qualities

Depth class: Deep
Drainage class: Moderately well drained
Permeability: Moderate above the duripan because of sodicity, very slow in the duripan, and moderately rapid below the duripan
Available water capacity: Low or moderate

Shrink-swell potential: Low
Salinity: 0 to 4 dS/m
Sodicity (SAR): 1 to 8
Depth to a duripan: 40 to 60 inches.
Surface runoff rate: Low
Flooding: Rare in years of abnormally high precipitation
Corrosivity: Steel—high; concrete—high

Characteristics of the Jerryslu Soil

Parent material: Alluvium derived from granitic rock sources

Typical profile

0 to 1 inch—brown loam
1 to 4 inch—light gray loam and very fine sandy loam
4 to 35 inches—yellowish brown and light yellowish brown sandy clay loam and loam
35 to 55 inches—an indurated duripan
55 to 79 inches—light yellowish brown sandy loam

Component properties and qualities

Depth class: Moderately deep
Drainage class: Moderately well drained
Permeability: Slow above the duripan, very slow in the duripan, and moderately rapid below the duripan
Available water capacity: Very low or low
Shrink-swell potential: Moderate
Salinity: 2 to 16 dS/m
Sodicity (SAR): 1 to 13 in the surface layer and 13 to 300 in the subsoil
Depth to a duripan: 20 to 40 inches
Surface runoff rate: Medium
Flooding: Rare in years of abnormally high precipitation
Corrosivity: Steel—high; concrete—low

Inclusions

Contrasting inclusions:
• Garces soils on fan remnants—5 percent
• Gareck soils on fan remnants—5 percent
• Saline-sodic Kimberlina soils on alluvial fans and flood plains—4 percent
• Soils in depressions that are ponded more than 14 days each year—1 percent

Similar inclusions:
• Soils with a surface layer of silt loam or fine sandy loam

Use and Management

Land uses: Irrigated crops, building site development, and farmstead dairies

Irrigated crops

Commonly grown crops: Alfalfa hay, corn silage, barley, cotton, table grapes, plums, walnuts, almonds, and wheat
Major management factors: Jerryslu—salinity and sodicity, moderate depth to a duripan, very slow permeability in the duripan, and very low or low available water capacity; Atesh—deep depth to a duripan, very slow permeability in the duripan, and low or moderate available water capacity
Management considerations in areas of the Jerryslu soil:
• The salinity and sodicity of the soil limit the kinds of crops that can be grown.
• Reclamation of this soil requires a long-range program that includes ongoing monitoring of salinity and sodicity.
• The content of salts and sodium can be reduced by applying proper soil amendments, such as gypsum; leaching below the root zone; and returning crop residue to the soil.
• Careful irrigation helps to prevent an increase in the concentration of salts and sodium.
Management considerations in areas of the Jerryslu and Atesh soils:
• The depth to a duripan limits the rooting depth in the Jerryslu soil and limits deep-rooting crops in the Atesh soil.
• The very slow permeability in the duripan limits the efficiency of irrigation.
• Ripping and shattering the duripan improve permeability, increase the available water capacity, extend the rooting depth, and improve internal drainage.
• Applications of irrigation water should be adjusted to the available water capacity, the restricted permeability, and the needs of the crop.
• Moderately rapidly permeable soil layers below the duripan can speed the leaching of nutrients, primarily nitrates, and certain pesticides into the ground water.

Building site development

Major management factors: Jerryslu and Atesh—rare flooding, very slow permeability in the duripan, moderately rapid permeability in the substratum, high corrosivity to steel; Atesh—high corrosivity to concrete
Management considerations:
• The risk of flood damage can be reduced by locating structures above the expected level of flooding.
• The very slow permeability in the duripan increases the likelihood that improperly designed septic tank absorption fields will fail.

• Onsite investigation is needed to determine whether an area selected as a site for a septic tank absorption field is underlain by unsuitable material. The absorption lines should be installed beneath such material.
• If the density of housing is moderate or high, a community sewage system may be needed.
• Locating septic tank absorption fields a sufficient distance away from domestic wells helps to prevent the contamination of water.
• The corrosion of steel can be minimized by using corrosion-resistant material and coatings and cathodic protectors.
• The corrosion of concrete in areas of the Atesh soil can be minimized by using sulfate-resistant material.

Farmstead dairies

Major management factors: Moderately rapid permeability below the duripan
Management considerations:
• Dairy waste lagoons may not be suitable because of the risk of ground-water pollution. Onsite investigation is needed to determine whether an area selected as a site for a dairy waste lagoon is underlain by unsuitable material. If layers with moderately rapid, rapid, or very rapid permeability are encountered during excavation, special measures may be required to seal the surface of the lagoon.

Interpretive Groups

Land capability classification: Jerryslu—4s-8, irrigated, and 7s, nonirrigated; Atesh—3s-8, irrigated, and 6s, nonirrigated
MLRA: 17
Prime farmland: Jerryslu—No; Atesh—No

104—Biggriz-Biggriz, saline-sodic, complex, 0 to 2 percent slopes

Setting

Landform: Fan remnants
Description of area: Irrigated cropland that has been leveled, drained, and reclaimed with soil amendments
Elevation: 190 to 270 feet
Major use: Irrigated cropland
Mean annual precipitation: 6 to 8 inches
Mean annual temperature: 63 to 66 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Biggriz soil and similar soils: 55 percent
Saline-sodic Biggriz soil and similar soils: 30 percent
Minor components: 15 percent
Note: The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Characteristics of the Biggriz Soil

Parent material: Alluvium derived mainly from granitic rock sources

Typical profile

0 to 14 inches—light brownish gray loam
14 to 50 inches—light brownish gray and grayish brown loam
50 to 65 inches—light brownish gray and grayish brown loam and sandy clay loam

Component properties and qualities

Depth class: Very deep
Drainage class: Somewhat poorly drained (artificially drained because of protection from flooding, pumping from the water table, the use of tile and interceptor drains, and the filling and leveling of sloughs)
Permeability: Moderately slow
Available water capacity: High
Shrink-swell potential: Moderate
Salinity: 0 to 4 dS/m
Sodicity (SAR): 1 to 13
Surface runoff: Negligible
Flooding: Rare in years of abnormally high precipitation
Corrosivity: Steel—high; concrete—moderate

Characteristics of the Saline-Sodic Biggriz Soil

Parent material: Alluvium derived mainly from granitic rock sources

Typical profile

0 to 14 inches—light brownish gray loam
14 to 50 inches—light brownish gray and grayish brown loam
50 to 65 inches—light brownish gray and grayish brown loam and sandy clay loam

Component properties and qualities

Depth class: Very deep
Drainage class: Somewhat poorly drained (artificially drained because of protection from flooding, pumping from the water table, the use of tile and interceptor drains, and the filling and leveling of sloughs)
Permeability: Moderately slow
Available water capacity: Moderate

Shrink-swell potential: Moderate
Salinity: 4 to 8 dS/m
Sodicity (SAR): 13 to 200, with some layer always greater than 30
Surface runoff: Negligible
Flooding: Rare in years of abnormally high precipitation
Corrosivity: Steel—high; concrete—moderate

Inclusions

Contrasting inclusions:
- Nord soils on flood plains and alluvial fans—3 percent
- Gambogy soils on flood plains and alluvial fans—3 percent
- Garces soils on fan remnants on the western edge of the map unit—2 percent
- Lethent soils on fan remnants on the western edge of the map unit—2 percent
- Colpien soils on fan remnants—2 percent
- Tujunga soils on flood plains—2 percent
- Soils in depressions that are ponded more than 14 days each year—1 percent

Similar inclusions:
- Soils with a surface layer of silt loam or clay loam

Note: Pollution of ground water is a major concern in areas of similar and contrasting inclusions that have layers with moderately rapid, rapid, or very rapid permeability.

Use and Management

Land uses: Irrigated crops, building site development, and farmstead dairies

Irrigated crops

Commonly grown crops: Alfalfa hay, table grapes, plums, almonds, corn silage, cotton, walnuts, and wheat
Major management factors: Saline-sodic Biggriz—salinity and sodicity; nonsaline-nonsodic Biggriz—few or no limitations affecting the use of this soil for irrigated crops
Management considerations:
- The salinity and sodicity of the saline-sodic Biggriz soil limit the kinds of crops that can be grown.
- Reclamation of the saline-sodic Biggriz soil requires a long-range program that includes ongoing monitoring of salinity and sodicity.
- The content of salts and sodium can be reduced by applying proper soil amendments, such as gypsum; leaching below the root zone; and returning crop residue to the soil.
- Careful irrigation helps to prevent an increase in the concentration of salts and sodium.

Building site development

Major management factors: Rare flooding and high corrosivity to steel
Management considerations:
- The risk of flood damage can be reduced by locating structures above the expected level of flooding.
- The corrosion of steel can be minimized by using corrosion-resistant material and coatings and cathodic protectors.

Farmstead dairies

Major management factors: Pollution of ground water
Management considerations:
- The Biggriz soils have few limitations as sites for dairy waste lagoons. Onsite investigation is needed to determine whether an area selected as a site for a dairy waste lagoon is underlain by unsuitable material below a depth of 60 inches. If the underlying material has moderately rapid, rapid, or very rapid permeability, special measures may be required to seal the surface of the lagoon.

Interpretive Groups

Land capability classification: Biggriz—2s-6, irrigated, and 6s, nonirrigated; saline-sodic Biggriz—3s-6, irrigated, and 7s, nonirrigated
MLRA: 17
Prime farmland: Biggriz—yes, where irrigated and protected from flooding; saline-sodic Biggriz—no

105—Calgro-Calgro, saline-sodic, complex, 0 to 2 percent slopes

Setting

Landform: Fan remnants
Description of area: Irrigated cropland that has been leveled and reclaimed with soil amendments
Elevation: 250 to 480 feet
Major use: Irrigated cropland
Mean annual precipitation: 8 to 12 inches
Mean annual temperature: 62 to 65 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Calgro soil and similar soils: 60 percent
Saline-sodic Calgro soil and similar soils: 25 percent
Minor components: 15 percent
Note: The components of this unit are so intricately

intermingled that it was not practical to map them separately at the scale used.

Characteristics of the Calgro Soil

Parent material: Alluvium derived from granitic rock sources

Typical profile

0 to 7 inches—brown sandy loam
7 to 25 inches—yellowish brown sandy loam
25 to 33 inches—a slightly fractured, indurated duripan
33 to 53 inches—pale brown gravelly loamy sand
53 to 60 inches—a slightly fractured, indurated duripan

Component properties and qualities

Depth class: Moderately deep
Drainage class: Moderately well drained
Permeability: Moderate above the duripan because of a sodicity of 1 to 12, very slow in the duripan, and rapid below the duripan
Available water capacity: Low or moderate
Shrink-swell potential: Low
Salinity: 0 to 4 dS/m
Sodicity (SAR): 1 to 12
Depth to a duripan: 20 to 40 inches.
Surface runoff rate: Low
Flooding: Very rare in years of abnormally high precipitation
Corrosivity: Steel—high; concrete—low

Characteristics of the Saline-Sodic Calgro Soil

Parent material: Alluvium derived from granitic rock sources

Typical profile

0 to 8 inches—brown sandy loam
8 to 24 inches—yellowish brown sandy loam
24 to 33 inches—a slightly fractured, indurated duripan
33 to 52 inches—pale brown gravelly loamy sand
52 to 60 inches—a slightly fractured, indurated duripan

Component properties and qualities

Depth class: Moderately deep
Drainage class: Moderately well drained
Permeability: Moderate above the duripan because of a sodicity of 13 to 100, very slow in the duripan, and rapid below the duripan
Available water capacity: Low or moderate
Shrink-swell potential: Low
Salinity: 2 to 16 dS/m, with some layer always above 12
Sodicity (SAR): 13 to 100
Depth to a duripan: 20 to 40 inches.
Surface runoff rate: Low
Flooding: Very rare in years of abnormally high precipitation
Corrosivity: Steel—high; concrete—low

Inclusions

Contrasting inclusions:
- Colpien soils on fan remnants—5 percent
- Grangeville soils on flood plains and alluvial fans—4 percent
- Tujunga soils on flood plains—3 percent
- Exeter soils on fan remnants—2 percent
- Soils in depressions that are ponded more than 14 days each year—1 percent

Similar inclusions:
- Soils with a surface layer of loam

Use and Management

Land uses: Irrigated crops, building site development, and farmstead dairies

Irrigated crops

Commonly grown crops: Alfalfa hay, table grapes, barley, cotton, plums, nectarines, corn silage, almonds, and wheat
Major management factors: Saline-sodic Calgro soil—salinity and sodicity; both soils—depth to the duripan, very slow permeability in the duripan and rapid permeability below the duripan, and low or moderate available water capacity
Management considerations:
- The salinity and sodicity of the saline-sodic Calgro soil limit the kinds of crops that can be grown.
- Reclamation of the saline-sodic Calgro soil requires a long-range program that includes ongoing monitoring of salinity and sodicity.
- The content of salts and sodium can be reduced by applying proper soil amendments, such as gypsum; leaching below the root zone; and returning crop residue to the soil.
- Careful irrigation helps to prevent an increase in the concentration of salts and sodium.
- The depth to a duripan limits the rooting depth.
- The very slow permeability in the duripan limits the efficiency of irrigation.
- Ripping and shattering the duripan improve permeability, increase the available water capacity, extend the rooting depth, and improve internal drainage.

• Applications of irrigation water should be adjusted to the low or moderate available water capacity, the restricted permeability, and the needs of the crop.
• Rapidly permeable soil layers below the duripan can speed the leaching of nutrients, primarily nitrates, and certain pesticides into the ground water.

Building site development

Major management factors: Very slow permeability in the duripan, rapid permeability below the duripan, and high corrosivity to steel
Management considerations:
• Very slow permeability in the duripan increases the likelihood that improperly designed septic tank absorption fields will fail. Onsite investigation is needed when septic tank systems are designed.
• Onsite investigation is needed to determine whether an area selected as a site for a septic tank absorption field has a duripan that is underlain by unsuitable material. The absorption lines should be installed beneath such material.
• If the density of housing is moderate or high, a community sewage system may be needed.
• Locating septic tank absorption fields a sufficient distance away from domestic wells helps to prevent the contamination of water.
• The corrosion of steel can be minimized by using corrosion-resistant material and coatings and cathodic protectors.

Farmstead dairies

Major management factors: Rapid permeability below the duripan
Management considerations:
• Dairy waste lagoons may not be suitable because of the risk of ground-water pollution. Onsite investigation is needed to determine whether an area selected as a site for a dairy waste lagoon is underlain by unsuitable material. If layers with moderately rapid, rapid, or very rapid permeability are encountered during excavation, special measures may be required to seal the surface of the lagoon.

Interpretive Groups

Land capability classification: Calgro—3s-8, irrigated, and 6s, nonirrigated; saline-sodic Calgro—4s-6, irrigated, and 7s, nonirrigated
MLRA: 17
Prime farmland: No

106—Centerville clay, 0 to 2 percent slopes

Setting

Landform: Fan remnants
Description of area: Irrigated cropland that has been leveled and reclaimed with soil amendments
Elevation: 300 to 600 feet
Major use: Irrigated cropland
Slope features: An undulating topography because stream terraces have been dissected by numerous drainage channels
Mean annual precipitation: 9 to 12 inches
Mean annual temperature: 62 to 65 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Centerville soil and similar soils: 90 percent
Minor components: 10 percent

Characteristics of the Centerville Soil

Parent material: Alluvium derived mainly from granitic rock sources

Typical profile

0 to 7 inches—dark grayish brown clay
7 to 48 inches—light brownish gray, dark brown, and brown clay loam and clay
48 to 60 inches—light yellowish brown gravelly sandy clay loam

Component properties and qualities

Depth class: Very deep
Drainage class: Well drained
Permeability: Slow
Available water capacity: Moderate
Shrink-swell potential: High
Salinity: 0 to 8 dS/m
Sodicity (SAR): 13 to 40
Surface runoff rate: Low
Flooding: Very rare in years of abnormally high precipitation
Corrosivity: Steel—high; concrete—low

Inclusions

Contrasting inclusions:
• Exeter soils on fan remnants—7 percent
• San Joaquin soils on fan remnants—2 percent
• Soils in depressions that are ponded more than 14 days each year—1 percent

Similar inclusions:
• Soils with a surface layer of clay loam

Note: Pollution of ground water is a major concern in areas of similar and contrasting inclusions that have layers with moderately rapid, rapid, or very rapid permeability.

Use and Management

Land uses: Irrigated crops, building site development, and farmstead dairies

Irrigated crops

Commonly grown crops: Olives, corn silage, cotton, oranges, pistachios, plums, persimmons, kiwis, table grapes, alfalfa hay, barley, and wheat
Major management factors: Sodicity and slow permeability
Management considerations:
• The sodicity of the soil may limit the kinds of crops that can be grown.
• Reclamation of this soil requires a long-range program that includes ongoing monitoring of sodicity.
• The content of sodium can be reduced by applying proper soil amendments, such as gypsum; leaching below the root zone; and returning crop residue to the soil.
• Careful irrigation helps to prevent an increase in the concentration of salts and sodium.
• Because of the restricted permeability, applications of irrigation water should be regulated so that the water does not stand on the surface and damage crops.

Building site development

Major management factors: High shrink-swell potential, high corrosivity to steel, and slow permeability
Management considerations:
• Properly designing foundations and footings and diverting runoff away from buildings help to prevent the structural damage caused by shrinking and swelling.
• The corrosion of steel can be minimized by using corrosion-resistant material and coatings and cathodic protectors.
• The slow permeability increases the likelihood that improperly designed septic tank absorption fields will fail. Onsite investigation is needed when septic tank systems are designed.

Farmstead dairies

Major management factors: Pollution of ground water
Management considerations:
• The Centerville soil has few limitations as a site for dairy waste lagoons. Onsite investigation is needed to determine whether an area selected as a site for such a lagoon is underlain by unsuitable material below a depth of 60 inches. If the underlying material has moderately rapid, rapid, or very rapid permeability, special measures may be required to seal the surface of the lagoon.

Interpretive Groups

Land capability classification: 3s-3, irrigated, and 4s-3, nonirrigated
MLRA: 17
Prime farmland: No

107—Centerville clay, 2 to 5 percent slopes

Setting

Landform: Fan remnants
Description of area: Irrigated cropland that has been reclaimed with soil amendments
Elevation: 300 to 600 feet
Major use: Irrigated cropland
Slope features: An undulating topography because stream terraces have been dissected by numerous drainage channels
Mean annual precipitation: 9 to 12 inches
Mean annual temperature: 62 to 65 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Centerville soil and similar soils: 90 percent
Minor components: 10 percent

Characteristics of the Centerville Soil

Parent material: Alluvium derived mainly from granitic rock sources

Typical profile

0 to 7 inches—dark grayish brown clay
7 to 48 inches—light brownish gray, dark brown, and brown clay loam and clay
48 to 60 inches—light yellowish brown gravelly sandy clay loam

Component properties and qualities

Depth class: Very deep
Drainage class: Well drained
Permeability: Slow
Available water capacity: Moderate
Shrink-swell potential: High
Salinity: 0 to 8 dS/m
Sodicity (SAR): 13 to 40

Surface runoff rate: Low
Flooding: Very rare in years of abnormally high precipitation
Corrosivity: Steel—high; concrete—low

Inclusions

Contrasting inclusions:
- Exeter soils on fan remnants—7 percent
- San Joaquin soils on fan remnants—2 percent
- Soils in depressions that are ponded more than 14 days each year—1 percent

Similar inclusions:
- Soils with a surface layer of clay loam

Note: Pollution of ground water is a major concern in areas of similar and contrasting inclusions that have layers with moderately rapid, rapid, or very rapid permeability.

Use and Management

Land uses: Irrigated crops, building site development, and farmstead dairies

Irrigated crops

Commonly grown crops: Olives, corn silage, cotton, oranges, pistachios, plums, persimmons, kiwis, table grapes, alfalfa hay, barley, and wheat
Major management factors: Sodicity and slow permeability
Management considerations:
- The sodicity of the soil may limit the kinds of crops that can be grown.
- Reclamation of this soil requires a long-range program that includes ongoing monitoring of sodicity.
- The content of sodium can be reduced by applying proper soil amendments, such as gypsum; leaching below the root zone; and returning crop residue to the soil.
- Careful irrigation helps to prevent an increase in the concentration of salts and sodium.
- Because of the restricted permeability, applications of irrigation water should be regulated so that the water does not stand on the surface and damage crops.

Building site development

Major management factors: High shrink-swell potential, high corrosivity to steel, and slow permeability
Management considerations:
- Properly designing foundations and footings and diverting runoff away from buildings help to prevent the structural damage caused by shrinking and swelling.
- The corrosion of steel can be minimized by using corrosion-resistant material and coatings and cathodic protectors.
- The slow permeability increases the likelihood that improperly designed septic tank absorption fields will fail. Onsite investigation is needed when septic tank systems are designed.

Farmstead dairies

Major management factors: Pollution of ground water
Management considerations:
- The Centerville soil has few limitations as a site for dairy waste lagoons. Onsite investigation is needed to determine whether an area selected as a site for such a lagoon is underlain by unsuitable material below a depth of 60 inches. If the underlying material has moderately rapid, rapid, or very rapid permeability, special measures may be required to seal the surface of the lagoon.

Interpretive Groups

Land capability classification: 3e-3, irrigated, and 4e-3, nonirrigated
MLRA: 17
Prime farmland: No

108—Colpien loam, 0 to 2 percent slopes

Setting

Landform: Fan remnants
Description of area: Irrigated cropland that has been leveled and reclaimed with soil amendments
Elevation: 220 to 550 feet
Major use: Irrigated cropland
Mean annual precipitation: 8 to 12 inches
Mean annual temperature: 62 to 65 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Colpien soil and similar soils: 85 percent
Minor components: 15 percent

Characteristics of the Colpien Soil

Parent material: Alluvium derived mainly from granitic rock sources

Typical profile

0 to 6 inches—dark gray loam
6 to 24 inches—dark gray clay loam
24 to 60 inches—grayish brown and light brownish gray loam and clay loam
60 to 65 inches—light brownish gray sandy loam

Component properties and qualities

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Moderately slow
Available water capacity: Very high
Shrink-swell potential: Moderate
Salinity: 0.5 to 4 dS/m
Sodicity (SAR): 1 to 12
Surface runoff: Negligible
Flooding: Rare in years of abnormally high precipitation
Corrosivity: Steel—high; concrete—low

Inclusions

Contrasting inclusions:
• Drained, saline-sodic Biggriz soils on fan remnants—3 percent
• Gambogy soils on alluvial fans and flood plains—3 percent
• Hanford soils on alluvial fans and flood plains—3 percent
• Saline-sodic Akers soils on fan remnants—2 percent
• Nord soils on alluvial fans and flood plains—2 percent
• Tujunga soils on elongated flood plains—2 percent

Similar inclusions:
• Soils with a surface layer of fine sandy loam, silt loam, sandy clay loam, or clay loam

Note: Pollution of ground water is a major concern in areas of similar and contrasting inclusions that have layers with moderately rapid, rapid, or very rapid permeability.

Use and Management

Land uses: Irrigated crops, building site development, and farmstead dairies

Irrigated crops

Commonly grown crops: Cotton, wheat, alfalfa hay, corn silage, table grapes, plums, and walnuts
Major management factors: Few or no limitations affect the use of this soil for irrigated crops.

Building site development

Major management factors: Rare flooding and high corrosivity to steel
Management considerations:
• The risk of flood damage can be reduced by locating structures above the expected level of flooding.
• The corrosion of steel can be minimized by using corrosion-resistant material and coatings and cathodic protectors.

Farmstead dairies

Major management factors: Pollution of ground water
Management considerations:
• The Colpien soil has few limitations as a site for dairy waste lagoons. Onsite investigation is needed to determine whether an area selected as a site for such a lagoon is underlain by unsuitable material below a depth of 60 inches. If the underlying material has moderately rapid, rapid, or very rapid permeability, special measures may be required to seal the surface of the lagoon.

Interpretive Groups

Land capability classification: 1, irrigated, and 4c, nonirrigated
MLRA: 17
Prime farmland: Yes in areas that are irrigated and protected from flooding

109—Crosscreek-Kai association, 0 to 2 percent slopes

Setting

Landform: Fan remnants
Description of area: Crosscreek—on irrigated cropland that has been leveled, ripped, and reclaimed with soil amendments; Kai—in native areas, some of which are in the Pixley Vernal Pool Preserve of the Nature Conservancy
Elevation: 225 to 400 feet
Major use: Irrigated cropland
Vegetation: Annual grasses and forbs in native areas
Mean annual precipitation: 8 to 12 inches
Mean annual temperature: 62 to 65 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Crosscreek soil and similar soils: 70 percent
Kai soil and similar soils: 15 percent
Minor components: 15 percent
Note: Component percentages vary from place to place, depending on the amount of native land versus the amount of reclaimed farmland.

Characteristics of the Crosscreek Soil

Parent material: Formed through the chemical and mechanical alteration of the Kai soil

Typical profile

0 to 11 inches—light gray loam
11 to 17 inches—light brownish gray gravelly loam
17 to 55 inches—pale brown and light brownish gray loam

55 to 60 inches—a duripan cemented by silica and calcium carbonate

Component properties and qualities

Depth class: Deep
Drainage class: Well drained
Permeability: Moderately slow above the duripan because of sodicity and very slow in the duripan
Available water capacity: Moderate or high
Shrink-swell potential: Moderate
Salinity: 1 to 12 dS/m
Sodicity (SAR): 1 to 12
Depth to a duripan: 40 to 60 inches
Surface runoff rate: Medium
Flooding: Very rare in years of abnormally high precipitation
Corrosivity: Steel—high; concrete—high

Characteristics of the Kai Soil

Parent material: Alluvium derived mainly from granitic rock sources

Typical profile

0 to 6 inches—light brownish gray loam
6 to 39 inches—grayish brown, pale brown, and brown silt loam, clay loam, and loam
39 to 46 inches—a duripan that is strongly cemented with silica
46 to 65 inches—brown loam that is weakly cemented with silica

Component properties and qualities

Depth class: Moderately deep
Drainage class: Moderately well drained
Permeability: Moderately slow above the duripan and very slow in the duripan
Available water capacity: Low or moderate
Shrink-swell potential: Moderate
Salinity: 0 to 16 dS/m
Sodicity (SAR): 13 to 80 in the upper part of the profile; 4 to 13 in the lower part
Depth to a duripan: 20 to 40 inches
Surface runoff rate: Medium
Flooding: Very rare in years of abnormally high precipitation
Corrosivity: Steel—high; concrete—low

Inclusions

Contrasting inclusions:
- Quonal soils on fan remnants—5 percent
- Exeter soils on fan remnants—4 percent
- Saline-sodic Calgro soils on fan remnants—3 percent
- Hanford soils on flood plains and alluvial fans—2 percent
- Soils in depressions that are ponded more than 14 days each year—1 percent

Similar inclusions:
- Soils with a surface layer of sandy loam

Note: Pollution of ground water is a major concern in areas of similar and contrasting inclusions that have layers with moderately rapid, rapid, or very rapid permeability.

Use and Management

Land uses: Irrigated crops, building site management, wetlands and wildlife habitat, and farmstead dairies

Irrigated crops

Commonly grown crops: Corn silage, cotton, alfalfa hay, and wheat
Major management factors: Kai—salinity and sodicity and low or moderate available water capacity; Kai and Crosscreek—depth to the duripan and very slow permeability in the duripan
Management considerations:
- The salinity and sodicity of the Kai soil limit the kinds of crops that can be grown.
- Reclamation of the Kai soil requires a long-range program that includes ongoing monitoring of salinity and sodicity.
- The content of salts and sodium in the Kai soil can be reduced by applying proper soil amendments, such as gypsum; leaching below the root zone; and returning crop residue to the soil.
- Careful irrigation helps to prevent an increase in the concentration of salts and sodium in the Kai soil.
- Applications of irrigation water should be adjusted to the available water capacity and water intake rate of the Kai soil and to the needs of the crop.
- The depth to a duripan limits the rooting depth in the Kai soil.
- The very slow permeability in the duripan of both soils limits the efficiency of irrigation.
- Because of the restricted permeability of both soils, applications of irrigation water should be regulated so that the water does not stand on the surface and damage crops.
- Ripping and shattering the duripan improve permeability, increase the available water capacity, extend the rooting depth, and improve internal drainage.

Building site development

Major management factors: Very slow permeability in

the duripan, moderate or moderately rapid permeability below the duripan, high corrosivity to steel in both soils and high corrosivity to concrete in the Crosscreek soil

Management considerations:

• The very slow permeability increases the likelihood that improperly designed septic tank absorption fields will fail. Onsite investigation is needed when septic tank systems are designed.

• The corrosion of steel can be minimized by using corrosion-resistant material and coatings and cathodic protectors.

• The corrosion of concrete in areas of the Crosscreek soil can be minimized by using sulfate-resistant material.

Wetlands and wildlife habitat

Management considerations:

• This unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion. Many of the native areas are currently identified as vernal pool wetlands.

Farmstead dairies

Major management factors: Pollution of ground water

Management considerations:

• The Crosscreek and Kai soils have few limitations as sites for dairy waste lagoons. Onsite investigation is needed to determine whether an area selected as a site for such a lagoon is underlain by unsuitable material below a depth of 60 inches. If the underlying material has moderately rapid, rapid, or very rapid permeability, special measures may be required to seal the surface of the lagoon.

Interpretive Groups

Land capability classification: Crosscreek—2s-6, irrigated, and 6s, nonirrigated; Kai—3s-6 irrigated, and 7s, nonirrigated

MLRA: 17

Prime farmland: No

110—Delhi loamy sand, 0 to 2 percent slopes

Setting

Landform: Alluvial fans and flood plains

Description of area: Irrigated cropland that has been leveled

Elevation: 300 to 375 feet

Major use: Irrigated cropland

Mean annual precipitation: 10 to 12 inches

Mean annual temperature: 62 to 65 degrees F

Frost-free period: 225 to 300 days

Map Unit Composition

Delhi soil and similar soils: 95 percent

Minor components: 5 percent

Characteristics of the Delhi Soil

Parent material: Wind-modified alluvium derived from granitic rock sources

Typical profile

0 to 11 inches—light brownish gray loamy sand

11 to 72 inches—pale brown loamy sand

Component properties and qualities

Depth class: Very deep

Drainage class: Somewhat excessively drained

Permeability: Rapid

Available water capacity: Low

Shrink-swell potential: Low

Surface runoff rate: Very low

Flooding: Very rare in years of abnormally high precipitation

Corrosivity: Steel—moderate; concrete—low

Inclusions

Contrasting inclusions:

• Hanford soils on fan remnants—2 percent

• Tujunga soils on flood plains—1 percent

• Calgro soils on fan remnants—1 percent

• Yettem soils on flood plains and alluvial fans—1 percent

Similar inclusions:

• Soils with a surface layer of sandy loam

Use and Management

Land uses: Irrigated crops, building site development, and farmstead dairies

Irrigated crops

Commonly grown crops: Cotton, almonds, wheat, alfalfa hay, corn silage, table grapes, plums, and walnuts

Major management factors: Wind erosion, soil blowing, rapid permeability, and low available water capacity

Management considerations:

• Leaving the maximum amount of crop residue on the soil surface and minimizing tillage help to control soil blowing.

• The rapid permeability and low available water capacity limit the efficiency of irrigation.

• The available water capacity can be improved by

maintaining crop residue on or near the surface and growing cover crops.
• If furrow irrigation is used, the field should be irrigated at frequent intervals. Short runs result in more efficient irrigation.
• Rapidly permeable soil layers can speed the leaching of nutrients, primarily nitrates, and certain pesticides into the ground water.

Building site development

Major management factors: Rapid permeability
Management considerations:
• Onsite sewage disposal systems may not be suitable because of the risk of ground-water pollution.
• Onsite investigation is needed to determine whether an area selected as a site for a septic tank absorption field is underlain by unsuitable material. The absorption lines should be installed beneath such material.
• If the density of housing is moderate or high, a community sewage system may be needed.
• Locating septic tank absorption fields a sufficient distance away from domestic wells helps to prevent the contamination of water.

Farmstead dairies

Major management factors: Rapid permeability
Management considerations:
• Dairy waste lagoons may not be suitable because of the risk of ground-water pollution. Onsite investigation is needed to determine whether an area selected as a site for such a lagoon is underlain by unsuitable material. If layers with moderately rapid, rapid, or very rapid permeability are encountered during excavation, special measures may be required to seal the surface of the lagoon.

Interpretive Groups

Land capability classification: 3s-1, irrigated, and 4e-1, nonirrigated
MLRA: 17
Prime farmland: No

111—Delvar clay loam, 2 to 9 percent slopes

Setting

Landform: Fan remnants
Elevation: 400 to 600 feet
Slope features: An undulating topography because stream terraces have been dissected by numerous drainage channels
Major use: Irrigated cropland
Mean annual precipitation: 8 to 12 inches
Mean annual temperature: 62 to 65 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Delvar soil and similar soils: 85 percent
Minor components: 15 percent

Characteristics of the Delvar Soil

Parent material: Mixed alluvium derived mainly from granitic and metasedimentary rock sources

Typical profile

0 to 12 inches—dark grayish brown clay loam
12 to 42 inches—dark brown clay
42 to 60 inches—yellowish brown sandy loam

Component properties and qualities

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Slow
Available water capacity: High
Shrink-swell potential: Moderate
Salinity: 0 to 8 dS/m
Sodicity (SAR): 1 to 13 in the upper part of the profile; 13 to 20 in the lower part
Surface runoff rate: Medium
Flooding: Very rare in years of abnormally high precipitation
Corrosivity: Steel—high; concrete—low

Inclusions

Contrasting inclusions:
• San Joaquin soils on fan remnants in drainage channels—5 percent
• Exeter soils on fan remnants in drainage channels—4 percent
• Centerville soils on fan remnants—3 percent
• Colpien soils on fan remnants—2 percent
• Soils in depressions that are ponded more than 14 days each year—1 percent

Similar inclusions:
• Soils with a surface layer of loam or clay

Note: Pollution of ground water is a major concern in areas of similar and contrasting inclusions that have layers with moderately rapid, rapid, or very rapid permeability.

Use and Management

Land uses: Irrigated crops, building site development, and farmstead dairies

Irrigated crops

Commonly grown crops: Oranges, table grapes, cotton, corn silage, plums, walnuts, alfalfa hay, and wheat
Major management factors: Slow permeability and sodicity in the substratum
Management considerations:
• Because of the restricted permeability, applications of irrigation water should be regulated so that the water does not stand on the surface and damage crops.
• The sodicity of the substratum limits the kinds of crops that can be grown.
• Reclamation of this soil requires a long-range program that includes ongoing monitoring of sodicity.
• The content of sodium can be reduced by applying proper soil amendments, such as gypsum; leaching below the root zone; and returning crop residue to the soil.
• Careful irrigation helps to prevent an increase in the concentration of sodium in the soil.

Building site development

Major management factors: Slow permeability, high shrink-swell potential, and high corrosivity to steel
Management considerations:
• The slow permeability increases the likelihood that improperly designed septic tank absorption fields will fail. Onsite investigation is needed when septic tank systems are designed.
• Properly designing foundations and footings and diverting runoff away from buildings help to prevent the structural damage caused by shrinking and swelling.
• The corrosion of steel can be minimized by using corrosion-resistant material and coatings and cathodic protectors.

Farmstead dairies

Major management factors: Pollution of ground water
Management considerations:
• The Delvar soil has few limitations as a site for dairy waste lagoons. Onsite investigation is needed to determine whether an area selected as a site for such a lagoon is underlain by unsuitable material below a depth of 60 inches. If the underlying material has moderately rapid, rapid, or very rapid permeability, special measures may be required to seal the surface of the lagoon.

Interpretive Groups

Land capability classification: 2e-3, irrigated, and 4e-3, nonirrigated
MLRA: 17
Prime farmland: No

112—Dumps

Setting

Landform: Various
Description of area: Smoothed or uneven accumulations of refuse that cannot support plants unless major reclamation measures are applied; in scattered areas throughout the county
Slope range: 0 to 2 percent

Composition

Dumps: 100 percent

Characteristics of the Dumps

Soil properties, such as permeability, drainage, runoff, effective rooting depth, and available water capacity, vary from one area to another. This unit is poorly suited to most land uses. It is not assigned a land capability classification.

113—Excelsior fine sandy loam, 0 to 1 percent slopes

Setting

Landform: Alluvial fans
Description of area: Irrigated cropland that has been leveled and reclaimed with soil amendments
Elevation: 205 to 275 feet
Major use: Irrigated cropland
Mean annual precipitation: 7 to 8 inches
Mean annual temperature: 62 to 64 degrees F
Frost-free period: 250 to 275 days

Map Unit Composition

Excelsior soil and similar soils: 85 percent
Minor components: 15 percent

Characteristics of the Excelsior Soil

Parent material: Mixed alluvium derived mainly from granitic rock sources

Typical profile

0 to 8 inches—light brownish gray fine sandy loam
8 to 36 inches—stratified light gray sandy loam, fine sandy loam, and loamy sand
36 to 60 inches—light gray silt loam and loam

Component properties and qualities

Depth class: Very deep
Drainage class: Well drained
Permeability: Slow
Available water capacity: Low or moderate
Shrink-swell potential: Low

Salinity: 0 to 8 dS/m in the upper part of the profile; 2 to 16 dS/m in the lower part
Sodicity (SAR): 1 to 13 in the upper part of the profile; 13 to 80 in the lower part
Surface runoff rate: Low
Flooding: Rare in years of abnormally high precipitation
Corrosivity: Steel—high; concrete—high

Inclusions

Contrasting inclusions:
• Saline-sodic Kimberlina soils on flood plains—5 percent
• Armona soils on basin rims and flood plains—5 percent
• Westcamp soils on basin rims—3 percent
• Posochanet soils on fan skirts—1 percent
• Soils that have sandy particle-size families—1 percent

Similar inclusions:
• Soils with a surface layer of sandy loam

Note: Pollution of ground water is a major concern in areas of similar and contrasting inclusions that have layers with moderately rapid, rapid, or very rapid permeability.

Use and Management

Land uses: Irrigated crops, building site development, and farmstead dairies

Irrigated crops

Commonly grown crops: Cotton, wheat, corn silage, table grapes, and alfalfa hay
Major management factors: Salinity and sodicity, slow permeability, and low or moderate available water capacity
Management considerations:
• The salinity and sodicity of the soil limit the kinds of crops that can be grown.
• Reclamation of this soil requires a long-range program that includes ongoing monitoring of salinity and sodicity.
• The content of salts and sodium can be reduced by applying proper soil amendments, such as gypsum; leaching below the root zone; and returning crop residue to the soil.
• Careful irrigation helps to prevent an increase in the concentration of salts and sodium.
• Because of the restricted permeability, applications of irrigation water should be regulated so that the water does not stand on the surface and damage crops.
• Applications of irrigation water should be adjusted to the available water capacity, the slow permeability, and the needs of the crop.

Building site development

Major management factors: Rare flooding, slow permeability, and high corrosivity to steel and concrete
Management considerations:
• The risk of flood damage can be reduced by locating structures above the expected level of flooding.
• The slow permeability increases the likelihood that improperly designed septic tank absorption fields will fail. Onsite investigation is needed when septic tank systems are designed.
• The corrosion of steel can be minimized by using corrosion-resistant material and coatings and cathodic protectors.
• The corrosion of concrete can be minimized by using sulfate-resistant material.

Farmstead dairies

Major management factors: Pollution of ground water
Management considerations:
• The Excelsior soil has few limitations as a site for dairy waste lagoons. Onsite investigation is needed to determine whether an area selected as a site for such a lagoon is underlain by unsuitable material below a depth of 60 inches. If the underlying material has moderately rapid, rapid, or very rapid permeability, special measures may be required to seal the surface of the lagoon.

Interpretive Groups

Land capability classification: 2s-6, irrigated, and 7s, nonirrigated
MLRA: 17
Prime farmland: No

114—Exeter loam, 0 to 2 percent slopes

Setting

Landform: Fan remnants
Description of area: Irrigated cropland that has been leveled
Elevation: 250 to 575 feet
Major use: Irrigated cropland
Mean annual precipitation: 8 to 12 inches
Mean annual temperature: 62 to 65 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Exeter soil and similar soils: 85 percent
Minor components: 15 percent

Characteristics of the Exeter Soil

Parent material: Alluvium derived mainly from granitic rock sources

Typical profile

0 to 9 inches—yellowish brown loam
9 to 26 inches—light yellowish brown and reddish yellow loam
26 to 28 inches—strong brown clay loam
28 to 46 inches—an indurated duripan
46 to 72 inches—reddish yellow, stratified gravelly loamy coarse sand, gravelly coarse sandy loam, and very gravelly coarse sandy loam

Component properties and qualities

Depth class: Moderately deep to a duripan
Drainage class: Moderately well drained
Permeability: Moderately slow above the duripan and very slow in the duripan
Available water capacity: Low or moderate
Shrink-swell potential: Moderate
Salinity: 0 to 2 dS/m
Depth to a duripan: 20 to 40 inches.
Surface runoff rate: Medium
Flooding: Very rare in years of abnormally high precipitation
Corrosivity: Steel—high; concrete—low

Inclusions

Contrasting inclusions:
• Hanford soils on flood plains and alluvial fans—4 percent
• San Joaquin soils on fan remnants—3 percent
• Colpien soils on fan remnants—3 percent
• Calgro soils on fan remnants—2 percent
• Quonal soils on fan remnants—2 percent
• Soils in depressions that are ponded more than 14 days each year—1 percent
• Some areas where the duripan has been removed by mechanical ripping to a depth of more than 40 inches, some areas where additions of large amounts of irrigation water and soil amendments over a long period of time have softened the duripan, and some areas where the duripan has been removed by explosives, generally at each site now occupied by a tree. Onsite investigation is needed to determine if the duripan is reclaimed. In some areas large amounts of organic matter have been added to the soil, making it slightly darker than is typical.

Similar inclusions:
• Soils with a surface layer of sandy loam

Note: Pollution of ground water is a major concern in areas of similar and contrasting inclusions that have layers with moderately rapid, rapid, or very rapid permeability.

Use and Management

Land uses: Irrigated crops, building site development, and farmstead dairies

Irrigated crops

Commonly grown crops: Oranges, table grapes, olives, plums, corn silage, nectarines, wheat, cotton, alfalfa hay, walnuts, and almonds
Major management factors: Depth to a duripan, very slow permeability in the duripan, and low or moderate available water capacity.
Management considerations:
• The depth to a duripan limits the rooting depth.
• The very slow permeability in the duripan limits the efficiency of irrigation.
• Because of the restricted permeability, applications of irrigation water should be regulated so that the water does not stand on the surface and damage crops.
• Ripping and shattering the duripan improve permeability, increase the available water capacity, extend the rooting depth, and improve internal drainage.
• Applications of irrigation water should be adjusted to the available water capacity and water intake rate of the soil and to the needs of the crop.

Building site development

Major management factors: Very slow permeability in the duripan and high corrosivity to steel
Management considerations:
• The very slow permeability in the duripan increases the likelihood that improperly designed septic tank absorption fields will fail. Onsite investigation is needed when septic tank systems are designed.
• The corrosion of steel can be minimized by using corrosion-resistant material and coatings and cathodic protectors.

Farmstead dairies

Major management factors: Pollution of ground water
Management considerations:
• The Exeter soil has few limitations as a site for dairy waste lagoons. Onsite investigation is needed to determine whether an area selected as a site for such a lagoon is underlain by unsuitable material below a depth of 60 inches. If the underlying material has moderately rapid, rapid, or very rapid permeability, special measures may be required to seal the surface of the lagoon.

Interpretive Groups

Land capability classification: 3s-8, irrigated, and 4s-8, nonirrigated
MLRA: 17
Prime farmland: No

115—Exeter loam, 2 to 5 percent slopes

Setting

Landform: Fan remnants
Elevation: 350 to 575 feet
Slope features: An undulating topography because stream terraces have been dissected by numerous drainage channels
Major use: Irrigated cropland
Mean annual precipitation: 8 to 12 inches
Mean annual temperature: 62 to 65 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Exeter soil and similar soils: 85 percent
Minor components: 15 percent

Characteristics of the Exeter Soil

Parent material: Alluvium derived mainly from granitic rock sources

Typical profile

0 to 9 inches—yellowish brown loam
9 to 26 inches—light yellowish brown and reddish yellow loam
26 to 28 inches—strong brown clay loam
28 to 46 inches—an indurated duripan
46 to 72 inches—reddish yellow, stratified gravelly loamy coarse sand, gravelly coarse sandy loam, and very gravelly coarse sandy loam

Component properties and qualities

Depth class: Moderately deep to a duripan
Drainage class: Moderately well drained
Permeability: Moderately slow above the duripan and very slow in the duripan
Available water capacity: Low or moderate
Shrink-swell potential: Moderate
Salinity: 0 to 2 dS/m
Depth to a duripan: 20 to 40 inches.
Surface runoff rate: Medium
Flooding: Very rare in years of abnormally high precipitation
Corrosivity: Steel—high; concrete—low

Inclusions

Contrasting inclusions:
- Exeter soils on fan remnants—4 percent
- San Joaquin soils on fan remnants—4 percent
- Centerville soils on fan remnants—3 percent
- Colpien soils on fan remnants—3 percent
- Calgro soils on fan remnants—1 percent
- Some areas where the duripan has been removed by mechanical ripping to a depth of more than 40 inches, some areas where additions of large amounts of irrigation water and soil amendments over a long period of time have softened the duripan, and some areas where the duripan has been removed by explosives, generally at each site now occupied by a tree. Onsite investigation is needed to determine if the duripan is reclaimed.

Similar inclusions:
- Soils with a surface layer of sandy loam

Note: Pollution of ground water is a major concern in areas of similar and contrasting inclusions that have layers with moderately rapid, rapid, or very rapid permeability.

Use and Management

Land uses: Irrigated crops, building site development, and farmstead dairies

Irrigated crops

Commonly grown crops: Oranges, table grapes, olives, plums, nectarines, wheat, cotton, alfalfa hay, walnuts, corn silage, and almonds
Major management factors: Depth to a duripan, very slow permeability in the duripan, low or moderate available water capacity, and slope
Management considerations:
- The depth to a duripan limits the rooting depth.
- The very slow permeability in the duripan limits the efficiency of irrigation.
- Ripping and shattering the duripan improve permeability, increase the available water capacity, extend the rooting depth, and improve internal drainage.
- Applications of irrigation water should be adjusted to the available water capacity, the restricted permeability, and the needs of the crop.

Building site development

Major management factors: Very slow permeability in the duripan and high corrosivity to steel
Management considerations:
- The very slow permeability in the duripan increases

the likelihood that improperly designed septic tank absorption fields will fail. Onsite investigation is needed when septic tank systems are designed.
• The corrosion of steel can be minimized by using corrosion-resistant material and coatings and cathodic protectors.

Farmstead dairies

Major management factors: Pollution of ground water
Management considerations:
• The Exeter soil has few limitations as a site for dairy waste lagoons. Onsite investigation is needed to determine whether an area selected as a site for such a lagoon is underlain by unsuitable material below a depth of 60 inches. If the underlying material has moderately rapid, rapid, or very rapid permeability, special measures may be required to seal the surface of the lagoon.

Interpretive Groups

Land capability classification: 3e-8, irrigated, and 4e-8, nonirrigated
MLRA: 17
Prime farmland: No

116—Flamen loam, 0 to 2 percent slopes

Setting

Landform: Fan remnants
Description of area: Irrigated cropland that has been leveled
Elevation: 260 to 550 feet
Major use: Irrigated cropland
Mean annual precipitation: 8 to 12 inches
Mean annual temperature: 62 to 65 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Flamen soil and similar soils: 85 percent
Minor components: 15 percent

Characteristics of the Flamen Soil

Parent material: Alluvium derived mainly from granitic rock sources

Typical profile

0 to 17 inches—dark gray and dark grayish brown loam
17 to 28 inches—brown loam
28 to 43 inches—light brown and pinkish gray loam
43 to 72 inches—a strongly cemented duripan

Component properties and qualities

Depth class: Deep to a duripan
Drainage class: Moderately well drained
Permeability: Moderate above the duripan and slow in the duripan
Available water capacity: Moderate or high
Shrink-swell potential: Moderate
Salinity: 0 to 2 dS/m
Sodicity (SAR): 1 to 12
Depth to a duripan: 40 to 60 inches.
Surface runoff rate: Low
Flooding: Very rare in years of abnormally high precipitation
Corrosivity: Steel—high; concrete—low

Inclusions

Contrasting inclusions:
• Exeter soils on fan remnants—3 percent
• San Joaquin soils on fan remnants—3 percent
• Centerville soils on fan remnants—2 percent
• Colpien soils on fan remnants—2 percent
• Calgro soils on fan remnants—2 percent
• Hanford soils on flood plains and alluvial fans—2 percent
• Soils in depressions that are ponded more than 14 days each year—1 percent

Similar inclusions:
• Soils with a surface layer of sandy loam

Note: Pollution of ground water is a major concern in areas of similar and contrasting inclusions that have layers with moderately rapid, rapid, or very rapid permeability.

Use and Management

Land uses: Irrigated crops, building site development, and farmstead dairies

Irrigated crops

Commonly grown crops: Cotton, alfalfa hay, plums, nectarines, wheat, walnuts, almonds, table grapes, corn silage, and oranges
Major management factors: Depth to a duripan and slow permeability in the duripan
Management considerations:
• The depth to a duripan limits the rooting depth.
• The slow permeability in the duripan limits the efficiency of irrigation.
• Because of the restricted permeability, applications of irrigation water should be regulated so that the water does not stand on the surface and damage crops.
• Ripping and shattering the duripan improve

permeability, increase the available water capacity, extend the rooting depth, and improve internal drainage.

Building site development

Major management factors: Slow permeability in the duripan and high corrosivity to steel
Management considerations:
• The slow permeability in the duripan increases the likelihood that improperly designed septic tank absorption fields will fail. Onsite investigation is needed when septic tank systems are designed.
• The corrosion of steel can be minimized by using corrosion-resistant material and coatings and cathodic protectors.

Farmstead dairies

Major management factors: Pollution of ground water
Management considerations:
• The Flamen soil has few limitations as a site for dairy waste lagoons. Onsite investigation is needed to determine whether an area selected as a site for such a lagoon is underlain by unsuitable material below a depth of 60 inches. If the underlying material has moderately rapid, rapid, or very rapid permeability, special measures may be required to seal the surface of the lagoon.

Interpretive Groups

Land capability classification: 2s-8, irrigated, and 4e-8, nonirrigated
MLRA: 17
Prime farmland: Yes in areas that are irrigated and protected from flooding

117—Gambogy loam, drained, 0 to 1 percent slopes

Setting

Landform: Alluvial fans and flood plains
Description of area: Irrigated cropland that has been leveled, drained, and reclaimed with soil amendments
Elevation: 190 to 270 feet
Major use: Irrigated cropland
Mean annual precipitation: 6 to 8 inches
Mean annual temperature: 63 to 66 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Gambogy soil and similar soils: 85 percent
Minor components: 15 percent

Characteristics of the Gambogy Soil

Parent material: Mixed alluvium derived mainly from granitic rock sources

Typical profile

0 to 6 inches—grayish brown loam
6 to 19 inches—grayish brown clay loam and loam
19 to 47 inches—grayish brown and dark grayish brown, stratified loam and sandy loam
47 to 72 inches—brown, stratified sandy loam and fine sandy loam

Component properties and qualities

Depth class: Very deep
Drainage class: Poorly drained (partly drained artificially because of protection from flooding, pumping from the water table, the use of tile and interceptor drains, and the filling and leveling of sloughs)
Permeability: Moderately slow
Available water capacity: High
Shrink-swell potential: Moderate
Salinity: 0 to 4 dS/m
Sodicity (SAR): 1 to 12
Surface runoff: Negligible
Flooding: Rare in years of abnormally high precipitation
Corrosivity: Steel—high; concrete—moderate

Inclusions

Contrasting inclusions:
• Colpien soils on fan remnants—3 percent
• Hanford soils on flood plains—3 percent
• Grangeville soils on alluvial fans and flood plains—3 percent
• Yettem soils on alluvial fans and flood plains—2 percent
• Nord soils on alluvial fans and flood plains—2 percent
• Tujunga soils on flood plains—2 percent

Similar inclusions:
• Soils with a surface layer of silt loam

Note: Pollution of ground water is a major concern in areas of similar and contrasting inclusions that have layers with moderately rapid, rapid, or very rapid permeability.

Use and Management

Land uses: Irrigated crops, building site development, and farmstead dairies

Irrigated crops

Commonly grown crops: Alfalfa hay, almonds, barley, corn silage, cotton, walnuts, table grapes, plums, and wheat
Major management factors: Sodicity
Management considerations:
• The sodicity of the soil limits the kinds of crops that can be grown.
• The content of sodium can be reduced by applying proper soil amendments, such as gypsum; leaching below the root zone; and returning crop residue to the soil.
• Careful irrigation helps to prevent an increase in the concentration of sodium in the soil.

Building site development

Major management factors: Rare flooding and high corrosivity to steel
Management considerations:
• The risk of flood damage can be reduced by locating structures above the expected level of flooding.
• The corrosion of steel can be minimized by using corrosion-resistant material and coatings and cathodic protectors.

Farmstead dairies

Management considerations: Pollution of ground water
• The Gambogy soil has few limitations as a site for dairy waste lagoons. Onsite investigation is needed to determine whether an area selected as a site for such a lagoon is underlain by unsuitable material below a depth of 60 inches. If the underlying material has moderately rapid, rapid, or very rapid permeability, special measures may be required to seal the surface of the lagoon.

Interpretive Groups

Land capability classification: 2s-6, irrigated, and 4s-6, nonirrigated
MLRA: 17
Prime farmland: No

118—Gambogy-Biggriz, saline-sodic, association, drained, 0 to 2 percent slopes

Setting

Landform: Gambogy—alluvial fans and flood plains; Biggriz—fan remnants
Description of area: Irrigated cropland that has been leveled, drained, and reclaimed with soil amendments. Onsite investigation may be required to identify the location of each component in leveled areas. The components are identifiable by their surface coloration when crops are not grown. When crops are grown, the components can be identified by noticeably lower crop yields on the Biggriz soil than on the Gambogy soil. Part of the unit occurs within the Pixley National Wildlife Refuge.
Elevation: 190 to 270 feet
Major use: Irrigated cropland
Mean annual precipitation: 6 to 8 inches
Mean annual temperature: 63 to 66 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Gambogy soil and similar soils: 50 percent
Saline-sodic Biggriz soil and similar soils: 35 percent
Minor components: 15 percent

Characteristics of the Gambogy Soil

Parent material: Mixed alluvium derived mainly from granitic rock sources

Typical profile

0 to 6 inches—grayish brown loam
6 to 19 inches—grayish brown clay loam and loam
19 to 47 inches—grayish brown and dark grayish brown, stratified loam and sandy loam
47 to 72 inches—brown, stratified sandy loam and fine sandy loam

Component properties and qualities

Depth class: Very deep
Drainage class: Poorly drained (artificially drained because of protection from flooding, pumping from the water table, the use of tile and interceptor drains, and the filling and leveling of sloughs)
Permeability: Moderately slow
Available water capacity: High
Shrink-swell potential: Moderate
Salinity: 0 to 4 dS/m
Sodicity (SAR): 1 to 12
Surface runoff rate: Low
Flooding: Rare in years of abnormally high precipitation
Corrosivity: Steel—high; concrete—moderate

Characteristics of the Saline-Sodic Biggriz Soil

Parent material: Alluvium derived mainly from granitic rock sources

Typical profile

0 to 14 inches—light brownish gray loam

14 to 50 inches—light brownish gray and grayish brown loam
50 to 65 inches—light brownish gray and grayish brown loam and sandy clay loam

Component properties and qualities

Depth class: Very deep
Drainage class: Somewhat poorly drained (artificially drained because of protection from flooding, pumping from the water table, the use of tile and interceptor drains, and the filling and leveling of sloughs)
Permeability: Moderately slow
Available water capacity: Moderate
Shrink-swell potential: Moderate
Salinity: 4 to 8 dS/m
Sodicity (SAR): 13 to 200
Surface runoff: Negligible
Flooding: Rare in years of abnormally high precipitation
Corrosivity: Steel—high; concrete—moderate

Inclusions

Contrasting inclusions:
- Colpien soils on fan remnants—5 percent
- Hanford soils on flood plains—4 percent
- Grangeville soils on alluvial fans and flood plains—3 percent
- Nord soils on alluvial fans and flood plains—1 percent
- Tujunga soils on flood plains in elongated drainageways—1 percent
- Soils in depressions that are ponded more than 14 days each year—1 percent

Similar inclusions:
- Soils with a surface layer of silt loam, clay loam, or fine sandy loam

Note: Pollution of ground water is a major concern in areas of similar and contrasting inclusions that have layers with moderately rapid, rapid, or very rapid permeability.

Use and Management

Land uses: Irrigated crops, building site development, and farmstead dairies

Irrigated crops

Commonly grown crops: Gambogy and Biggriz—alfalfa hay, wheat, corn silage, and cotton; Gambogy—table grapes, plums, and walnuts
Major management factors: Gambogy—sodicity; Biggriz—salinity and sodicity
Management considerations:
- The sodicity of the Gambogy soil and the salinity and sodicity of the Biggriz soil limit the kinds of crops that can be grown.
- Reclamation of the Biggriz soil requires a long-range program that includes ongoing monitoring of salinity and sodicity.
- The content of salts and sodium can be reduced by applying proper soil amendments, such as gypsum; leaching below the root zone; and returning crop residue to the soil.
- Careful irrigation helps to prevent an increase in the concentration of salts and sodium.

Building site development

Major management factors: Rare flooding and high corrosivity to steel
Management considerations:
- The risk of flood damage can be reduced by locating structures above the expected level of flooding.
- The corrosion of steel can be minimized by using corrosion-resistant material and coatings and cathodic protectors.

Farmstead dairies

Major management factors: Pollution of ground water
Management considerations:
- The Gambogy and Biggriz soils have few limitations as sites for dairy waste lagoons. Onsite investigation is needed to determine whether an area selected as a site for such a lagoon is underlain by unsuitable material below a depth of 60 inches. If the underlying material has moderately rapid, rapid, or very rapid permeability, special measures may be required to seal the surface of the lagoon.

Interpretive Groups

Land capability classification: Gambogy—2s-6, irrigated, and 4s-6, nonirrigated; Biggriz—3s-6, irrigated, and 7s, nonirrigated
MLRA: 17
Prime farmland: No

119—Gareck-Garces association, 0 to 2 percent slopes

Setting

Landform: Fan remnants
Description of area: Gareck—on irrigated cropland that has been leveled, ripped, and reclaimed with soil amendments; Garces—in native areas, some of which are in the Pixley National Wildlife Refuge
Elevation: 210 to 390 feet

Major use: Irrigated cropland
Vegetation: Annual grasses and forbs in native areas
Mean annual precipitation: 6 to 8 inches
Mean annual temperature: 62 to 65 degrees F
Frost-free period: 250 to 275 days

Map Unit Composition

Gareck soil and similar soils: 70 percent
Garces soil and similar soils: 15 percent
Minor components: 15 percent

Characteristics of the Gareck Soil

Parent material: Formed through the chemical and mechanical alteration of the Garces soil

Typical profile

0 to 6 inches—pale brown sandy loam
6 to 28 inches—light yellowish brown loam
28 to 47 inches—light yellowish brown sandy clay loam
47 to 62 inches—light gray sandy loam

Component properties and qualities

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: High
Shrink-swell potential: Low
Salinity: 0 to 4 dS/m
Sodicity (SAR): 1 to 8
Surface runoff rate: Low
Flooding: Rare in years of abnormally high precipitation
Corrosivity: Steel—high; concrete—high

Characteristics of the Garces Soil

Parent material: Alluvium derived from granitic rock sources

Typical profile

0 to 4 inches—light brownish gray and light gray loam
4 to 14 inches—light brownish gray clay loam
14 to 21 inches—light yellowish brown loam
21 to 29 inches—light yellowish brown and light gray loam
29 to 62 inches—light yellowish brown and light gray, stratified loam and clay loam

Component properties and qualities

Depth class: Very deep
Drainage class: Well drained
Permeability: Very slow
Available water capacity: Low or moderate
Shrink-swell potential: Moderate
Salinity: 2 to 16 dS/m
Sodicity (SAR): 1 to 100
Surface runoff rate: Medium
Flooding: Rare in years of abnormally high precipitation
Corrosivity: Steel—high; concrete—moderate

Inclusions

Contrasting inclusions:
- Saline-sodic Kimberlina soils on flood plains and alluvial fans—4 percent
- Lethent soils on fan remnants—3 percent
- Nahrub soils on basin rims—3 percent
- Atesh soils on fan remnants—2 percent
- Jerryslu soils on fan remnants—2 percent
- Soils in depressions that are ponded more than 14 days each year—1 percent

Similar inclusions:
- Soils with a surface layer of silt loam, fine sandy loam, or sandy loam

Note: Pollution of ground water is a major concern in areas of similar and contrasting inclusions that have layers with moderately rapid, rapid, or very rapid permeability.

Use and Management

Land uses: Irrigated crops, building site development, wildlife habitat, and farmstead dairies

Irrigated crops

Commonly grown crops: Cotton, wheat, corn silage, table grapes, plums, and alfalfa hay
Major management factors: Garces—salinity and sodicity, very slow permeability, and low or moderate available water capacity; Gareck—sodicity
Management considerations:
- The salinity and sodicity of the Garces soil and the sodicity of the Gareck soil limit the kinds of crops that can be grown.
- Reclamation of these soils requires a long-range program that includes ongoing monitoring of salinity and sodicity.
- The content of salts and sodium can be reduced by applying proper soil amendments, such as gypsum; leaching below the root zone; and returning crop residue to the soil.
- Careful irrigation helps to prevent an increase in the concentration of salts and sodium.
- Applications of irrigation water should be adjusted to the restricted permeability and available water capacity of the soils and to the needs of the crop.

Building site development

Major management factors: Garces—very slow permeability; Gareck—high corrosivity to concrete; both soils—rare flooding and high corrosivity to steel
Management considerations:
• The very slow permeability of the Garces soil increases the likelihood that improperly designed septic tank absorption fields will fail. Onsite investigation is needed when septic tank systems are designed.
• The corrosion of concrete in areas of the Gareck soil can be minimized by using sulfate-resistant material.
• The risk of flood damage can be reduced by locating structures above the expected level of flooding.
• The corrosion of steel can be minimized by using corrosion-resistant material and coatings and cathodic protectors.

Farmstead dairies

Major management factors: Pollution of ground water
Management considerations:
• The Gareck and Garces soils have few limitations as sites for dairy waste lagoons. Onsite investigation is needed to determine whether an area selected as a site for such a lagoon is underlain by unsuitable material below a depth of 60 inches. If the underlying material has moderately rapid, rapid, or very rapid permeability, special measures may be required to seal the surface of the lagoon.

Interpretive Groups

Land capability classification: Gareck—2s-6, irrigated, and 6s, nonirrigated; Garces—3s-6, irrigated, and 7s, nonirrigated
MLRA: 17
Prime farmland: No

120—Gepford silty clay, partially drained, 0 to 1 percent slopes

Setting

Landform: Basin rims and flood plains
Description of area: Irrigated cropland that has been leveled, partially drained, and reclaimed with soil amendments
Elevation: 190 to 220 feet
Major use: Irrigated cropland
Mean annual precipitation: 6 to 7 inches
Mean annual temperature: 63 to 66 degrees F
Frost-free period: 250 to 275 days

Map Unit Composition

Gepford soil and similar soils: 85 percent
Minor components: 15 percent

Characteristics of the Gepford Soil

Parent material: Mixed alluvium derived mainly from granitic rock sources

Typical profile

0 to 21 inches—gray silty clay
21 to 50 inches—light olive gray, light yellowish brown, and light gray clay and silty clay
50 to 72 inches—light gray clay

Component properties and qualities

Depth class: Very deep
Drainage class: Poorly drained (partly drained artificially because of protection from flooding, pumping from the water table, the use of tile and interceptor drains, and the filling and leveling of sloughs)
Permeability: Very slow
Available water capacity: Moderate
Shrink-swell potential: High
Salinity: 2 to 15 dS/m
Sodicity (SAR): 2 to 30 in the upper part of the profile; 13 to 50 in the lower part
Surface runoff rate: Medium
Flooding: Rare in years of abnormally high precipitation
Depth to the seasonal high water table: 2.5 to 4.0 feet
Kind of water table: Perched
Corrosivity: Steel—high; concrete—high

Inclusions

Contrasting inclusions:
• Houser soils on basin rims—4 percent
• Westcamp soils on basin rims—4 percent
• Armona soils on basin rims and flood plains—3 percent
• Gepford soils that have a sandy substratum and are on basin rims and flood plains—2 percent
• Posochanet soils on fan skirts—2 percent

Similar inclusions:
• Soils with a surface layer of silt loam or clay loam

Note: Pollution of ground water is a major concern in areas of similar and contrasting inclusions that have layers with moderately rapid, rapid, or very rapid permeability.

Use and Management

Land uses: Irrigated crops and building site development

Irrigated crops

Commonly grown crops: Cotton, wheat, alfalfa hay, and corn silage
Major management factors: Salinity and sodicity, high water table, and very slow permeability
Management considerations:
• The salinity and sodicity of the soil limit the kinds of crops that can be grown.
• Reclamation of this soil requires a long-range program that includes ongoing monitoring of salinity and sodicity.
• The content of salts and sodium can be reduced by applying proper soil amendments, such as gypsum; leaching below the root zone; and returning crop residue to the soil.
• Careful irrigation helps to prevent an increase in the concentration of salts and sodium.
• The water table limits the suitability for deep-rooted crops. A surface drainage system and open drainage ditches are needed to remove excess water and lower the water table.
• Applications of irrigation water should be adjusted to the restricted permeability and to the needs of the crop.

Building site development

Major management factors: Rare flooding, high corrosivity to steel and concrete, high water table, and very slow permeability
Management considerations:
• The risk of flood damage can be reduced by locating structures above the expected level of flooding.
• The corrosion of steel can be minimized by using corrosion-resistant material and coatings and cathodic protectors.
• The corrosion of concrete can be minimized by using sulfate-resistant material.
• The high water table and very slow permeability increase the likelihood that improperly designed septic tank absorption fields will fail. Onsite investigation is needed when septic tank systems are designed.

Interpretive Groups

Land capability classification: 3w-6, irrigated, and 6w, nonirrigated
MLRA: 17
Prime farmland: No

121—Gepford silty clay, partially drained, sandy substratum, 0 to 1 percent slopes

Setting

Landform: Basin rims and flood plains
Description of area: Irrigated cropland that has been leveled, partially drained, and reclaimed with soil amendments
Elevation: 190 to 220 feet
Major use: Irrigated cropland
Mean annual precipitation: 6 to 7 inches
Mean annual temperature: 63 to 66 degrees F
Frost-free period: 250 to 275 days

Map Unit Composition

Gepford soil and similar soils: 90 percent
Minor components: 10 percent

Characteristics of the Gepford Soil

Parent material: Mixed alluvium derived mainly from granitic rock sources

Typical profile

0 to 23 inches—olive gray silty clay
23 to 46 inches—olive gray and light olive gray silty clay
46 to 60 inches—light olive gray and light gray fine sand

Component properties and qualities

Depth class: Very deep
Drainage class: Poorly drained (partly drained artificially because of protection from flooding, pumping from the water table, the use of tile and interceptor drains, and the filling and leveling of sloughs)
Permeability: Very slow in the upper part of the profile and moderately rapid in the substratum
Available water capacity: Low or moderate
Shrink-swell potential: High
Salinity: 2 to 15 dS/m
Sodicity (SAR): 2 to 30 in the upper part of the profile; 13 to 50 in the lower part
Surface runoff rate: Medium
Flooding: Rare in years of abnormally high precipitation
Depth to the seasonal high water table: 2.5 to 4.0 feet
Kind of water table: Perched
Corrosivity: Steel—high; concrete—high

Inclusions

Contrasting inclusions:
- Houser soils on basin rims—4 percent
- Westcamp soils on basin rims—3 percent
- Posochanet soils on fan skirts—3 percent

Similar inclusions:
- Soils with a surface layer of silt loam or clay loam

Use and Management

Land uses: Irrigated crops and building site development

Irrigated crops

Commonly grown crops: Cotton, wheat, alfalfa hay, and corn silage
Major management factors: Salinity and sodicity, high water table, low or moderate available water capacity, very slow permeability in the surface layer and subsoil, and moderately rapid permeability in the substratum
Management considerations:
- The salinity and sodicity of the soil limit the kinds of crops that can be grown.
- Reclamation of this soil requires a long-range program that includes ongoing monitoring of salinity and sodicity.
- The content of salts and sodium can be reduced by applying proper soil amendments, such as gypsum; leaching below the root zone; and returning crop residue to the soil.
- Careful irrigation helps to prevent an increase in the concentration of salts and sodium.
- The water table limits the suitability for deep-rooted crops. A surface drainage system and open drainage ditches are needed to remove excess water and lower the water table.
- Applications of irrigation water should be adjusted to the available water capacity, the restricted permeability, and the needs of the crop.
- The moderately rapidly permeable soil layers can speed the leaching of nutrients, primarily nitrates, and certain pesticides into the ground water.

Building site development

Major management factors: Rare flooding, high corrosivity to steel and concrete, high water table, very slow permeability in the surface layer and subsoil, and moderately rapid permeability in the substratum
Management considerations:
- The risk of flood damage can be reduced by locating structures above the expected level of flooding.
- The corrosion of steel can be minimized by using corrosion-resistant material and coatings and cathodic protectors.
- The corrosion of concrete can be minimized by using sulfate-resistant material.
- The high water table and the very slow permeability in the subsoil increase the likelihood that improperly designed septic tank absorption fields will fail. Onsite investigation is needed when septic tank systems are designed.
- Because of the moderately rapid permeability in the substratum, onsite investigation is needed to determine whether an area selected as a site for a septic tank absorption field is underlain by unsuitable material. The absorption lines should be installed beneath such material.
- If the density of housing is moderate or high, a community sewage system may be needed.
- Locating septic tank absorption fields a sufficient distance away from domestic wells helps to prevent the contamination of water.

Interpretive Groups

Land capability classification: 3w-6, irrigated, and 6w, nonirrigated
MLRA: 17
Prime farmland: No

122—Grangeville sandy loam, drained, 0 to 2 percent slopes

Setting

Landform: Alluvial fans and flood plains
Description of area: Irrigated cropland that has been leveled, drained, and reclaimed. Part of the unit includes the Kaweah Oaks Preserve of the Nature Conservancy.
Elevation: 190 to 410 feet
Major use: Irrigated cropland
Mean annual precipitation: 8 to 12 inches
Mean annual temperature: 62 to 64 degrees F
Frost-free period: 250 to 275 days

Map Unit Composition

Grangeville soil and similar soils: 90 percent
Minor components: 10 percent

Characteristics of the Grangeville Soil

Parent material: Alluvium derived mainly from granitic rock sources

Typical profile

0 to 16 inches—brown sandy loam
16 to 27 inches—light brownish gray loam

27 to 67 inches—light brownish gray fine sandy loam and sandy loam

Component properties and qualities

Depth class: Very deep
Drainage class: Somewhat poorly drained (artificially drained because of protection from flooding, pumping from the water table, the use of tile and interceptor drains, and the filling and leveling of sloughs)
Permeability: Moderately rapid
Available water capacity: Moderate
Shrink-swell potential: Low
Salinity: 0 to 2 dS/m
Sodicity (SAR): 0 to 4
Surface runoff: Negligible
Flooding: Rare in years of abnormally high precipitation
Corrosivity: Steel—high; concrete—low

Inclusions

Contrasting inclusions:
• Tujunga soils on flood plains—3 percent
• Yettem soils on alluvial fans and flood plains—3 percent
• Saline-sodic Grangeville soils on alluvial fans and flood plains—2 percent
• Hanford soils on flood plains—1 percent
• Nord soils on alluvial fans and flood plains—1 percent

Similar inclusions:
• Soils with a surface layer of fine sandy loam, silt loam, or loam

Use and Management

Land uses: Irrigated crops, building site development, and farmstead dairies

Irrigated crops

Commonly grown crops: Walnuts, corn silage, cotton, sugar beets, alfalfa hay, barley, wheat, table grapes, plums, and olives
Major management factors: Few or no limitations affect the use of this soil for irrigated crops.
• Moderately rapidly permeable soil layers can speed the leaching of nutrients, primarily nitrates, and certain pesticides into the ground water.

Building site development

Major management factors: Rare flooding and high corrosivity to steel
Management considerations:
• The risk of flood damage can be reduced by locating structures above the expected level of flooding.
• The corrosion of steel can be minimized by using corrosion-resistant material and coatings and cathodic protectors.

Farmstead dairies

Major management factors: Moderately rapid permeability
Management considerations:
• Dairy waste lagoons may not be suitable because of the risk of ground-water pollution. Onsite investigation is needed to determine whether an area selected as a site for such a lagoon is underlain by unsuitable material. If layers with moderately rapid, rapid, or very rapid permeability are encountered during excavation, special measures may be required to seal the surface of the lagoon.

Interpretive Groups

Land capability classification: 1, irrigated, and 4c, nonirrigated
MLRA: 17
Prime farmland: Yes in areas that are irrigated and protected from flooding

123—Grangeville fine sandy loam, saline-sodic, 0 to 1 percent slopes

Setting

Landform: Alluvial fans and flood plains
Description of area: Irrigated cropland that has been leveled, partially drained, and reclaimed with soil amendments
Elevation: 190 to 410 feet
Major use: Irrigated cropland
Mean annual precipitation: 8 to 12 inches
Mean annual temperature: 62 to 64 degrees F
Frost-free period: 250 to 275 days

Map Unit Composition

Grangeville soil and similar soils: 90 percent
Minor components: 10 percent

Characteristics of the Grangeville Soil

Parent material: Alluvium derived mainly from granitic rock sources

Typical profile

0 to 5 inches—brown fine sandy loam
5 to 80 inches—brown, stratified loamy sand to silt loam

Component properties and qualities

Depth class: Very deep

Drainage class: Somewhat poorly drained (partly drained artificially because of protection from flooding, pumping from the water table, the use of tile and interceptor drains, and the filling and leveling of sloughs)
Permeability: Moderate
Available water capacity: Moderate
Shrink-swell potential: Low
Salinity: 2 to 8 dS/m
Sodicity (SAR): 2 to 100
Surface runoff: Negligible
Flooding: Rare in years of abnormally high precipitation
Depth to the seasonal high water table: 4 to 6 feet
Kind of water table: Perched
Months with high water table: January to April
Corrosivity: Steel—high; concrete—low

Inclusions

Contrasting inclusions:
• Tujunga soils on flood plains—3 percent
• Grangeville soils that are nonsaline and nonsodic and are on alluvial fans and flood plains—3 percent
• Nord soils on alluvial fans and flood plains—2 percent
• Yettem soils on alluvial fans and flood plains—2 percent

Similar inclusions:
• Soils with a surface layer of fine sandy loam, silt loam, or loam

Use and Management

Land uses: Irrigated crops and building site development

Irrigated crops

Commonly grown crops: Alfalfa hay, cotton, wheat, and corn silage
Major management factors: Salinity, sodicity, and high water table
Management considerations:
• The salinity and sodicity of the soil limit the kinds of crops that can be grown.
• Reclamation of this soil requires a long-range program that includes ongoing monitoring of salinity and sodicity.
• The content of salts and sodium can be reduced by applying proper soil amendments, such as gypsum; leaching below the root zone; and returning crop residue to the soil.
• Careful irrigation helps to prevent an increase in the concentration of salts and sodium.
• The water table limits the suitability for deep-rooted crops. A surface drainage system and open drainage ditches are needed to remove excess water and lower the water table.

Building site development

Major management factors: Rare flooding, high water table, and high corrosivity to steel.
Management considerations:
• The risk of flood damage can be reduced by locating structures above the expected level of flooding.
• The high water table increases the likelihood that improperly designed septic tank absorption fields will fail. Onsite investigation is needed when septic tank systems are designed.
• The corrosion of steel can be minimized by using corrosion-resistant material and coatings and cathodic protectors.

Interpretive Groups

Land capability classification: 2s-6, irrigated, and 4s-6, nonirrigated
MLRA: 17
Prime farmland: No

124—Hanford sandy loam, 0 to 2 percent slopes

Setting

Landform: Flood plains and alluvial fans
Description of area: Irrigated cropland that has been leveled and reclaimed with soil amendments
Elevation: 225 to 500 feet
Major use: Irrigated cropland
Mean annual precipitation: 9 to 12 inches
Mean annual temperature: 62 to 65 degrees F
Frost-free period: 250 to 280 days

Map Unit Composition

Hanford soil and similar soils: 85 percent
Minor components: 15 percent

Characteristics of the Hanford Soil

Parent material: Alluvium derived mainly from granitic rock sources

Typical profile

0 to 30 inches—pale brown sandy loam
30 to 60 inches—light yellowish brown sandy loam

Component properties and qualities

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: Moderate

Shrink-swell potential: Low
Salinity: 0 to 2 dS/m
Sodicity (SAR): 0 to 7
Surface runoff: Negligible
Flooding: Very rare in years of abnormally high precipitation
Corrosivity: Steel—moderate; concrete—moderate

Inclusions

Contrasting inclusions:
- Tujunga soils on flood plains—5 percent
- Exeter soils on fan remnants—5 percent
- Calgro soils on fan remnants—3 percent
- Yettem soils on alluvial fans and flood plains—2 percent

Similar inclusions:
- Soils that have surface layer of loam or fine sandy loam

Use and Management

Land uses: Irrigated crops, building site development, and farmstead dairies

Irrigated crops

Commonly grown crops: Walnuts, table grapes, plums, corn silage, cotton, alfalfa hay, barley, wheat, and olives
Major management factors: Few or no limitations affect the use of this soil for irrigated crops.
Management considerations:
- Moderately rapidly permeable soil layers can speed the leaching of nutrients, primarily nitrates, and certain pesticides into the ground water.

Building site development

Major management factors: A moderately rapidly permeable substratum
Management considerations:
- Onsite investigation is needed to determine whether an area selected as a site for a septic tank absorption field is underlain by unsuitable material. The absorption lines should be installed beneath such material.
- If the density of housing is moderate or high, a community sewage system may be needed.
- Locating septic tank absorption fields a sufficient distance away from domestic wells helps to prevent the contamination of water.

Farmstead dairies

Major management factors: Moderately rapid permeability
Management considerations:
- Dairy waste lagoons may not be suitable because of the risk of ground-water pollution. Onsite investigation is needed to determine whether an area selected as a site for such a lagoon is underlain by unsuitable material. If layers with moderately rapid, rapid, or very rapid permeability are encountered during excavation, special measures may be required to seal the surface of the lagoon.

Interpretive Groups

Land capability classification: 1, irrigated, and 3c, nonirrigated
MLRA: 17
Prime farmland: Yes in areas that are irrigated and protected from flooding

125—Houser fine sandy loam, drained, 0 to 1 percent slopes

Setting

Landform: Basin rims
Description of area: Irrigated cropland that has been leveled, drained, and reclaimed with soil amendments
Elevation: 190 to 220 feet
Major use: Irrigated cropland
Mean annual precipitation: 6 to 7 inches
Mean annual temperature: 62 to 65 degrees F
Frost-free period: 260 to 275 days

Map Unit Composition

Houser soil and similar soils: 85 percent
Minor components: 15 percent

Characteristics of the Houser Soil

Parent material: Mixed alluvium derived mainly from granitic rock sources

Typical profile

0 to 7 inches—light brownish gray fine sandy loam
7 to 60 inches—light brownish gray silty clay

Component properties and qualities

Depth class: Very deep
Drainage class: Somewhat poorly drained (artificially drained because of protection from flooding, pumping from the water table, the use of tile and interceptor drains, and the filling and leveling of sloughs)
Permeability: Very slow
Available water capacity: Very low to moderate, depending on the amount of salinity
Shrink-swell potential: High
Salinity: 1 to 30 dS/m

Sodicity (SAR): 4 to 60
Surface runoff rate: Medium
Flooding: Rare in years of abnormally high precipitation
Corrosivity: Steel—high; concrete—high

Inclusions

Contrasting inclusions:
• Armona soils on basin rims and flood plains—5 percent
• Gepford soils on basin rims and flood plains—5 percent
• Gepford soils that have a sandy substratum and are on basin rims and flood plains—3 percent
• Westcamp soils on basin rims—2 percent

Similar inclusions:
• Soils with a surface layer of silty clay loam or clay

Use and Management

Land uses: Irrigated crops and building site development

Irrigated crops

Commonly grown crops: Cotton, wheat, alfalfa hay, and corn silage
Major management factors: Salinity and sodicity, very low to moderate available water capacity, and very slow permeability
Management considerations:
• The salinity and sodicity of the soil limit the kinds of crops that can be grown.
• Reclamation of this soil requires a long-range program that includes ongoing monitoring of salinity and sodicity.
• The content of salts and sodium can be reduced by applying proper soil amendments, such as gypsum; leaching below the root zone; and returning crop residue to the soil.
• Careful irrigation helps to prevent an increase in the concentration of salts and sodium.
• Applications of irrigation water should be adjusted to the available water capacity and restricted permeability of the soil and to the needs of the crop.

Building site development

Major management factors: Rare flooding, high corrosivity to steel and concrete, and very slow permeability.
Management considerations:
• The risk of flood damage can be reduced by locating structures above the expected level of flooding.
• The corrosion of steel can be minimized by using corrosion-resistant material and coatings and cathodic protectors.
• The corrosion of concrete can be minimized by using sulfate-resistant material.
• The very slow permeability increases the likelihood that improperly designed septic tank absorption fields will fail. Onsite investigation is needed when septic tank systems are designed.

Interpretive Groups

Land capability classification: 3w-6, irrigated, and 7w, nonirrigated
MLRA: 17
Prime farmland: No

126—Houser silty clay, drained, 0 to 1 percent slopes

Setting

Landform: Basin rims
Description of area: Irrigated cropland that has been leveled, drained, and reclaimed with soil amendments
Elevation: 190 to 220 feet
Major use: Irrigated cropland
Mean annual precipitation: 6 to 7 inches
Mean annual temperature: 62 to 65 degrees F
Frost-free period: 260 to 275 days

Map Unit Composition

Houser soil and similar soils: 85 percent
Minor components: 15 percent

Characteristics of the Houser Soil

Parent material: Mixed alluvium derived mainly from granitic rock sources

Typical profile

0 to 7 inches—light brownish gray silty clay
7 to 60 inches—light brownish gray and light gray silty clay

Component properties and qualities

Depth class: Very deep
Drainage class: Somewhat poorly drained (artificially drained because of protection from flooding, pumping from the water table, the use of tile and interceptor drains, and the filling and leveling of sloughs)
Permeability: Very slow
Available water capacity: Very low to moderate, depending on the amount of salinity
Shrink-swell potential: High
Salinity: 1 to 30 dS/m
Sodicity (SAR): 4 to 60

Surface runoff rate: Medium
Flooding: Rare in years of abnormally high precipitation
Corrosivity: Steel—high; concrete—high

Inclusions

Contrasting inclusions:
- Armona soils on basin rims and flood plains—5 percent
- Gepford soils on basin rims and flood plains—5 percent
- Gepford soils that have a sandy substratum and are on basin rims and flood plains—3 percent
- Westcamp soils on basin rims—2 percent

Similar inclusions:
- Soils with a surface layer of silty clay loam or clay

Use and Management

Land uses: Irrigated crops and building site development

Irrigated crops

Commonly grown crops: Cotton, wheat, corn silage, and alfalfa hay
Major management factors: Salinity and sodicity, very low to moderate available water capacity, and very slow permeability
Management considerations:
- The salinity and sodicity of the soil limit the kinds of crops that can be grown.
- Reclamation of this soil requires a long-range program that includes ongoing monitoring of salinity and sodicity.
- The content of salts and sodium can be reduced by applying proper soil amendments, such as gypsum; leaching below the root zone; and returning crop residue to the soil.
- Careful irrigation helps to prevent an increase in the concentration of salts and sodium.
- Applications of irrigation water should be adjusted to the available water capacity and restricted permeability of the soil and to the needs of the crop.

Building site development

Major management factors: Rare flooding, high corrosivity to steel and concrete, and very slow permeability
Management considerations:
- The risk of flood damage can be reduced by locating structures above the expected level of flooding.
- The corrosion of steel can be minimized by using corrosion-resistant material and coatings and cathodic protectors.
- The corrosion of concrete can be minimized by using sulfate-resistant material.
- The very slow permeability increases the likelihood that improperly designed septic tank absorption fields will fail. Onsite investigation is needed when septic tank systems are designed.

Interpretive Groups

Land capability classification: 3w-6, irrigated, and 7w, nonirrigated
MLRA: 17
Prime farmland: No

127—Kimberlina fine sandy loam, 0 to 2 percent slopes

Setting

Landform: Flood plains
Description of area: Irrigated cropland that has been leveled. Part of this unit occurs within the Pixley National Wildlife Refuge.
Elevation: 190 to 350 feet
Major use: Irrigated cropland
Mean annual precipitation: 6 to 8 inches
Mean annual temperature: 62 to 65 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Kimberlina soil and similar soils: 85 percent
Minor components: 15 percent

Characteristics of the Kimberlina Soil

Parent material: Mixed alluvium derived mainly from granitic rock sources

Typical profile

0 to 58 inches—light gray fine sandy loam
58 to 72 inches—grayish brown silt loam

Component properties and qualities

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: Low
Shrink-swell potential: Low
Salinity: 4 to 8 dS/m
Sodicity (SAR): 13 to 30
Surface runoff: Negligible
Flooding: Rare in years of abnormally high precipitation
Corrosivity: Steel—high; concrete—high

Inclusions

Contrasting inclusions:
- Garces soils on fan remnants—5 percent
- Remnoy soils on fan remnants—5 percent
- Wasco soils on alluvial fans and flood plains—3 percent
- Youd soils on fan remnants—2 percent

Similar inclusions:
- Soils with a surface layer of silt loam or loam

Note: Pollution of ground water is a major concern in areas of similar and contrasting inclusions that have layers with moderately rapid, rapid, or very rapid permeability.

Use and Management

Land uses: Irrigated crops, building site development, wildlife habitat, and farmstead dairies

Irrigated crops

Commonly grown crops: Alfalfa hay, corn silage, barley, cotton, and wheat
Major management factors: Salinity, sodicity, and low available water capacity
Management considerations:
- The salinity and sodicity of the soil limit the kinds of crops that can be grown.
- Reclamation of this soil requires a long-range program that includes ongoing monitoring of salinity and sodicity.
- The content of salts and sodium can be reduced by applying proper soil amendments, such as gypsum; leaching below the root zone; and returning crop residue to the soil.
- Careful irrigation helps to prevent an increase in the concentration of salts and sodium.
- Applications of irrigation water should be adjusted to the available water capacity and water intake rate of the soil and to the needs of the crop.

Building site development

Major management factors: Rare flooding and high corrosivity to steel and concrete
Management considerations:
- The risk of flood damage can be reduced by locating structures above the expected level of flooding.
- The corrosion of steel can be minimized by using corrosion-resistant material and coatings and cathodic protectors.
- The corrosion of concrete can be minimized by using sulfate-resistant material.

Farmstead dairies

Major management factors: Pollution of ground water
Management considerations:
- The Kimberlina soil has few limitations as a site for dairy waste lagoons. Onsite investigation is needed to determine whether an area selected as a site for such a lagoon is underlain by unsuitable material below a depth of 60 inches. If the underlying material has moderately rapid, rapid, or very rapid permeability, special measures may be required to seal the surface of the lagoon.

Interpretive Groups

Land capability classification: 2s-6, irrigated, and 7s, nonirrigated
MLRA: 17
Prime farmland: No

128—Lethent silt loam, 0 to 1 percent slopes

Setting

Landform: Terraces
Description of area: Irrigated cropland that has been leveled and reclaimed with soil amendments. Part of this unit occurs within the Pixley National Wildlife Refuge.
Elevation: 190 to 250 feet
Major use: Irrigated cropland
Mean annual precipitation: 6 to 8 inches
Mean annual temperature: 63 to 66 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Lethent soil and similar soils: 85 percent
Minor components: 15 percent

Characteristics of the Lethent Soil

Parent material: Mixed alluvium derived mainly from granitic rock sources

Typical profile

0 to 7 inches—light gray silt loam
7 to 35 inches—light brownish gray and pale olive clay, silty clay, and silty clay loam
35 to 65 inches—pale brown clay loam and silty clay loam

Component properties and qualities

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Very slow
Available water capacity: Low or moderate
Shrink-swell potential: High
Salinity: 1 to 30 dS/m

Sodicity (SAR): 13 to 200
Surface runoff rate: Medium
Flooding: Rare in years of abnormally high precipitation
Corrosivity: Steel—high; concrete—high

Inclusions

Contrasting inclusions:
• Garces soils on fan remnants—5 percent
• Nahrub soils on basin rims—4 percent
• Jerryslu soils on fan remnants—3 percent
• Saline-sodic Kimberlina soils on alluvial fans and flood plains—2 percent
• Soils in depressions that are ponded more than 14 days each year—1 percent

Similar inclusions:
• Soils with a surface layer of clay loam, fine sandy loam, or loam

Note: Pollution of ground water is a major concern in areas of similar and contrasting inclusions that have layers with moderately rapid, rapid, or very rapid permeability.

Use and Management

Land uses: Irrigated crops, building site development, wildlife habitat, and farmstead dairies

Irrigated crops

Commonly grown crops: Alfalfa hay, corn silage, cotton, and wheat
Major management factors: Salinity and sodicity, very slow permeability, and low or moderate available water capacity
Management considerations:
• The salinity and sodicity of the soil limit the kinds of crops that can be grown.
• Reclamation of this soil requires a long-range program that includes ongoing monitoring of salinity and sodicity.
• The content of salts and sodium can be reduced by applying proper soil amendments, such as gypsum; leaching below the root zone; and returning crop residue to the soil.
• Careful irrigation helps to prevent an increase in the concentration of salts and sodium.
• Because of the restricted permeability, applications of irrigation water should be regulated so that the water does not stand on the surface and damage crops.
• Applications of irrigation water should be adjusted to the available water capacity and very slow permeability of the soil and to the needs of the crop.

Building site development

Major management factors: Rare flooding, very slow permeability, high corrosivity to steel and concrete, and high shrink-swell potential
Management considerations:
• The risk of flood damage can be reduced by locating structures above the expected level of flooding.
• The very slow permeability increases the likelihood that improperly designed septic tank absorption fields will fail. Onsite investigation is needed when septic tank systems are designed.
• The corrosion of steel can be minimized by using corrosion-resistant material and coatings and cathodic protectors.
• The corrosion of concrete can be minimized by using sulfate-resistant material.
• Properly designing foundations and footings and diverting runoff away from buildings help to prevent the structural damage caused by shrinking and swelling.

Farmstead dairies

Major management factors: Pollution of ground water
Management considerations:
• The Lethent soil has few limitations as a site for dairy waste lagoons. Onsite investigation is needed to determine whether an area selected as a site for such a lagoon is underlain by unsuitable material below a depth of 60 inches. If the underlying material has moderately rapid, rapid, or very rapid permeability, special measures may be required to seal the surface of the lagoon.

Interpretive Groups

Land capability classification: 3s-6, irrigated, and 7s, nonirrigated
MLRA: 17
Prime farmland: No

129—Nahrub silt loam, overwashed, 0 to 1 percent slopes

Setting

Landform: Basin rims
Description of area: Irrigated cropland that has been leveled, drained, and reclaimed with soil amendments. Part of this unit occurs within the Pixley National Wildlife Refuge.
Elevation: 190 to 240 feet
Major use: Irrigated cropland
Mean annual precipitation: 6 to 8 inches
Mean annual temperature: 63 to 65 degrees F

Frost-free period: 250 to 300 days

Map Unit Composition

Nahrub soil and similar soils: 85 percent
Minor components: 15 percent

Characteristics of the Nahrub Soil

Parent material: Mixed alluvium derived mainly from granitic rock sources

Typical profile

0 to 9 inches—light brownish gray silt loam
9 to 32 inches—light olive gray clay
32 to 66 inches—light olive gray and pale olive silty clay loam

Component properties and qualities

Depth class: Very deep
Drainage class: Somewhat poorly drained (artificially drained because of protection from flooding, pumping from the water table, the use of tile and interceptor drains, and the filling and leveling of sloughs)
Permeability: Very slow
Available water capacity: Moderate
Shrink-swell potential: High
Salinity: 1 to 16 dS/m in the upper part of the profile; 8 to 30 dS/m in the lower part
Sodicity (SAR): 2 to 80 in the upper part of the profile; 30 to 300 in the lower part
Surface runoff rate: Medium
Flooding: Rare in years of abnormally high precipitation
Corrosivity: Steel—high; concrete—high

Inclusions

Contrasting inclusions:
- Garces soils on fan remnants—5 percent
- Lethent soils on fan remnants—4 percent
- Jerryslu soils on fan remnants—3 percent
- Saline-sodic Kimberlina soils on flood plains and alluvial fans—2 percent
- Soils in depressions that are ponded more than 14 days each year—1 percent

Similar inclusions:
- Soils with a surface layer of silty clay loam or loam

Note: Pollution of ground water is a major concern in areas of similar and contrasting inclusions that have layers with moderately rapid, rapid, or very rapid permeability.

Use and Management

Land uses: Irrigated crops, building site development, wildlife habitat, and farmstead dairies

Irrigated crops

Commonly grown crops: Alfalfa hay, cotton, corn silage, and wheat
Major management factors: Salinity, sodicity, and very slow permeability
Management considerations:
- The salinity and sodicity of the soil limit the kinds of crops that can be grown.
- Reclamation of this soil requires a long-range program that includes ongoing monitoring of salinity and sodicity.
- The content of salts and sodium can be reduced by applying proper soil amendments, such as gypsum; leaching below the root zone; and returning crop residue to the soil.
- Careful irrigation helps to prevent an increase in the concentration of salts and sodium.
- Because of the restricted permeability, applications of irrigation water should be regulated so that the water does not stand on the surface and damage crops.

Building site development

Major management factors: Rare flooding, very slow permeability, high corrosivity to steel and concrete, and high shrink-swell potential
Management considerations:
- The risk of flood damage can be reduced by locating structures above the expected level of flooding.
- The very slow permeability increases the likelihood that improperly designed septic tank absorption fields will fail. Onsite investigation is needed when septic tank systems are designed.
- The corrosion of steel can be minimized by using corrosion-resistant material and coatings and cathodic protectors.
- The corrosion of concrete can be minimized by using sulfate-resistant material.
- Properly designing foundations and footings and diverting runoff away from buildings help to prevent the structural damage caused by shrinking and swelling.

Farmstead dairies

Major management factors: Pollution of ground water
Management considerations:
- The Nahrub soil has few limitations as a site for dairy waste lagoons. Onsite investigation is needed to

determine whether an area selected as a site for such a lagoon is underlain by unsuitable material below a depth of 60 inches. If the underlying material has moderately rapid, rapid, or very rapid permeability, special measures may be required to seal the surface of the lagoon.

Interpretive Groups

Land capability classification: 3s-6, irrigated, and 6s, nonirrigated
MLRA: 17
Prime farmland: No

130—Nord fine sandy loam, 0 to 2 percent slopes

Setting

Landform: Alluvial fans and flood plains
Description of area: Irrigated cropland that has been leveled and reclaimed with soil amendments
Elevation: 190 to 520 feet
Major use: Irrigated cropland
Mean annual precipitation: 8 to 12 inches
Mean annual temperature: 62 to 64 degrees F
Frost-free period: 250 to 275 days

Map Unit Composition

Nord soil and similar soils: 85 percent
Minor components: 15 percent

Characteristics of the Nord Soil

Parent material: Mixed alluvium derived mainly from granitic rock sources

Typical profile

0 to 11 inches—grayish brown fine sandy loam
11 to 38 inches—grayish brown and light brownish gray loam and fine sandy loam
38 to 50 inches—grayish brown and light brownish gray coarse sandy loam
50 to 72 inches—grayish brown and light brownish gray loam and silt loam

Component properties and qualities

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Moderate
Shrink-swell potential: Low
Salinity: 0 to 2 dS/m
Sodicity (SAR): 2 to 10
Surface runoff: Negligible
Flooding: Very rare in years of abnormally high precipitation
Corrosivity: Steel—high; concrete—low

Inclusions

Contrasting inclusions:
- Tujunga soils on flood plains—3 percent
- Hanford soils on flood plains—3 percent
- Saline-sodic Grangeville soils on alluvial fans and flood plains—3 percent
- Colpien soils on fan remnants—2 percent
- Saline-sodic Akers soils on fan remnants—2 percent
- Tagus soils on fan remnants—2 percent

Similar inclusions:
- Soils with a surface layer of loam

Note: Pollution of ground water is a major concern in areas of similar and contrasting inclusions that have layers with moderately rapid, rapid, or very rapid permeability.

Use and Management

Land uses: Irrigated crops, building site development, and farmstead dairies

Irrigated crops

Commonly grown crops: Alfalfa hay, corn silage, plums, nectarines, cotton, almonds, table grapes, walnuts, and wheat
Major management factors: Few or no limitations affect the use of this soil for irrigated crops.

Building site development

Major management factors: High corrosivity to steel
Management considerations:
- The corrosion of steel can be minimized by using corrosion-resistant material and coatings and cathodic protectors.

Farmstead dairies

Major management factors: Pollution of ground water
Management considerations:
- The Nord soil has few limitations as a site for dairy waste lagoons. Onsite investigation is needed to determine whether an area selected as a site for such a lagoon is underlain by unsuitable material below a depth of 60 inches. If the underlying material has moderately rapid, rapid, or very rapid permeability, special measures may be required to seal the surface of the lagoon.

Interpretive Groups

Land capability classification: 1, irrigated, and 4c, nonirrigated

MLRA: 17
Prime farmland: Yes in areas that are irrigated and protected from flooding

131—Pits

Setting

Landform: Various
Description of area: This map unit occurs as open excavations from which soil and the underlying material have been removed and other material that supports few or no plants has been exposed. These excavations cannot support plants unless major reclamation measures are applied. The map unit is in scattered areas throughout the county.
Elevation: 190 to 600 feet
Slope range: 0 to 2 percent

Composition

Pits: 100 percent

Characteristics of the Pits

Soil properties, such as permeability, drainage, runoff, effective rooting depth, and available water capacity, vary from one area to another. This unit is poorly suited to most land uses. It is not assigned a land capability classification

132—Quonal-Lewis association, 0 to 2 percent slopes

Setting

Landform: Fan remnants
Description of area: Quonal—on irrigated cropland that has been leveled, ripped, and reclaimed with soil amendments; Lewis—in native areas
Elevation: 280 to 400 feet
Vegetation: Annual grasses and forbs in native areas
Major use: Irrigated cropland
Mean annual precipitation: 9 to 12 inches
Mean annual temperature: 62 to 65 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Quonal soil and similar soils: 70 percent
Lewis soil and similar soils: 15 percent
Minor components: 15 percent

Note: Component percentages vary from place to place, depending on the amount of native land versus the amount of reclaimed farmland.

Characteristics of the Quonal Soil

Parent material: Formed through the chemical and mechanical alteration of the Lewis soil

Typical profile

0 to 7 inches—grayish brown silty clay
7 to 16 inches—brown clay
16 to 41 inches—light yellowish brown and yellowish brown silty clay and clay
41 to 44 inches—a duripan
44 to 62 inches—light yellowish brown clay loam and silty clay loam

Component properties and qualities

Depth class: Deep
Drainage class: Moderately well drained
Permeability: Slow above the duripan and very slow in the duripan
Available water capacity: Low
Shrink-swell potential: High
Salinity: 0 to 8 dS/m
Sodicity (SAR): 0 to 13 in the upper part of the profile; 13 to 50 in the lower part
Surface runoff rate: High
Flooding: Very rare in years of abnormally high precipitation
Corrosivity: Steel—high; concrete—high

Characteristics of the Lewis Soil

Parent material: Alluvium derived from mixed rock sources

Typical profile

0 to 5 inches—light brownish gray silty clay loam
5 to 25 inches—light brownish gray, grayish brown, and pale brown clay loam
25 to 39 inches—a duripan
39 to 60 inches—light brownish gray to light yellowish brown sandy loam

Component properties and qualities

Depth class: Moderately deep
Drainage class: Moderately well drained
Permeability: Slow above the duripan and very slow in the duripan
Available water capacity: Very low or low
Shrink-swell potential: High
Salinity: 4 to 16 dS/m in the surface layer and 8 to 40 dS/m below the surface layer
Sodicity (SAR): 13 to 100
Depth to a duripan: 20 to 40 inches
Surface runoff rate: Medium
Flooding: Very rare in years of abnormally high precipitation

Corrosivity: Steel—high; concrete—high

Inclusions

Contrasting inclusions:
- Exeter soils on fan remnants—4 percent
- Flamen soils on fan remnants—3 percent
- Colpien soils on fan remnants—3 percent
- San Joaquin soils on fan remnants—2 percent
- Tujunga soils on flood plains—2 percent
- Soils in depressions that are ponded more than 14 days each year—1 percent

Similar inclusions:
- Soils with a surface layer of loam or clay loam

Note: Pollution of ground water is a major concern in areas of similar and contrasting inclusions that have layers with moderately rapid, rapid, or very rapid permeability.

Use and Management

Land uses: Irrigated crops, building site development, wetlands and wildlife habitat, and farmstead dairies

Irrigated crops

Commonly grown crops: Cotton, alfalfa hay, sugar beets, corn silage, and wheat
Major management factors: Salinity and sodicity, slow permeability above the duripan and very slow permeability in the duripan, depth to the duripan, and very low or low available water capacity
Management considerations:
- The salinity and sodicity of the soils limit the kinds of crops that can be grown.
- Reclamation of the soils requires a long-range program that includes ongoing monitoring of salinity and sodicity.
- The content of salts and sodium can be reduced by applying proper soil amendments, such as gypsum; leaching below the root zone; and returning crop residue to the soil.
- Careful irrigation helps to prevent an increase in the concentration of salts and sodium.
- The depth to a duripan limits the rooting depth.
- Slow permeability above the duripan and very slow permeability in the duripan limit the efficiency of irrigation.
- Ripping and shattering the duripan improve permeability, increase the available water capacity, extend the rooting depth, and improve internal drainage.
- Applications of irrigation water should be adjusted to the available water capacity, the restricted permeability, and the needs of the crop.

Building site development

Major management factors: Slow and very slow permeability, a high shrink-swell potential, and high corrosivity to steel and concrete
Management considerations:
- The slow permeability above the duripan and very slow permeability in the duripan increase the likelihood that improperly designed septic tank absorption fields will fail. Onsite investigation is needed when septic tank systems are designed.
- Properly designing foundations and footings and diverting runoff away from buildings help to prevent the structural damage caused by shrinking and swelling.
- The corrosion of steel can be minimized by using corrosion-resistant material and coatings and cathodic protectors.
- The corrosion of concrete can be minimized by using sulfate-resistant material.

Wetlands and wildlife habitat

Management considerations:
- This unit may provide wetland functions and values. These should be considered when plans are made for enhancement of wildlife habitat or for land use conversion. Many of the native areas are currently identified as vernal pool wetlands.

Farmstead dairies

Major management factors: Pollution of ground water
Management considerations:
- The Quonal and Lewis soils have few limitations as sites for dairy waste lagoons. Onsite investigation is needed to determine whether an area selected as a site for such a lagoon is underlain by unsuitable material below a depth of 60 inches. If the underlying material has moderately rapid, rapid, or very rapid permeability, special measures may be required to seal the surface of the lagoon.

Interpretive Groups

Land capability classification: Quonal—3s-3, irrigated, and 6s, nonirrigated; Lewis—6s, irrigated, and 7s, nonirrigated
MLRA: 17
Prime farmland: No

133—Remnoy silt loam, 0 to 2 percent slopes

Setting

Landform: Fan remnants
Description of area: Irrigated cropland that has been leveled and reclaimed with soil amendments
Elevation: 190 to 300 feet
Major use: Irrigated cropland
Mean annual precipitation: 7 to 8 inches
Mean annual temperature: 62 to 65 degrees F
Frost-free period: 250 to 275 days

Map Unit Composition

Remnoy soil and similar soils: 85 percent
Minor components: 15 percent

Characteristics of the Remnoy Soil

Parent material: Mixed alluvium derived mainly from granitic rock sources

Typical profile

0 to 3 inches—light brownish gray and grayish brown silt loam
3 to 17 inches—light brownish gray and light gray clay loam
17 to 23 inches—an indurated duripan
23 to 60 inches—pale yellow sandy loam

Component properties and qualities

Depth class: Shallow
Drainage class: Somewhat poorly drained
Permeability: Slow
Available water capacity: Very low
Shrink-swell potential: Moderate
Salinity: 2 to 16 dS/m
Sodicity (SAR): 2 to 13 in the upper part of the profile; 13 to 100 in the lower part
Depth to a duripan: 10 to 20 inches
Surface runoff rate: Medium
Flooding: Rare in years of abnormally high precipitation
Corrosivity: Steel—high; concrete—high

Inclusions

Contrasting inclusions:
- Youd soils—5 percent
- Saline-sodic Calgro soils—4 percent
- Quonal soils on fan remnants—3 percent
- Crosscreek soils on fan remnants—2 percent
- Soils in depressions that are ponded more than 14 days each year—1 percent
- Some areas where the duripan has been removed by mechanical ripping to a depth of more than 40 inches. Onsite investigation is needed to determine if the duripan has been reclaimed.

Similar inclusions:
- Soils with a surface layer of sandy loam, fine sandy loam, or loam

Note: Pollution of ground water is a major concern in areas of similar and contrasting inclusions that have layers with moderately rapid, rapid, or very rapid permeability.

Use and Management

Land uses: Irrigated crops, building site development, and farmstead dairies

Irrigated crops

Commonly grown crops: Alfalfa hay, cotton, wheat, and corn silage
Major management factors: Salinity and sodicity, depth to a duripan, slow permeability, and very low available water capacity
Management considerations:
- The salinity and sodicity of the soil limit the kinds of crops that can be grown.
- Reclamation of this soil requires a long-range program that includes ongoing monitoring of salinity and sodicity.
- The content of salts and sodium can be reduced by applying proper soil amendments, such as gypsum; leaching below the root zone; and returning crop residue to the soil.
- Careful irrigation helps to prevent an increase in the concentration of salts and sodium.
- The depth to a duripan limits the rooting depth.
- Slow permeability in the duripan limits the efficiency of irrigation.
- Ripping and shattering the duripan improve permeability, increase the available water capacity, extend the rooting depth, and improve internal drainage.
- Applications of irrigation water should be adjusted to the available water capacity, the restricted permeability, and the needs of the crop.

Building site development

Major management factors: Rare flooding, slow permeability, and high corrosivity to steel and concrete
Management considerations:
- The risk of flood damage can be reduced by locating structures above the expected level of flooding.
- The slow permeability increases the likelihood that

improperly designed septic tank absorption fields will fail. Onsite investigation is needed when septic tank systems are designed.
• The corrosion of steel can be minimized by using corrosion-resistant material and coatings and cathodic protectors.
• The corrosion of concrete can be minimized by using sulfate-resistant material.

Farmstead dairies

Major management factors: Pollution of ground water
Management considerations:
• The Remnoy soil has few limitations as a site for dairy waste lagoons. Onsite investigation is needed to determine whether an area selected as a site for such a lagoon is underlain by unsuitable material below a depth of 60 inches. If the underlying material has moderately rapid, rapid, or very rapid permeability, special measures may be required to seal the surface of the lagoon.

Interpretive Groups

Land capability classification: 4s-8, irrigated, and 7s, nonirrigated
MLRA: 17
Prime farmland: No

134—Riverwash

Setting

Landform: Flood plains
Description of area: This map unit occurs as areas of sand and gravel that are within stream and river channels. These areas are dry at most times in most years. During periods when the upstream dams and diversions are allowed to overflow, however, the areas become inundated and are frequently flooded. Riverwash supports little if any vegetation. It has severe limitations for farming and livestock grazing. It has greatest value as a site for certain recreational uses and as a source of aggregate material for road building or general construction.
Elevation: 190 to 600 feet
Slope range: 0 to 2 percent

Composition

Riverwash: 100 percent

Characteristics of the Riverwash

Soil properties, such as permeability, drainage, runoff, effective rooting depth, and available water capacity, vary from one area to another. This unit is poorly suited to most land uses. It is not assigned a land capability classification

135—San Joaquin loam, 0 to 2 percent slopes

Setting

Landform: Fan remnants
Description of area: Irrigated cropland that has been leveled
Elevation: 300 to 500 feet
Major use: Irrigated cropland
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 60 to 63 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

San Joaquin soil and similar soils: 85 percent
Minor components: 15 percent

Characteristics of the San Joaquin Soil

Parent material: Mixed alluvium derived mainly from granitic rock sources

Typical profile

0 to 10 inches—yellowish brown and brown loam
10 to 15 inches—brown sandy clay loam
15 to 29 inches—reddish brown clay
29 to 34 inches—an indurated duripan

Component properties and qualities

Depth class: Moderately deep
Drainage class: Moderately well drained
Permeability: Very slow
Available water capacity: Very low or low
Shrink-swell potential: High
Depth to a duripan: 20 to 40 inches
Surface runoff rate: High
Flooding: Very rare in years of abnormally high precipitation
Corrosivity: Steel—moderate; concrete—moderate

Inclusions

Contrasting inclusions:
• Exeter soils on fan remnants—5 percent
• Tujunga soils on flood plains—5 percent
• Colpien soils on fan remnants—3 percent
• Akers soils on fan remnants—2 percent
• Some areas where the duripan has been removed by mechanical ripping to a depth of more than 40 inches. Onsite investigation is needed to determine if the duripan has been reclaimed.

Similar inclusions:
• Soils with a surface layer of clay loam, sandy clay loam, or sandy loam

Note: Pollution of ground water is a major concern in areas of similar and contrasting inclusions that have layers with moderately rapid, rapid, or very rapid permeability.

Use and Management

Land uses: Irrigated crops, building site development, and farmstead dairies

Irrigated crops

Commonly grown crops: Cotton, alfalfa hay, wheat, olives, oranges, plums, nectarines, walnuts, almonds, corn silage, and table grapes
Major management factors: Depth to a duripan, very slow permeability, and very low or low available water capacity
Management considerations:
• The depth to a duripan limits the rooting depth.
• The very slow permeability in the duripan limits the efficiency of irrigation.
• Ripping and shattering the duripan improve permeability, increase the available water capacity, extend the rooting depth, and improve internal drainage.
• Applications of irrigation water should be adjusted to the available water capacity, the restricted permeability, and the needs of the crop.

Building site development

Major management factors: Very slow permeability and high shrink-swell potential
Management considerations:
• The very slow permeability increases the likelihood that improperly designed septic tank absorption fields will fail. Onsite investigation is needed when septic tank systems are designed.
• Properly designing foundations and footings and diverting runoff away from buildings help to prevent the structural damage caused by shrinking and swelling.

Farmstead dairies

Major management factors: Pollution of ground water
Management considerations:
• The San Joaquin soil has few limitations as a site for dairy waste lagoons. Onsite investigation is needed to determine whether an area selected as a site for such a lagoon is underlain by unsuitable material below a depth of 60 inches. If the underlying material has moderately rapid, rapid, or very rapid permeability, special measures may be required to seal the surface of the lagoon.

Interpretive Groups

Land capability classification: 3s-3, irrigated, and 4s-3, nonirrigated
MLRA: 17
Prime farmland: No

136—Seville clay, 0 to 2 percent slopes

Setting

Landform: Fan remnants
Description of area: Irrigated cropland that has been leveled
Elevation: 300 to 490 feet
Major use: Irrigated cropland
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 62 to 65 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Seville soil and similar soils: 85 percent
Minor components: 15 percent

Characteristics of the Seville Soil

Parent material: Alluvium derived mainly from basic igneous rock sources

Typical profile

0 to 6 inches—dark reddish gray clay
6 to 29 inches—dark reddish gray and reddish brown clay
29 to 44 inches—a weakly cemented duripan
44 to 60 inches—light reddish brown and reddish brown coarse sandy loam, loamy coarse sand, and sandy loam

Component properties and qualities

Depth class: Moderately deep
Drainage class: Moderately well drained
Permeability: Slow above the duripan, very slow in the duripan, and moderately rapid below the duripan
Available water capacity: Low or moderate
Shrink-swell potential: High
Salinity: 0 to 2 dS/m
Sodicity (SAR): 0 to 4
Depth to a duripan: 20 to 40 inches
Surface runoff rate: High
Flooding: Very rare in years of abnormally high precipitation
Corrosivity: Steel—high; concrete—low

Inclusions

Contrasting inclusions:
• San Joaquin soils on fan remnants—5 percent

• Lewis soils on fan remnants—5 percent
• Yettem soils on flood plains and alluvial fans—3 percent
• Quonal soils on fan remnants—2 percent
• Some areas where the duripan has been removed by mechanical ripping to a depth of more than 40 inches. Onsite investigation is needed to determine if the duripan has been reclaimed.

Similar inclusions:
• Soils that have a surface layer of clay loam

Use and Management

Land uses: Irrigated crops, building site development, and farmstead dairies

Irrigated crops

Commonly grown crops: Corn silage, alfalfa hay, cotton, table grapes, olives, oranges, wheat, and plums
Major management factors: Depth to a duripan, slow permeability above the duripan and very slow permeability in the duripan, low or moderate available water capacity, and moderately rapid permeability below the duripan
Management considerations:
• The depth to a duripan limits the rooting depth.
• The slow permeability above the duripan and very slow permeability in the duripan limit the efficiency of irrigation.
• Ripping and shattering the duripan improve permeability, increase the available water capacity, extend the rooting depth, and improve internal drainage.
• Applications of irrigation water should be adjusted to the available water capacity, the restricted permeability, and the needs of the crop.
• Moderately rapidly permeable soil layers below the duripan can speed the leaching of nutrients, primarily nitrates, and certain pesticides into the ground water.

Building site development

Major management factors: Very slow permeability in the duripan, high shrink-swell potential, high corrosivity to steel, and moderately rapid permeability below the duripan
Management considerations:
• The very slow permeability in the duripan increases the likelihood that improperly designed septic tank absorption fields will fail. Onsite investigation is needed when septic tank systems are designed.
• Properly designing foundations and footings and diverting runoff away from buildings help to prevent the structural damage caused by shrinking and swelling.
• The corrosion of steel can be minimized by using corrosion-resistant material and coatings and cathodic protectors.
• Onsite investigation is needed to determine whether an area selected as a site for a septic tank absorption field is underlain by the moderately rapidly permeable material below the duripan. The absorption lines should be installed beneath such material.

Farmstead dairies

Major management factors: Moderately rapid permeability below the duripan
Management considerations:
• Dairy waste lagoons may not be suitable because of the risk of ground-water pollution. Onsite investigation is needed to determine whether an area selected as a site for such a lagoon is underlain by unsuitable material. If layers with moderately rapid, rapid, or very rapid permeability are encountered during excavation, special measures may be required to seal the surface of the lagoon.

Interpretive Groups

Land capability classification: 3s-3, irrigated, and 4s-3, nonirrigated
MLRA: 17
Prime farmland: No

137—Tagus loam, 0 to 2 percent slopes

Setting

Landform: Fan remnants
Description of area: Irrigated cropland that has been leveled and reclaimed with soil amendments
Elevation: 230 to 400 feet
Major use: Irrigated cropland
Mean annual precipitation: 9 to 12 inches
Mean annual temperature: 62 to 65 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Tagus soil and similar soils: 85 percent
Minor components: 15 percent

Characteristics of the Tagus Soil

Parent material: Alluvium derived from granitic rock sources

Typical profile

0 to 17 inches—grayish brown loam
17 to 40 inches—brown and light yellowish brown loam and fine sandy loam

40 to 63 inches—light yellowish brown loam

Component properties and qualities

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: High
Shrink-swell potential: Low
Salinity: 0 to 2 dS/m
Sodicity (SAR): 0 to 12
Surface runoff rate: Low
Flooding: Very rare in years of abnormally high precipitation
Corrosivity: Steel—high; concrete—low

Inclusions

Contrasting inclusions:
• Hanford soils on flood plains and alluvial fans—5 percent
• Tujunga soils on flood plains—5 percent
• Grangeville soils on flood plains and alluvial fans—3 percent
• Colpien soils on fan remnants—2 percent

Similar inclusions:
• Soils with a surface layer of fine sandy loam or sandy loam

Note: Pollution of ground water is a major concern in areas of similar and contrasting inclusions that have layers with moderately rapid, rapid, or very rapid permeability.

Use and Management

Land uses: Irrigated crops, building site development, and farmstead dairies

Irrigated crops

Commonly grown crops: Alfalfa hay, barley, corn silage, cotton, plums, nectarines, walnuts, almonds, table grapes, and wheat
Major management factors: Few or no limitations affect the use of this soil for irrigated crops.

Building site development

Major management factors: High corrosivity to steel
Management considerations:
• The corrosion of steel can be minimized by using corrosion-resistant material and coatings and cathodic protectors.

Farmstead dairies

Major management factors: Pollution of ground water
Management considerations:
• The Tagus soil has few limitations as a site for dairy waste lagoons. Onsite investigation is needed to determine whether an area selected as a site for such a lagoon is underlain by unsuitable material below a depth of 60 inches. If the underlying material has moderately rapid, rapid, or very rapid permeability, special measures may be required to seal the surface of the lagoon.

Interpretive Groups

Land capability classification: 1, irrigated, and 4c, nonirrigated
MLRA: 17
Prime farmland: Yes in areas that are irrigated and protected from flooding

138—Tujunga loamy sand, 0 to 2 percent slopes

Setting

Landform: Flood plains
Description of area: Irrigated cropland that has been leveled
Elevation: 210 to 520 feet
Major use: Irrigated cropland
Mean annual precipitation: 10 to 12 inches
Mean annual temperature: 62 to 65 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Tujunga soil and similar soils: 85 percent
Minor components: 15 percent

Characteristics of the Tujunga Soil

Parent material: Alluvium derived from granitic rock sources

Typical profile

0 to 14 inches—brown loamy sand
14 to 70 inches—yellowish brown, pale brown, and very pale brown sand, coarse sand, and loamy coarse sand

Component properties and qualities

Depth class: Very deep
Drainage class: Somewhat excessively drained
Permeability: Rapid
Available water capacity: Low
Shrink-swell potential: Low
Surface runoff: Negligible
Flooding: Rare in years of abnormally high precipitation
Corrosivity: Steel—moderate; concrete—low

Inclusions

Contrasting inclusions:
- Grangeville soils on alluvial fans and flood plains—5 percent
- Yettem soils on alluvial fans and flood plains—4 percent
- Akers soils on fan remnants—3 percent
- Saline-sodic Akers soils on fan remnants—3 percent

Similar inclusions:
- Soils with a surface layer of sand or fine sandy loam

Use and Management

Land uses: Irrigated crops, building site development, and farmstead dairies

Irrigated crops

Commonly grown crops: Alfalfa hay, cotton, plums, wheat, corn silage, walnuts, and table grapes
Major management factors: Wind erosion, soil blowing, rapid permeability, and low available water capacity
Management considerations:
- Leaving the maximum amount of crop residue on the soil surface and minimizing tillage help to control soil blowing.
- The rapid permeability and low or moderate available water capacity limit the efficiency of irrigation.
- If furrow irrigation is used, the field should be irrigated at frequent intervals. Short runs result in more efficient irrigation.
- The available water capacity can be improved by maintaining crop residue on or near the surface and growing cover crops.
- Rapidly permeable soil layers can speed the leaching of nutrients, primarily nitrates, and certain pesticides into the ground water.

Building site development

Major management factors: Rapid permeability and rare flooding
Management considerations:
- Onsite sewage disposal systems may not be suitable because of the risk of ground-water pollution.
- Onsite investigation is needed to determine whether an area selected as a site for a septic tank absorption field is underlain by unsuitable material. The absorption lines should be installed beneath such material.
- If the density of housing is moderate or high, a community sewage system may be needed.
- Locating septic tank absorption fields a sufficient distance away from domestic wells helps to prevent the contamination of water.
- The risk of flood damage can be reduced by locating structures above the expected level of flooding.

Farmstead dairies

Major management factors: Rapid permeability
Management considerations:
- Dairy waste lagoons may not be suitable because of the risk of ground-water pollution. Onsite investigation is needed to determine whether an area selected as a site for such a lagoon is underlain by unsuitable material. If layers with moderately rapid, rapid, or very rapid permeability are encountered during excavation, special measures may be required to seal the surface of the lagoon.

Interpretive Groups

Land capability classification: 3s-1, irrigated, and 6e, nonirrigated
MLRA: 17
Prime farmland: No

139—Wasco sandy loam, 0 to 2 percent slopes

Setting

Landform: Alluvial fans and flood plains
Description of area: Irrigated cropland that has been leveled
Elevation: 225 to 400 feet
Major use: Irrigated cropland
Mean annual precipitation: 6 to 7 inches
Mean annual temperature: 62 to 65 degrees F
Frost-free period: 250 to 275 days

Map Unit Composition

Wasco soil and similar soils: 85 percent
Minor components: 15 percent

Characteristics of the Wasco Soil

Parent material: Mixed alluvium derived mainly from granitic rock sources

Typical profile

0 to 9 inches—brown sandy loam
9 to 60 inches—brown and pale brown coarse sandy loam

Component properties and qualities

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: Low
Shrink-swell potential: Low

Surface runoff rate: Very low
Flooding: Very rare in years of abnormally high precipitation
Corrosivity: Steel—high; concrete—low

Inclusions

Contrasting inclusions:
• Tujunga soils on flood plains—5 percent
• Saline-sodic Kimberlina soils on alluvial fans and flood plains—5 percent
• Hanford soils on flood plains—3 percent
• Yettem soils on alluvial fans and flood plains—2 percent

Similar inclusions:
• Soils with a surface layer of coarse sandy loam or loam

Use and Management

Land uses: Irrigated crops, building site development, and farmstead dairies

Irrigated crops

Commonly grown crops: Alfalfa hay, almonds, cotton, corn silage, plums, nectarines, wheat, table grapes, and walnuts
Major management factors: Moderately rapid permeability and low available water capacity
Management considerations:
• The moderately rapid permeability limits the efficiency of irrigation.
• Applications of irrigation water should be adjusted to the available water capacity and water intake rate of the soil and to the needs of the crop.
• Moderately rapidly permeable soil layers can speed the leaching of nutrients, primarily nitrates, and certain pesticides into the ground water.

Building site development

Major management factors: Moderately rapid permeability and high corrosivity to steel
Management considerations:
• Onsite investigation is needed to determine whether an area selected as a site for a septic tank absorption field is underlain by unsuitable material. The absorption lines should be installed beneath such material.
• If the density of housing is moderate or high, a community sewage system may be needed.
• Locating septic tank absorption fields a sufficient distance away from domestic wells helps to prevent the contamination of water.
• The corrosion of steel can be minimized by using corrosion-resistant material and coatings and cathodic protectors.

Farmstead dairies

Major management factors: Moderately rapid permeability
Management considerations:
• Dairy waste lagoons may not be suitable because of the risk of ground-water pollution. Onsite investigation is needed to determine whether an area selected as a site for such a lagoon is underlain by unsuitable material. If layers with moderately rapid, rapid, or very rapid permeability are encountered during excavation, special measures may be required to seal the surface of the lagoon.

Interpretive Groups

Land capability classification: 2s-4, irrigated, and 7e, nonirrigated
MLRA: 17
Prime farmland: Yes in areas that are irrigated and protected from flooding

140—Westcamp silt loam, partially drained, 0 to 2 percent slopes

Setting

Landform: Basin rims and flood plains
Description of area: Irrigated cropland that has been leveled, partially drained, and reclaimed with soil amendments
Elevation: 190 to 220 feet
Major use: Irrigated cropland
Mean annual precipitation: 6 to 7 inches
Mean annual temperature: 62 to 65 degrees F
Frost-free period: 260 to 275 days

Map Unit Composition

Westcamp soil and similar soils: 85 percent
Minor components: 15 percent

Characteristics of the Westcamp Soil

Parent material: Mixed alluvium derived mainly from granitic rock sources

Typical profile

0 to 5 inches—grayish brown and light brownish gray silt loam
5 to 33 inches—light olive gray and grayish brown silty clay loam and silt loam
33 to 60 inches—very dark gray silty clay loam

Component properties and qualities

Depth class: Very deep
Drainage class: Somewhat poorly drained (partly drained artificially because of protection from

flooding, pumping from the water table, the use of tile and interceptor drains, and the filling and leveling of sloughs)
Permeability: Very slow
Available water capacity: Low or moderate
Shrink-swell potential: Low in the upper part of the profile and high below a depth of 40 inches
Salinity: 2 to 16 dS/m
Sodicity (SAR): 2 to 13 in the upper part of the profile; 13 to 100 in the lower part
Surface runoff rate: Medium
Flooding: Rare in years of abnormally high precipitation
Depth to the seasonal high water table: 4 to 6 feet
Kind of water table: Perched
Corrosivity: Steel—high; concrete—high

Inclusions

Contrasting inclusions:
• Excelsior soils on alluvial fans—5 percent
• Houser soils basin rims—5 percent
• Nahrub soils on basin rims—3 percent
• Posochanet soils on fan skirts—2 percent

Similar inclusions:
• Soils with a surface layer of silty clay loam, fine sandy loam, or loamy fine sand

Use and Management

Land uses: Irrigated crops and building site development

Irrigated crops

Commonly grown crops: Alfalfa hay, corn silage, cotton, and wheat
Major management factors: Salinity and sodicity, high water table, very slow permeability, and low or moderate available water capacity
Management considerations:
• The salinity and sodicity of the soil limit the kinds of crops that can be grown.
• Reclamation of this soil requires a long-range program that includes ongoing monitoring of salinity and sodicity.
• The content of salts and sodium can be reduced by applying proper soil amendments, such as gypsum; leaching below the root zone; and returning crop residue to the soil.
• Careful irrigation helps to prevent an increase in the concentration of salts and sodium.
• The water table limits the suitability for deep-rooted crops. A surface drainage system and open drainage ditches are needed to remove excess water and lower the water table.
• Applications of irrigation water should be adjusted to the restricted permeability and available water capacity of the soil and to the needs of the crop.

Building site development

Major management factors: Rare flooding, very slow permeability, high water table, high shrink-swell potential, and high corrosivity to steel and concrete
Management considerations:
• The risk of flood damage can be reduced by locating structures above the expected level of flooding.
• The high water table and very slow permeability increase the likelihood that improperly designed septic tank absorption fields will fail. Onsite investigation is needed when septic tank systems are designed.
• Properly designing foundations and footings and diverting runoff away from buildings help to prevent the structural damage caused by shrinking and swelling.
• The corrosion of steel can be minimized by using corrosion-resistant material and coatings and cathodic protectors.
• The corrosion of concrete can be minimized by using sulfate-resistant material.

Interpretive Groups

Land capability classification: 3w-6, irrigated, and 7w, nonirrigated
MLRA: 17
Prime farmland: No

141—Posochanet silt loam, 0 to 2 percent slopes

Setting

Landform: Fan skirts
Description of area: Irrigated cropland that has been leveled and reclaimed with soil amendments
Elevation: 200 to 215 feet
Major use: Irrigated cropland
Mean annual precipitation: 6 to 8 inches
Mean annual temperature: 62 to 65 degrees F
Frost-free period: 250 to 275 days

Map Unit Composition

Posochanet soil and similar soils: 85 percent
Minor components: 15 percent

Characteristics of the Posochanet Soil

Parent material: Mixed alluvium derived mainly from granitic rock sources

Typical profile

0 to 5 inches—grayish brown silt loam

5 to 33 inches—light olive gray, grayish brown, and light brownish gray silty clay, silt loam, and silty clay loam
33 to 60 inches—very dark gray silty clay loam

Component properties and qualities

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Slow
Available water capacity: High
Shrink-swell potential: High
Salinity: 4 to 8 dS/m in the upper part of the profile; 4 to 30 dS/m in the lower part
Sodicity (SAR): 2 to 13 in the upper part of the profile; 13 to 50 in the lower part
Surface runoff rate: Low
Flooding: Rare in years of abnormally high precipitation
Corrosivity: Steel—high; concrete—high

Inclusions

Contrasting inclusions:
- Excelsior soils on alluvial fans—5 percent
- Nahrub soils on basin rims—5 percent
- Houser soils on basin rims—3 percent
- Westcamp soils on basin rims—2 percent

Similar inclusions:
- Soils with a surface layer of very fine sandy loam, loam, or silty clay loam

Note: Pollution of ground water is a major concern in areas of similar and contrasting inclusions that have layers with moderately rapid, rapid, or very rapid permeability.

Use and Management

Land uses: Irrigated crops, building site development, and farmstead dairies

Irrigated crops

Commonly grown crops: Alfalfa hay, corn silage, cotton, and wheat
Major management factors: Salinity, sodicity, and slow permeability
Management considerations:
- The salinity and sodicity of the soil limit the kinds of crops that can be grown.
- Reclamation of this soil requires a long-range program that includes ongoing monitoring of salinity and sodicity.
- The content of salts and sodium can be reduced by applying proper soil amendments, such as gypsum; leaching below the root zone; and returning crop residue to the soil.
- Careful irrigation helps to prevent an increase in the concentration of salts and sodium.
- Because of the restricted permeability, applications of irrigation water should be regulated so that the water does not stand on the surface and damage crops.

Building site development

Major management factors: Rare flooding, slow permeability, high corrosivity to steel and concrete, and high shrink-swell potential
Management considerations:
- The risk of flood damage can be reduced by locating structures above the expected level of flooding.
- The slow permeability increases the likelihood that improperly designed septic tank absorption fields will fail. Onsite investigation is needed when septic tank systems are designed.
- The corrosion of steel can be minimized by using corrosion-resistant material and coatings and cathodic protectors.
- The corrosion of concrete can be minimized by using sulfate-resistant material.
- Properly designing foundations and footings and diverting runoff away from buildings help to prevent the structural damage caused by shrinking and swelling.

Farmstead dairies

Major management factors: Pollution of ground water
Management considerations:
- The Posochanet soil has few limitations as a site for dairy waste lagoons. Onsite investigation is needed to determine whether an area selected as a site for such a lagoon is underlain by unsuitable material below a depth of 60 inches. If the underlying material has moderately rapid, rapid, or very rapid permeability, special measures may be required to seal the surface of the lagoon.

Interpretive Groups

Land capability classification: 2s-6, irrigated, and 6s, nonirrigated
MLRA: 17
Prime farmland: No

142—Wutchumna-Rock outcrop association, 5 to 50 percent slopes

Setting

Landform: Side slopes of hills
Description of area: Dominantly rangeland; some very small areas of irrigated cropland
Elevation: 340 to 870 feet

Vegetation: Annual grasses and forbs
Major use: Rangeland
Mean annual precipitation: 9 to 11 inches
Mean annual temperature: 62 to 65 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Wutchumna gravelly clay loam, 15 to 50 percent slopes, and similar soils: 55 percent
Wutchumna gravelly clay loam, 5 to 15 percent slopes, and similar soils: 15 percent
Rock outcrop: 15 percent
Minor components: 15 percent

Characteristics of the Wutchumna Soil

Parent material: Residuum and colluvium weathered from metagabbro

Typical profile

0 to 18 inches—brown gravelly clay loam
18 to 35 inches—reddish brown and yellowish red gravelly clay
35 inches—metagabbro bedrock

Component properties and qualities

Depth class: Moderately deep to bedrock
Drainage class: Well drained
Permeability: Slow
Available water capacity: Low or moderate
Shrink-swell potential: High
Surface runoff rate: High where slopes are 15 to 50 percent and medium where slopes are 5 to 15 percent
Flooding: None
Hazard of erosion by water: High in the steeper areas

Inclusions

Contrasting inclusions:
• Soils that have clayey-skeletal particle-size families and are in depressions on the side slopes of hills—10 percent
• Soils that have fine particle-size families, have visible cracks when dry, and are on the concave toe slopes of hills—5 percent

Similar inclusions:
• Soils with a surface layer of clay or gravelly clay

Use and Management

Land uses: Building site development; livestock grazing; and, in some very small areas, irrigated crops, mainly oranges and avocados

Building site development

Major management factors: High hazard of erosion by water, slope, moderate depth to bedrock, slow permeability, and high shrink-swell potential
Management considerations:
• The soil tends to creep or slide downslope when it is saturated. Onsite investigation is needed when buildings and roads are constructed.
• The depth to bedrock and slow permeability increase the likelihood that improperly designed septic tank absorption fields will fail. Onsite investigation is needed when septic tank systems are designed.
• Properly designing foundations and footings and diverting runoff away from buildings help to prevent the structural damage caused by shrinking and swelling.

Livestock grazing

Major management factors: Hazard of erosion, slope, compaction by livestock, low or moderate available water capacity, depth to bedrock, and rock outcrop
Management considerations:
• Proper grazing management helps to maintain the content of organic matter in the surface layer, increases the rate of water infiltration, improves plant growth early in the spring, and helps to control erosion. Grazing management should be at an intensity that maintains enough cover to protect the soil.
• The slope limits access by livestock and can result in overgrazing of the less sloping areas.
• Grazing should be delayed until the soil is adequately drained and is firm enough to withstand trampling by livestock.
• A planned grazing system that includes rest periods for the pastures promotes the growth of desirable vegetation.
• Rock outcrop and the slope limit reseeding methods.

Interpretive Groups

Land capability classification: Wutchumna, 5 to 15 percent slopes—4e-1, nonirrigated, and 3e-1, irrigated; Wutchumna, 15 to 50 percent slopes—6e, nonirrigated; Rock outcrop—8
MLRA: 18
Prime farmland: No

143—Yettem sandy loam, 0 to 2 percent slopes

Setting

Landform: Flood plains and alluvial fans
Description of area: Irrigated cropland that has been leveled
Elevation: 225 to 530 feet
Major use: Irrigated cropland

Mean annual precipitation: 9 to 12 inches
Mean annual temperature: 62 to 65 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Yettem soil and similar soils: 85 percent
Minor components: 15 percent

Characteristics of the Yettem Soil

Parent material: Alluvium derived from granitic rock sources

Typical profile

0 to 13 inches—brown sandy loam
13 to 60 inches—yellowish brown and light yellowish brown sandy loam

Component properties and qualities

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: Moderate
Shrink-swell potential: Low
Surface runoff rate: Very low
Flooding: Very rare in years of abnormally high precipitation
Corrosivity: Steel—high; concrete—moderate

Inclusions

Contrasting inclusions:
• Saline-sodic Kimberlina soils on alluvial fans and flood plains—5 percent
• Grangeville soils on alluvial fans and flood plains—5 percent
• Colpien soils on fan remnants—3 percent
• Tujunga soils on flood plains—2 percent

Similar inclusions:
• Soils with a surface layer of fine sandy loam or loam

Use and Management

Land uses: Irrigated crops, building site development, and farmstead dairies

Irrigated crops

Commonly grown crops: Alfalfa hay, corn silage, plums, table grapes, cotton, walnuts, and wheat
Major management factors: Few or no limitations affect the use of this soil for irrigated crops.

Building site development

Major management factors: Moderately rapid permeability and high corrosivity to steel
Management considerations:
• Onsite investigation is needed to determine whether an area selected as a site for a septic tank absorption field is underlain by unsuitable material. The absorption lines should be installed beneath such material.
• If the density of housing is moderate or high, a community sewage system may be needed.
• Locating septic tank absorption fields a sufficient distance away from domestic wells helps to prevent the contamination of water.
• The corrosion of steel can be minimized by using corrosion-resistant material and coatings and cathodic protectors.

Farmstead dairies

Major management factors: Moderately rapid permeability
Management considerations:
• Dairy waste lagoons may not be suitable because of the risk of ground-water pollution. Onsite investigation is needed to determine whether an area selected as a site for such a lagoon is underlain by unsuitable material. If layers with moderately rapid, rapid, or very rapid permeability are encountered during excavation, special measures may be required to seal the surface of the lagoon.

Interpretive Groups

Land capability classification: 1, irrigated, and 4c, nonirrigated
MLRA: 17
Prime farmland: Yes in areas that are irrigated and protected from flooding

144—Youd loam, 0 to 1 percent slopes

Setting

Landform: Fan remnants
Description of area: Irrigated cropland that has been leveled and reclaimed with soil amendments
Elevation: 220 to 300 feet
Major use: Irrigated cropland
Mean annual precipitation: 7 to 8 inches
Mean annual temperature: 62 to 65 degrees F
Frost-free period: 250 to 275 days

Map Unit Composition

Youd soil and similar soils: 85 percent
Minor components: 15 percent

Characteristics of the Youd Soil

Parent material: Alluvium derived mainly from granitic rock sources

Typical profile

0 to 9 inches—light brownish gray loam
9 to 32 inches—a duripan that is strongly cemented with silica
32 to 60 inches—light brownish gray loamy sand and sandy loam

Component properties and qualities

Depth class: Shallow
Drainage class: Somewhat poorly drained
Permeability: Moderately slow above the duripan and slow or very slow in the duripan
Available water capacity: Very low
Shrink-swell potential: Low
Salinity: 4 to 16 dS/m above the duripan
Sodicity (SAR): 13 to 50 above the duripan
Depth to a duripan: 10 to 20 inches
Surface runoff rate: Medium
Flooding: Rare in years of abnormally high precipitation
Corrosivity: Steel—high; concrete—high

Inclusions

Contrasting inclusions:
- Crosscreek soils on fan remnants—5 percent
- Quonal soils on fan remnants—4 percent
- Remnoy soils on fan remnants—3 percent
- Tujunga soils on flood plains—2 percent
- Soils in depressions that are ponded more than 14 days each year—1 percent
- Some areas where the duripan has been removed by mechanical ripping to a depth of more than 40 inches. Onsite investigation is needed to determine if the duripan has been reclaimed.

Similar inclusions:
- Soils with a surface layer of sandy loam

Note: Pollution of ground water is a major concern in areas of similar and contrasting inclusions that have layers with moderately rapid, rapid, or very rapid permeability.

Use and Management

Land uses: Irrigated crops, building site development, and farmstead dairies

Irrigated crops

Commonly grown crops: Alfalfa hay, cotton, wheat, nectarines, and vegetables
Major management factors: Depth to a duripan, slow or very slow permeability in the duripan, salinity and sodicity, and very low available water capacity
Management considerations:
- The depth to a duripan limits the rooting depth.
- The slow or very slow permeability in the duripan limits the efficiency of irrigation.
- Because of the restricted permeability, applications of irrigation water should be regulated so that the water does not stand on the surface and damage crops.
- Ripping and shattering the duripan improve permeability, increase the available water capacity, extend the rooting depth, and improve internal drainage.
- The salinity and sodicity of the soil limit the kinds of crops that can be grown.
- Reclamation of this soil requires a long-range program that includes ongoing monitoring of salinity and sodicity.
- The content of salts and sodium can be reduced by applying proper soil amendments, such as gypsum; leaching below the root zone; and returning crop residue to the soil.
- Careful irrigation helps to prevent an increase in the concentration of salts and sodium.
- Applications of irrigation water should be adjusted to the available water capacity and water intake rate of the soil and to the needs of the crop.

Building site development

Major management factors: Rare flooding, slow or very slow permeability in the duripan, and high corrosivity to steel and concrete
Management considerations:
- The risk of flood damage can be reduced by locating structures above the expected level of flooding.
- The slow or very slow permeability increases the likelihood that improperly designed septic tank absorption fields will fail. Onsite investigation is needed when septic tank systems are designed.
- The corrosion of steel can be minimized by using corrosion-resistant material and coatings and cathodic protectors.
- The corrosion of concrete can be minimized by using sulfate-resistant material.

Farmstead dairies

Major management factors: Pollution of ground water
Management considerations:
- The Youd soil has few limitations as a site for dairy waste lagoons. Onsite investigation is needed to determine whether an area selected as a site for such a lagoon is underlain by unsuitable material below a depth of 60 inches. If the underlying material has moderately rapid, rapid, or very rapid permeability,

special measures may be required to seal the surface of the lagoon.

Interpretive Groups

Land capability classification: 4s-8, irrigated, and 7s, nonirrigated

MLRA: 17
Prime farmland: No

145—Water, perennial

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help to prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, salinity, sodicity, drainage, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, duripans, salts, or clayey soils can cause problems associated with construction.

Health officials, highway officials, agricultural commissioners, irrigation or drainage districts, consultants, engineers, and others may also find this survey useful in planning and understanding the use and management of different soils. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Interpretive Ratings

Many interpretive tables in this survey rate the soils in the survey area for various uses. Many of the tables identify the limitations that affect specified uses and indicate the severity of those limitations. The ratings in these tables are both verbal and numerical.

Crops and Pasture

Prepared by David L. Carter, Area Agronomist, Natural Resources Conservation Service.

General management needed for crops and pasture is suggested in this section. The estimated yields of the main crops and pasture plants are listed for each soil, the system of land capability classification used by the Natural Resources Conservation Service is explained, and prime farmland is described.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under the heading "Detailed Soil Map Units." Specific information can be obtained from the local office of the Natural Resources Conservation Service.

Most of the soils in the survey area are suitable for irrigated cultivation. Some may require extensive modification and management before they are arable. For most practical purposes, the land in the area is either prime farmland or farmland of statewide importance. Many of the soils have a variety of limitations because of soil characteristics. Management practices can overcome most cropping limitations and can also improve soil tilth, allow the efficient use of irrigation water, manage soil salts and sodium, decrease the risk of ground-water pollution, and minimize water erosion and soil blowing. Proper management can ensure sustained productivity, maintain favorable soil characteristics, promote soil fertility, and assist in pest management.

Some common farming practices and management techniques are *conservation tillage*, *irrigation water*

management, tailwater recovery systems, soil salinity management, toxic salt reduction, subsurface drains, a conservation cropping sequence, crop residue management, grasses and legumes in the crop rotation, cover and green manure crops, waste utilization, nutrient and pest management, chiseling and subsoiling, erosion control, agroforestry planting, pasture management, and *hayland management.* Use of these and other applicable practices depends upon land use goals, soil characteristics or limitations, crop suitability, and capital investment. Some soil limitations cannot be mitigated or profitably corrected; therefore, land use planning is essential for profitable land use and prevention of soil degradation. Technical assistance in land use planning and soil-related problems can be obtained from local offices of the Natural Resources Conservation Service and the Cooperative Extension Service.

Conservation tillage is a reduction in conventional tillage operations. It controls weeds, incorporates crop residue into the soil, modifies the soil for favorable air and water movement, and prepares a favorable seedbed. Conservation tillage can range from a no-till operation to something less than conventional tillage. Crop residue management is a very important component that maintains a ground cover of 30 percent after planting.

Conservation tillage, in contrast to conventional tillage, utilizes less tillage, decreases production costs, and provides additional soil protection, but it requires more intensive management. The soils benefiting the most from conservation tillage in this survey area are coarse textured soils, such as Delhi and Tujunga, which are susceptible to soil blowing. Some major cultural considerations are:

1—Handling of residues by tillage and planting equipment
2—Slower warmup of cold and wet soils in spring
3—Fertilizer placement
4—Pesticide effectiveness
5—Crop response
6—Farming tradition

Well planned farming operations are required for a good conservation tillage program. Crop production goals and soil conservation effects must be evaluated to ensure that the producer's objectives are met. Because of the surface residues required for successful conservation tillage, crop residue management is essential.

The soils and local climatic conditions affect conservation tillage programs. When these programs are planned, production goals and conservation needs should be considered. Adjustments to cropping and tillage operations will be required, and more management must be applied.

Irrigation water management is essential for all irrigated crops. Correct field irrigation guides, water delivery systems, and irrigation water management are important for profitable crop production, soil conservation, the efficient use of irrigation water, and protection of ground and surface water. Irrigation evaluations show whether excessive deep-water loss is occurring. This deep-water loss is accompanied by the movement of nutrients, pesticides, and salts. The amount of available water is determined by soil texture, organic matter content, salt content, and compaction.

The total amount of available water that the soils in the survey area can hold is described under the heading "Detailed Soil Map Units." Additional water for leaching of saline-sodic soils may be needed.

Irrigation systems are required for sustained production on all irrigated cropland. Properly managed water systems are designed for minimum losses. Tailwater is kept and used on the farm. The irrigation methods used in the survey area are *graded furrow, level basin flood, drip,* and *sprinkler.* Graded furrow flood systems are the most common and are well suited to loamy and clayey soils and deep-rooted crops. A well designed system may require laser land leveling to improve the uniformity of flooding. The downward movement of irrigation water below the root zone can be significant on fields with irrigation runs over a quarter mile long or on soils with sandy textures or substrata, such as Delhi and Tujunga soils. Flood systems are not well suited to crops with shallow root zones, which require frequent applications of water, in areas of soils that have a limited rooting depth, such as Exeter, Remnoy, and Youd soils. Drip systems are the most efficient. They are used extensively on permanent cropland, such as orchards and vineyards. Sprinklers and drip systems can easily control the amount of water applied with uniformity.

Tailwater recovery systems consist of collection ditches and structures that recover tailwater in a holding pond so that it can be pumped back into the irrigation system for reuse. With a tailwater recovery system in place, the flow rate down the furrow can be increased. This increase will improve the distribution pattern and decrease deep-water loss through the drainage system.

Soil salinity management maintains an acceptable level of salinity in the root zone. It can consist of a single component or several components. A well designed salinity management plan ensures that effluent will not adversely affect wildlife or surface or

subsurface water. Management of toxic substances in effluent must be given high priority.

Toxic salt reduction can significantly improve crop performance by reducing the amount of exchangeable salts and sodium in such soils as Kai, Jerryslu, and Lewis. In soils that are highly saline and sodic, the rate of water infiltration and the amount of available water are reduced. Crop production also is reduced. Sodium commonly occurs in the soil in a form that is not readily leachable. An exchange with calcium is needed to allow the sodium to be leached. Some soils have adequate calcium but require sulfuric acid to allow the calcium to enter the soil solution and complete the exchange with sodium. Gypsum is commonly used to treat sodic soils. Once in solution, the calcium from the gypsum undergoes exchange with the sodium and then becomes part of the soil solution and can be removed by leaching. Application rates are based on the amount of exchangeable sodium in the soil as estimated by onsite investigations and determined by laboratory analysis. Small areas with high concentrations of sodium are treated with additional gypsum. Surface layers in which sodium has been leached should be maintained. Because of the need to prevent the return of salt to the surface layers, deep plowing or land leveling should be avoided in soils with a saline-sodic substratum.

Subsurface drains are usually perforated pipes buried below the root zone to intercept, concentrate, and transport water to an outlet for disposal. Subsurface drains are installed in such soils as Armona, Gepford, and Houser. They keep the water table below the root zone of sensitive crops and provide an outlet for flushing salts from the root zone. They are also used to intercept laterally moving subsurface water adjacent to canals, lagoons, ponds, and reservoirs and thus prevent offsite damage. Water quantity, quality, and capacity are the main considerations in planning subsurface drain systems.

A conservation cropping sequence helps to maintain favorable soil conditions for good crop performance and sustained production. This approach involves consideration of all tillage practices, fertilizer programs, pest-control programs, and crop rotations. All inputs are evaluated and managed for optimum production with minimum soil degradation. Economic benefits are realized through reduced farming expenses and machinery costs. Intensive tillage practices reduce the amount of organic matter and destroy soil structure. A low content of organic matter and poor soil structure result in poor soil tilth, a reduced rate of water infiltration, the loss of plant nutrients, and increased susceptibility to erosion. These effects can seriously affect crop performance and productivity.

A good cropping sequence includes cultural practices and crop rotations that offset the harmful effects of continuous single cropping. The crops selected for inclusion in the rotation are important considerations. Legumes, such as alfalfa hay, are soil enhancing because of the fixation of nitrogen, reduced tillage, and permanent root systems.

Crop residue management helps to protect cultivated fields. Crop residue is maintained at or near the surface. Incorporating the residue into the soil conserves soil moisture, increases the rate of water infiltration, reduces soil loss, and improves soil tilth.

Grasses and legumes in the crop rotation can reduce the hazard of erosion and improve or maintain the content of organic matter and productivity. The stand of grasses and legumes is maintained for a definite number of years. It will produce forage for hay, silage, seed, or grazing. In this survey area, alfalfa is the main legume included in the crop rotation. It is usually rotated every 3 or 4 years.

Cover and green manure crops are usually close-growing legumes or small grains grown primarily for seasonal erosion control and soil improvement. They are grown for 1 year or less, except on permanent cropland, such as orchards. They help to control erosion, increase water penetration, improve soil tilth, and add organic matter, but they result in higher water use. Cover and green manure crops have a very wide range of uses and functions with integrated pest management and other related practices.

Waste utilization in this survey area primarily involves the management of poultry and dairy manure. The wise use of manure improves soil tilth, prevents excessive erosion, and safeguards water resources. Dry manure improves the available water capacity of Delhi, Tujunga, and other sandy soils. The nitrogen in dry manure is less likely to leach out of the soil profile. Dry manure acts as a time-release fertilizer; the nutrients are partially tied up because of the results of microbial activity. A well designed waste management system includes the proper use and disposal of agricultural waste.

Nutrient and pest management includes control of pest infestations and of the kind, amount, form, and placement of nutrients and pesticides. Irrigation water management is essential to prevent losses of pesticides and nutrients in soils with a high leaching potential. A well designed nutrient and pest management system minimizes the entry of nutrients and pesticides into surface and ground water.

Chiseling and subsoiling can permanently correct

the problems associated with duripans or temporarily correct the problems associated with a plowpan or a compaction pan. These layers restrict the effective rooting depth and affect soil water characteristics. Chiseling less than 16 inches deep or subsoiling deeper than 16 inches increases the rooting depth, enhances permeability and internal drainage, and prevents perched water tables. A duripan may be permanently shattered, and a plowpan or compaction pan is temporarily destroyed.

Moisture content is extremely important during the process of chiseling or subsoiling. The soil has to be dry enough for a shattering effect. Shearing results if the soil is too wet. Soils with duripans generally require onsite investigation to determine if deep ripping is necessary. Cross ripping, which is subsoiling in more than one direction, is much more effective than subsoiling in one direction only.

Benefits can be derived from chiseling or subsoiling clayey subsoils. Quonal and San Joaquin are examples of soils that could temporarily benefit from chiseling or subsoiling.

Chiseling also can temporarily improve soils in areas where cropping or tillage compaction has developed. Most soils in areas of cropland develop tillage compaction layers through cultivation or through tillage when the soils are wet. Cultivation should be avoided when the soils are excessively wet. If the soil moisture is near or above field capacity, the soil is too wet for cultivation. Timing farming operations so that the soil is worked during favorable soil moisture conditions can minimize the formation of compaction layers as well as the formation of clods.

Erosion control is essential to reduce the hazards of water erosion and wind erosion. Water erosion occurs when raindrops strike bare soil and disperse soil aggregates. Soils on slopes of more than 2 percent are susceptible to water erosion. Wutchumna soils are an example. Coarse to medium textured soils are susceptible to wind erosion. Sandy soils, such as Delhi and Tujunga, should be protected from both water erosion and wind erosion. Both permanent and cover crops provide enough cover to keep erosion losses below tolerance levels.

Wind erosion is a hazard when the soil is bare. The most susceptible coarse textured soils are Delhi and Tujunga. Protection from erosion may require planning and modification of cropping and cultural practices. Permanent windbreaks are a sound, long-term investment where sufficient water is available. Windbreaks not only reduce the hazard of erosion but also prevent the crop damage caused by winds. Permanent windbreaks can be trees, shrubs, or perennial grasses. Their maintenance can be incorporated into a conservation cropping plan.

Agroforestry planting is a conservation practice in which trees are farmed as a crop and used to consume agricultural drain water, consume soil moisture from a perched water table, or affect the lateral movement of ground water by interception. If agricultural drain water is not too salty, the first step is to alternate the reuse of drain water with good water on salt-tolerant crops. This irrigation practice is used on salt-tolerant trees, such as eucalyptus. The concentrated leachate is collected with drain lines and then reused on more salt-tolerant shrubs, such as Atriplex. This practice is also used where rows of deep-rooted trees intercept the water before it enters the drainage system. These trees have to be irrigated during their establishment period, during drought years, and when leaching may be needed.

Pasture management should include management strategies that protect the soil and that prolong the life of the stand and thus help to obtain sustained forage yields. Maintenance of desirable plant communities is a major consideration. Desirable plants are the most palatable. Weedy or other undesirable plants usually thrive because they are not harvested by livestock, except as a last resort. Grazing at levels that allow continued vigorous growth helps to maintain a pasture of desirable plants. The grazing plan should leave enough leaf surface for the regrowth of the plant and should provide enough rest time after grazing for plant recovery.

Irrigation is necessary to meet the water requirements of the pasture plants. A balanced fertilization program can enhance forage production. The hazard of soil compaction can be reduced by keeping animals off the pasture immediately after irrigation or precipitation.

Hayland management helps to achieve sustained production and soil protection. Profitable production can be maintained by keeping the field free of weeds and harvesting the forage at intervals that allow the plants to sustain thrifty growth. Good water management is essential. Applying too much irrigation water can deplete soil oxygen and leach nutrients below the root zone. Alfalfa plants cannot tolerate even short periods of water saturation. Plants often die or are attacked by disease and lose vigor. Grasses take advantage of excess water and infest the field.

Soils with a high water table in spring, such as Armona, Gepford, and Houser soils, are poorly suited to alfalfa hay. Stands on these soils can be severely damaged or destroyed during years when the water table is high for long periods. Fine textured soils with

slow or very slow permeability, such as Quonal soils, also are poorly suited to alfalfa hay. Stands on these soils can be severely damaged or destroyed by periods of prolonged saturation during the growing season.

Yields per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations also are considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown, that good-quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Natural Resources Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations that are designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system, soils are generally grouped at three levels—capability class, subclass, and unit.

Capability classes, the broadest groups, are designated by numerals 1 through 8. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class 1 soils have few limitations that restrict their use.

Class 2 soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class 3 soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class 4 soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class 5 soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class 6 soils have severe limitations that make them generally unsuitable for cultivation.

Class 7 soils have very severe limitations that make them unsuitable for cultivation.

Class 8 soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, 4e. The letter *e* shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c,* used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class 1 there are no subclasses because the soils of this class have few limitations. Class 5

contains only the subclasses indicated by *w, s,* or *c* because the soils in class 5 are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

Capability units are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, 4e-1. No unit designations are shown for class 1 soils since soil characteristics are similar for all soils in this class.

The numbers used to designate units within the subclass are as follows:

0.—Indicates a problem or limitation caused by stony, cobbly, or gravelly material in the substratum.

1.—Indicates a problem or limitation caused by slope or by an actual or potential erosion hazard.

2.—Indicates a problem or limitation of wetness caused by poor drainage or flooding.

3.—Indicates a problem or limitation of slow or very slow permeability in a clayey subsoil or a semiconsolidated substratum.

4.—Indicates a problem or limitation caused by a very low or low available water capacity in sandy or gravelly soils.

5.—Indicates a problem or limitation caused by a fine textured or very fine textured surface layer.

6.—Indicates a problem or limitation caused by sodicity or salinity.

7.—Indicates a problem or limitation caused by rocks, stones, or cobbles.

8.—Indicates a problem or limitation in a root zone that generally is less than 40 inches over massive bedrock and lacks moisture for plants.

9.—Indicates a problem or limitation caused by low or very low fertility, acidity, or toxicity that cannot be corrected by adding normal amounts of fertilizer, lime, or other amendments.

The capability classification of each component in the map units in this survey area is given in the section "Detailed Soil Map Units" and in table 6.

Major Land Resource Area

The land capability classification system is further refined by designating the major land resource area (MLRA) in which the soils in a unit occur. A major land resource area is a broad geographic area that has a distinct combination of climate, topography, vegetation, land use, and general type of farming. Parts of two of these nationally designated areas are in the survey area. These areas and their numbers are Sacramento and San Joaquin Valleys, MLRA 17, and Sierra Nevada Foothills, MLRA 18.

MLRA 17, Sacramento and San Joaquin Valleys.—About 99 percent of the survey area occurs within MLRA 17. This MLRA is characterized by basins in the center of the valleys, alluvial fans and flood plains along tributary streams, and fan remnants around the edge of the valleys. The natural vegetation is currently annuals and scattered trees. Elevation ranges from 190 to about 600 feet. The average annual precipitation ranges from 6 to 12 inches, the average annual temperature ranges from 62 to 66 degrees F, and the average frost-free period ranges from 250 to 300 days.

In this survey area, most of this MLRA is used for irrigated crops.

MLRA 18, Sierra Nevada Foothills.—This MLRA makes up less than 1 percent of the survey area. It occurs in two small areas on the eastern edge of the survey boundary. This MLRA is characterized by rolling to steep hills. The natural vegetation is annual grasses and shrubs. Elevation ranges from 340 to 870 feet. The average annual precipitation ranges from 9 to 11 inches, the average annual temperature ranges from 62 to 65 degrees F, and the average frost-free period ranges from 250 to 300 days.

In this survey area, most of this MLRA is used for livestock grazing, but some small areas are used for irrigated crops.

Important Farmlands

Two kinds of important farmland are recognized in this soil survey—prime farmland and additional farmland of statewide importance.

Prime Farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation's short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land, pastureland, forestland, or other land, but it is not urban or built-up land or water areas. The soil qualities,

growing season, and moisture supply are those needed for the soil to economically produce sustained high yields of crops when proper management, including water management, and acceptable farming methods are applied. In general, prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, an acceptable salt and sodium content, and few or no rocks. It is permeable to water and air. It is not excessively erodible or saturated with water for long periods, and it is not frequently flooded during the growing season or is protected from flooding. The slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Natural Resources Conservation Service.

About 392,390 acres in the survey area, or nearly 50 percent of the area, would meet the requirements for prime farmland if an adequate and dependable supply of irrigation water were available.

A recent trend in land use in some parts of the area has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive and cannot be easily cultivated.

The map units in the area that are considered prime farmland are listed in table 7. This list does not constitute a recommendation for a particular land use. On some soils included in the list, measures that overcome a hazard or limitation, such as flooding, wetness, and droughtiness, are needed. Onsite evaluation is needed to determine whether or not the hazard or limitation has been overcome by corrective measures. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps in this publication. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

Additional Farmland of Statewide Importance

This is land, in addition to prime farmlands, that is of statewide importance for the production of food, feed, fiber, forage, and oilseed crops.

The criteria for defining and delineating this land are to be determined by the appropriate state agency or agencies. Generally, additional farmlands of statewide importance include those that are nearly prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods. Some may produce as high a yield as prime farmland if conditions are favorable. In some States additional farmland of statewide importance may include tracts of land that have been designated for agriculture by State law.

The map units in the survey area that are considered additional farmland of statewide importance are listed in table 8. This list does not constitute a recommendation for a particular land use. On some soils included in the list, measures that overcome a hazard or limitation, such as flooding, wetness, and droughtiness, are needed. Onsite evaluation is needed to determine whether or not the hazard or limitation has been overcome by corrective measures. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps in this publication. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

Storie Index

By Melissa A. Oliva-Vargas, undergraduate intern, and Randal J. Southard, Professor, Department of Land, Air, and Water Resources, University of California, Davis.

The soils in the survey area are rated in table 9 according to the Storie index (Storie, 1933 and 1976). This index expresses numerically the relative degree of suitability of a soil for general intensive agricultural uses at the time of the evaluation. The rating is based on soil characteristics and is obtained by evaluating surface and subsurface chemical and physical properties and surface landscape features. Availability of water for irrigation, local climate, size and accessibility of mapped areas, distance to markets, and other factors that might determine the desirability of growing certain plants in a given locality are not considered. Therefore, the index should not be used as the only indicator of land value. Where the local economic and geographic factors are known to the user, however, the Storie index may provide additional objective information for land tract value comparisons.

Four general factors are used in determining the index rating—*A*, the permeability, available water capacity, and depth of the soil; *B*, the texture of the surface soil; *C*, the dominant slope of the soil body; and *X*, other conditions more readily subject to management or modification by the land user. In this survey area these conditions include drainage, salinity and sodicity, nutrient level, hazard of water erosion, hazard of wind erosion, and microrelief. For some soils, more than one of these X conditions are used in determining the rating. A rating of 100 percent expresses the most favorable, or ideal, condition for general crop production. Lower percentage ratings are assigned for less favorable conditions or characteristics. Factor ratings, in percentages, are

selected from tables prepared from data, including yield data. Certain properties are assigned a range of values to allow for variations in the properties that affect the suitability of the soil for general agricultural purposes.

The index rating for a soil component of a map unit is obtained by multiplying the percentage rating values given to its four factors, A, B, C, and X. If more than one condition is recognized for the X factor for a soil, the value for each condition acts as a multiplier. Therefore, any of the general factors or X factor conditions may dominate or control the final rating. As an example, consider the map unit Centerville clay, 2 to 5 percent slopes. The rating for factor A is 95 percent because of a stratified subsoil; the rating for factor B is 60 percent because of the surface layer of clay, which is very sticky and difficult to cultivate when wet; the rating for factor C is 95 percent because of the slope; and the rating for factor X is 60 percent because of salinity and sodicity. The product of A, B, C, and X is 32 percent.

In table 9, an index rating is shown for the named soil components of the map units in the survey area. To calculate a map unit index, take the percentage of each of the named components in the map unit as a weighted average. Miscellaneous areas are considered to be unsuitable for agriculture and are not assigned a rating or are assigned a rating of zero. Inclusions of other soils, not identified in the map unit name, are ignored in the calculations.

Named components are assigned grades according to their suitability for general intensive agriculture as shown by their Storie index ratings. The six grades and their range in index ratings are:

Grade 1	80 to 100
Grade 2	60 to 79
Grade 3	40 to 59
Grade 4	20 to 39
Grade 5	10 to 19
Grade 6	less than 10

In this survey area, soils in *grade 1* are well suited to intensively grown irrigated crops that are climatically adapted to the region.

Grade 2 soils are good agricultural soils, although they are not so desirable as soils in grade 1, primarily because of deep cemented layers, such as a duripan; a moderately coarse textured or coarse textured surface layer; moderately well drained or somewhat poorly drained conditions; a low or moderate available water capacity; slight salinity and sodicity; or lower soil fertility.

Grade 3 soils are only fairly well suited to agriculture, primarily because of moderately deep or deep cemented layers, such as a duripan, which restrict permeability in the subsoil; moderately well drained or somewhat poorly drained conditions; slight or moderate salinity or sodicity; a clayey or stratified subsoil; or lower soil fertility.

Grade 4 soils are poorly suited to agriculture. They are more limited in their agricultural potential than the soils in grade 3 because of such restrictions as a shallower depth to a cemented layer, for example, a duripan, which restricts permeability; moderate or strong slopes; moderately well drained to poorly drained conditions; moderate or strong salinity and sodicity; a clayey surface layer; or channeled or hummocky microrelief.

Grade 5 soils are very poorly suited to agriculture. They are more commonly used as pasture or rangeland. They are more limited in their agricultural potential than the soils in grade 4, primarily because of such restrictions as a shallow depth to a cemented layer, for example, a duripan, or a moderate depth to hard bedrock; somewhat poorly or poorly drained conditions; a clayey surface layer; or moderately steep or steep slopes.

Grade 6 soils and miscellaneous areas are not suited to agriculture because of very severe or extreme limitations. They are better suited to limited use as rangeland, protective habitat, woodland, or watershed.

Saline-Sodic Soils

Soluble salts and sodium in soils can be traced to several sources. Most originated in the decomposition of soil minerals and rocks by weathering. In this survey area, where rainfall is low and evaporation is high, soluble salts remain within the soil profile and may accumulate sufficiently to restrict the growth of plants. In addition, many low areas receive salt-charged runoff or ground water. In areas that have a high water table, water may rise by capillary action and bring dissolved salts to the surface of the soil (figure 9). The salts remain as the moisture evaporates. Percolating water from seasonal rainfall modifies the location and amount of salts that accumulate within the soil, but it does not remove the salts from the soil.

In many areas on fan remnants, some of the present-day saline-sodic conditions are related to the agricultural practices of the past. From the 1850s to the early 1900s, Tulare County was one of the largest wheat-producing areas of the world (Preston, 1981). Some of the land was farmed until the soils were depleted of nutrients to the point that profitable crops

could not grow. Intensive farming also played a role in an increase in the content of salts and sodium in some of these soils (Lapham, 1949). In 1906, E.W. Hilgard studied saline-sodic soils and their reclamation in the Tulare County area (Hilgard, 1906). Some of these areas remain unfarmed to this day.

A saline-sodic soil contains harmful concentrations of salts and exchangeable sodium and is strongly alkaline. On approximately 230,000 acres in the survey area, or about 30 percent of the area, the soils are affected by salts and sodium that somewhat limit crop growth. Saline-sodic soils are most common on the flood plain and along the basin rim of Tulare Lake and are common on fan remnants in the more concave areas. They occur to a lesser extent on the alluvial fans and flood plains along the major rivers and streams.

Figure 9.—Polygonal cracking of the highly saline-sodic soil surface of the Jerryslu soils in one of the few areas of native soils left in the county. Directly across the road from this Jerryslu site is the highly productive Atesh soil. Atesh soils formed in the chemically and mechanically reclaimed remnants of the Jerryslu soils.

Guidelines for Reclamation

Field and laboratory determinations indicate that the amount of soluble salts and sodium can vary considerably within short distances. Soil conditions vary so much that a general statement about the specific salts each soil contains or about the practices needed to improve any particular soil cannot be made. Some general guidelines that should be helpful in dealing with the problem can be given. The key items to be considered when a reclamation program is planned are described in the following paragraphs.

Water supply.—An ample supply of good-quality water is a primary requirement. More water than is needed to grow crops should be applied. The additional water is for leaching the salts downward into the lower part of the subsoil or below. If extensive reclamation is planned in the area and the content of salts is not known, a laboratory determination should be made.

Drainage.—Adequate drainage is needed to remove excess salts from the soil. Whatever the other conditions may be, improvement is likely only to that depth in the soil for which adequate drainage can be provided. The better the drainage, the more readily excess salts can be removed. If drainage is not adequate and no measures are taken to improve it, little change is likely.

Rate of internal drainage.—Many factors affect the downward movement of water through the soil, including texture, bulk density, porosity, structure, and the shrinking or swelling of the soil upon wetting and drying. The more rapid the rate of internal drainage, the more quickly excess salts can be removed and the sooner improvements can be made.

Lewis silty clay loam is an example of a soil with a dense, very slowly permeable subsoil and a cemented duripan. Unless this soil is deeply plowed and mixed or is ripped and the duripan is broken, reclamation generally is not successful.

Amount of excess salts and sodium.—If internal drainage is adequate or is artificially improved, even severely affected saline soils can be readily improved by deep soaking. The use of sufficient water to flush the salts downward is all that is needed.

Removing excess sodium is somewhat more difficult and expensive than removing excess salts. A chemical change must take place in the soil. This is generally brought about by applying gypsum or calcium sulfate. A soil test shows how much gypsum to be applied. Gypsum supplies the calcium to replace the excess sodium on the surface of the clay particles. The needed calcium can also be obtained by applying sulfuric acid in bulk quantities. The acid reacts with the calcium carbonate prevalent in the soil. Both the

calcium and hydrogen ions work to displace the adsorbed sodium. The acid method often achieves quick results, but it is more expensive and extra care is needed in handling the acid. Elemental sulfur also can be used instead of gypsum, but sulfur takes longer to react. Before it can act, sulfur must be changed to sulfate. This change is made by microbes living in the soil. About the same result is obtained with any of these materials, but time and cost differences should be considered.

Reclamation Practices

Reclaiming saline-sodic soils that have a duripan, such as Kai, Lewis, and Jerryslu soils, requires intensive management. The key practices needed to improve these soils include leveling the land; deep ripping, which shatters the duripan or substratum and thus improves internal drainage; establishing drainage ditches or subsurface drains; applying large amounts of gypsum or sulfur to correct the sodic conditions; applying water to leach excess salts downward; and establishing plants that can tolerate salts and sodium.

Assistance in interpreting laboratory tests of soil and water and detailed reclamation schedules for various soil conditions can be obtained from the local office of the Natural Resources Conservation Service or the Tulare County Farm Advisor's Office.

Dairy Waste Management Concerns

Prepared by Robert Fry, Resource Conservationist, Natural Resources Conservation Service.

Since the 1930s, the trend in Tulare County has been toward large individual dairy herds and a growing dairy cow population. During the 1980s and 1990s, the trend accelerated. In 1930, there were 35,130 dairy cows in Tulare County. The average herd size was 31 cows. By 1980, the dairy cow population in the county had increased to 120,695 and the average herd size was 511 cows. By 1995, the population had grown to 260,000 and the average herd size was 900, on 290 farms.

The growth of the dairy industry can impact air and water quality as it benefits the economy. Salts and nitrates can leach into ground water if wastes containing these compounds are not managed properly. Discharge of waste into streams or canals because of flooding or human error can affect surface waters. Air quality may be impaired by volatilization of ammonia from waste during the winter. Ammonia combines in the atmosphere with the oxides of nitrogen contained in auto emissions to form ammonium nitrate, which is an air pollutant. Currently, there is little evidence that dairies are polluting the water. It may take a pollutant many years to reach the water table, and so the impacts of the dramatic growth of the industry on water quality may not yet be apparent. Therefore, emphasis should now be placed on proper management of wastes to protect water quality.

Typically, dairies in Tulare County own or manage enough cropland to grow most of the silage and hay required by the herd. Dairy waste, applied to the cropland, supplies a large portion of the nutrients required for crop production. In most areas there is enough farmland for properly managed waste to be applied without overloading. Overloading occurs when more nutrients are applied than the crop can use and the excess is allowed to move below the root zone of the crop. If a dairy does not have enough cropland to use all of the waste produced, the waste may be used offsite through sale or agreements with neighbors to accept the excess.

Most waste is collected on the dairy by washing down the facilities with water and storing the waste in a lagoon. This water is reused several times to flush the dairy housing areas before it is applied with irrigation water to cropland. Typically, water has been used to cool the milk, wash the cows before milking, and flush the milking parlor before it is used to flush heavy loads of manure from the feeding and loafing areas. Some of the manure is collected when dry and is scraped and stacked. The dry material is applied to cropland once or twice a year. Depending on the design of the dairy, as little as 15 percent or as much as 85 percent of the manure may be handled dry.

There are three major concerns in waste management that relate directly to the soil conditions on the dairy. These are 1) the design and construction of the dairy facilities, particularly the waste storage, transfer, and treatment facilities; 2) the application of waste on cropland; and 3) the management and design of the irrigation system used in the fields that receive the waste.

Construction of a waste storage lagoon is affected by soil conditions and the depth of the local water table. If the lagoon is constructed on a sandy soil, the waste may leak and move offsite in the sandy layers, perhaps entering the ground water. Some research has indicated that lagoons tend to seal soon after receiving the waste, which is high in fibrous organic material. According to State regulations in 1995, however, the soil lining the sides and bottom of the lagoon must have at least 10 percent clay to limit seepage from the lagoon. If there are areas in the lagoon that do not meet this criteria, then soil with 10 percent clay can be applied or mixed to a depth of

about 1 foot over the necessary sections. Delhi and Tujunga are examples of soils having extensive sandy layers that do not have at least 10 percent clay. Other soils may have a sandy substratum. Some map units may have inclusions of sandy soils. Sandy layers can be exposed on either the bottom or the sides of the lagoon. They must be treated in either case. If the streaks are above the level of the inlet to the lagoon, they usually do not require treatment. Constructing a lagoon on Delhi and Tujunga soils will require extensive treatment since most of these soils have less than 10 percent clay.

Dairy lagoons must be constructed so that there is at least 5 feet between the bottom of the lagoon and the highest known local water table depth. This requirement may limit the depth of the lagoon, or it may necessitate that the lagoon be built entirely or partly above the natural ground surface. Armona, Gepford, and Westcamp soils and the saline-sodic Grangeville soils have a high water table.

Dairy facilities must be protected from the flooding caused by a 100-year frequency storm. Building the dairy above the flood zone or building a protective berm reduces the risk of flood damage. Local flood zone maps should be checked before the site for a dairy is selected. In this survey area, flooding is a concern mainly on alluvial fans and flood plains, but rare flooding can occur in all map units in the area during years of abnormally high precipitation.

The second major concern is the application of waste to cropland. This practice may contribute to ground-water contamination. An excellent practice reuses nutrients from the waste and improves the soil condition without contaminating water. Careful management of waste is necessary since soils and crops cannot use excessive amounts of the waste. When excessive waste is applied to soils, the risk of pollution is increased. Management of waste is particularly important in sandy soils, such as the Delhi soils in the northwestern part of the survey area and the Tujunga soils occurring as elongated stringers throughout the survey area. Nitrates and other salts from the waste can move rapidly through sandy soils with irrigation water or rainfall. Fields must be managed so that the nutrients in the waste are applied in amounts close to the needs of the crop. Soil and plant tests can be used to measure the nutrient needs before waste or commercial fertilizer is applied. The nutrient content of the waste should be estimated at or near the point of application. Improved tools and techniques for measuring the nutrient content of waste are needed. Nutrient losses during the storage and application of the waste should be considered. The manager should also measure the nitrate applied with the irrigation water. The amount of nitrogen applied with waste and fertilizer can be reduced by the amount applied with the well water.

The amount of waste applied to cropland should also be limited by the amount of salts in the waste. In 1995, the standard used by the Regional Water Quality Control Board is 3,000 pounds of salts per acre per year. Salts accumulate in the soil and water and may be the highest long-term risk to water quality. The risks to water quality are higher in sandy soils but are not limited to them. In areas of heavier textured soils, pollutants move more slowly but are present.

The third major concern is the design and management of the irrigation system. Waste is frequently mixed with irrigation water and applied directly to the cropland. Irrigation systems must be designed and managed so that they apply water evenly. When water is not evenly applied to a field, that portion of the field receiving excess water will also receive excess waste. Depending on the amount of the water and the soil condition, the excess water will percolate below the root zone while carrying salts and nutrients. These salts and nutrients may eventually enter the ground water.

The irrigation system should allow the manager to send water containing waste to any field on the dairy. If all of the cropland designated to receive waste is used appropriately, the risk of contaminating ground water is reduced. When some fields receive more waste than others because the irrigation system cannot distribute the waste throughout the farm, the risk to water quality is increased.

Applying irrigation water to soils that are too moist can result in water losses. The decision to apply water should be made after the soil moisture level has been estimated. Water applied to overly moist soils may move below the root zone, carrying nutrients and salts. During winter, the decision to apply water containing waste can have a magnified effect. Fields may be moist from rainfall and may not have a growing crop to use the water. Leaching may be excessive. If the storage lagoon must be lowered in winter, the water should be applied after the moisture level of the soil in the receiving field is considered. If application of waste to Delhi, Tujunga, and other sandy soils in winter is considered, special attention is needed because these soils are readily leached.

The irrigation system should tie together all water sources and all fields and should prevent backflow. This kind of system gives irrigation planners the ability to move waste to the field best ready to accept it and to establish adequate flow rates to all fields.

Windbreaks and Environmental Plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens and furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, help to keep snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To ensure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

The trees that are commonly grown as windbreaks in the survey area are Russian-olive, Arizona cypress, and eucalyptus. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from the local office of the Natural Resources Conservation Service or Cooperative Extension Service or from a commercial nursery.

Recreational Development

The soils in the survey area are rated in the tables 10 and 11 according to limitations that affect their suitability for recreational uses. The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect the recreational uses. *Slight* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Moderate* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Severe* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the tables indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.00 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

The ratings in the tables are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation also are important. Soils that are subject to flooding are limited for recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

The information in tables 10 and 11 can be supplemented by other information in this survey, for example, interpretations for building site development, construction materials, sanitary facilities, and water management.

Camp Areas

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The ratings are based on the soil properties that affect the ease of developing camp areas and the performance of the areas after development. Slope, stoniness, and depth to bedrock or a cemented pan are the main concerns affecting the development of camp areas.

The soil properties that affect the performance of the areas after development are those that influence trafficability and promote the growth of vegetation, especially in heavily used areas. For good trafficability, the surface of camp areas should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry. The soil properties that influence trafficability are texture of the surface layer, depth to a water table, ponding, flooding, permeability, and rock fragments. The soil properties that affect the growth of plants are depth to bedrock or a cemented pan, permeability, and toxic substances in the soil.

Major Management Considerations

Depth to bedrock.—Bedrock is close enough to the surface to restrict the use.

Depth to pan.—Dense, hard, somewhat impervious cemented soil material at a specific depth restricts the use.

Dusty.—Soil particles detach easily and cause dust.

Flooding.—The soil is flooded by moving water from stream overflow, runoff, or high tides.

Organic matter (OM).—A high content of organic matter at some depth, sometimes expressed as a Unified soil class (PT, OL, or OH), can result in poor engineering properties and subsidence. A low content of organic matter can restrict the growth of plants.

Permeability.—The movement of water through the soil adversely affects the specified use. The permeability may be either too slow or too fast.

Ponding.—Standing water on soils in closed depressions that is removed only by percolation or evapotranspiration.

Rock fragments.—The profile contains enough rock fragments of a specific size to adversely affect site preparation or trafficability.

Salinity (EC).—Excess water-soluble salts in the soil restrict the growth of most plants.

Sand or sandy texture.—At some depth the content of sand or a sandy texture results in soil that is soft and loose, droughty, and low in fertility or is too fine for use as gravel.

Slope.—The slope is steep enough that special practices are required to ensure satisfactory performance of the soil.

Sodicity (SAR).—Excess exchangeable sodium, which imparts poor physical properties, restricts the growth of plants.

Surface clay.—The clay content or clayey texture of the surface layer results in a soil that is slippery and sticky when wet and slow to dry. The soil climate may modify the limitation.

Wetness.—Wetness near the surface or a high water table affects the growth of plants and the construction of facilities.

Picnic Areas

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The ratings are based on the soil properties that affect the ease of developing picnic areas and that influence trafficability and the growth of vegetation after development. Slope and stoniness are the main concerns affecting the development of picnic areas. For good trafficability, the surface of picnic areas should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry. The soil properties that influence trafficability are texture of the surface layer, wetness, ponding, flooding, permeability, and rock fragments. The soil properties that affect the growth of plants are depth to bedrock or a cemented pan, permeability, and toxic substances in the soil.

Major Management Considerations

Depth to bedrock.—Bedrock is close enough to the surface to restrict the use.

Depth to pan.—Dense, hard, somewhat impervious cemented soil material at a specific depth restricts the use.

Dusty.—Soil particles detach easily and cause dust.

Flooding.—The soil is flooded by moving water from stream overflow, runoff, or high tides.

Organic matter (OM).—A high content of organic matter at some depth, sometimes expressed as a Unified soil class (PT, OL, or OH), can result in poor engineering properties and subsidence. A low content of organic matter can restrict the growth of plants.

Permeability.—The movement of water through the soil adversely affects the specified use. The permeability may be either too slow or too fast.

pH.—The pH of the soil is too low (acid) or too high (basic) for the growth of most plants.

Ponding.—Standing water on soils in closed depressions that is removed only by percolation or evapotranspiration.

Rock fragments.—The profile contains enough rock fragments of a specific size to adversely affect site preparation or trafficability.

Salinity (EC).—Excess water-soluble salts in the soil restrict the growth of most plants.

Sand or sandy texture.—At some depth the content of sand or a sandy texture results in soil that is soft and loose, droughty, and low in fertility or is too fine for use as gravel.

Slope.—The slope is steep enough that special practices are required to ensure satisfactory performance of the soil.

Sodicity (SAR).—Excess exchangeable sodium, which imparts poor physical properties, restricts the growth of plants.

Surface clay.—The clay content or clayey texture of the surface layer results in a soil that is slippery and sticky when wet and slow to dry. The soil climate may modify the limitation.

Wetness.—Wetness near the surface or a high water table affects the growth of plants and the construction of facilities.

Playgrounds

Playgrounds require soils that are nearly level, are free of stones, and can withstand intensive foot traffic. The ratings are based on the soil properties that affect the ease of developing playgrounds and that influence trafficability and the growth of vegetation after development. Slope and rock fragments on the surface are the main concerns affecting the development of playgrounds. For good trafficability, the surface of the playgrounds should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry. The soil properties that influence trafficability are texture of the surface layer, content of clay or sand, organic matter, wetness, ponding, flooding, permeability, and rock fragments. The soil properties that affect the growth of plants are depth to bedrock or a cemented pan, permeability, and toxic substances in the soil.

Major Management Considerations

Depth to bedrock.—Bedrock is close enough to the surface to restrict the use.

Depth to pan.—Dense, hard, somewhat impervious cemented soil material at a specific depth restricts the use.

Dusty.—Soil particles detach easily and cause dust.

Flooding.—The soil is flooded by moving water from stream overflow, runoff, or high tides.

Organic matter (OM).—A high content of organic matter at some depth, sometimes expressed as a Unified soil class (PT, OL, or OH), can result in poor engineering properties and subsidence. A low content of organic matter can restrict the growth of plants.

Permeability.—The movement of water through the soil adversely affects the specified use. The permeability may be either too slow or too fast.

pH.—The pH of the soil is too low (acid) or too high (basic) for the growth of most plants.

Ponding.—Standing water on soils in closed depressions that is removed only by percolation or evapotranspiration.

Rock fragments.—The profile contains enough rock fragments of a specific size to adversely affect site preparation or trafficability.

Salinity (EC).—Excess water-soluble salts in the soil restrict the growth of most plants.

Sand or sandy texture.—At some depth the content of sand or a sandy texture results in soil that is soft and loose, droughty, and low in fertility or is too fine for use as gravel.

Slope.—The slope is steep enough that special practices are required to ensure satisfactory performance of the soil.

Sodicity (SAR).—Excess exchangeable sodium, which imparts poor physical properties, restricts the growth of plants.

Surface clay.—The clay content or clayey texture of the surface layer results in a soil that is slippery and sticky when wet and slow to dry. The soil climate may modify the limitation

Wetness.—Wetness near the surface or a high water table affects the growth of plants and the construction of facilities.

Paths and Trails

Paths and trails for hiking and horseback riding should require little or no slope modification through cutting and filling. The ratings are based on the soil properties that affect trafficability and erodibility. These properties are rock fragments on the surface, wetness, ponding, flooding, slope, texture of the surface layer, and content of sand, clay, or organic matter.

Major Management Considerations

Dusty.—Soil particles detach easily and cause dust.

Flooding.—The soil is flooded by moving water from stream overflow, runoff, or high tides.

K factor.—The soil is in a potential water erosion class.

Organic matter (OM).—A high content of organic matter at some depth, sometimes expressed as a Unified soil class (PT, OL, or OH), can result in poor engineering properties and subsidence. A low content of organic matter can restrict the growth of plants.

Ponding.—Standing water on soils in closed depressions that is removed only by percolation or evapotranspiration.

Rock fragments.—The profile contains enough rock fragments of a specific size to adversely affect site preparation or trafficability.

Sand or sandy texture.—At some depth the content of sand or a sandy texture results in soil that is soft and loose, droughty, and low in fertility or is too fine for use as gravel.

Slope.—The slope is steep enough that special practices are required to ensure satisfactory performance of the soil.

Surface clay.—The clay content or clayey texture of the surface layer results in a soil that is slippery and sticky when wet and slow to dry. The soil climate may modify the limitation.

Wetness.—Wetness near the surface or a high

water table affects the growth of plants and the construction of facilities.

Off-Road Motorcycle Trails

Off-road motorcycle trails require little or no site preparation. They are not covered with surfacing material or vegetation. Considerable compaction of the soil material is likely. The ratings are based on the soil properties that influence erodibility, trafficability, dustiness, and the ease of revegetation. These properties are rock fragments on the surface, slope, wetness, ponding, flooding, texture of the surface layer, and the content of clay, sand, or organic matter.

Major Management Considerations

Dusty.—Soil particles detach easily and cause dust.

Flooding.—The soil is flooded by moving water from stream overflow, runoff, or high tides.

Organic matter (OM).—A high content of organic matter at some depth, sometimes expressed as a Unified soil class (PT, OL, or OH), can result in poor engineering properties and subsidence. A low content of organic matter can restrict the growth of plants.

Ponding.—Standing water on soils in closed depressions that is removed only by percolation or evapotranspiration.

Rock fragments.—The profile contains enough rock fragments of a specific size to adversely affect site preparation or trafficability.

Sand or sandy texture.—At some depth the content of sand or a sandy texture results in soil that is soft and loose, droughty, and low in fertility or is too fine for use as gravel.

Slope.—The slope is steep enough that special practices are required to ensure satisfactory performance of the soil.

Surface clay.—The clay content or clayey texture of the surface layer results in a soil that is slippery and sticky when wet and slow to dry. The soil climate may modify the limitation.

Wetness.—Wetness near the surface or a high water table affects the growth of plants and the construction of facilities.

Lawns, Landscaping, and Golf Fairways

Lawns and *landscaping* require soils on which turf and ornamental trees and shrubs can be established and maintained. Irrigation is not considered in the ratings. The ratings are based on the soil properties that affect plant growth and trafficability after vegetation is established. The properties that affect plant growth are reaction; depth to a water table; ponding; depth to bedrock or a cemented pan; the available water capacity in the upper 40 inches; the content of salts, sodium, or calcium carbonate; and sulfidic materials. The properties that affect trafficability are flooding, wetness, ponding, slope, stoniness, and the content of sand, clay, or organic matter in the surface layer.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. Irrigation is not considered in the ratings. The ratings are based on the soil properties that affect plant growth and trafficability after vegetation is established. The properties that affect plant growth are reaction; depth to a water table; ponding; depth to bedrock or a cemented pan; the available water capacity in the upper 40 inches; the content of salts, sodium, or calcium carbonate; and sulfidic materials. The properties that affect trafficability are flooding, wetness, ponding, slope, rock fragments on the surface, and the content of sand, clay, or organic matter in the surface layer. The suitability of the soil for traps, tees, roughs, and greens is not considered in the ratings.

Major Management Considerations

Available water capacity (AWC).—The available water capacity is low enough to restrict the growth of plants.

Calcium carbonates.—The content of calcium carbonates may be high enough to restrict the growth of plants.

Depth to bedrock.—Bedrock is close enough to the surface to restrict the use.

Depth to pan.—Dense, hard, somewhat impervious cemented soil material at a specific depth restricts the use.

Flooding.—The soil is flooded by moving water from stream overflow, runoff, or high tides.

Organic matter (OM).—A high content of organic matter at some depth, sometimes expressed as a Unified soil class (PT, OL, or OH), can result in poor engineering properties and subsidence. A low content of organic matter can restrict the growth of plants.

pH.—The pH of the soil is too low (acid) or too high (basic) for the growth of most plants.

Ponding.—Standing water on soils in closed depressions that is removed only by percolation or evapotranspiration.

Rock fragments.—The profile contains enough rock fragments of a specific size to adversely affect site preparation or trafficability.

Salinity (EC).—Excess water-soluble salts in the soil restrict the growth of most plants.

Sand or sandy texture.—At some depth the content of sand or a sandy texture results in soil that is soft and loose, droughty, and low in fertility or is too fine for use as gravel.

Slope.—The slope is steep enough that special practices are required to ensure satisfactory performance of the soil.

Sodicity (SAR).—Excess exchangeable sodium, which imparts poor physical properties, restricts the growth of plants.

Sulfur content.—The sulfur level in the soil may be high enough to restrict the growth of plants.

Surface clay.—The clay content or clayey texture of the surface layer results in a soil that is slippery and sticky when wet and slow to dry. The soil climate may modify the limitation.

Wetness.—Wetness near the surface or a high water table affects the growth of plants and the construction of facilities.

Wildlife Habitat

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

Most of the native plants and habitat in the survey area have been replaced with introduced species and human-created habitats. Almost all of the original wildlife species are gone because wildlife is dependent on habitat. A few species survive on several isolated nature preserves and refuges in the survey area. The original plant communities were Riparian Forest, Tree Savanna, and Prairie that included vernal pool wetlands, saltbrush, and marsh areas. Some small native areas along isolated fence lines, canals, and rivers support a few native plant species. Wildlife are scarce in the present environment. Like native plants, a few wild animals have found havens in and around towns. Skunks and opossums commonly wander in the streets very early the morning, and bats are a common sight early in the evening.

Because of changes brought about by irrigated agriculture and urbanization, the animals and plants in the survey area are increasingly introduced rather than native species. One will occasionally see a coyote away from the towns. Cow egrets are common in the fields, as are many minor species of birds. Approximately 300 species of birds may be observed in the survey area. Constant pressure from agricultural pest control, urban pesticides, and domesticated animals has greatly decreased the numbers of birds observed in the area.

The existing refuges and preserves are too small to have any of the large mammals that once inhabited the survey area, such as grizzly and black bears, tule elk, pronghorn antelope, mule deer, gray wolf, mountain lion, beaver, river otter, and mink. Currently, small mammals still inhabit isolated areas. Examples are coyotes, bobcats, gray foxes, kit foxes, raccoons, badgers, porcupines, skunks, weasels, gophers, and various species of hare and squirrel. Constant pressure from urban expansion, agricultural pest control, urban pesticides, and domesticated animals has greatly decreased the numbers of these animals.

Wetlands once were a major topographical feature of Tulare County. Tulare Lake made up about 20,000 acres in the county, on its western edge, and it was once the largest body of fresh water west of the Great Lakes. It was a major part of the Pacific Flyway, and as late as the early 1900s, it supported incredible numbers of ducks, geese, swans, cranes, and many other birds. Today, reclaimed and farmed, the lake is essentially gone.

The large number of rivers and streams in the survey area once provided habitat for many species of animals and fish. Very little native habitat remains along these rivers and streams today. Tulare County had large areas of vernal pool wetlands. These wetlands occurred on hummocky ground that was dotted with internally drained pools that filled with winter rains and then slowly dried as the summer heat began. Under native conditions, about 193,000 acres in the survey area, or about 25 percent of the area, was high-quality vernal pool habitat (figures 10 and 11) and another 200,000 acres was marginal vernal pool habitat. Currently, about 11,200 acres, or 1.4 percent of the area, is left in its native state as vernal pool habitat. Because of these widespread rivers and vernal pools, wildlife flourished in what otherwise would have been a semiarid desert. Currently, the native areas that have vernal pools are habitat to a surprising number of surviving native species of flowering plants and a few animals. Some of these plants and animals are rare because so little of this habitat remains.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. Ratings are given

Figure 10.—Vernal pools surrounded by rings of flowering plants are typical of native areas of Exeter soils. Areas such as this once made up a large amount of Tulare County.

for building site development, sanitary facilities, construction materials, and water management. The ratings are based on observed performance of the soils and on data in the tables described under the heading "Soil Properties."

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kinds of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary

Figure 11.—A native vernal pool surrounded by rings of flowering plants in an area of Lewis soils.

estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Soil properties influence the development of building sites, including site selection, the design of the structure, construction, performance after construction, and maintenance. Tables 12 and 13 show the degree and kind of soil limitations that affect dwellings with and without basements, small commercial buildings, local roads and streets, and shallow excavations.

The ratings in the tables are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect building site development. *Slight* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Moderate* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation.

Fair performance and moderate maintenance can be expected. *Severe* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the tables indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.00 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

Dwellings are single-family houses of three stories or less. For dwellings without basements, the foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of 2 feet or at the depth of maximum frost penetration, whichever is deeper. For dwellings with basements, the foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of about 7 feet. The ratings for dwellings are based on the soil properties that affect the capacity of the soil to support a load without movement and on the properties that affect excavation and construction costs. The properties that affect the load-supporting capacity include wetness, ponding, flooding, subsidence, linear extensibility (LEP or shrink-swell potential), and compressibility. Compressibility is inferred from the Unified classification. The properties that affect the ease and amount of excavation include wetness, ponding, flooding, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, and the amount, size, and depth of rock fragments.

Small commercial buildings are structures that are less than three stories high and do not have basements. The foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of 2 feet or at the depth of maximum frost penetration, whichever is deeper. The ratings are based on the soil properties that affect the capacity of the soil to support a load without movement and on the properties that affect excavation and construction costs. The properties that affect the load-supporting capacity include wetness, ponding, flooding, subsidence, linear extensibility (LEP or shrink-swell potential), and compressibility (which is inferred from the Unified classification). The properties that affect the ease and amount of excavation include flooding, depth to a water table, ponding, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, and the amount, size, and depth of rock fragments.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or soil material stabilized by lime or cement; and a surface of flexible material (asphalt), rigid material (concrete), or gravel with a binder. The ratings are based on the soil properties that affect the ease of excavation and grading and the traffic-supporting capacity. The properties that affect the ease of excavation and grading are depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, wetness, ponding, flooding, the amount of large stones, and slope. The properties that affect the traffic-supporting capacity are soil strength (as inferred from the AASHTO group index number), subsidence, linear extensibility (LEP or shrink-swell potential), the potential for frost action, depth to a water table, and ponding.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for graves, utility lines, open ditches, or other purposes. The ratings are based on the soil properties that influence the ease of digging and the resistance to sloughing. Depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, the amount of large stones, and dense layers influence the ease of digging, filling, and compacting. Seasonal wetness, flooding, and ponding may restrict the period when excavations can be made. Slope influences the ease of using machinery. Soil texture, wetness, and linear extensibility (LEP or shrink-swell potential) influence the resistance to sloughing.

The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm, dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and depth to the water table.

Major Management Considerations for Dwellings Without Basements

Depth to bedrock.—Bedrock is close enough to the surface to restrict the use.

- Onsite investigation is needed to identify areas where the soil is deep enough for dwellings.
- If slopes are more than 8 percent, cutting may be needed to provide essentially level building sites. The cuts can expose the bedrock.

• The bedrock can serve as a good base for the foundation.
• Frequent irrigation cycles and controlled application rates help to maintain vegetation.

Depth to pan.—Dense, hard, somewhat impervious cemented soil material at a specific depth restricts the use.
• Onsite investigation is needed to identify areas where the soil is deep enough for dwellings.
• If slopes are more than 8 percent, cutting may be needed to provide essentially level building sites. The cuts can expose the cemented pan.
• The pan can serve as a good base for the foundation.
• Frequent irrigation cycles and controlled application rates help to maintain vegetation and prevent a perched water table.
• If deep-rooted plants, such as trees, are planted, ripping or breaking the pan can increase the rooting depth.

Flooding.—The soil is flooded by moving water from stream overflow, runoff, or high tides.
• The hazard of flooding should be considered before buildings or capital improvements are planned and installed.
• Buildings, roads, and streets should be located above the expected level of flooding.
• Dikes and channels that have outlets for floodwater can protect buildings from flooding.

Organic matter (OM).—A high content of organic matter at some depth, sometimes expressed as a Unified soil class (PT, OL, or OH), can result in poor engineering properties and subsidence. A low content of organic matter can restrict the growth of plants.

Ponding.—Standing water on soils in closed depressions that is removed only by percolation or evapotranspiration.

Rock fragments.—The profile contains enough rock fragments of a specific size to adversely affect site preparation or trafficability.

Shrink-swell (LEP).—Shrinking when the soil is dry and swelling when it is wet are expressed as the linear extensibility percent (LEP). Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.
• Properly designing foundations and footings and diverting runoff away from buildings help to prevent the structural damage caused by shrinking and swelling.

Slope.—The slope is steep enough that special practices are required to ensure satisfactory performance of the soil.
• Excavation for buildings increases the hazard of erosion.
• During construction all bare ground should be mulched. A ground cover should be established to prevent excessive erosion during periods of high rainfall.

Wetness.—Wetness near the surface or a high water table affects the growth of plants and the construction of facilities.
• A drainage system is needed if roads and building foundations are constructed.

Major Management Considerations for Dwellings With Basements

Depth to bedrock.—Bedrock is close enough to the surface to restrict the use.
• Onsite investigation is needed to identify areas where the soil is deep enough for dwellings.
• If slopes are more than 8 percent, cutting may be needed to provide essentially level building sites. The cuts can expose the bedrock.
• The bedrock can serve as a good base for the foundation.
• Frequent irrigation cycles and controlled application rates help to maintain vegetation.

Depth to pan.—Dense, hard, somewhat impervious cemented soil material at a specific depth restricts the use.
• Onsite investigation is needed to identify areas where the soil is deep enough for dwellings.
• If slopes are more than 8 percent, cutting may be needed to provide essentially level building sites. The cuts can expose the cemented pan.
• The pan can serve as a good base for the foundation.
• Frequent irrigation cycles and controlled application rates help to maintain vegetation and prevent a perched water table.
• If deep-rooted plants, such as trees, are planted, ripping or breaking the pan can increase the rooting depth.

Flooding.—The soil is flooded by moving water from stream overflow, runoff, or high tides.
• The hazard of flooding should be considered before buildings or capital improvements are planned and installed.
• Buildings, roads, and streets should be located above the expected level of flooding.
• Dikes and channels that have outlets for floodwater can protect buildings from flooding.

Organic matter (OM).—A high content of organic matter at some depth, sometimes expressed as a Unified soil class (PT, OL, or OH), can result in poor engineering properties and subsidence. A low content of organic matter can restrict the growth of plants.

Ponding.—Standing water on soils in closed depressions that is removed only by percolation or evapotranspiration.
• A drainage system is needed if roads and building foundations are constructed.

Rock fragments.—The profile contains enough rock fragments of a specific size to adversely affect site preparation or trafficability.

Shrink-swell (LEP).—Shrinking when the soil is dry and swelling when it is wet are expressed as the linear extensibility percent. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.
• Properly designing foundations and footings and diverting runoff away from buildings help to prevent the structural damage caused by shrinking and swelling.

Slope.—The slope is steep enough that special practices are required to ensure satisfactory performance of the soil.
• Excavation for buildings increases the hazard of erosion.
• During construction all bare ground should be mulched. A ground cover should be established to prevent excessive erosion during periods of high rainfall.

Wetness.—Wetness near the surface or a high water table affects the growth of plants and the construction of facilities.
• A drainage system is needed if roads and building foundations are constructed.

Major Management Considerations for Small Commercial Buildings

Depth to bedrock.—Bedrock is close enough to the surface to restrict the use.
• Onsite investigation is needed to identify areas where the soil is deep enough for small commercial buildings.
• If slopes are more than 4 percent, cutting may be needed to provide essentially level building sites. The cuts can expose the bedrock.
• The bedrock can serve as a good base for the foundation.
• Frequent irrigation cycles and controlled application rates help to maintain vegetation.

Depth to pan.—Dense, hard, somewhat impervious cemented soil material at a specific depth restricts the use.
• Onsite investigation is needed to identify areas where the soil is deep enough for dwellings.
• If slopes are more than 4 percent, cutting may be needed to provide essentially level building sites. The cuts can expose the cemented pan.
• The pan can serve as a good base for the foundation.
• Frequent irrigation cycles and controlled application rates help to maintain vegetation and prevent a perched water table.
• If deep-rooted plants, such as trees, are planted, ripping or breaking the pan can increase the rooting depth.

Flooding.—The soil is flooded by moving water from stream overflow, runoff, or high tides.
• The hazard of flooding should be considered before buildings or capital improvements are planned and installed.
• Buildings, roads, and streets should be located above the expected level of flooding.
• Dikes and channels that have outlets for floodwater can protect buildings from flooding

Organic matter (OM).—A high content of organic matter at some depth, sometimes expressed as a Unified soil class (PT, OL, or OH), can result in poor engineering properties and subsidence. A low content of organic matter can restrict the growth of plants.

Ponding.—Standing water on soils in closed depressions that is removed only by percolation or evapotranspiration.

A drainage system is needed if roads and building foundations are constructed.

Rock fragments.—The profile contains enough rock fragments of a specific size to adversely affect site preparation or trafficability.

Shrink-swell (LEP).—Shrinking when the soil is dry and swelling when it is wet are expressed as the linear extensibility percent. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.
• Properly designing foundations and footings and diverting runoff away from buildings help to prevent the structural damage caused by shrinking and swelling.

Slope.—The slope is steep enough that special practices are required to ensure satisfactory performance of the soil.
• Excavation for buildings increases the hazard of erosion.
• During construction all bare ground should be mulched. A ground cover should be established to prevent excessive erosion during periods of high rainfall.

Wetness.— Wetness near the surface or a high water table affects the growth of plants and the construction of facilities.
• A drainage system is needed if roads and building foundations are constructed.

Major Management Considerations for Local Roads and Streets

AASHTO GI (soil strength).—Engineering properties of the soil expressed as the AASHTO group index indicate soil strength. Values of more than 8 indicate low soil strength for roads and airfield construction.

Depth to bedrock.—Bedrock is close enough to the surface to restrict the use.

- Onsite investigation is needed to identify areas where the soil is deep enough for local roads and streets.
- If slopes are more than 8 percent, cutting may be needed to provide essentially level sites for the local roads and streets. The cuts can expose the bedrock.
- The bedrock can serve as a good base for the roads and streets.

Depth to pan.—Dense, hard, somewhat impervious cemented soil material at a specific depth restricts the use.

- Onsite investigation is needed to identify areas where the soil is deep enough for local roads and streets.
- If slopes are more than 8 percent, cutting may be needed to provide essentially level sites for the local roads and streets. The cuts can expose the cemented pan.
- The pan can serve as a good base for the roads and streets.

Flooding.—The soil is flooded by moving water from stream overflow, runoff, or high tides.

Frost action.—The upward or lateral movement of the soil caused by the formation of ice lenses may damage structures, roads, and plant roots.

Organic matter (OM).—A high content of organic matter at some depth, sometimes expressed as a Unified soil class (PT, OL, or OH), can result in poor engineering properties and subsidence. A low content of organic matter can restrict the growth of plants.

Ponding.—Standing water on soils in closed depressions that is removed only by percolation or evapotranspiration.

- A drainage system is needed if roads are constructed.

Rock fragments.—The profile contains enough rock fragments of a specific size to adversely affect site preparation or trafficability.

Shrink-swell (LEP).—Shrinking when the soil is dry and swelling when it is wet are expressed as the linear extensibility percent. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

- Properly designing the road base and diverting runoff away from the roads help to prevent the damage caused by shrinking and swelling.

Slope.—The slope is steep enough that special practices are required to ensure satisfactory performance of the soil.

- Excavation for roads increases the hazard of erosion.
- During construction all bare ground should be mulched. A ground cover should be established to prevent excessive erosion during periods of high rainfall.

Wetness.—Wetness near the surface or a high water table affects the growth of plants and the construction of facilities.

- A drainage system is needed if roads are constructed.

Major Management Considerations for Shallow Excavations

Clay or clayey texture.—At some depth there is a clay content or clayey texture that results in soil that is slippery and sticky when wet and slow to dry.

Caving potential.—The walls or sides of excavations tend to cave inwards. All soil excavations have the potential to cave, but some soils have a higher potential than others.

Bulk density (dense layer).—A dense soil layer with a high bulk density.

Depth to bedrock.—Bedrock is close enough to the surface to restrict the use.

- Onsite investigation is needed to identify areas where the soil is deep enough for excavations.
- If slopes are more than 8 percent, excavations may be needed to provide an essentially level site. These excavations can expose the bedrock.

Depth to pan.—Dense, hard, somewhat impervious cemented soil material at a specific depth restricts the use.

- Onsite investigation is needed to identify areas where the soil is deep enough for excavations.
- If slopes are more than 8 percent, excavations may be needed to provide an essentially level site. These excavations can expose the cemented pan.

Flooding.—The soil is flooded by moving water from stream overflow, runoff, or high tides.

- The hazard of flooding should be considered before excavations are made.
- Dikes and channels that have outlets for floodwater can protect excavations.

Organic matter (OM).—A high content of organic matter at some depth, sometimes expressed as a Unified soil class (PT, OL, or OH), can result in poor engineering properties and subsidence. A low

content of organic matter can restrict the growth of plants.

Ponding.—Standing water on soils in closed depressions that is removed only by percolation or evapotranspiration.

- A drainage system is needed during some periods of the year.

Rock fragments.—The profile contains enough rock fragments of a specific size to adversely affect site preparation or trafficability.

Slope.—The slope is steep enough that special practices are required to ensure satisfactory performance of the soil.

- Excavation increases the hazard of erosion.
- During construction all bare ground should be mulched. A ground cover should be established to prevent excessive erosion during periods of high rainfall.

Wetness.—Wetness near the surface or a high water table affects the growth of plants and the construction of facilities.

- A drainage system is needed during some periods of the year.

Sanitary Facilities

Tables 14 and 15 show the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, sanitary landfills, and daily cover for landfill. The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect these uses. *Slight* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Moderate* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Severe* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the tables indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.00 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 60 inches is evaluated. The ratings are based on the soil properties that affect absorption of the effluent, construction and maintenance of the system, and public health. Permeability, depth to a water table, ponding, depth to bedrock or a cemented pan, and flooding affect absorption of the effluent. Stones and boulders, ice, and bedrock or a cemented pan interfere with installation. Subsidence interferes with installation and maintenance. Excessive slope may cause lateral seepage and surfacing of the effluent in downslope areas.

Some soils are underlain by loose sand and gravel or fractured bedrock at a depth of less than 4 feet below the distribution lines. In these soils the absorption field may not adequately filter the effluent, particularly when the system is new. As a result, the ground water may become contaminated.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water. Considered in the ratings are slope, permeability, depth to a water table, ponding, depth to bedrock or a cemented pan, flooding, large stones, and content of organic matter.

Soil permeability is a critical property affecting the suitability for sewage lagoons. Most porous soils eventually become sealed when they are used as sites for sewage lagoons. Until sealing occurs, however, the hazard of pollution is severe. Soils that have a permeability rate of more than 2 inches per hour are too porous for the proper functioning of sewage lagoons. In these soils, seepage of the effluent can result in contamination of the ground water. Ground-water contamination is also a hazard if fractured bedrock is within a depth of 40 inches, if the water table is high enough to raise the level of sewage in the lagoon, or if floodwater overtops the lagoon.

A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor. If the lagoon is to be uniformly deep throughout, the slope must be gentle enough and the soil material must be thick enough over bedrock or a cemented pan to make land smoothing practical.

Sanitary landfills are areas where solid waste is

disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground-water pollution. Ease of excavation and revegetation should be considered.

A *trench sanitary landfill* is an area where solid waste is placed in successive layers in an excavated trench. The waste is spread, compacted, and covered daily with a thin layer of soil excavated at the site. When the trench is full, a final cover of soil material at least 2 feet thick is placed over the landfill. The ratings in the table are based on the soil properties that affect the risk of pollution, the ease of excavation, trafficability, and revegetation. These properties include permeability, depth to bedrock or a cemented pan, wetness, ponding, slope, flooding, texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, onsite investigation may be needed.

Hard, nonrippable bedrock, creviced bedrock, or highly permeable strata in or directly below the proposed trench bottom can affect the ease of excavation and the hazard of ground-water pollution. Slope affects construction of the trenches and the movement of surface water around the landfill. It also affects the construction and performance of roads in areas of the landfill.

Soil texture and consistence affect the ease with which the trench is dug and the ease with which the soil can be used as daily or final cover. They determine the workability of the soil when dry and when wet. Soils that are plastic and sticky when wet are difficult to excavate, grade, or compact and are difficult to place as a uniformly thick cover over a layer of refuse.

The soil material used as the final cover for a trench landfill should be suitable for plants. It should not have excess sodium or salts and should not be too acid. The surface layer generally has the best workability, the highest content of organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

In an *area sanitary landfill*, solid waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site. A final cover of soil material at least 2 feet thick is placed over the completed landfill. The ratings in the table are based on the soil properties that affect trafficability and the risk of pollution. These properties include flooding, permeability, wetness, ponding, slope, and depth to bedrock or a cemented pan.

Flooding is a serious problem because it can result in pollution in areas downstream from the landfill. If permeability is too rapid or if fractured bedrock, a fractured cemented pan, or the water table is close to the surface, the leachate can contaminate the water supply. Slope is a consideration because of the extra grading required to maintain roads in the steeper areas of the landfill. Also, leachate may flow along the surface of the soils in the steeper areas and cause difficult seepage problems.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste. The ratings in the table also apply to the final cover for a landfill. They are based on the soil properties that affect workability, the ease of digging, and the ease of moving and spreading the material over the refuse daily during wet and dry periods. These properties include soil texture, wetness, ponding, rock fragments, slope, depth to bedrock or a cemented pan, reaction, and content of salts, sodium, or lime.

Loamy or silty soils that are free of large stones and excess gravel are the best cover for a landfill. Clayey soils may be sticky and difficult to spread; sandy soils are subject to wind erosion.

Slope affects the ease of excavation and of moving the cover material. Also, it can influence runoff, erosion, and reclamation of the borrow area.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or a water table to permit revegetation. The soil material used as the final cover for a landfill should be suitable for plants. It should not have excess sodium, salts, or lime and should not be too acid.

Major Management Considerations for Septic Tank Absorption Fields

Depth to bedrock.—Bedrock is close enough to the surface to restrict the use.

- Onsite investigation is needed to identify areas where the soil is deep enough for septic tank absorption fields.
- The filtering capacity of the leach lines is restricted by the limited soil volume available for filtering the effluent, or the bedrock can prevent installation of the

leach lines. If the lines are installed too close to the bedrock, the effluent can contaminate ground water.
• Enlarging septic tank absorption fields helps to overcome the limited depth to bedrock.
• If slopes are more than 8 percent, cutting may be needed to provide essentially level sites. The cuts can expose the bedrock.

Depth to pan.—Dense, hard, somewhat impervious cemented soil material at a specific depth restricts the use.
• The soil volume available for filtering the effluent is limited. Tests should be made below the pan depth to determine if the leach lines should be placed below the pan.

Flooding.—The soil is flooded by moving water from stream overflow, runoff, or high tides.
• The hazard of flooding should be considered before capital improvements are planned and the system is installed.
• The system should be located above the expected level of flooding.
• Dikes and channels that have outlets for floodwater can protect the onsite sewage disposal system from flooding.

Organic matter (OM).—A high content of organic matter at some depth, sometimes expressed as a Unified soil class (PT, OL, or OH), can result in poor engineering properties and subsidence. A low content of organic matter can restrict the growth of plants.

Permeability.—The movement of water through the soil adversely affects the specified use. The permeability may be either too slow or too fast.
• Restricted permeability increases the possibility of failure of septic tank absorption fields.
• Restricted permeability can be overcome by increasing the size of the absorption field and using coarser backfill material or by installing the leach lines in strata that are more permeable.
• Building up or mounding the septic system site with suitable fill material helps to increase the filtering capacity of the absorption field.

Ponding.—Standing water on soils in closed depressions that is removed only by percolation or evapotranspiration.
• Adding suitable fill material to raise the absorption field can improve the performance of the septic system.

Rock fragments.—The profile contains enough rock fragments of a specific size to adversely affect site preparation or trafficability.

Slope.—The slope is steep enough that special practices are required to ensure satisfactory performance of the soil.
• Onsite investigation is needed to identify less sloping areas where the soil is suitable for septic tank absorption fields.
• Installing the leach lines on the contour helps to prevent the seepage of effluent in downslope areas.
• During construction all bare ground should be mulched. A ground cover should be established to prevent excessive erosion during periods of high rainfall.

Wetness.—Wetness near the surface or a high water table affects the growth of plants and the construction of facilities.
• Adding suitable fill material to raise the absorption field a sufficient distance above the seasonal high water table can improve the performance of the septic system.

Major Management Considerations for Sewage Lagoons

Depth to bedrock.—Bedrock is close enough to the surface to restrict the use.
• Onsite investigation is needed to identify areas where the soil is deep enough for sewage lagoons.
• Enlarging the sewage lagoon helps to overcome the limited depth to bedrock.
• If slopes are more 2 percent, cutting may be needed to provide essentially level sites. The cuts can expose the bedrock.

Depth to pan.—Dense, hard, somewhat impervious cemented soil material at a specific depth restricts the use.
• Onsite investigation is needed to identify areas where the soil is deep enough for sewage lagoons.
• Enlarging the sewage lagoon helps to overcome the limited depth to a cemented pan.
• If slopes are more than 2 percent, cutting may be needed to provide essentially level sites. The cuts can expose the cemented pan.

Flooding.—The soil is flooded by moving water from stream overflow, runoff, or high tides.
• The hazard of flooding should be considered before capital improvements are planned and the sewage lagoon is installed.
• The sewage lagoon should be located above the expected level of flooding.
• Dikes and channels that have outlets for floodwater can protect the sewage lagoon from flooding.

Rock fragments.—The profile contains enough rock fragments of a specific size to adversely affect site preparation or trafficability.

Organic matter (OM).—A high content of organic matter at some depth, sometimes expressed as a Unified soil class (PT, OL, or OH), can result in poor

engineering properties and subsidence. A low content of organic matter can restrict the growth of plants.

Permeability.—The movement of water through the soil adversely affects the specified use. The permeability may be either too slow or too fast.

- A suitable lining is needed to prevent seepage and contamination of the ground water.

Ponding.—Standing water on soils in closed depressions that is removed only by percolation or evapotranspiration.

- Adding suitable fill material to raise the sewage lagoon improves performance.

Slope.—The slope is steep enough that special practices are required to ensure satisfactory performance of the soil.

- Onsite investigation is needed to identify less sloping areas where the soil is suitable for sewage lagoons.
- Installing sewage lagoons on the contour helps to prevent the seepage of effluent in downslope areas.
- During construction all bare ground should be mulched. A ground cover should be established to prevent excessive erosion during periods of high rainfall.

Wetness.—Wetness near the surface or a high water table affects the growth of plants and the construction of facilities.

- Adding suitable fill material to raise the sewage lagoon a sufficient distance above the seasonal high water table improves performance.

Major Management Considerations for Trench Sanitary Landfills

Clay or clayey texture.—At some depth there is a clay content or clayey texture that results in soil that is slippery and sticky when wet and slow to dry.

Depth to bedrock.—Bedrock is close enough to the surface to restrict the use.

- Onsite investigation is needed to identify areas where the soil is deep enough for sanitary landfills.
- Enlarging the sanitary landfill helps to overcome the limited depth to bedrock.
- If slopes are more than 8 percent, cutting may be needed to provide essentially level sites. The cuts can expose the bedrock.

Depth to pan.—Dense, hard, somewhat impervious cemented soil material at a specific depth restricts the use.

- Onsite investigation is needed to identify areas where the soil is deep enough for sanitary landfills.
- If the cemented pan is thick, enlarging the sanitary landfill helps to overcome the limited depth to a cemented pan.
- If the cemented pan is thin and is underlain by suitable soil material, ripping the pan can improve performance.

Flooding.—The soil is flooded by moving water from stream overflow, runoff, or high tides.

- The hazard of flooding should be considered before capital improvements are planned and the sanitary landfill is installed.
- The sanitary landfill should be located above the expected level of flooding.
- Dikes and channels that have outlets for floodwater can protect the sanitary landfill from flooding.

Organic matter (OM).—A high content of organic matter at some depth, sometimes expressed as a Unified soil class (PT, OL, or OH), can result in poor engineering properties and subsidence. A low content of organic matter can restrict the growth of plants.

Permeability.—The movement of water through the soil adversely affects the specified use. The permeability may be either too slow or too fast.

- A suitable lining is needed to prevent seepage and the contamination of ground water.

pH.—The pH of the soil is too low (acid) or too high (basic) for the growth of most plants.

Ponding.—Standing water on soils in closed depressions that is removed only by percolation or evapotranspiration.

- Adding suitable fill material to raise the sanitary landfill improves performance.

Rock fragments.—The profile contains enough rock fragments of a specific size to adversely affect site preparation or trafficability.

Salinity (EC).—Excess water-soluble salts in the soil restrict the growth of most plants.

Sand or sandy texture.—At some depth the content of sand or a sandy texture results in soil that is soft and loose, droughty, and low in fertility or is too fine for use as gravel.

Slope.—The slope is steep enough that special practices are required to ensure satisfactory performance of the soil.

- Onsite investigation is needed to identify less sloping areas where the soil is suitable for sanitary landfills.
- Installing sanitary landfills on the contour helps to prevent the seepage of effluent in downslope areas.
- During construction all bare ground should be mulched. A ground cover should be established to prevent excessive erosion during periods of high rainfall.

Sodicity (SAR).—Excess exchangeable sodium,

which imparts poor physical properties, restricts the growth of plants.

Wetness.—Wetness near the surface or a high water table affects the growth of plants and the construction of facilities.

- Adding suitable fill material to raise the sanitary landfill a sufficient distance above the seasonal high water table improves performance.

Major Management Considerations for Area Sanitary Landfills

Depth to bedrock.—Bedrock is close enough to the surface to restrict the use.

- Onsite investigation is needed to identify areas where the soil is deep enough for the sanitary landfill.
- Enlarging the sanitary landfill helps to overcome the limited depth to bedrock.

Depth to pan.—Dense, hard, somewhat impervious cemented soil material at a specific depth restricts the use.

- Onsite investigation is needed to identify areas where the soil is deep enough for the sanitary landfill.
- Enlarging the sanitary landfill helps to overcome the limited depth to a cemented pan.

Flooding.—The soil is flooded by moving water from stream overflow, runoff, or high tides.

- The hazard of flooding should be considered before capital improvements are planned and the sanitary landfill is installed.
- The sanitary landfill should be located above the expected level of flooding.
- Dikes and channels that have outlets for floodwater can protect the onsite sanitary landfill from flooding.

Permeability.—The movement of water through the soil adversely affects the specified use. The permeability may be either too slow or too fast.

- A suitable lining is needed to prevent seepage and the contamination of ground water.

Ponding.—Standing water on soils in closed depressions that is removed only by percolation or evapotranspiration.

- Adding suitable fill material to raise the sanitary landfill improves performance.

Slope.—The slope is steep enough that special practices are required to ensure satisfactory performance of the soil.

- Onsite investigation is needed to identify areas where the soil is suitable for sanitary landfill.
- Installing sanitary landfills on the contour helps to prevent the seepage of effluent in downslope areas.
- During construction all bare ground should be mulched. A ground cover should be established to prevent excessive erosion during periods of high rainfall.

Wetness.—Wetness near the surface or a high water table affects the growth of plants and the construction of facilities.

- Adding suitable fill material to raise the sanitary landfill a sufficient distance above the seasonal high water table improves performance.

Major Management Considerations for Daily Cover for Landfill

Calcium carbonates.—The content of calcium carbonates may be high enough to restrict the growth of plants.

Clay or clayey texture.—At some depth there is a clay content or clayey texture that results in soil that is slippery and sticky when wet and slow to dry.

Depth to bedrock.—Bedrock is too near the surface.

- Onsite investigation is needed to identify areas where the soil is deep enough to provide cover material.

Depth to pan.—Dense, hard, somewhat impervious cemented soil material at a specific depth restricts the use.

- Onsite investigation is needed to identify areas where the soil is deep enough to provide cover material.

Packing.—The Unified class OL, OH, CH, or MH indicates that the soil may be difficult to compact with regular earthwork construction equipment.

Organic matter (OM).—A high content of organic matter at some depth, sometimes expressed as a Unified soil class (PT, OL, or OH), can result in poor engineering properties and subsidence. A low content of organic matter can restrict the growth of plants.

Permeability.—The movement of water through the soil adversely affects the specified use. The permeability may be either too slow or too fast.

- The material is too coarse for use as landfill cover, resulting in seepage and the contamination of ground water.

pH.—The pH of the soil is too low (acid) or too high (basic) for the growth of most plants.

Ponding.—Standing water on soils in closed depressions that is removed only by percolation or evapotranspiration.

- Seasonal ponding may restrict access to the material.

Rock fragments.—The profile contains enough rock fragments of a specific size to adversely affect site preparation or trafficability.

Salinity (EC).—Excess water-soluble salts in the soil restrict the growth of most plants.

Sand or sandy texture.—At some depth the content of sand or a sandy texture results in soil that is

soft and loose, droughty, and low in fertility or is too fine for use as gravel.

Slope.—The slope is steep enough that special practices are required to ensure satisfactory performance of the soil.

- Onsite investigation is needed to identify areas where the soil is suitable for landfill cover.
- If slopes are more than 8 percent, cutting may be needed. The cuts can expose undesirable material.
- The cuts should be mulched. A ground cover should be established to prevent excessive erosion during periods of high rainfall.

Sodicity (SAR).—Excess exchangeable sodium, which imparts poor physical properties, restricts the growth of plants.

Wetness.—Wetness near the surface or a high water table affects the growth of plants and the construction of facilities.

- Seasonal wetness may restrict access to the material.

Construction Materials

Tables 16 and 17 give information about the soils as potential sources of gravel, sand, topsoil, reclamation material, and roadfill. Normal compaction, minor processing, and other standard construction practices are assumed.

The soils are rated *good, fair,* or *poor* as potential sources of topsoil, reclamation material, and roadfill. The features that limit the soils as sources of these materials are specified in the tables. The numerical ratings given after the specified features indicate the degree to which the features limit the soils as sources of topsoil, reclamation material, or roadfill. The lower the number, the greater the limitation.

The soils are rated as a *good, fair,* or *poor* source of sand and gravel. A rating of *good* means that the source material is likely to be in or below the soil. The numerical ratings in these columns indicate the degree of probability. The number 0.00 indicates that the soil is an improbable source. A number between 0.00 and 1.00 indicates the degree to which the soil is a probable source of sand or gravel.

Sand and *gravel* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In table 16, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material. The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes, the thickness of suitable material, and the content of rock fragments. If the lowest layer of the soil contains sand or gravel, the soil is rated as a probable source regardless of thickness. The assumption is that the sand or gravel layer below the depth of observation exceeds the minimum thickness.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area. The ratings are based on the soil properties that affect plant growth; the ease of excavating, loading, and spreading the material; and reclamation of the borrow area. Toxic substances, soil reaction, and the properties that are inferred from soil texture, such as available water capacity and fertility, affect plant growth. The ease of excavating, loading, and spreading is affected by rock fragments, slope, depth to a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, depth to a water table, rock fragments, depth to bedrock or a cemented pan, and toxic material.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Reclamation material is used in areas that have been drastically disturbed by surface mining or similar activities. When these areas are reclaimed, layers of soil material or unconsolidated geological material, or both, are replaced in a vertical sequence. The reconstructed soil favors plant growth. The ratings in the table do not apply to quarries and other mined areas that require an offsite source of reconstruction material. The ratings are based on the soil properties that affect erosion and stability of the surface and the productive potential of the reconstructed soil. These properties include the content of sodium, salts, and calcium carbonate; reaction; available water capacity; erodibility; texture; content of rock fragments; and content of organic matter and other features that affect fertility.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In table 17, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the whole soil, from the surface to a depth of about 5 feet. It is assumed that soil layers will be mixed when the soil material is excavated and spread.

The ratings are based on the amount of suitable material and on soil properties that affect the ease of excavation and the performance of the material after it is in place. The thickness of the suitable material is a major consideration. The ease of excavation is affected by rock fragments, wetness, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the AASHTO classification of the soil) and linear extensibility (shrink-swell potential).

Water Management

Table 18 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for embankments, dikes, and levees and for pond reservoir areas. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Table 5.--Yields per Acre of Crops

(Yields are for irrigated soils. They are the yields that can be expected under a high level of management. Absence of an entry indicates that data were not estimated.)

Soil name and map symbol	Wheat	Cotton lint	Alfalfa hay	Corn silage	Table grapes	Plums	Walnuts
	Tons	*Lbs*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*
101:							
Akers	3.0	1,300	8.5	26.5	4.2	5.2	2.5
Akers, saline-sodic	2.7	1,100	7.5	24.0	4.0	4.9	1.6
102	1.9	750	7.0	20.0	---	---	---
Armona							
103:							
Atesh	2.2	1,000	8.4	20.0	4.8	4.9	---
Jerryslu.							
104:							
Biggriz	3.0	1,300	7.9	26.5	4.2	5.0	1.7
Biggriz, saline-sodic	2.7	1,100	7.3	23.0	---	---	---
105:							
Calgro	1.8	950	7.0	15.0	7.2	5.6	---
Calgro, saline-sodic	1.8	850	6.0	13.0	4.8	3.9	---
106	2.5	1,000	7.0	23.0	7.1	7.6	---
Centerville, 0-2% slopes							
107	2.2	900	6.5	22.0	7.0	7.3	---
Centerville, 2-5% slopes							
108	3.0	1,300	9.0	27.0	8.2	9.5	3.0
Colpien							
109:							
Crosscreek	2.2	1,000	6.0	22.0	---	---	---
Kai.							
110	2.7	900	8.0	21.0	6.5	5.0	1.0
Delhi							
111	2.7	1,000	7.0	25.0	8.2	5.2	1.0
Delvar							
112.							
Dumps							
113	2.7	900	5.5	18.0	4.4	---	---
Excelsior							
114	2.7	1,000	6.3	22.0	7.0	5.0	1.2
Exeter, 0-2% slopes							
115	2.7	1,000	6.3	22.0	7.0	5.0	1.2
Exeter, 2-5% slopes							

Table 5.--Yields per Acre of Crops--Continued

Soil name and map symbol	Wheat	Cotton lint	Alfalfa hay	Corn silage	Table grapes	Plums	Walnuts
	Tons	*Lbs*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*
116--- Flamen	1.8	900	6.9	19.0	7.9	6.0	1.8
117--- Gambogy	2.7	1,200	7.5	26.0	4.2	4.9	1.6
118:							
Gambogy---	2.7	1,200	7.5	26.0	4.2	4.9	1.6
Biggriz---	2.7	1,100	7.3	23.0	---	---	---
119:							
Gareck---	2.7	1,100	8.4	20.0	6.5	7.0	---
Garces.							
120--- Gepford	1.3	800	6.0	13.0	---	---	---
121--- Gepford, partially drained, sandy substratum	1.3	800	6.0	13.0	---	---	---
122--- Grangeville	2.4	1,000	8.0	26.0	8.2	8.1	2.0
123--- Grangeville	2.4	1,100	7.5	25.0	---	---	---
124--- Hanford	3.0	1,100	7.0	20.0	8.2	9.0	2.5
125, 126--- Houser	2.7	1,000	7.0	20.0	---	---	---
127--- Kimberlina	---	1,000	7.0	25.0	---	---	---
128--- Lethent	2.2	1,000	7.0	22.0	---	---	---
129--- Nahrub	2.2	1,000	7.0	22.0	---	---	---
130--- Nord	3.0	1,100	9.0	25.0	9.0	9.0	1.7
131. Pits							
132:							
Quonal---	2.2	850	6.5	20.0	---	---	---
Lewis.							
133--- Remnoy	2.4	500	5.0	13.0	---	---	---

Table 5.--Yields per Acre of Crops--Continued

Soil name and map symbol	Wheat	Cotton lint	Alfalfa hay	Corn silage	Table grapes	Plums	Walnuts
	Tons	*Lbs*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*
134. Riverwash							
135---------- San Joaquin	2.7	1,000	6.0	22.0	7.0	5.2	---
136---------- Seville	---	600	---	---	7.6	4.2	---
137---------- Tagus	3.4	1,400	9.0	28.0	8.2	5.2	2.5
138---------- Tujunga	2.5	1,000	6.0	20.0	7.2	5.2	1.0
139---------- Wasco	3.0	1,100	8.0	26.0	8.4	5.6	1.5
140---------- Westcamp	2.7	900	7.0	19.0	---	---	---
141---------- Posochanet	2.4	1,300	8.0	22.0	---	---	---
142: Wutchumna, 15-50% slopes.							
Wutchumna, 5-15% slopes-----	1.8	900	6.9	19.0	7.9	6.0	1.8
Rock outcrop.							
143---------- Yettem	3.0	1,300	9.0	27.0	9.0	7.0	2.0
144---------- Youd	2.4	600	5.0	13.0	---	---	---
145. Water, perennial							

Table 6.--Land Capability Classification

(The land capability system groups soils primarily on the basis of their ability to produce the commonly grown cultivated crops and pasture plants over a long period of time without deteriorating. Absence of an entry indicates that no land capability classification is assigned.)

Map symbol and soil name	Land capability	
	N	I
101:		
Akers	4c	1
Akers, saline-sodic	4s-6	2s-6
102:		
Armona	7w	3w-6
103:		
Atesh	6s	3s-8
Jerryslu	7s	4s-8
104:		
Biggriz	6s	2s-6
Biggriz, saline-sodic	7s	3s-6
105:		
Calgro	6s	3s-8
Calgro, saline-sodic	7s	4s-6
106:		
Centerville, 0-2% slopes	4s-3	3s-3
107:		
Centerville, 2-5% slopes	4e-3	3e-3
108:		
Colpien	4c	1
109:		
Crosscreek	6s	2s-6
Kai	7s	3s-6
110:		
Delhi	4e-1	3s-1
111:		
Delvar	4e-3	2e-3
112:		
Dumps.		
113:		
Excelsior	7s	2s-6
114:		
Exeter, 0-2% slopes	4s-8	3s-8
115:		
Exeter, 2-5% slopes	4e-8	3e-8

Table 6.--Land Capability Classification--Continued

Map symbol and soil name	Land capability	
	N	I
116:		
Flamen	4e-8	2s-8
117:		
Gambogy	4s-6	2s-6
118:		
Gambogy	4s-6	2s-6
Biggriz	7s	3s-6
119:		
Gareck	6s	2s-6
Garces	7s	3s-6
120:		
Gepford	6w	3w-6
121:		
Gepford, partially drained, sandy substratum	6w	3w-6
122:		
Grangeville	4c	1
123:		
Grangeville, saline-sodic	4s-6	2s-6
124:		
Hanford	3c	1
125:		
Houser fine sandy loam	7w	3w-6
126:		
Houser silty clay	7w	3w-6
127:		
Kimberlina	7s	2s-6
128:		
Lethent	7s	3s-6
129:		
Nahrub	6s	3s-6
130:		
Nord	4c	1
131:		
Pits.		
132:		
Quonal	6s	3s
Lewis	7s	6s
133:		
Remnoy	7s	4s-8
134:		
Riverwash.		

Table 6.--Land Capability Classification--Continued

Map symbol and soil name	Land capability	
	N	I
135:		
San Joaquin	4s-3	3s-3
136:		
Seville	4s-3	3s-3
137:		
Tagus	4c	1
138:		
Tujunga	6e	3s-1
139:		
Wasco	7e	2s-4
140:		
Westcamp	7w	3w-6
141:		
Posochanet	6s	2s-6
142:		
Wutchumna, 15-50% slopes	6e	---
Wutchumna, 5-15% slopes	4e-1	3e-1
Rock outcrop	8	8
143:		
Yettem	4c	1
144:		
Youd	7s	4s-8
145:		
Water, perennial.		

Table 7.--Prime Farmland

(Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name.)

Map symbol	Soil name
101	Akers-Akers, saline-sodic, complex, 0 to 2 percent slopes (where irrigated and either protected from flooding or not frequently flooded during the growing season)
104	Biggriz-Biggriz, saline-sodic, complex, 0 to 2 percent slopes (where irrigated and either protected from flooding or not frequently flooded during the growing season)
108	Colpien loam, 0 to 2 percent slopes (where irrigated and either protected from flooding or not frequently flooded during the growing season)
116	Flamen loam, 0 to 2 percent slopes (where irrigated and either protected from flooding or not frequently flooded during the growing season)
122	Grangeville sandy loam, drained, 0 to 2 percent slopes (where irrigated and either protected from flooding or not frequently flooded during the growing season)
124	Hanford sandy loam, 0 to 2 percent slopes (where irrigated and either protected from flooding or not frequently flooded during the growing season)
130	Nord fine sandy loam, 0 to 2 percent slopes (where irrigated and either protected from flooding or not frequently flooded during the growing season)
137	Tagus loam, 0 to 2 percent slopes (where irrigated and either protected from flooding or not frequently flooded during the growing season)
139	Wasco sandy loam, 0 to 2 percent slopes (where irrigated and either protected from flooding or not frequently flooded during the growing season)
143	Yettem sandy loam, 0 to 2 percent slopes (where irrigated and either protected from flooding or not frequently flooded during the growing season)

Table 8.--Additional Farmland of Statewide Importance

(Urban or built-up areas of the soils listed in this table are not considered farmland of statewide importance.)

Map symbol	Soil name
102*	Armona sandy loam, partially drained, 0 to 1 percent slopes
103	Atesh-Jerryslu association, 0 to 2 percent slopes
105	Calgro-Calgro, saline-sodic, complex, 0 to 2 percent slopes
106	Centerville clay, 0 to 2 percent slopes
107	Centerville clay, 2 to 5 percent slopes
109	Crosscreek-Kai association, 0 to 2 percent slopes
110	Delhi loamy sand, 0 to 2 percent slopes
111	Delvar clay loam, 2 to 9 percent slopes
113	Excelsior fine sandy loam, 0 to 1 percent slopes
114	Exeter loam, 0 to 2 percent slopes
115	Exeter loam, 2 to 5 percent slopes
117	Gambogy loam, drained, 0 to 1 percent slopes
118	Gambogy-Biggriz, saline-sodic, association, drained, 0 to 2 percent slopes
119	Gareck-Garces association, 0 to 2 percent slopes
120	Gepford silty clay, partially drained, 0 to 1 percent slopes
121	Gepford silty clay, partially drained, sandy substratum , 0 to 1 percent slopes
123	Grangeville fine sandy loam, saline-sodic, 0 to 1 percent slopes
125*	Houser fine sandy loam, drained, 0 to 1 percent slopes
126*	Houser silty clay, drained, 0 to 1 percent slopes
127	Kimberlina fine sandy loam, 0 to 2 percent slopes
128*	Lethent silt loam, 0 to 1 percent slopes
129*	Nahrub silt loam, overwashed, 0 to 1 percent slopes
132*	Quonal-Lewis association, 0 to 2 percent slopes
133	Remnoy silt loam, 0 to 2 percent slopes
135	San Joaquin loam, 0 to 2 percent slopes
136	Seville clay, 0 to 2 percent slopes
138	Tujunga loamy sand, 0 to 2 percent slopes
140	Westcamp silt loam, partially drained, 0 to 2 percent slopes
141*	Posochanet silt loam, 0 to 2 percent slopes
144*	Youd loam, 0 to 1 percent slopes

* This map unit is farmland of statewide importance only where the electrical conductivity is less than 16 decisiemens per meter (mmhos/cm) because of reclamation.

Table 9.--Storie Index Rating

(The California Storie index expresses numerically the relative degree of suitability of a soil for general intensive agricultural uses at the time of evaluation. The rating is based on soil characteristics only and is obtained by evaluating such factors as soil depth, texture of the surface soil, subsoil characteristics, and surface relief. The Storie index is not applied to map units that include urban land. Absence of an entry indicates that the soil was not rated.)

Soil name and map symbol	Rating factors				Index	Grade	Properties affecting X
	A	B	C	X			
101:							
Akers	0.95	1.00	1.00	0.95	0.90	1	Salinity and sodicity
Akers, saline-sodic	0.95	1.00	1.00	0.75	0.71	2	Salinity and sodicity
102:							
Armona	0.95	0.95	1.00	0.40	0.21	4	Drainage
				0.60			Salinity and sodicity
103:							
Atesh	0.45	1.00	1.00	0.90	0.39	4	Drainage
				0.95			Salinity and sodicity
Jerryslu	0.70	1.00	1.00	0.90	0.12	5	Drainage
				0.20			Salinity and sodicity
				0.95			Nutrient level
104:							
Biggriz	0.95	1.00	1.00	0.80	0.72	2	Drainage
				0.95			Salinity and sodicity
Biggriz, saline-sodic	0.95	1.00	1.00	0.80	0.44	3	Drainage
				0.60			Salinity and sodicity
				0.95			Nutrient level
105:							
Calgro	0.70	0.95	1.00	0.90	0.60	2	Drainage
Calgro, saline-sodic	0.70	0.95	1.00	0.90	0.34	4	Drainage
				0.60			Salinity and sodicity
				0.95			Nutrient level
106:							
Centerville, 0-2% slopes	0.95	0.60	1.00	0.60	0.34	4	Salinity and sodicity
107:							
Centerville, 2-5% slopes	.0.95	0.60	0.95	0.60	0.32	4	Salinity and sodicity
108:							
Colpien	0.95	1.00	1.00	0.90	0.85	1	Drainage
109:							
Crosscreek	0.60	1.00	1.00	0.60	0.34	4	Salinity and sodicity
				0.95			Nutrient level
Kai	0.35	1.00	1.00	0.90	0.13	5	Drainage
				0.50			Salinity and sodicity
				0.90			Nutrient level
				0.95			Microrelief
110:							
Delhi	1.00	0.80	1.00	0.90	0.72	2	Nutrient level
111:							
Delvar	0.80	0.85	0.95	0.90	0.58	3	Drainage
112:							
Dumps.							

Table 9.--Storie Index Rating--Continued

Soil name and map symbol	Rating factors				Index	Grade	Properties affecting X
	A	B	C	X			
113:							
Excelsior	0.95	1.00	1.00	0.60	0.54	3	Salinity and sodicity
				0.95			Nutrient level
114:							
Exeter, 0-2% slopes	0.50	1.00	1.00	0.90	0.40	3	Drainage
				0.90			Microrelief
115:							
Exeter, 2-5% slopes	0.50	1.00	0.95	0.90	0.38	4	Drainage
				0.90			Microrelief
116:							
Flamen	0.80	1.00	1.00	0.90	0.72	2	Drainage
117:							
Gambogy	0.95	1.00	1.00	0.40	0.38	4	Drainage
118:							
Gambogy	0.95	1.00	1.00	0.40	0.38	4	Drainage
Biggriz, saline-sodic	0.95	1.00	1.00	0.80	0.44	3	Drainage
				0.60			Salinity and sodicity
				0.95			Nutrient level
119:							
Gareck	0.85	1.00	1.00	0.95	0.81	1	Salinity and sodicity
Garces	0.95	1.00	1.00	0.40	0.34	4	Salinity and sodicity
				0.90			Nutrient level
120:							
Gepford	0.80	0.70	1.00	0.40	0.10	5	Drainage
				0.45			Salinity and sodicity
121:							
Gepford, partially drained, sandy substratum	0.80	0.70	1.00	0.40	0.10	5	Drainage
				0.45			Salinity and sodicity
122:							
Grangeville	0.95	0.95	1.00	0.80	0.72	2	Drainage
123:							
Grangeville, saline-sodic	0.95	1.00	1.00	0.80	0.46	3	Drainage
				0.60			Salinity and sodicity
124:							
Hanford	1.00	0.95	1.00	1.00	0.95	1	
125:							
Houser fine sandy loam	0.90	1.00	1.00	0.80	0.22	4	Drainage
				0.30			Salinity and sodicity
126:							
Houser silty clay	0.90	0.70	1.00	0.80	0.15	5	Drainage
				0.30			Salinity and sodicity
127:							
Kimberlina	1.00	1.00	1.00	0.60	0.60	2	Salinity and sodicity
128:							
Lethent	0.80	1.00	1.00	0.90	0.36	4	Drainage
				0.50			Salinity and sodicity

Table 9.--Storie Index Rating--Continued

Soil name and map symbol	Rating factors				Index	Grade	Properties affecting X
	A	B	C	X			
129:							
Nahrub	0.90	1.00	1.00	0.80	0.34	4	Drainage
				0.50			Salinity and sodicity
				0.95			Nutrient level
130:							
Nord	0.95	1.00	1.00	1.00	0.95	1	
131:							
Pits.							
132:							
Quonal	0.70	0.70	1.00	0.90	0.36	4	Drainage
				0.85			Salinity and sodicity
				0.95			Nutrient level
Lewis	0.50	0.90	1.00	0.90	0.12	5	Drainage
				0.30			Salinity and sodicity
				0.95			Nutrient level
133:							
Remnoy	0.30	1.00	1.00	0.80	0.11	5	Drainage
				0.50			Salinity and sodicity
				0.95			Nutrient level
134:							
Riverwash.							
135:							
San Joaquin	0.40	1.00	1.00	0.90	0.36	4	Drainage
136:							
Seville	0.50	0.60	1.00	0.90	0.27	4	Drainage
137:							
Tagus	0.95	1.00	1.00	1.00	0.95	1	
138:							
Tujunga	0.95	0.80	1.00	0.95	0.57	3	Nutrient level
				0.80			Wind erosion hazard
139:							
Wasco	1.00	0.95	1.00	0.95	0.90	1	Nutrient level
140:							
Westcamp	0.95	1.00	1.00	0.80	0.46	3	Drainage
				0.60			Salinity and sodicity
141:							
Posochanet	0.85	1.00	1.00	0.90	0.37	4	Drainage
				0.50			Salinity and sodicity
				0.95			Nutrient level
142:							
Wutchumna, 15-50% slopes	0.60	0.80	0.30	0.80	0.11	5	Water erosion hazard
Wutchumna, 5-15% slopes	0.60	0.80	0.80	0.80	0.31	4	Water erosion hazard
Rock outcrop.							
143:							
Yettem	1.00	0.95	1.00	1.00	0.95	1	
144:							
Youd	0.30	1.00	1.00	0.80	0.14	5	Drainage
				0.60			Salinity and sodicity
145:							
Water, perennial.							

Table 10.--Recreational Development (Part 1)

(The information in this table is based on Pacific Southwest MLRA Office interpretations. It indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the potential limitation. The rating is based on the limitation with the highest value. Only the three highest value limitations are listed. There may be more limitations. Fine-earth fractions and rock fragments are reported on a weight basis. An explanataion of the rating criteria and of the abbreviations used in describing the limitations is given at the end of the table.)

Map symbol and soil name	Pct.	Camp areas		Picnic areas		Playgrounds	
		Limitation	Value	Limitation	Value	Limitation	Value
101:							
Akers	60	Slight		Slight		Slight	
Akers, saline-sodic	25	Severe		Moderate		Moderate	
		SAR >12	1.00	Surface EC 4-8 mmhos/cm	0.13	Surface EC 4-8 mmhos/cm	0.13
		Surface EC 6-8 mmhos/cm	0.13				
102:							
Armona	85	Severe		Moderate		Moderate	
		Flooding ≥ rare	1.00	Surface EC 4-8 mmhos/cm	0.13	Surface EC 4-8 mmhos/cm	0.13
		SAR >12	1.00				
		Surface EC 6-8 mmhos/cm	0.13				
103:							
Atesh	65	Severe		Slight		Moderate	
		Flooding ≥ rare	1.00			Surface rock fragments (<3") 10-25%	0.06
Jerryslu	20	Severe		Severe		Severe	
		Flooding ≥ rare	1.00	Surface EC >8 mmhos/cm	1.00	Surface EC >8 mmhos/cm	1.00
		SAR >12	1.00	Dusty	0.50	Dusty	0.50
		Surface EC >8 mmhos/cm	1.00				
104:							
Biggriz	55	Severe		Moderate		Moderate	
		Flooding ≥ rare	1.00	Dusty	0.50	Dusty	0.50
		Dusty	0.50				
Biggriz, saline-sodic	30	Severe		Severe		Severe	
		Flooding ≥ rare	1.00	Surface SAR >13	1.00	Surface SAR >13	1.00
		SAR >12	1.00	Surface EC 4-8 mmhos/cm	0.50	Surface EC 4-8 mmhos/cm	0.50
		Surface EC 6-8 mmhos/cm	0.50	Dusty	0.50	Dusty	0.50
105:							
Calgro	60	Moderate		Moderate		Moderate	
		Permeability of .06-.6"/hr	0.48	Permeability of .06 to .6"/hr	0.48	Permeability of .06 to .6"/hr	0.48

Table 10.--Recreational Development (Part 1)--Continued

Map symbol and soil name	Pct.	Camp areas		Picnic areas		Playgrounds	
		Limitation	Value	Limitation	Value	Limitation	Value
105:							
Calgro, saline-sodic	25	Severe		Severe		Severe	
		SAR >12	1.00	Surface SAR >13	1.00	Surface SAR >13	1.00
		Permeability of .06-.6"/hr	0.48	Permeability of .06 to .6"/hr	0.48	Permeability of .06 to .6"/hr	0.48
		Surface EC 6-8 mmhos/cm	0.12	Surface EC 4-8 mmhos/cm	0.13	Surface EC 4-8 mmhos/cm	0.13
106:							
Centerville, 0-2% slopes	90	Severe		Severe		Severe	
		SAR >12	1.00	Surface SAR >13	1.00	Surface SAR >13	1.00
		Surface clay >40% and dry climate	0.50	Surface clay >40% and dry climate	0.50	Surface clay >40% and dry climate	0.50
		Permeability of .06-.6"/hr	0.46	Permeability of .06 to .6"/hr	0.46	Permeability of .06 to .6"/hr	0.46
107:							
Centerville, 2-5% slopes	90	Severe		Severe		Severe	
		SAR >12	1.00	Surface SAR >13	1.00	Surface SAR >13	1.00
		Surface clay >40% and dry climate	0.50	Surface clay >40% and dry climate	0.50	Slopes of 2-6%	0.50
		Permeability of .06-.6"/hr	0.46	Permeability of .06 to .6"/hr	0.46	Surface clay >40% and dry climate	0.50
108:							
Colpien	85	Severe		Moderate		Moderate	
		Flooding ≥ rare	1.00	Dusty	0.50	Dusty	0.50
		Dusty	0.50				
109:							
Crosscreek	70	Moderate		Moderate		Moderate	
		Surface EC 6-8 mmhos/cm	0.72	Surface EC 4-8 mmhos/cm	0.72	Surface EC 4-8 mmhos/cm	0.72
		Dusty	0.50	Dusty	0.50	Dusty	0.50
						Surface rock fragments (<3") 10-25%	0.06
Kai	15	Severe		Severe		Severe	
		SAR >12	1.00	Surface SAR >13	1.00	Surface SAR >13	1.00
		Dusty	0.50	Dusty	0.50	Dusty	0.50
		Surface EC 4-6 mmhos/cm	0.00	Surface EC 4-8 mmhos/cm	0.00	Surface EC 4-8 mmhos/cm	0.00
110:							
Delhi	95	Moderate		Moderate		Moderate	
		Surface sand fraction 70-90% by wt.	0.12	Surface sand fraction 70-90% by wt.	0.12	Surface sand fraction 70-90% by wt.	0.12

Table 10.--Recreational Development (Part 1)--Continued

Map symbol and soil name	Pct.	Camp areas		Picnic areas		Playgrounds	
		Limitation	Value	Limitation	Value	Limitation	Value
111:							
Delvar	85	Severe		Moderate		Moderate	
		SAR >12	1.00	Permeability of .06 to		Slopes of 2-6%	0.98
		Permeability of .06-.6"/hr	0.46	.6"/hr	0.46	Permeability of .06 to	
						.6"/hr	0.46
112:							
Dumps	100	Not rated		Not rated		Not rated	
113:							
Excelsior	85	Severe		Moderate		Moderate	
		Flooding ≥ rare	1.00	Permeability of .06 to		Permeability of .06 to	
		SAR >12	1.00	.6"/hr	0.46	.6"/hr	0.46
		Permeability of .06-.6"/hr	0.46	Surface EC 4-8 mmhos/cm	0.00	Surface EC 4-8 mmhos/cm	0.00
114:							
Exeter, 0-2% slopes	85	Moderate		Moderate		Moderate	
		Dusty	0.50	Dusty	0.50	Dusty	0.50
		Permeability of .06-.6"/hr	0.50	Permeability of .06 to		Permeability of .06 to	
				.6"/hr	0.50	.6"/hr	0.50
115:							
Exeter, 2-5% slopes	85	Moderate		Moderate		Moderate	
		Dusty	0.50	Dusty	0.50	Slopes of 2-6%	0.50
		Permeability of .06-.6"/hr	0.50	Permeability of .06 to		Dusty	0.50
				.6"/hr	0.50	Permeability of .06 to	
						.6"/hr	0.50
116:							
Flamen	85	Moderate		Moderate		Moderate	
		Dusty	0.50	Dusty	0.50	Dusty	0.50
						Surface rock fragments	
						(<3") 10-25%	0.06
117:							
Gambogy	85	Severe		Moderate		Moderate	
		Flooding ≥ rare	1.00	Permeability of .06 to		Permeability of .06 to	
		Permeability of .06-.6"/hr	0.21	.6"/hr	0.21	.6"/hr	0.21
118:							
Gambogy	50	Severe		Moderate		Moderate	
		Flooding ≥ rare	1.00	Permeability of .06 to		Permeability of .06 to	
		Permeability of .06-.6"/hr	0.21	.6"/hr	0.21	.6"/hr	0.21

Table 10.--Recreational Development (Part 1)--Continued

Map symbol and soil name	Pct.	Camp areas		Picnic areas		Playgrounds	
		Limitation	Value	Limitation	Value	Limitation	Value
118:							
Biggriz	35	Severe		Severe		Severe	
		Flooding ≥ rare	1.00	Surface SAR >13	1.00	Surface SAR >13	1.00
		SAR >12	1.00	Surface EC 4-8 mmhos/cm	0.50	Surface EC 4-8 mmhos/cm	0.50
		Surface EC 6-8 mmhos/cm	0.50	Dusty	0.50	Dusty	0.50
119:							
Gareck	70	Severe		Slight		Slight	
		Flooding ≥ rare	1.00				
Garces	15	Severe		Severe		Severe	
		Flooding ≥ rare	1.00	Surface SAR >13	1.00	Surface SAR >13	1.00
		SAR >12	1.00	Dusty	0.50	Dusty	0.50
		Dusty	0.50	Surface EC 4-8 mmhos/cm	0.13	Surface EC 4-8 mmhos/cm	0.13
120:							
Gepford	85	Severe		Severe		Severe	
		Flooding ≥ rare	1.00	Surface clay >40%	1.00	Surface clay >40%	1.00
		SAR >12	1.00	Permeability >.06"/hr	1.00	Permeability >.06"/hr	1.00
		Surface clay >40%	1.00	Surface EC >8 mmhos/cm	1.00	Surface EC >8 mmhos/cm	1.00
121:							
Gepford, partially drained, sandy substratum	85	Severe		Severe		Severe	
		Flooding ≥ rare	1.00	Surface clay >40%	1.00	Surface clay >40%	1.00
		SAR >12	1.00	Surface EC >8 mmhos/cm	1.00	Surface EC >8 mmhos/cm	1.00
		Surface clay >40%	1.00	Surface SAR >13	1.00	Surface SAR >13	1.00
122:							
Grangeville	90	Severe		Slight		Slight	
		Flooding ≥ rare	1.00				
123:							
Grangeville, saline-sodic	90	Severe		Moderate		Moderate	
		Flooding ≥ rare	1.00	Surface EC 4-8 mmhos/cm	0.13	Surface EC 4-8 mmhos/cm	0.13
		SAR >12	1.00				
		Surface EC 6-8 mmhos/cm	0.13				
124:							
Hanford	85	Slight		Slight		Slight	
125:							
Houser fine sandy loam	85	Severe		Severe		Severe	
		Flooding ≥ rare	1.00	Surface EC >8 mmhos/cm	1.00	Surface EC >8 mmhos/cm	1.00
		SAR >12	1.00	Surface SAR from 8-13	0.08	Surface SAR from 8-13	0.08
		Surface EC >8 mmhos/cm	1.00				

Table 10.--Recreational Development (Part 1)--Continued

Map symbol and soil name	Pct.	Camp areas		Picnic areas		Playgrounds	
		Limitation	Value	Limitation	Value	Limitation	Value
126:							
Houser silty clay	85	Severe		Severe		Severe	
		Flooding ≥ rare	1.00	Surface SAR >13	1.00	Surface SAR >13	1.00
		SAR >12	1.00	Permeability >.06"/hr	1.00	Permeability >.06"/hr	1.00
		Permeability >.06"/hr	1.00	Surface EC >8 mmhos/cm	1.00	Surface EC >8 mmhos/cm	1.00
127:							
Kimberlina	85	Severe		Severe		Severe	
		Flooding ≥ rare	1.00	Surface SAR >13	1.00	Surface SAR >13	1.00
		SAR >12	1.00	Surface EC 4-8 mmhos/cm	0.50	Surface EC 4-8 mmhos/cm	0.50
		Surface EC 6-8 mmhos/cm	0.50			Surface rock fragments (<3") 10-25%	0.06
128:							
Lethent	85	Severe		Severe		Severe	
		Flooding ≥ rare	1.00	Surface SAR >13	1.00	Surface SAR >13	1.00
		SAR >12	1.00	Surface EC >8 mmhos/cm	1.00	Surface EC >8 mmhos/cm	1.00
		Surface EC >8 mmhos/cm	1.00	Dusty	0.50	Dusty	0.50
129:							
Nahrub	85	Severe		Severe		Severe	
		Flooding ≥ rare	1.00	Surface EC >8 mmhos/cm	1.00	Surface EC >8 mmhos/cm	1.00
		SAR >12	1.00	Surface SAR >13	1.00	Surface SAR >13	1.00
		Surface EC >8 mmhos/cm	1.00	Dusty	0.50	Dusty	0.50
130:							
Nord	85	Slight		Slight		Slight	
131:							
Pits	100	Not rated		Not rated		Not rated	
132:							
Quonal	70	Severe		Moderate		Moderate	
		SAR >12	1.00	Permeability of .06 to .6"/hr	0.50	Permeability of .06 to .6"/hr	0.50
		Permeability of .06-.6"/hr	0.50	Surface clay >40% and dry climate	0.50	Surface clay >40% and dry climate	0.50
		Surface clay >40% and dry clamate	0.50	Surface EC 4-8 mmhos/cm	0.00	Surface rock fragments (<3") 10-25%	0.06
Lewis	15	Severe		Severe		Severe	
		SAR >12	1.00	Surface SAR >13	1.00	Surface SAR >13	1.00
		Surface EC >8 mmhos/cm	1.00	Surface EC >8 mmhos/cm	1.00	Surface EC >8 mmhos/cm	1.00

Table 10.--Recreational Development (Part 1)--Continued

Map symbol and soil name	Pct.	Camp areas		Picnic areas		Playgrounds	
		Limitation	Value	Limitation	Value	Limitation	Value
133:							
Remnoy	85	Severe		Severe		Severe	
		Flooding ≥ rare	1.00	Surface EC >8 mmhos/cm	1.00	Surface EC >8 mmhos/cm	1.00
		SAR >12	1.00	Depth to pan <20"	1.00	Depth to cemented pan	1.00
134:							
Riverwash	100	Not rated		Not rated		Not rated	
135:							
San Joaquin	85	Moderate		Moderate		Moderate	
		Dusty	0.50	Dusty	0.50	Dusty	0.50
		Permeability of .06-.6"/hr	0.50	Permeability of .06 to .6"/hr	0.50	Permeability of .06 to .6"/hr	0.50
136:							
Seville	85	Moderate		Moderate		Moderate	
		Permeability of .06-.6"/hr	0.50	Permeability of .06 to .6"/hr	0.50	Permeability of .06 to .6"/hr	0.50
		Surface clay >40% and dry climate	0.50	Surface clay >40% and dry climate	0.50	Surface clay >40% and dry climate	0.50
137:							
Tagus	85	Moderate		Moderate		Moderate	
		Dusty	0.50	Dusty	0.50	Dusty	0.50
138:							
Tujunga	85	Severe		Moderate		Moderate	
		Flooding ≥ rare	1.00	Surface sand fraction 70-90% by wt.	0.72	Surface sand fraction 70-90% by wt.	0.72
		Surface sand fraction 70-90% by wt.	0.72				
139:							
Wasco	85	Slight		Slight		Moderate	
						Surface rock fragments (<3") 10-25%	0.06
140:							
Westcamp	85	Severe		Severe		Severe	
		Flooding ≥ rare	1.00	Permeability >.06"/hr	1.00	Permeability >.06"/hr	1.00
		SAR >12	1.00	Surface EC >8 mmhos/cm	1.00	Surface EC >8 mmhos/cm	1.00
		Permeability >.06"/hr	1.00				

Table 10.--Recreational Development (Part 1)--Continued

Map symbol and soil name	Pct.	Camp areas		Picnic areas		Playgrounds	
		Limitation	Value	Limitation	Value	Limitation	Value
141:							
Posochanet	85	Severe		Moderate		Moderate	
		Flooding ≥ rare	1.00	Surface EC 4-8 mmhos/cm	0.50	Surface EC 4-8 mmhos/cm	0.50
		SAR >12	1.00	Dusty	0.50	Dusty	0.50
		Surface EC 6-8 mmhos/cm	0.50	Permeability of .06 to .6"/hr	0.46	Permeability of .06 to .6"/hr	0.46
142:							
Wutchumna, 15-50% slopes	55	Severe		Severe		Severe	
		Slopes >15%	1.00	Slopes >15%	1.00	Slopes >6%	1.00
		Permeability of .06-.6"/hr	0.46	Permeability of .06 to .6"/hr	0.46	Surface rock fragments (<3") >25%	1.00
		Rock fragments (<3") 25-50%	0.29	Rock fragments (<3") 25-50%	0.29	Bedrock 20-40" and slopes >2%	0.50
Wutchumna, 5-15% slopes	15	Moderate		Moderate		Severe	
		Permeability of .06-.6"/hr	0.46	Permeability of .06 to .6"/hr	0.46	Surface rock fragments (<3") >25%	1.00
		Rock fragments (<3") 25-50%	0.29	Rock fragments (<3") 25-50%	0.29	Slopes >6%	1.00
		Slopes of 8-15%	0.16	Slopes of 8-15%	0.16	Bedrock 20-40" and slopes >2%	0.50
Rock outcrop	15	Not rated		Not rated		Not rated	
143:							
Yettem	85	Slight		Slight		Slight	
144:							
Youd	85	Severe		Severe		Severe	
		Flooding ≥ rare	1.00	Surface SAR >13	1.00	Surface SAR >13	1.00
		SAR >12	1.00	Surface EC >8 mmhos/cm	1.00	Surface EC >8 mmhos/cm	1.00
		Surface EC >8 mmhos/cm	1.00	Depth to pan <20"	1.00	Depth to cemented pan	1.00
145:							
Water, perennial	---	Not rated		Not rated		Not rated	

The interpretation for *camp areas* evaluates the following soil properties at varying depths in the soil: flooding; ponding; wetness; slope; depth to bedrock; depth to a cemented pan; rock fragments less than, equal to, or more than 3 inches in size; sodium content (SAR); salinity (EC); a clayey surface layer; Unified classes for a high content of organic matter (PT, OL, and OH); soil dustiness; and permeability that is too high, allowing seepage in some climates.

The interpretation for *picnic areas* evaluates the following soil properties at varying depths in the soil: flooding, ponding, wetness, slope, depth to bedrock, depth to a cemented pan, salinity (EC), pH, soil dustiness, rock fragments more than 3 inches in size, surface rock fragments more than 10 inches in size, the amount of sand or clay in the surface layer, Unified classes for a high content of organic matter (PT, OL, and OH), and permeability that is too high, allowing seepage in some climates.

The interpretation for *playgrounds* evaluates the following soil properties at varying depths in the soil: flooding, ponding, wetness, slope, depth to bedrock, depth to a cemented pan, surface rock fragments more than 10 inches in size, rock fragments equal to or less than 3 inches in size, Unified classes for a high content of organic matter (PT, OL, and OH), soil dustiness, sand or clay content in the surface layer, pH, salinity (EC), and permeability that is too high, allowing seepage in some climates.

Table 11.--Recreational Development (Part 2)

(The information in this table is based on Pacific Southwest MLRA Office interpretations. It indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the potential limitation. The rating is based on the limitation with the highest value. Only the three highest value limitations are listed. There may be more limitations. Fine-earth fractions and rock fragments are reported on a weight basis. An explanataion of the rating criteria and of the abbreviations used in describing the limitations is given at the end of the table.)

Map symbol and soil name	Pct.	Paths and trails		Off-road motorcycle trails		Lawns, landscaping, and golf fairways	
		Limitation	Value	Limitation	Value	Limitation	Value
101:							
Akers	60	Slight		Slight		Slight	
Akers, saline-sodic	25	Slight		Slight		Severe	
						SAR >12	1.00
						Surface EC 6-8 mmhos/cm	0.13
102:							
Armona	85	Slight		Slight		Severe	
						SAR >12	1.00
						AWC 2-4" to 40"	0.54
						Surface EC 6-8 mmhos/cm	0.13
103:							
Atesh	65	Slight		Slight		Slight	
Jerryslu	20	Moderate		Moderate		Severe	
		Dusty	0.50	Dusty	0.50	SAR >12	1.00
						AWC <2" to 40"	1.00
						Surface EC >8 mmhos/cm	1.00
104:							
Biggriz	55	Moderate		Moderate		Slight	
		Dusty	0.50	Dusty	0.50		
Biggriz, saline-sodic	30	Moderate		Moderate		Severe	
		Dusty	0.50	Dusty	0.50	SAR >12	1.00
						Surface EC 6-8 mmhos/cm	0.50
105:							
Calgro	60	Slight		Slight		Moderate	
						Depth to pan 20-40"	0.42
						AWC 2-4" to 40"	0.08
Calgro, saline-sodic	25	Slight		Slight		Severe	
						SAR >12	1.00
						AWC 2-4" to 40"	0.51
						Depth to pan 20-40"	0.42

Table 11.--Recreational Development (Part 2)--Continued

Map symbol and soil name	Pct.	Paths and trails		Off-road motorcycle trails		Lawns, landscaping, and golf fairways	
		Limitation	Value	Limitation	Value	Limitation	Value
106:							
Centerville, 0-2% slopes	90	Moderate		Moderate		Severe	
		Surface clay >40% and dry climate	0.50	Surface clay >40% and dry climate	0.50	SAR >12	1.00
						Surface clay >40%	1.00
						Surface EC 4-6 mmhos/cm	0.00
107:							
Centerville, 2-5% slopes	90	Moderate		Moderate		Severe	
		Surface clay >40% and dry climate	0.50	Surface clay >40% and dry climate	0.50	SAR >12	1.00
						Surface clay >40%	1.00
						Surface EC 4-6 mmhos/cm	0.00
108:							
Colpien	85	Moderate		Moderate		Slight	
		Dusty	0.50	Dusty	0.50		
109:							
Crosscreek	70	Moderate		Moderate		Moderate	
		Dusty	0.50	Dusty	0.50	Surface EC 6-8 mmhos/cm	0.72
Kai	15	Moderate		Moderate		Severe	
		Dusty	0.50	Dusty	0.50	SAR >12	1.00
						AWC <2" to 40"	1.00
						Depth to pan 20-40"	0.42
110:							
Delhi	95	Moderate		Moderate		Moderate	
		Surface sand fraction 70-90% by wt.	0.12	Surface sand fraction 70-90% by wt.	0.12	AWC 2-4" to 40"	0.34
111:							
Delvar	85	Slight		Slight		Severe	
						SAR >12	1.00
112:							
Dumps	100	Not rated		Not rated		Not rated	
113:							
Excelsior	85	Slight		Slight		Severe	
						SAR >12	1.00
						Surface EC 4-6 mmhos/cm	0.00

Table 11.--Recreational Development (Part 2)--Continued

Map symbol and soil name	Pct.	Paths and trails		Off-road motorcycle trails		Lawns, landscaping, and golf fairways	
		Limitation	Value	Limitation	Value	Limitation	Value
114:							
Exeter, 0-2% slopes	85	Moderate		Moderate		Moderate	
		Dusty	0.50	Dusty	0.50	Depth to pan 20-40"	0.42
115:							
Exeter, 2-5% slopes	85	Moderate		Moderate		Moderate	
		Dusty	0.50	Dusty	0.50	Depth to pan 20-40"	0.42
116:							
Flamen	85	Moderate		Moderate		Slight	
		Dusty	0.50	Dusty	0.50		
117:							
Gambogy	85	Slight		Slight		Slight	
118:							
Gambogy	50	Slight		Slight		Slight	
Biggriz	35	Moderate		Moderate		Severe	
		Dusty	0.50	Dusty	0.50	SAR >12	1.00
						Surface EC 6-8 mmhos/cm	0.50
119:							
Gareck	70	Slight		Slight		Slight	
Garces	15	Moderate		Moderate		Severe	
		Dusty	0.50	Dusty	0.50	SAR >12	1.00
						AWC <2" to 40"	1.00
						Surface EC 6-8 mmhos/cm	0.13
120:							
Gepford	85	Severe		Severe		Severe	
		Surface clay >40%	1.00	Surface clay >40%	1.00	Surface clay ≥ 40%	1.00
						SAR >12	1.00
						Surface EC >8 mmhos/cm	1.00
121:							
Gepford, partially drained, sandy substratum	85	Severe		Severe		Severe	
		Surface clay >40%	1.00	Surface clay >40%	1.00	Surface clay ≥ 40%	1.00
						SAR >12	1.00
						Surface EC >8 mmhos/cm	1.00
122:							
Grangeville	90	Slight		Slight		Slight	

Table 11.--Recreational Development (Part 2)--Continued

Map symbol and soil name	Pct.	Paths and trails		Off-road motorcycle trails		Lawns, landscaping, and golf fairways	
		Limitation	Value	Limitation	Value	Limitation	Value
123:							
Grangeville, saline-sodic	90	Slight		Slight		Severe	
						SAR >12	1.00
						Surface EC 6-8 mmhos/cm	0.13
						AWC 2-4" to 40"	0.03
124:							
Hanford	85	Slight		Slight		Slight	
125:							
Houser fine sandy loam	85	Slight		Slight		Severe	
						SAR >12	1.00
						AWC <2" to 40"	1.00
						Surface EC >8 mmhos/cm	1.00
126:							
Houser silty clay	85	Severe		Severe		Severe	
		Surface clay >40%	1.00	Surface clay >40%	1.00	SAR >12	1.00
						Surface EC >8 mmhos/cm	1.00
						Surface clay ≥ 40%	1.00
127:							
Kimberlina	85	Slight		Slight		Severe	
						SAR >12	1.00
						AWC <2" to 40"	1.00
						Surface EC 6-8 mmhos/cm	0.50
128:							
Lethent	85	Moderate		Moderate		Severe	
		Dusty	0.50	Dusty	0.50	SAR >12	1.00
						AWC <2" to 40"	1.00
						Surface EC >8 mmhos/cm	1.00
129:							
Nahrub	85	Moderate		Moderate		Severe	
		Dusty	0.50	Dusty	0.50	SAR >12	1.00
						AWC <2" to 40"	1.00
						Surface EC >8 mmhos/cm	1.00
130:							
Nord	85	Slight		Slight		Slight	
131:							
Pits	100	Not rated		Not rated		Not rated	

Table 11.--Recreational Development (Part 2)--Continued

Map symbol and soil name	Pct.	Paths and trails		Off-road motorcycle trails		Lawns, landscaping, and golf fairways	
		Limitation	Value	Limitation	Value	Limitation	Value
132:							
Quonal	70	Moderate		Moderate		Severe	
		Surface clay >40% and dry climate	0.50	Surface clay >40% and dry climate	0.50	SAR >12	1.00
						Surface clay ≥ 40%	1.00
						Surface EC 4-6 mmhos/cm	0.00
Lewis	15	Slight		Slight		Severe	
						SAR >12	1.00
						AWC <2" to 40"	1.00
						Surface EC >8 mmhos/cm	1.00
133:							
Remnoy	85	Moderate		Moderate		Severe	
		Dusty	0.50	Dusty	0.50	SAR >12	1.00
						AWC <2" to 40"	1.00
						Depth to pan <20"	1.00
134:							
Riverwash	100	Not rated		Not rated		Not rated	
135:							
San Joaquin	85	Moderate		Moderate		Moderate	
		Dusty	0.50	Dusty	0.50	Depth to pan 20-40"	0.42
						AWC 2-4" to 40"	0.42
136:							
Seville	85	Moderate		Moderate		Severe	
		Surface clay >40% and dry climate	0.50	Surface clay >40% and dry climate	0.50	Surface clay ≥ 40%	1.00
						Depth to pan 20-40"	0.42
137:							
Tagus	85	Moderate		Moderate		Slight	
		Dusty	0.50	Dusty	0.50		
138:							
Tujunga	85	Moderate		Moderate		Moderate	
		Surface sand fraction 70-90% by wt.	0.72	Surface sand fraction 70-90% by wt.	0.72	AWC 2-4" to 40"	0.99
139:							
Wasco	85	Slight		Slight		Moderate	
						AWC 2-4" to 40"	0.21
140:							
Westcamp	85	Slight		Slight		Severe	
						SAR >12	1.00
						Surface EC >8 mmhos/cm	1.00

Table 11.--Recreational Development (Part 2)--Continued

Map symbol and soil name	Pct.	Paths and trails		Off-road motorcycle trails		Lawns, landscaping, and golf fairways	
		Limitation	Value	Limitation	Value	Limitation	Value
141:							
Posochanet	85	Moderate		Moderate		Severe	
		Dusty	0.50	Dusty	0.50	SAR >12	1.00
						Surface EC 6-8 mmhos/cm	0.50
142:							
Wutchumna, 15-50% slopes	55	Severe		Moderate		Severe	
		Slopes >25%	1.00	Slopes of 25-40%	0.56	Slopes >15%	1.00
						Bedrock depth 20-40"	0.42
						Rock fragments (gravel size) 25-50%	0.29
Wutchumna, 5-15% slopes	15	Slight		Slight		Moderate	
						Bedrock depth 20-40"	0.42
						Rock fragments (gravel size) 25-50%	0.29
						Slopes of 8-15%	0.16
Rock outcrop	15	Not rated		Not rated		Not rated	
143:							
Yettem	85	Slight		Slight		Slight	
144:							
Youd	85	Slight		Slight		Severe	
						SAR >12	1.00
						AWC <2" to 40"	1.00
						Depth to pan <20"	1.00
145:							
Water, perennial	---	Not rated		Not rated		Not rated	

The interpretation for *paths and trails* evaluates the following soil properties at varying depths in the soil: flooding; ponding; wetness; slope; rock fragments less than, equal to, or more than 3 inches in size; clay and sand content in the surface layer; surface rock fragments more than or equal to 10 inches in size; Unified classes for a high content of organic matter (PT, OL, and OH); soil dustiness; and hazard of water erosion.

The interpretation for *off-road motorcycle trails* evaluates the following soil properties at varying depths in the soil: flooding; ponding; wetness; slope; soil dustiness; rock fragments less than, equal to, or more than 3 inches in size; sand or clay content in the surface layer; and Unified classes for a high content of organic matter (PT, OL, and OH).

The interpretation for *lawns, landscaping and golf fairways* evaluates the following soil properties at varying depths in the soil: flooding; ponding; wetness; slope; depth to bedrock; depth to a cemented pan; rock fragments more than, equal to, or less than 3 inches in size; Unified classes for a high content of organic matter (PT, OL, and OH); soil dustiness; sand or clay content in the surface layer; surface rock fragments more than or equal to 10 inches in size; soil pH; salinity (EC); sodium content (SAR); calcium carbonates; and sulfur content.

Table 12.--Building Site Development (Part 1)

(The information in this table is based on Pacific Southwest MLRA Office interpretations. It indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the potential limitation. The rating is based on the limitation with the highest value. Only the three highest value limitations are listed. There may be more limitations. Fine-earth fractions and rock fragments are reported on a weight basis. An explanataion of the rating criteria and of the abbreviations used in describing the limitations is given at the end of the table.)

Map symbol and soil name	Pct.	Dwellings without basements		Dwellings with basements		Small commercial buildings	
		Limitation	Value	Limitation	Value	Limitation	Value
101:							
Akers	60	Slight		Slight		Slight	
Akers, saline-sodic	25	Slight		Slight		Slight	
102:							
Armona	85	Severe		Severe		Severe	
		Flooding ≥ rare	1.00	Flooding ≥ rare	1.00	Flooding ≥ rare	1.00
		Shrink-swell (LEP 3-6)	0.50	Wetness from 2.5' to 6' depth	0.61	Shrink-swell (LEP 3-6)	0.50
				Shrink-swell (LEP 3-6)	0.50		
103:							
Atesh	65	Severe		Severe		Severe	
		Flooding ≥ rare	1.00	Flooding ≥ rare	1.00	Flooding ≥ rare	1.00
Jerryslu	20	Severe		Severe		Severe	
		Flooding ≥ rare	1.00	Flooding ≥ rare	1.00	Flooding ≥ rare	1.00
				Pan (thin) from 20-40"	0.46		
104:							
Biggriz	55	Severe		Severe		Severe	
		Flooding ≥ rare	1.00	Flooding ≥ rare	1.00	Flooding ≥ rare	1.00
		Shrink-swell (LEP 3-6)	0.50	Shrink-swell (LEP 3-6)	0.50	Shrink-swell (LEP 3-6)	0.50
Biggriz, saline-sodic	30	Severe		Severe		Severe	
		Flooding ≥ rare	1.00	Flooding ≥ rare	1.00	Flooding ≥ rare	1.00
		Shrink-swell (LEP 3-6)	0.50	Shrink-swell (LEP 3-6)	0.50	Shrink-swell (LEP 3-6)	0.50
105:							
Calgro	60	Slight		Moderate		Slight	
				Pan (thin) from 20-40"	0.42		
Calgro, saline-sodic	25	Slight		Moderate		Slight	
				Pan (thin) from 20-40"	0.42		

Table 12.--Building Site Development (Part 1)--Continued

Map symbol and soil name	Pct.	Dwellings without basements		Dwellings with basements		Small commercial buildings	
		Limitation	Value	Limitation	Value	Limitation	Value
106:							
Centerville, 0-2% slopes	90	Severe		Severe		Severe	
		Shrink-swell (LEP >6)	1.00	Shrink-swell (LEP >6)	1.00	Shrink-swell (LEP >6)	1.00
107:							
Centerville, 2-5% slopes	90	Severe		Severe		Severe	
		Shrink-swell (LEP >6)	1.00	Shrink-swell (LEP >6)	1.00	Shrink-swell (LEP >6)	1.00
108:							
Colpien	85	Severe		Severe		Severe	
		Flooding ≥ rare	1.00	Flooding ≥ rare	1.00	Flooding ≥ rare	1.00
		Shrink-swell (LEP 3-6)	0.50	Shrink-swell (LEP 3-6)	0.50	Shrink-swell (LEP 3-6)	0.50
109:							
Crosscreek	70	Moderate		Moderate		Moderate	
		Shrink-swell (LEP 3-6)	0.50	Shrink-swell (LEP 3-6)	0.50	Shrink-swell (LEP 3-6)	0.50
Kai	15	Moderate		Moderate		Moderate	
		Shrink-swell (LEP 3-6)	0.50	Shrink-swell (LEP 3-6)	0.50	Shrink-swell (LEP 3-6)	0.50
				Pan (thin) from 20-40"	0.42		
110:							
Delhi	95	Slight		Slight		Slight	
111:							
Delvar	85	Severe		Moderate		Severe	
		Shrink-swell (LEP >6)	1.00	Shrink-swell (LEP 3-6)	0.50	Shrink-swell (LEP >6)	1.00
						Slopes from 4 to 8%	0.47
112:							
Dumps	100	Not rated		Not rated		Not rated	
113:							
Excelsior	85	Severe		Severe		Severe	
		Flooding ≥ rare	1.00	Flooding ≥ rare	1.00	Flooding ≥ rare	1.00
114:							
Exeter, 0-2% slopes	85	Moderate		Moderate		Moderate	
		Shrink-swell (LEP 3-6)	0.50	Shrink-swell (LEP 3-6)	0.50	Shrink-swell (LEP 3-6)	0.50
115:							
Exeter, 2-5% slopes	85	Moderate		Moderate		Moderate	
		Shrink-swell (LEP 3-6)	0.50	Shrink-swell (LEP 3-6)	0.50	Shrink-swell (LEP 3-6)	0.50

Table 12.--Building Site Development (Part 1)--Continued

Map symbol and soil name	Pct.	Dwellings without basements		Dwellings with basements		Small commercial buildings	
		Limitation	Value	Limitation	Value	Limitation	Value
116:							
Flamen	85	Moderate		Moderate		Moderate	
		Shrink-swell (LEP 3-6)	0.50	Shrink-swell (LEP 3-6)	0.50	Shrink-swell (LEP 3-6)	0.50
				Pan (thick) from 40-60"	0.42		
117:							
Gambogy	85	Severe		Severe		Severe	
		Flooding ≥ rare	1.00	Flooding ≥ rare	1.00	Flooding ≥ rare	1.00
118:							
Gambogy	50	Severe		Severe		Severe	
		Flooding ≥ rare	1.00	Flooding ≥ rare	1.00	Flooding ≥ rare	1.00
Biggriz	35	Severe		Severe		Severe	
		Flooding ≥ rare	1.00	Flooding X rare	1.00	Flooding X rare	1.00
		Shrink-swell (LEP 3-6)	0.50	Shrink-swell (LEP 3-6)	0.50	Shrink-swell (LEP 3-6)	0.50
119:							
Gareck	70	Severe		Severe		Severe	
		Flooding ≥ rare	1.00	Flooding ≥ rare	1.00	Flooding ≥ rare	1.00
				Shrink-swell (LEP 3-6)	0.50		
Garces	15	Severe		Severe		Severe	
		Flooding ≥ rare	1.00	Flooding ≥ rare	1.00	Flooding ≥ rare	1.00
		Shrink-swell (LEP 3-6)	0.50	Shrink-swell (LEP 3-6)	0.50	Shrink-swell (LEP 3-6)	0.50
120:							
Gepford	85	Severe		Severe		Severe	
		Flooding ≥ rare	1.00	Flooding ≥ rare	1.00	Flooding ≥ rare	1.00
		Shrink-swell (LEP >6)	1.00	Shrink-swell (LEP >6)	1.00	Shrink-swell (LEP >6)	1.00
				Wetness from 2.5' to 6' depth	0.90		
121:							
Gepford, partially drained, sandy substratum	85	Severe		Severe		Severe	
		Flooding ≥ rare	1.00	Flooding ≥ rare	1.00	Flooding ≥ rare	1.00
		Shrink-swell (LEP >6)	1.00	Shrink-swell (LEP >6)	1.00	Shrink-swell (LEP >6)	1.00
				Wetness from 2.5' to 6' depth	0.90		
122:							
Grangeville	90	Severe		Severe		Severe	
		Flooding ≥ rare	1.00	Flooding ≥ rare	1.00	Flooding ≥ rare	1.00

Table 12.--Building Site Development (Part 1)--Continued

Map symbol and soil name	Pct.	Dwellings without basements		Dwellings with basements		Small commercial buildings	
		Limitation	Value	Limitation	Value	Limitation	Value
123:							
Grangeville, saline-sodic	90	Severe		Severe		Severe	
		Flooding ≥ rare	1.00	Flooding ≥ rare	1.00	Flooding ≥ rare	1.00
				Wetness from 2.5' to 6' depth	0.15		
124:							
Hanford	85	Slight		Slight		Slight	
125:							
Houser fine sandy loam	85	Severe		Severe		Severe	
		Flooding ≥ rare	1.00	Flooding ≥ rare	1.00	Flooding ≥ rare	1.00
126:							
Houser silty clay	85	Severe		Severe		Severe	
		Flooding ≥ rare	1.00	Flooding ≥ rare	1.00	Flooding ≥ rare	1.00
		Shrink-swell (LEP >6)	1.00	Shrink-swell (LEP >6)	1.00	Shrink-swell (LEP >6)	1.00
127:							
Kimberlina	85	Severe		Severe		Severe	
		Flooding ≥ rare	1.00	Flooding ≥ rare	1.00	Flooding ≥ rare	1.00
128:							
Lethent	85	Severe		Severe		Severe	
		Flooding ≥ rare	1.00	Flooding ≥ rare	1.00	Flooding ≥ rare	1.00
		Shrink-swell (LEP 3-6)	0.50	Shrink-swell (LEP 3-6)	0.50	Shrink-swell (LEP 3-6)	0.50
129:							
Nahrub	85	Severe		Severe		Severe	
		Flooding ≥ rare	1.00	Flooding ≥ rare	1.00	Flooding ≥ rare	1.00
		Shrink-swell (LEP >6)	1.00	Shrink-swell (LEP >6)	1.00	Shrink-swell (LEP >6)	1.00
130:							
Nord	85	Slight		Slight		Slight	
131:							
Pits	100	Not rated		Not rated		Not rated	
132:							
Quonal	70	Severe		Severe		Severe	
		Shrink-swell (LEP >6)	1.00	Shrink-swell (LEP >6)	1.00	Shrink-swell (LEP >6)	1.00
Lewis	15	Moderate		Severe		Moderate	
		Shrink-swell (LEP 3-6)	0.50	Pan (thick) <40" depth	1.00	Shrink-swell (LEP 3-6)	0.50
		Pan from 20 to 40"	0.42	Shrink-swell (LEP 3-6)	0.50	Pan from 20 to 40"	0.42

Table 12.--Building Site Development (Part 1)--Continued

Map symbol and soil name	Pct.	Dwellings without basements		Dwellings with basements		Small commercial buildings	
		Limitation	Value	Limitation	Value	Limitation	Value
133:							
Remnoy	85	Severe		Severe		Severe	
		Flooding ≥ rare	1.00	Flooding ≥ rare	1.00	Flooding ≥ rare	1.00
		Thin pan <20" depth	1.00	Pan (thin) <20" depth	1.00	Thin pan <20" depth	1.00
134:							
Riverwash	100	Not rated		Not rated		Not rated	
135:							
San Joaquin	85	Severe		Severe		Severe	
		Shrink-swell (LEP >6)	1.00	Shrink-swell (LEP >6)	1.00	Shrink-swell (LEP >6)	1.00
				Pan (thin) from 20-40"	0.42		
136:							
Seville	85	Severe		Severe		Severe	
		Shrink-swell (LEP >6)	1.00	Shrink-swell (LEP >6)	1.00	Shrink-swell (LEP >6)	1.00
				Pan (thin) from 20-40"	0.42		
137:							
Tagus	85	Slight		Slight		Slight	
138:							
Tujunga	85	Severe		Severe		Severe	
		Flooding ≥ rare	1.00	Flooding ≥ rare	1.00	Flooding ≥ rare	1.00
139:							
Wasco	85	Slight		Slight		Slight	
140:							
Westcamp	85	Severe		Severe		Severe	
		Flooding ≥ rare	1.00	Flooding ≥ rare	1.00	Flooding ≥ rare	1.00
				Shrink-swell (LEP >6)	1.00		
				Wetness from 2.5' to 6' depth	0.15		
141:							
Posochanet	85	Severe		Severe		Severe	
		Flooding ≥ rare	1.00	Flooding ≥ rare	1.00	Flooding ≥ rare	1.00
		Shrink-swell (LEP 3-6)	0.50	Shrink-swell (LEP >6)	1.00	Shrink-swell (LEP 3-6)	0.50
142:							
Wutchumna, 15-50% slopes	55	Severe		Severe		Severe	
		Slopes > 15%	1.00	Slopes > 15%	1.00	Slopes >8%	1.00
		Shrink-swell (LEP >6)	1.00	Shrink-swell (LEP >6)	1.00	Shrink-swell (LEP >6)	1.00
		Bedrock (hard) from 20 to 40"	0.42	Bedrock (hard) <40" depth	1.00	Bedrock (hard) from 20 to 40"	0.42

Table 12.--Building Site Development (Part 1)--Continued

Map symbol and soil name	Pct.	Dwellings without basements		Dwellings with basements		Small commercial buildings	
		Limitation	Value	Limitation	Value	Limitation	Value
142:							
Wutchumna, 5-15% slopes	15	Severe		Severe		Severe	
		Shrink-swell (LEP >6)	1.00	Shrink-swell (LEP >6)	1.00	Shrink-swell (LEP >6)	1.00
		Bedrock (hard) from 20 to 40"	0.42	Bedrock (hard) <40" depth	1.00	Slopes >8%	1.00
		Slopes of 8 to 15%	0.16	Slopes of 8 to 15%	0.16	Bedrock (hard) from 20 to 40"	0.42
Rock outcrop	15	Not rated		Not rated		Not rated	
143:							
Yettem	85	Slight		Slight		Slight	
144:							
Youd	85	Severe		Severe		Severe	
		Flooding ≥ rare	1.00	Flooding ≥ rare	1.00	Flooding ≥ rare	1.00
		Pan (thick) <20" depth	1.00	Pan (thick) <40" depth	1.00	Pan (thick) <20" depth	1.00
145:							
Water, perennial	---	Not rated		Not rated		Not rated	

The interpretation for *dwellings without basements* evaluates the following soil properties, some at varying depths in the soil: flooding, ponding, wetness, slope, subsidence of organic soils, shrink-swell expressed as linear extensibility percent (LEP), organic Unified classes for low soil strength (PT, OL, and OH), depth to hard or soft bedrock, depth to a thick or thin cemented pan, and rock fragments more than 3 inches in size.

The interpretation for *dwellings with basements* evaluates the following soil properties, some at varying depths in the soil: flooding, ponding, wetness, slope, subsidence of organic soils, shrink-swell potential expressed as linear extensibility percent (LEP), organic Unified classes for low soil strength (PT, OL, and OH), depth to hard or soft bedrock, depth to a thick or thin cemented pan, and rock fragments more than 3 inches in size.

The interpretation for *small commercial buildings* evaluates the following soil properties, some at varying depths in the soil: flooding, ponding, wetness, slope, subsidence of organic soils, shrink-swell potential expressed as linear extensibility percent (LEP), depth to hard or soft bedrock, depth to a thick or thin cemented pan, and rock fragments more than 3 inches in size.

Table 13.--Building Site Development (Part 2)

(The information in this table is based on Pacific Southwest MLRA Office interpretations. It indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the potential limitation. The rating is based on the limitation with the highest value. Only the three highest value limitations are listed. There may be more limitations. Fine-earth fractions and rock fragments are reported on a weight basis. An explanataion of the rating criteria and of the abbreviations used in describing the limitations is given at the end of the table.)

Map symbol and soil name	Pct.	Local roads and streets		Shallow excavations	
		Limitation	Value	Limitation	Value
101:					
Akers	60	Slight		Moderate	
				Low caving potential	0.10
Akers, saline-sodic	25	Slight		Moderate	
				Low caving potential	0.10
102:					
Armona	85	Severe		Moderate	
		AASHTO GI >8 (soil strength)	1.00	Wetness from 2.5' to 6' depth	0.61
		Shrink-swell (LEP 3-6)	0.50	Low caving potential	0.10
		Rare flooding	0.50		
103:					
Atesh	65	Moderate		Severe	
		Rare flooding	0.50	Caving potential	1.00
				Depth to pan from 40 to 60"	0.46
Jerryslu	20	Moderate		Severe	
		Rare flooding	0.50	Caving potential	1.00
				Depth to pan <40"	1.00
				Pan (thin) from 20 to 40"	0.46
104:					
Biggriz	55	Moderate		Moderate	
		AASHTO GI 5-8 (soil strength	0.78	Low caving potential	0.10
		Shrink-swell (LEP 3-6)	0.50		
		Rare flooding	0.50		
Biggriz, saline-sodic	30	Moderate		Moderate	
		AASHTO GI 5-8 (soil strength)	0.78	Low caving potential	0.10
		Shrink-swell (LEP 3-6)	0.50		
		Rare flooding	0.50		
105:					
Calgro	60	Slight		Severe	
				Caving potential	1.00
				Depth to pan <40"	1.00
				Pan (thin) from 20 to 40"	0.42
Calgro, saline-sodic	25	Slight		Severe	
				Caving potential	1.00
				Depth to pan <40"	1.00
				Pan (thin) from 20 to 40"	0.42
106:					
Centerville, 0-2% slopes	90	Severe		Severe	
		Shrink-swell (LEP >6)	1.00	Caving potential	1.00
		AASHTO GI >8 (soil strength)	1.00	Clay from 40 to 60%	0.28
107:					
Centerville, 2-5% slopes	90	Severe		Severe	
		Shrink-swell (LEP >6)	1.00	Caving potential	1.00
		AASHTO GI >8 (soil strength)	1.00	Clay from 40 to 60%	0.28

Table 13.--Building Site Development (Part 2)--Continued

Map symbol and soil name	Pct.	Local roads and streets		Shallow excavations	
		Limitation	Value	Limitation	Value
108:					
Colpien	85	Moderate		Moderate	
		Shrink-swell (LEP 3-6)	0.50	Low caving potential	0.10
		Rare flooding	0.50		
109:					
Crosscreek	70	Moderate		Moderate	
		Shrink-swell (LEP 3-6)	0.50	Depth to pan from 40 to 60"	0.42
				Low caving potential	0.10
Kai	15	Moderate		Severe	
		Shrink-swell (LEP 3-6)	0.50	Depth to pan <40"	1.00
				Pan (thin) from 20 to 40"	0.42
				Low caving potential	0.10
110:					
Delhi	95	Slight		Severe	
				Caving potential	1.00
111:					
Delvar	85	Severe		Moderate	
		AASHTO GI >8 (soil strength	1.00	Clay from 40 to 60%	0.28
		Shrink-swell (LEP >6)	1.00	Low caving potential	0.10
112:					
Dumps	100	Not rated		Not rated	
113:					
Excelsior	85	Moderate		Severe	
		Rare flooding	0.50	Caving potential	1.00
114:					
Exeter, 0-2% slopes	85	Moderate		Severe	
		Shrink-swell (LEP 3-6)	0.50	Caving potential	1.00
				Depth to pan <40"	1.00
115:					
Exeter, 2-5% slopes	85	Moderate		Severe	
		Shrink-swell (LEP 3-6)	0.50	Caving potential	1.00
				Depth to pan <40"	1.00
116:					
Flamen	85	Moderate		Moderate	
		Shrink-swell (LEP 3-6)	0.50	Depth to pan from 40 to 60"	0.42
				Low caving potential	0.10
117:					
Gambogy	85	Moderate		Moderate	
		Rare flooding	0.50	Low caving potential	0.10
118:					
Gambogy	50	Moderate		Moderate	
		Rare flooding	0.50	Low caving potential	0.10
Biggriz	35	Moderate		Moderate	
		AASHTO GI 5-8 (soil strength)	0.78	Low caving potential	0.10
		Shrink-swell (LEP 3-6)	0.50		
		Rare flooding	0.50		
119:					
Gareck	70	Moderate		Severe	
		Rare flooding	0.50	Caving potential	1.00

Table 13.--Building Site Development (Part 2)--Continued

Map symbol and soil name	Pct.	Local roads and streets		Shallow excavations	
		Limitation	Value	Limitation	Value
119:					
Garces	15	Moderate		Moderate	
		Shrink-swell (LEP 3-6)	0.50	Low caving potential	0.10
		Rare flooding	0.50		
120:					
Gepford	85	Severe		Severe	
		AASHTO GI >8 (soil strength)	1.00	Caving potential	1.00
		Shrink-swell (LEP >6)	1.00	Wetness from 2.5' to 6' depth	0.90
		Rare flooding	0.50	Clay from 40 to 60%	0.88
121:					
Gepford, partially drained, sandy substratum	85	Severe		Severe	
		AASHTO GI >8 (soil strength)	1.00	Caving potential	1.00
		Shrink-swell (LEP >6)	1.00	Wetness from 2.5' to 6' depth	0.90
		Rare flooding	0.50	Clay from 40 to 60%	0.88
122:					
Grangeville	90	Moderate		Severe	
		Rare flooding	0.50	Caving potential	1.00
123:					
Grangeville, saline-sodic	90	Moderate		Severe	
		Rare flooding	0.50	Caving potential	1.00
				Wetness from 2.5' to 6' depth	0.15
124:					
Hanford	85	Slight		Severe	
				Caving potential	1.00
125:					
Houser fine sandy loam	85	Moderate		Moderate	
		Rare flooding	0.50	Clay from 40 to 60%	0.50
				Low caving potential	0.10
126:					
Houser silty clay	85	Severe		Moderate	
		AASHTO GI >8 (soil strength)	1.00	Clay from 40 to 60%	0.50
		Shrink-swell (LEP >6)	1.00	Low caving potential	0.10
		Rare flooding	0.50		
127:					
Kimberlina	85	Moderate		Moderate	
		Rare flooding	0.50	Low caving potential	0.10
128:					
Lethent	85	Severe		Moderate	
		AASHTO GI >8 (soil strength)	1.00	Clay from 40 to 60%	0.12
		Shrink-swell (LEP 3-6)	0.50	Low caving potential	0.10
		Rare flooding	0.50		
129:					
Nahrub	85	Severe		Moderate	
		Shrink-swell (LEP >6)	1.00	Low caving potential	0.10
		AASHTO GI >8 (soil strength)	1.00	Clay from 40 to 60%	0.03
		Rare flooding	0.50		
130:					
Nord	85	Slight		Severe	
				Caving potential	1.00

Table 13.--Building Site Development (Part 2)--Continued

Map symbol and soil name	Pct.	Local roads and streets		Shallow excavations	
		Limitation	Value	Limitation	Value
131:					
Pits	100	Not rated		Not rated	
132:					
Quonal	70	Severe		Moderate	
		Shrink-swell (LEP >6)	1.00	Depth to pan from 40 to 60"	0.42
		AASHTO GI >8 (soil strength)	1.00	Clay from 40 to 60%	0.12
				Low caving potential	0.10
Lewis	15	Severe		Severe	
		AASHTO GI >8 (soil strength	1.00	Depth to pan <40"	1.00
		Shrink-swell (LEP 3-6)	0.50	Clay from 40 to 60%	0.28
		Pan from 20 to 40"	0.42	Low caving potential	0.10
133:					
Remnoy	85	Moderate		Severe	
		Thin pan <= 20"	1.00	Depth to pan <40"	1.00
		Rare flooding	0.50	Pan (thin) <20" depth	1.00
				Low caving potential	0.10
134:					
Riverwash	100	Not rated		Not rated	
135:					
San Joaquin	85	Severe		Severe	
		AASHTO GI >8 (soil strength)	1.00	Depth to pan <40"	1.00
		Shrink-swell (LEP >6)	1.00	Pan (thin) from 20 to 40"	0.42
				Low caving potential	0.10
136:					
Seville	85	Severe		Severe	
		AASHTO GI >8 (soil strength)	1.00	Caving potential	1.00
		Shrink-swell (LEP >6)	1.00	Depth to pan <40"	1.00
				Clay from 40 to 60%	0.50
137:					
Tagus	85	Slight		Moderate	
				Low caving potential	0.10
138:					
Tujunga	85	Moderate		Severe	
		Rare flooding	0.50	Caving potential	1.00
139:					
Wasco	85	Slight		Moderate	
				Low caving potential	0.10
140:					
Westcamp	85	Severe		Moderate	
		AASHTO GI >8 (soil strength)	1.00	Wetness from 2.5' to 6' depth	0.15
		Rare flooding	0.50	Clay from 40 to 60%	0.12
				Low caving potential	0.10
141:					
Posochanet	85	Severe		Moderate	
		AASHTO GI >8 (soil strength)	1.00	Low caving potential	0.10
		Shrink-swell (LEP 3-6)	0.50		
		Rare flooding	0.50		

Table 13.--Building Site Development (Part 2)--Continued

Map symbol and soil name	Pct.	Local roads and streets		Shallow excavations	
		Limitation	Value	Limitation	Value
142:					
Wutchumna, 15-50% slopes	55	Severe		Severe	
		Slopes >15%	1.00	Slopes >15%	1.00
		Shrink-swell (LEP >6)	1.00	Caving potential	1.00
		AASHTO GI >8 (soil strength)	1.00	Bedrock (hard) <40" depth	1.00
Wutchumna, 5-15% slopes	15	Severe		Severe	
		Shrink-swell (LEP >6)	1.00	Caving potential	1.00
		AASHTO GI >8 (soil strength)	1.00	Bedrock (hard) <40" depth	1.00
		Bedrock (hard) from 20 to 40"	0.42	Clay from 40 to 60%	0.50
Rock outcrop	15	Not rated		Not rated	
143:					
Yettem	85	Slight		Moderate	
				Low caving potential	0.10
144:					
Youd	85	Severe		Severe	
		Pan (thick) <20" depth	1.00	Depth to pan <40"	1.00
		Rare flooding	0.50	Caving potential	1.00
145:					
Water, perennial	---	Not rated		Not rated	

The interpretation for *local roads and streets* evaluates the following soil properties at varying depths in the soil: flooding, ponding, wetness, slope, organic Unified classes for low soil strength (PT, OL, and OH), amount of clay, depth to hard or soft bedrock, depth to a thick or thin cemented pan, rock fragments more than 3 inches in size, soil bulk density, and the potential of the soil to cave.

The interpretation for *shallow excavations* evaluates the following soil properties at varying depths in the soil: flooding, ponding, wetness, slope, subsidence of organic soils, shrink-swell potential expressed as linear extensibility percent (LEP), potential for frost action, depth to hard or soft bedrock, depth to a thick or thin cemented pan, rock fragments more than 3 inches in size, and soil strength expressed as the AASHTO group index number (AASHTO GI).

Table 14.--Sanitary Facilities (Part 1)

(The information in this table is based on Pacific Southwest MLRA Office interpretations. It indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the potential limitation. The rating is based on the limitation with the highest value. Only the three highest value limitations are listed. There may be more limitations. Fine-earth fractions and rock fragments are reported on a weight basis. An explanataion of the rating criteria and of the abbreviations used in describing the limitations is given at the end of the table.)

Map symbol and soil name	Pct.	Septic tank absorption fields		Sewage lagoons	
		Limitation	Value	Limitation	Value
101:					
Akers	60	Moderate		Moderate	
		Permeability .6-2"/hr	0.46	Permeability .6-2"/hr (some seepage)	0.53
Akers, saline-sodic	25	Severe		Slight	
		Permeability <.6"/hr in 24-72"	1.00		
102:					
Armona	85	Severe		Moderate	
		Permeability <.6"/hr in 24-72"	1.00	Wetness from 3.5 to 5' depth	0.71
		Wetness <4' depth	1.00	Rare flooding	0.50
		Rare flooding	0.50	Permeability .6-2"/hr (some seepage)	0.28
103:					
Atesh	65	Severe		Severe	
		Permeability <.6"/hr in 24-72"	1.00	Permeability >2"/hr (seepage)	1.00
		Depth to pan 40-72"	0.80	Rare flooding	0.50
		Rare flooding	0.50	Depth to pan 40-60"	0.46
Jerryslu	20	Severe		Severe	
		Depth to pan <40"	1.00	Permeability >2"/hr (seepage)	1.00
		Rare flooding	0.50	Depth to pan <40"	1.00
				Rare flooding	0.50
104:					
Biggriz	55	Severe		Moderate	
		Permeability <.6"/hr in 24-72"	1.00	Rare flooding	0.50
		Rare flooding	0.50		
Biggriz, saline-sodic	30	Severe		Moderate	
		Permeability <.6"/hr in 24-72"	1.00	Rare flooding	0.50
		Rare flooding	0.50		
105:					
Calgro	60	Severe		Severe	
		Depth to pan <40"	1.00	Permeability >2"/hr (seepage)	1.00
		Permeability .6-2"/hr	0.46	Depth to pan <40"	1.00
Calgro, saline-sodic	25	Severe		Severe	
		Depth to pan <40"	1.00	Permeability >2"/hr (seepage)	1.00
		Permeability .6-2"/hr	0.46	Depth to pan <40"	1.00
106:					
Centerville, 0-2% slopes	90	Severe		Slight	
		Permeability <.6"/hr in 24-72"	1.00		
107:					
Centerville, 2-5% slopes	90	Severe		Moderate	
		Permeability <.6"/hr in 24-72"	1.00	Slopes of 2 to 8%	0.33

Table 14.--Sanitary Facilities (Part 1)--Continued

Map symbol and soil name	Pct.	Septic tank absorption fields		Sewage lagoons	
		Limitation	Value	Limitation	Value
108:					
Colpien	85	Severe		Moderate	
		Permeability <.6"/hr in 24-72"	1.00	Rare flooding	0.50
		Rare flooding	0.50		
109:					
Crosscreek	70	Moderate		Moderate	
		Depth to pan 40-72"	0.78	Depth to pan 40-60"	0.42
				Permeability .6-2"/hr (some seepage)	0.28
Kai	15	Severe		Severe	
		Depth to pan <40"	1.00	Depth to pan <40"	1.00
				Permeability >2"/hr (seepage)	1.00
110:					
Delhi	95	Severe		Severe	
		Permeability >6"/hr above 60"	1.00	Permeability >2"/hr (seepage)	1.00
111:					
Delvar	85	Severe		Moderate	
		Permeability <.6"/hr in 24-72"	1.00	Slopes of 2 to 8%	0.67
				Permeability .6-2"/hr (some seepage)	0.28
112:					
Dumps	100	Not rated		Not rated	
113:					
Excelsior	85	Severe		Moderate	
		Permeability <.6"/hr in 24-72"	1.00	Permeability .6-2"/hr (some seepage)	0.53
		Rare flooding	0.50	Rare flooding	0.50
114:					
Exeter, 0-2% slopes	85	Severe		Severe	
		Permeability <.6"/hr in 24-72"	1.00	Depth to pan <40"	1.00
		Depth to pan <40"	1.00	Permeability >2"/hr (seepage)	1.00
115:					
Exeter, 2-5% slopes	85	Severe		Severe	
		Permeability <.6"/hr in 24-72"	1.00	Depth to pan <40"	1.00
		Depth to pan <40"	1.00	Permeability >2"/hr (seepage)	1.00
				Slopes of 2 to 8%	0.33
116:					
Flamen	85	Moderate		Moderate	
		Depth to pan 40-72"	0.78	Permeability .6-2"/hr (some seepage)	0.53
		Permeability .6-2"/hr	0.46	Depth to pan 40-60"	0.42
117:					
Gambogy	85	Moderate		Severe	
		Rare flooding	0.50	Permeability >2"/hr (seepage)	1.00
		Permeability .6-2"/hr	0.46	Rare flooding	0.50
118:					
Gambogy	50	Moderate		Severe	
		Rare flooding	0.50	Permeability >2"/hr (seepage)	1.00
		Permeability .6-2"/hr	0.46	Rare flooding	0.50

Table 14.--Sanitary Facilities (Part 1)--Continued

Map symbol and soil name	Pct.	Septic tank absorption fields		Sewage lagoons	
		Limitation	Value	Limitation	Value
118:					
Biggriz	35	Severe		Moderate	
		Permeability <.6"/hr in 24-72"	1.00	Rare flooding	0.50
		Rare flooding	0.50		
119:					
Gareck	70	Severe		Severe	
		Permeability <.6"/hr in 24-72"	1.00	Permeability >2"/hr (seepage)	1.00
		Rare flooding	0.50	Rare flooding	0.50
Garces	15	Moderate		Moderate	
		Rare flooding	0.50	Rare flooding	0.50
120:					
Gepford	85	Severe		Severe	
		Permeability <.6"/hr in 24-72"	1.00	Wetness <3.5' depth	1.00
		Wetness <4' depth	1.00	Rare flooding	0.50
		Rare flooding	0.50		
121:					
Gepford, partially drained, sandy substratum	85	Severe		Severe	
		Permeability <.6"/hr in 24-72"	1.00	Permeability >2"/hr (seepage)	1.00
		Wetness <4' depth	1.00	Wetness <3.5' depth	1.00
		Rare flooding	0.50	Rare flooding	0.50
122:					
Grangeville	90	Moderate		Severe	
		Rare flooding	0.50	Permeability >2"/hr (seepage)	1.00
				Rare flooding	0.50
123:					
Grangeville, saline-sodic	90	Moderate		Severe	
		Rare flooding	0.50	Permeability >2"/hr (seepage)	1.00
		Wetness from 4 to 6' depth	0.40	Rare flooding	0.50
124:					
Hanford	85	Severe		Severe	
		Permeability >6"/hr above 60"	1.00	Permeability >2"/hr (seepage)	1.00
125:					
Houser fine sandy loam	85	Moderate		Moderate	
		Rare flooding	0.50	Rare flooding	0.50
126:					
Houser silty clay	85	Severe		Moderate	
		Permeability <.6"/hr in 24-72"	1.00	Rare flooding	0.50
		Rare flooding	0.50		
127:					
Kimberlina	85	Severe		Moderate	
		Permeability <.6"/hr in 24-72"	1.00	Rare flooding	0.50
		Rare flooding	0.50		
128:					
Lethent	85	Moderate		Moderate	
		Rare flooding	0.50	Rare flooding	0.50
129:					
Nahrub	85	Moderate		Moderate	
		Rare flooding	0.50	Rare flooding	0.50

Table 14.--Sanitary Facilities (Part 1)--Continued

Map symbol and soil name	Pct.	Septic tank absorption fields		Sewage lagoons	
		Limitation	Value	Limitation	Value
130:					
Nord	85	Moderate		Severe	
		Permeability .6-2"/hr	0.46	Permeability >2"/hr (seepage)	1.00
131:					
Pits	100	Not rated		Not rated	
132:					
Quonal	70	Severe		Severe	
		Permeability <.6"/hr in 24-72"	1.00	Permeability >2"/hr (seepage)	1.00
		Depth to pan 40-72"	0.78	Depth to pan 40-60"	0.42
Lewis	15	Severe		Severe	
		Depth to pan <40"	1.00	Depth to pan <40"	1.00
133:					
Remnoy	85	Severe		Severe	
		Depth to pan <40"	1.00	Depth to pan <40"	1.00
		Rare flooding	0.50	Rare flooding	0.50
134:					
Riverwash	100	Not rated		Not rated	
135:					
San Joaquin	85	Severe		Severe	
		Permeability <.6"/hr in 24-72"	1.00	Depth to pan <40"	1.00
		Depth to pan <40"	1.00		
136:					
Seville	85	Severe		Severe	
		Permeability <.6"/hr in 24-72"	1.00	Permeability >2"/hr (seepage)	1.00
		Depth to pan <40"	1.00	Depth to pan <40"	1.00
137:					
Tagus	85	Moderate		Severe	
		Permeability .6-2"/hr	0.46	Permeability >2"/hr (seepage)	1.00
138:					
Tujunga	85	Severe		Severe	
		Permeability > 6"/hr above 60"	1.00	Permeability >2"/hr (seepage)	1.00
		Rare flooding	0.50	Rare flooding	0.50
139:					
Wasco	85	Slight		Severe	
				Permeability >2"/hr (seepage)	1.00
140:					
Westcamp	85	Severe		Moderate	
		Permeability <.6"/hr in 24-72"	1.00	Rare flooding	0.50
		Rare flooding	0.50		
		Wetness from 4 to 6' depth	0.40		
141:					
Posochanet	85	Severe		Moderate	
		Permeability <.6"/hr in 24-72"	1.00	Rare flooding	0.50
		Rare flooding	0.50		

Table 14.--Sanitary Facilities (Part 1)--Continued

Map symbol and soil name	Pct.	Septic tank absorption fields		Sewage lagoons	
		Limitation	Value	Limitation	Value
142:					
Wutchumna, 15-50% slopes	55	Severe		Severe	
		Slopes >15%	1.00	Slopes >8%	1.00
		Depth to bedrock <40"	1.00	Depth to bedrock (hard) <40"	1.00
Wutchumna, 5-15% slopes	15	Severe		Severe	
		Depth to bedrock <40"	1.00	Depth to bedrock (hard) <40"	1.00
		Slopes of 8 to 15%	0.16	Slopes >8%	1.00
Rock outcrop	15	Not rated		Not rated	
143:					
Yettem	85	Slight		Severe	
				Permeability >2"/hr (seepage)	1.00
144:					
Youd	85	Severe		Severe	
		Depth to pan <40"	1.00	Depth to pan <40"	1.00
		Rare flooding	0.50	Rare flooding	0.50
				Permeability .6-2"/hr (some seepage)	0.32
145:					
Water, perennial	---	Not rated		Not rated	

The interpretation for *septic tanks adsorption fields* evaluates the following soil properties at varying depths in the soil: flooding; ponding; wetness; slope; subsidence of organic soils; depth to hard or soft bedrock; depth to a cemented pan; permeability that is too fast, allowing seepage; and permeability that is too slow or an impermeable layer at a shallow depth.

The interpretation for *sewage lagoons* evaluates the following soil properties at varying depths in the soil: flooding, ponding, wetness, slope, organic Unified classes for low strength (PT, OL, and OH), depth to hard or soft bedrock, depth to a cemented pan, rock fragments more than 3 inches in size, and permeability that is too fast, allowing seepage.

Table 15.--Sanitary Facilities (Part 2)

(The information in this table is based on Pacific Southwest MLRA Office interpretations. It indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the potential limitation. The rating is based on the limitation with the highest value. Only the three highest value limitations are listed. There may be more limitations. Fine-earth fractions and rock fragments are reported on a weight basis. An explanataion of the rating criteria and of the abbreviations used in describing the limitations is given at the end of the table.)

Map symbol and soil name	Pct.	Trench sanitary landfill		Area sanitary landfill		Daily cover for landfill	
		Limitation	Value	Limitation	Value	Limitation	Value
101:							
Akers	60	Slight		Moderate Very rare flooding	0.20	Good	
Akers, saline-sodic	25	Severe SAR >13 and not aridic climate	1.00	Moderate Very rare flooding	0.20	Poor SAR >13 and not aridic climate	1.00
102:							
Armona	85	Severe Wetness <6' depth SAR >13 and not aridic climate Rare flooding	1.00 1.00 0.50	Moderate Rare flooding	0.40	Poor SAR >13 and not aridic climate	1.00
103:							
Atesh	65	Severe Thin pan <72" deep Rare flooding	1.00 0.50	Moderate Rare flooding	0.40	Fair Depth to pan 40-60"	0.46
Jerryslu	20	Severe Thin pan <72" deep Sandy textures (cos, s, fs, lcos, or vfs) Rare flooding	1.00 1.00 0.50	Moderate Rare flooding	0.40	Poor Depth to pan <40" Texture = s, fs, cos, or sg Thickest layer pH < 3.5	1.00 1.00 1.00
104:							
Biggriz	55	Moderate Rare flooding	0.50	Moderate Rare flooding	0.40	Good	
Biggriz, saline-sodic	30	Severe SAR >13 and not aridic climate Rare flooding	1.00 0.50	Moderate Rare flooding	0.40	Poor SAR >13 and not aridic climate	1.00

Table 15.--Sanitary Facilities (Part 2)--Continued

Map symbol and soil name	Pct.	Trench sanitary landfill		Area sanitary landfill		Daily cover for landfill	
		Limitation	Value	Limitation	Value	Limitation	Value
105:							
Calgro	60	Severe		Severe		Poor	
		Thin pan <72" deep	1.00	Seepage in 20-40" depth	1.00	Depth to pan <40"	1.00
				Depth to pan <40"	1.00		
				Very rare flooding	0.20		
Calgro, saline-sodic	25	Severe		Severe		Poor	
		Thin pan <72" deep	1.00	Seepage in 20-40" depth	1.00	Depth to pan <40"	1.00
		SAR >13 and not aridic climate	1.00	Depth to pan <40"	1.00	SAR >13 and not aridic climate	1.00
				Very rare flooding	0.20		
106:							
Centerville, 0-2% slopes	90	Slight		Moderate		Poor	
				Very rare flooding	0.20	Packing (OL, OH, CH, or MH)	1.00
107:							
Centerville, 2-5% slopes	90	Slight		Moderate		Poor	
				Very rare flooding	0.20	Packing (OL, OH, CH, or MH)	1.00
108:							
Colpien	85	Severe		Moderate		Good	
		Seepage in bottom layer	1.00	Rare flooding	0.40		
		Rare flooding	0.50				
109:							
Crosscreek	70	Severe		Moderate		Fair	
		Thin pan <72" deep	1.00	Depth to pan 40-60"	0.42	Depth to pan 40-60"	0.42
				Very rare flooding	0.20		
Kai	15	Severe		Severe		Poor	
		Thin pan <72" deep	1.00	Depth to pan <40"	1.00	Depth to pan <40"	1.00
		SAR >13 and not aridic climate	1.00	Very rare flooding	0.20	SAR >13 and not aridic climate	1.00
						Thickest layer pH < 3.5	1.00
110:							
Delhi	95	Severe		Severe		Poor	
		Seepage in bottom layer	1.00	Seepage in 20-40" depth	1.00	Permeability >2.0 in/hr	1.00
		Sandy textures (cosl, ls, lfs, or lvfs)	0.50	Very rare flooding	0.20	Texture = lcos, ls, lfs, vfs	0.50
111:							
Delvar	85	Severe		Moderate		Poor	
		SAR >13 and not aridic climate	1.00	Very rare flooding	0.20	SAR >13 and not aridic climate	1.00

Table 15.--Sanitary Facilities (Part 2)--Continued

Map symbol and soil name	Pct.	Trench sanitary landfill		Area sanitary landfill		Daily cover for landfill	
		Limitation	Value	Limitation	Value	Limitation	Value
112:							
Dumps	100	Not rated		Not rated		Not rated	
113:							
Excelsior	85	Moderate		Moderate		Good	
		Rare flooding	0.50	Rare flooding	0.40		
114:							
Exeter, 0-2% slopes	85	Slight		Severe		Poor	
				Depth to pan <40"	1.00	Depth to pan <40"	1.00
				Very rare flooding	0.20		
115:							
Exeter, 2-5% slopes	85	Slight		Severe		Poor	
				Depth to pan <40"	1.00	Depth to pan <40"	1.00
				Very rare flooding	0.20		
116:							
Flamen	85	Severe		Moderate		Fair	
		Thick pan <72" deep	1.00	Depth to pan 40-60"	0.42	Depth to pan 40-60"	0.42
				Very rare flooding	0.20		
117:							
Gambogy	85	Severe		Moderate		Good	
		Seepage in bottom layer	1.00	Rare flooding	0.40		
		Rare flooding	0.50				
118:							
Gambogy	50	Severe		Moderate		Good	
		Seepage in bottom layer	1.00	Rare flooding	0.40		
		Rare flooding	0.50				
Biggriz	35	Severe		Moderate		Poor	
		SAR >13 and not aridic climate	1.00	Rare flooding	0.40	SAR >13 and not aridic climate	1.00
		Rare flooding	0.50				
119:							
Gareck	70	Moderate		Moderate		Good	
		Rare flooding	0.50	Rare flooding	0.40		
Garces	15	Moderate		Moderate		Good	
		Rare flooding	0.50	Rare flooding	0.40		

Table 15.--Sanitary Facilities (Part 2)--Continued

Map symbol and soil name	Pct.	Trench sanitary landfill		Area sanitary landfill		Daily cover for landfill	
		Limitation	Value	Limitation	Value	Limitation	Value
120:							
Gepford	85	Severe		Moderate		Poor	
		Wetness <6' depth	1.00	Rare flooding	0.40	Silty clay or clay 10-60"	1.00
		Clay or silty clay	1.00			Clay or silty clay	1.00
		SAR >13 and not aridic climate	1.00			SAR >13 and not aridic climate	1.00
121:							
Gepford, partially drained, sandy substratum	85	Severe		Moderate		Poor	
		Wetness <6' depth	1.00	Rare flooding	0.40	Silty clay or clay 10-60"	1.00
		Clay or silty clay	1.00			Clay or silty clay	1.00
		SAR >13 and not aridic climate	1.00			SAR >13 and not aridic climate	1.00
122:							
Grangeville	90	Severe		Severe		Fair	
		Seepage in bottom layer	1.00	Seepage in 20-40" depth	1.00	Permeability >2.0 in/hr	0.52
		Rare flooding	0.50	Rare flooding	0.40	Texture = lcos, ls, lfs, or vfs	0.50
		Sandy textures (cosl, ls, lfs, or lvfs)	0.50				
123:							
Grangeville, saline-sodic	90	Severe		Severe		Poor	
		Wetness <6' depth	1.00	Seepage in 20-40" depth	1.00	SAR >13 and not aridic climate	1.00
		Seepage in bottom layer	1.00	Rare flooding	0.40	Texture = lcos, ls, lfs, or vfs	0.50
		SAR >13 and nor aridic climate	1.00			Permeability >2.0 in/hr	0.22
124:							
Hanford	85	Severe		Severe		Poor	
		Seepage in bottom layer	1.00	Seepage in 20-40" depth	1.00	Permeability >2.0 in/hr	1.00
		Sandy textures (cosl, ls, lfs, or lvfs)	0.50	Very rare flooding	0.20	Texture = lcos, ls, lfs, or vfs	0.50
125:							
Houser fine sandy loam	85	Severe		Moderate		Poor	
		Seepage in bottom layer	1.00	Rare flooding	0.40	SAR >13 and not aridic climate	1.00
		EC >16 mmhos/cm	1.00			Packing (OL, OH, CH, or MH)	1.00
		SAR >13 and not aridic climate	1.00			Permeability >2.0 in/hr	0.52

Table 15.--Sanitary Facilities (Part 2)--Continued

Map symbol and soil name	Pct.	Trench sanitary landfill		Area sanitary landfill		Daily cover for landfill	
		Limitation	Value	Limitation	Value	Limitation	Value
126:							
Houser silty clay	85	Severe		Moderate		Poor	
		Clay or silty clay	1.00	Rare flooding	0.40	Silty clay or clay 10-60"	1.00
		EC >16 mmhos/cm	1.00			Clay or silty clay	1.00
		SAR >13 and not aridic climate	1.00			SAR >13 and not aridic climate	1.00
127:							
Kimberlina	85	Moderate		Moderate		Good	
		Rare flooding	0.50	Rare flooding	0.40		
128:							
Lethent	85	Moderate		Moderate		Good	
		Rare flooding	0.50	Rare flooding	0.40		
129:							
Nahrub	85	Severe		Moderate		Poor	
		EC >16 mmhos/cm	1.00	Rare flooding	0.40	Packing (OL, OH, CH, or MH)	1.00
		Rare flooding	0.50				
130:							
Nord	85	Slight		Severe		Good	
				Seepage in 20-40" depth	1.00		
				Very rare flooding	0.20		
131:							
Pits	100	Not rated		Not rated		Not rated	
132:							
Quonal	70	Severe		Moderate		Poor	
		Thin pan <72" deep	1.00	Depth to pan 40-60"	0.42	Silty clay or clay 10-60"	1.00
		Clay or silty clay	1.00	Very rare flooding	0.20	Clay or silty clay	1.00
		SAR >13 and not aridic climate	1.00			SAR >13 and not aridic climate	1.00
Lewis	15	Severe		Severe		Poor	
		Thick pan <72" deep	1.00	Depth to pan <40"	1.00	Depth to pan <40"	1.00
		EC >16 mmhos/cm	1.00	Very rare flooding	0.20	SAR >13 and not aridic climate	1.00
		SAR >13 and not aridic climate	1.00			Texture = s, fs, cos, or sg	1.00

Table 15.--Sanitary Facilities (Part 2)--Continued

Map symbol and soil name	Pct.	Trench sanitary landfill		Area sanitary landfill		Daily cover for landfill	
		Limitation	Value	Limitation	Value	Limitation	Value
133:							
Remnoy	85	Severe		Severe		Poor	
		Thin pan <72" deep	1.00	Depth to pan <40"	1.00	Depth to pan <40"	1.00
		SAR >13 and not aridic climate	1.00	Rare flooding	0.40	SAR >13 and not aridic climate	1.00
		Sandy textures (cos, s, fs, lcos, or vfs)	1.00			Texture = s, fs, cos, or sg	1.00
134:							
Riverwash	100	Not rated		Not rated		Not rated	
135:							
San Joaquin	85	Severe		Severe		Poor	
		Thin pan <72" deep	1.00	Depth to pan <40"	1.00	Depth to pan <40"	1.00
		Clay loam, silty clay, or silty clay loam	0.50	Very rare flooding	0.20	Silt or clay from 10-60"	0.50
						Clay loam, silty clay, or silty clay loam	0.50
136:							
Seville	85	Severe		Moderate		Poor	
		Thin pan <72" deep	1.00	Very rare flooding	0.20	Depth to pan <40"	1.00
						Packing (OL, OH, CH, or MH)	1.00
137:							
Tagus	85	Severe		Moderate		Good	
		Seepage in bottom layer	1.00	Very rare flooding	0.20		
138:							
Tujunga	85	Severe		Severe		Poor	
		Seepage in bottom layer	1.00	Seepage in 20-40" depth	1.00	Texture = s, fs, cos, or sg	1.00
		Sandy textures (cos, s, fs, lcos, or vfs	1.00	Rare flooding	0.40	Permeability >2.0 in/hr	1.00
		Rare flooding	0.50				
139:							
Wasco	85	Slight		Moderate		Fair	
				Very rare flooding	0.20	Permeability >2.0 in/hr	0.52
140:							
Westcamp	85	Severe		Moderate		Poor	
		Wetness <6' depth	1.00	Rare flooding	0.40	SAR >13 and not aridic climate	1.00
		SAR >13 and not aridic climate	1.00			Packing (OL, OH, CH, or MH)	1.00
		Rare flooding	0.50			Silt or clay from 10-60"	0.50

Table 15.--Sanitary Facilities (Part 2)--Continued

Map symbol and soil name	Pct.	Trench sanitary landfill		Area sanitary landfill		Daily cover for landfill	
		Limitation	Value	Limitation	Value	Limitation	Value
141:							
Posochanet	85	Severe		Moderate		Poor	
		EC >16 mmhos/cm	1.00	Rare flooding	0.40	Packing (OL, OH, CH, or MH)	1.00
		Rare flooding	0.50				
142:							
Wutchumna, 15-50% slopes	55	Severe		Severe		Poor	
		Slopes> 15%	1.00	Slopes >15%	1.00	Slopes >15%	1.00
		Lithic or paralithic bedrock <72"	1.00	Bedrock depth <40"	1.00	Depth to bedrock <40"	1.00
		Clay or silty clay	1.00			Silty clay or clay 10-60"	1.00
Wutchumna, 5-15% slopes	15	Severe		Severe		Poor	
		Lithic or paralithic bedrock <72"	1.00	Bedrock depth <40"	1.00	Depth to bedrock <40"	1.00
		Clay or silty clay	1.00	Slopes of 8 to 15%	0.16	Silty clay or clay 10-60"	1.00
		Slopes of 8 to 15%	0.16			Clay or silty clay	1.00
Rock outcrop	15	Not rated		Not rated		Not rated	
143:							
Yettem	85	Severe		Severe		Fair	
		Seepage in bottom layer	1.00	Seepage in 20-40" depth	1.00	Permeability >2.0 in/hr	0.52
				Very rare flooding	0.20		
144:							
Youd	85	Severe		Severe		Poor	
		Thick pan <72" deep	1.00	Depth to pan <40"	1.00	Depth to pan <40"	1.00
		EC >16 mmhos/cm	1.00	Rare flooding	0.40		
		Rare flooding	0.50				
145:							
Water, perennial	---	Not rated		Not rated		Not rated	

The interpretation for *trench sanitary landfill* evaluates the following soil properties at varying depths in the soil: flooding, ponding, wetness, slope, depth to hard or soft bedrock, depth to a thick or thin cemented pan, rock fragments 3 to 10 inches in size, sodium content (SAR), soil pH, clayey or sandy textures, and permeability that is too high, allowing seepage in some climates.

The interpretation for *area sanitary landfill* evaluates the following soil properties at varying depths in the soil: flooding, ponding, wetness, slope, depth to bedrock, depth to a cemented pan, and permeability that is too high, allowing seepage in some climates.

The interpretation for *daily cover for landfill* evaluates the following soil properties at varying depths in the soil: ponding, wetness, slope, depth to bedrock, depth to a cemented pan, rock fragments more than or less than 3 inches in size, Unified class for peat (PT), Unified classes for packing (OL, OH, CH, and MH), sandy or clayey textures, soil pH, carbonates, sodium content (SAR), salinity (EC), soil climate, kaolinitic mineralogy, and permeability that is too high, allowing seepage.

Table 16.--Construction Materials (Part 1)

(The information in this table is based on Pacific Southwest MLRA Office interpretations. It indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.00 to 0.99. The closer the value is to 0.00, the greater the potential limitation. Values of 0.00 indicate absolute limitations based on the soil property criteria used to develop the interpretation. Values closer to 1.0 indicate lesser limitations. Features with a value of 1.00 have absolutely no limitation and are not shown in the table. Rating classes are determined by the most limiting value. Fine-earth fractions and rock fragments are reported on a weight basis. An explanataion of the rating criteria and of the abbreviations used in describing the limitations is given at the end of the table.)

Map symbol and soil name	Pct.	Potential as a source of gravel		Potential as a source of sand		Potential as a source of topsoil	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
101:							
Akers	60	Poor		Fair		Fair	
		Bottom layer not a source	0.00	Bottom layer not a source	0.00	SAR 4 to 13	0.78
		Thickest layer not a source due to fines or thin layer	0.00	Thickest layer a possible source	0.01		
Akers, saline-sodic	25	Poor		Fair		Poor	
		Bottom layer not a source	0.00	Bottom layer not a source	0.00	SAR >13	0.00
		Thickest layer not a source due to fines or thin layer	0.00	Thickest layer a possible source	0.01	EC 4 to 8 mmhos	0.50
102:							
Armona	85	Poor		Poor		Poor	
		Bottom layer not a source	0.00	Bottom layer not a source	0.00	EC >8 mmhos	0.00
		Thickest layer not a source due to fines or thin layer	0.00	Thickest layer not a source	0.00	SAR >13	0.00
103:							
Atesh	65	Poor		Fair		Fair	
		Bottom layer not a source	0.00	Thickest layer a possible source	0.01	Content of rock fragments	0.97
		Thickest layer not a source due to fines or thin layer	0.00	Bottom layer a possible source	0.98	SAR 4 to 13	0.98
Jerryslu	20	Poor		Fair		Poor	
		Bottom layer not a source	0.00	Thickest layer not a source	0.00	SAR >13	0.00
		Thickest layer not a source due to fines or thin layer	0.00	Bottom layer a possible source	0.12	EC >8 mmhos	0.00
						Depth to pan 20 to 40"	0.54
104:							
Biggriz	55	Poor		Poor		Fair	
		Bottom layer not a source	0.00	Bottom layer not a source	0.00	SAR 4 to 13	0.78
		Thickest layer not a source due to fines or thin layer	0.00	Thickest layer not a source	0.00		

Table 16.--Construction Materials (Part 1)--Continued

Map symbol and soil name	Pct.	Potential as a source of gravel		Potential as a source of sand		Potential as a source of topsoil	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
104:							
Biggriz, saline-sodic	30	Poor		Poor		Poor	
		Bottom layer not a source	0.00	Bottom layer not a source	0.00	SAR >13	0.00
		Thickest layer not a source due to fines or thin layer	0.00	Thickest layer not a source	0.00	EC 4 to 8 mmhos	0.50
105:							
Calgro	60	Poor		Fair		Fair	
		Bottom layer not a source	0.00	Bottom layer not a source	0.00	Depth to pan 20 to 40"	0.58
		Thickest layer not a source due to fines or thin layer	0.00	Thickest layer a possible source	0.07	SAR 4 to 13	0.78
Calgro, saline-sodic	25	Poor		Fair		Poor	
		Bottom layer not a source	0.00	Bottom layer not a source	0.00	SAR >13	0.00
		Thickest layer not a source due to fines or thin layer	0.00	Thickest layer a possible source	0.07	EC >8 mmhos	0.00
						Depth to pan 20 to 40"	0.58
106:							
Centerville, 0-2% slopes	90	Poor		Poor		Poor	
		Bottom layer not a source	0.00	Bottom layer not a source	0.00	Clay content >40%	0.00
		Thickest layer not a source due to fines or thin layer	0.00	Thickest layer not a source	0.00	SAR >13	0.00
107:							
Centerville, 2-5% slopes	90	Poor		Poor		Poor	
		Bottom layer not a source	0.00	Bottom layer not a source	0.00	Clay content >40%	0.00
		Thickest layer not a source due to fines or thin layer	0.00	Thickest layer not a source	0.00	SAR >13	0.00
108:							
Colpien	85	Poor		Poor		Fair	
		Bottom layer not a source	0.00	Bottom layer not a source	0.00	SAR 4 to 13	0.78
		Thickest layer not a source due to fines or thin layer	0.00	Thickest layer not a source	0.00		
109:							
Crosscreek	70	Poor		Poor		Fair	
		Bottom layer not a source	0.00	Bottom layer not a source	0.00	EC 4 to 8 mmhos	0.28
		Thickest layer not a source due to fines or thin layer	0.00	Thickest layer not a source	0.00	SAR 4 to 13	0.78
						Content of rock fragments	0.97
Kai	15	Poor		Poor		Poor	
		Bottom layer not a source	0.00	Bottom layer not a source	0.00	SAR >13	0.00
		Thickest layer not a source due to fines or thin layer	0.00	Thickest layer not a source	0.00	Depth to pan 20 to 40"	0.58

Table 16.--Construction Materials (Part 1)--Continued

Map symbol and soil name	Pct.	Potential as a source of gravel		Potential as a source of sand		Potential as a source of topsoil	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
110:							
Delhi	95	Poor		Fair		Fair	
		Bottom layer not a source	0.00	Thickest layer a possible source	0.12	Sand content 75-85%	0.78
		Thickest layer not a source due to fines or thin layer	0.00	Bottom layer a possible source	0.22		
111:							
Delvar	85	Poor		Poor		Fair	
		Bottom layer not a source	0.00	Bottom layer not a source	0.00	Clay content 27-40%	0.76
		Thickest layer not a source due to fines or thin layer	0.00	Thickest layer not a source	0.00	Content of rock fragments	0.97
						SAR 4 to 13	0.98
112:							
Dumps	100	Not rated		Not rated		Not rated	
113:							
Excelsior	85	Poor		Fair		Poor	
		Bottom layer not a source	0.00	Bottom layer not a source	0.00	SAR >13	0.00
		Thickest layer not a source due to fines or thin layer	0.00	Thickest layer a possible source	0.06		
114:							
Exeter, 0-2% slopes	85	Poor		Poor		Fair	
		Bottom layer not a source	0.00	Bottom layer not a source	0.00	Depth to pan 20 to 40"	0.58
		Thickest layer not a source due to fines or thin layer	0.00	Thickest layer not a source	0.00		
115:							
Exeter, 2-5% slopes	85	Poor		Poor		Fair	
		Bottom layer not a source	0.00	Bottom layer not a source	0.00	Depth to pan 20 to 40"	0.58
		Thickest layer not a source due to fines or thin layer	0.00	Thickest layer not a source	0.00		
116:							
Flamen	85	Poor		Poor		Fair	
		Bottom layer not a source	0.00	Bottom layer not a source	0.00	SAR 4 to 13	0.78
		Thickest layer not a source due to fines or thin layer	0.00	Thickest layer not a source	0.00	Content of rock fragments	0.97
117:							
Gambogy	85	Poor		Poor		Fair	
		Bottom layer not a source	0.00	Bottom layer not a source	0.00	SAR 4 to 13	0.78
		Thickest layer not a source due to fines or thin layer	0.00	Thickest layer not a source	0.00		

Table 16.--Construction Materials (Part 1)--Continued

Map symbol and soil name	Pct.	Potential as a source of gravel		Potential as a source of sand		Potential as a source of topsoil	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
118:							
Gambogy	50	Poor		Poor		Fair	
		Bottom layer not a source	0.00	Bottom layer not a source	0.00	SAR 4 to 13	0.78
		Thickest layer not a source due to fines or thin layer	0.00	Thickest layer not a source	0.00		
Biggriz	35	Poor		Poor		Poor	
		Bottom layer not a source	0.00	Bottom layer not a source	0.00	SAR >13	0.00
		Thickest layer not a source due to fines or thin layer	0.00	Thickest layer not a source	0.00	EC 4 to 8 mmhos	0.50
119:							
Gareck	70	Poor		Fair		Good	
		Bottom layer not a source	0.00	Thickest layer not a source	0.00		
		Thickest layer not a source due to fines or thin layer	0.00	Bottom layer a possible source	0.04		
Garces	15	Poor		Fair		Poor	
		Bottom layer not a source	0.00	Thickest layer not a source	0.00	SAR >13	0.00
		Thickest layer not a source due to fines or thin layer	0.00	Bottom layer a possible source	0.01	EC 4 to 8 mmhos	0.88
120:							
Gepford	85	Poor		Poor		Poor	
		Bottom layer not a source	0.00	Bottom layer not a source	0.00	SAR >13	0.00
		Thickest layer not a source due to fines or thin layer	0.00	Thickest layer not a source	0.00	EC >8 mmhos	0.00
						Clay content >40%	0.00
121:							
Gepford, partially drained, sandy substratum	85	Poor		Fair		Poor	
		Bottom layer not a source	0.00	Thickest layer not a source	0.00	SAR >13	0.00
		Thickest layer not a source due to fines or thin layer	0.00	Bottom layer a possible source	0.10	EC >8 mmhos	0.00
						Clay content >40%	0.00
122:							
Grangeville	90	Poor		Fair		Good	
		Bottom layer not a source	0.00	Thickest layer a possible source	0.04		
		Thickest layer not a source due to fines or thin layer	0.00	Bottom layer a possible source	0.07		

Table 16.--Construction Materials (Part 1)--Continued

Map symbol and soil name	Pct.	Potential as a source of gravel		Potential as a source of sand		Potential as a source of topsoil	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
123:							
Grangeville, saline-sodic	90	Poor		Fair		Poor	
		Bottom layer not a source	0.00	Thickest layer a possible source	0.04	SAR >13	0.00
		Thickest layer not a source due to fines or thin layer	0.00	Bottom layer a possible source	0.07	EC 4 to 8 mmhos	0.50
124:							
Hanford	85	Poor		Fair		Good	
		Bottom layer not a source	0.00	Thickest layer a possible source	0.03		
		Thickest layer not a source due to fines or thin layer	0.00	Bottom layer a possible source	0.09		
125:							
Houser fine sandy loam	85	Poor		Poor		Poor	
		Bottom layer not a source	0.00	Bottom layer not a source	0.00	EC >8 mmhos	0.00
		Thickest layer not a source due to fines or thin layer	0.00	Thickest layer not a source	0.00	SAR 4 to 13	0.40
126:							
Houser silty clay	85	Poor		Poor		Poor	
		Bottom layer not a source	0.00	Bottom layer not a source	0.00	EC >8 mmhos	0.00
		Thickest layer not a source due to fines or thin layer	0.00	Thickest layer not a source	0.00	Clay content >40%	0.00
						SAR >13	0.00
127:							
Kimberlina	85	Poor		Fair		Poor	
		Bottom layer not a source	0.00	Bottom layer not a source	0.00	SAR >13	0.00
		Thickest layer not a source due to fines or thin layer	0.00	Thickest layer a possible source	0.01	EC 4 to 8 mmhos	0.50
						Content of rock fragments	0.97
128:							
Lethent	85	Poor		Poor		Poor	
		Bottom layer not a source	0.00	Bottom layer not a source	0.00	EC >8 mmhos	0.00
		Thickest layer not a source due to fines or thin layer	0.00	Thickest layer not a source	0.00	SAR >13	0.00
129:							
Nahrub	85	Poor		Poor		Poor	
		Bottom layer not a source	0.00	Bottom layer not a source	0.00	SAR >13	0.00
		Thickest layer not a source due to fines or thin layer	0.00	Thickest layer not a source	0.00	EC >8 mmhos	0.00

Table 16.--Construction Materials (Part 1)--Continued

Map symbol and soil name	Pct.	Potential as a source of gravel		Potential as a source of sand		Potential as a source of topsoil	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
130:							
Nord	85	Poor		Poor		Fair	
		Bottom layer not a source	0.00	Bottom layer not a source	0.00	SAR 4 to 13	0.90
		Thickest layer not a source due to fines or thin layer	0.00	Thickest layer not a source	0.00		
131:							
Pits	100	Not rated		Not rated		Not rated	
132:							
Quonal	70	Poor		Poor		Poor	
		Bottom layer not a source	0.00	Bottom layer not a source	0.00	SAR >13	0.00
		Thickest layer not a source due to fines or thin layer	0.00	Thickest layer not a source	0.00	Clay content >40%	0.00
						Content of rock fragments	0.12
Lewis	15	Poor		Poor		Poor	
		Bottom layer not a source	0.00	Bottom layer not a source	0.00	SAR >13	0.00
		Thickest layer not a source due to fines or thin layer	0.00	Thickest layer not a source	0.00	EC >8 mmhos	0.00
						Depth to pan 20 to 40"	0.58
133:							
Remnoy	85	Poor		Poor		Poor	
		Bottom layer not a source	0.00	Bottom layer not a source	0.00	Depth to pan < 20"	0.00
		Thickest layer not a source due to fines or thin layer	0.00	Thickest layer not a source	0.00	EC >8 mmhos	0.00
						SAR 4 to 13	0.60
134:							
Riverwash	100	Not rated		Not rated		Not rated	
135:							
San Joaquin	85	Poor		Poor		Poor	
		Bottom layer not a source	0.00	Bottom layer not a source	0.00	Clay content >40%	0.00
		Thickest layer not a source due to fines or thin layer	0.00	Thickest layer not a source	0.00	Depth to pan 20 to 40"	0.58
136:							
Seville	85	Poor		Fair		Poor	
		Bottom layer not a source	0.00	Thickest layer not a source	0.00	Clay content >40%	0.00
		Thickest layer not a source due to fines or thin layer	0.00	Bottom layer a possible source	0.04	Depth to pan 20 to 40"	0.58
137:							
Tagus	85	Poor		Fair		Fair	
		Bottom layer not a source	0.00	Thickest layer not a source	0.00	SAR 4 to 13	0.90
		Thickest layer not a source due to fines or thin layer	0.00	Bottom layer a possible source	0.03		

Table 16.--Construction Materials (Part 1)--Continued

Map symbol and soil name	Pct.	Potential as a source of gravel		Potential as a source of sand		Potential as a source of topsoil	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
138:							
Tujunga	85	Poor		Fair		Fair	
		Bottom layer not a source	0.00	Bottom layer a possible source	0.16	Sand content 75-85%	0.50
		Thickest layer not a source due to fines or thin layer	0.00	Thickest layer a possible source	0.33	Content of rock fragments	0.88
139:							
Wasco	85	Poor		Fair		Fair	
		Bottom layer not a source	0.00	Bottom layer a possible source	0.04	Content of rock fragments	0.97
		Thickest layer not a source due to fines or thin layer	0.00	Thickest layer a possible source	0.04		
140:							
Westcamp	85	Poor		Poor		Poor	
		Bottom layer not a source	0.00	Bottom layer not a source	0.00	EC >8 mmhos	0.00
		Thickest layer not a source due to fines or thin layer	0.00	Thickest layer not a source	0.00	SAR >13	0.00
141:							
Posochanet	85	Poor		Poor		Poor	
		Bottom layer not a source	0.00	Bottom layer not a source	0.00	SAR >13	0.00
		Thickest layer not a source due to fines or thin layer	0.00	Thickest layer not a source	0.00	EC 4 to 8 mmhos	0.50
142:							
Wutchumna, 15-50% slopes	55	Poor		Poor		Poor	
		Bottom layer not a source	0.00	Bottom layer not a source	0.00	Content of rock fragments	0.00
		Thickest layer not a source due to fines or thin layer	0.00	Thickest layer not a source	0.00	Slopes >15%	0.00
						Clay content 27-40%	0.32
						Depth to bedrock 20 to 40"	0.54
Wutchumna, 5-15% slopes	15	Poor		Poor		Poor	
		Bottom layer not a source	0.00	Bottom layer not a source	0.00	Content of rock fragments	0.00
		Thickest layer not a source due to fines or thin layer	0.00	Thickest layer not a source	0.00	Clay content 27-40%	0.32
						Depth to bedrock 20 to 40"	0.54
						Slopes of 8 to 12%	0.84
Rock outcrop	15	Not rated		Not rated		Not rated	
143:							
Yettem	85	Poor		Fair		Good	
		Bottom layer not a source	0.00	Bottom layer a possible source	0.07		
		Thickest layer not a source due to fines or thin layer	0.00	Thickest layer a possible source	0.10		

Table 16.--Construction Materials (Part 1)--Continued

Map symbol and soil name	Pct.	Potential as a source of gravel		Potential as a source of sand		Potential as a source of topsoil	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
144:							
Youd	85	Poor		Fair		Poor	
		Bottom layer not a source	0.00	Thickest layer not a source	0.00	EC >8 mmhos	0.00
		Thickest layer not a source due to fines or thin layer	0.00	Bottom layer a possible source	0.04	Depth to pan <20"	0.00
						SAR >13	0.00
145:							
Water, perennial	---	Not rated		Not rated		Not rated	

The interpretation for *gravel* evaluates the content of rock fragments more than .2 inch in size in the bottom layer or in the thickest layer of the soil.

The interpretation for *sand* evaluates the amount of sand and fine gravel in the thickest layer or in the bottom layer of the soil. Organic soil layers with the Unified engineering class for peat (PT) also are evaluated.

The interpretation for *topsoil* evaluates the following soil properties at various depths: calcium carbonates, clay content, soil bulk density, sand content, soil wetness, content of rock fragments .2 inch to 3 inches in size and more than 3 inches in size, organic matter content (OM), sodium content expressed as the sodium adsorption ratio (SAR), salinity expressed as mmhos/cm of electrical conductivity (EC), depth to bedrock, slope, and soil pH.

Table 17.--Construction Materials (Part 2)

The information in this table is based on Pacific Southwest MLRA Office interpretations. It indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.00 to 0.99. The closer the value is to 0.00, the greater the potential limitation. Values of 0.00 indicate absolute limitations based on the soil property criteria used to develop the interpretation. Values closer to 1.0 indicate lesser limitations. Features with a value of 1.00 have absolutely no limitation and are not shown in the table. Rating classes are determined by the most limiting value. Fine-earth fractions and rock fragments are reported on a weight basis. An explanataion of the rating criteria and of the abbreviations used in describing the limitations is given at the end of the table.)

Map symbol and soil name	Pct.	Potential as a source of reclamation material		Potential as a source of roadfill	
		Rating class and limiting features	Value	Rating class and limiting features	Value
101:					
Akers	60	Poor		Poor	
		OM <.5%	0.00	LEP >9	0.00
		SAR from 4 to 13	0.78		
		K factor <.10	0.99		
Akers, saline-sodic	25	Poor		Poor	
		SAR >13	0.00	LEP >9	0.00
		OM <.5%	0.00		
		K factor <.10	0.99		
102:					
Armona	85	Poor		Poor	
		OM <.5%	0.00	AASHTO GI >8	0.00
		SAR >13	0.00	LEP 3 to 9	0.24
		EC >16 mmhos/cm	0.00		
		AWC 3-6" to 60" depth	0.59		
		K factor .10-.35	0.90		
103:					
Atesh	65	Poor		Poor	
		OM <.5%	0.00	LEP >9	0.00
		AWC 3-6" to 60" depth	0.79	Depth to pan 40-60"	0.54
		SAR from 4 to 13	0.97		
Jerryslu	20	Poor		Poor	
		AWC <3" to 60" depth	0.00	Depth to pan <40"	0.00
		Maximum pH >8.5	0.00	LEP 3 to 9	0.25
		SAR >13	0.00		
		OM <.5%	0.00		
		K factor .10-.35	0.90		
		EC 8 to 16 mmhos/cm	0.97		
104:					
Biggriz	55	Poor		Fair	
		Maximum pH >8.5	0.00	LEP 3 to 9	0.21
		OM of .5 to 1%	0.18	AASHTO GI 5 to 8	0.22
		SAR from 4 to 13	0.78		
		K factor <.10	0.99		
Biggriz, saline-sodic	30	Poor		Fair	
		Maximum pH >8.5	0.00	LEP 3 to 9	0.21
		SAR >13	0.00	AASHTO GI 5 to 8	0.22
		OM of .5 to 1%	0.18		
		K factor <.10	0.99		
105:					
Calgro	60	Poor		Poor	
		OM <.5%	0.00	Depth to pan <40"	0.00
		AWC 3-6" to 60" depth	0.09	LEP >9	0.00
		SAR from 4 to 13	0.78		

Table 17.--Construction Materials (Part 2)--Continued

Map symbol and soil name	Pct.	Potential as a source of reclamation material		Potential as a source of roadfill	
		Rating class and limiting features	Value	Rating class and limiting features	Value
105:					
Calgro, saline-sodic	25	Poor		Poor	
		SAR >13	0.00	Depth to pan <40"	0.00
		OM <.5%	0.00	LEP >9	0.00
		Maximum pH >8.5	0.00		
		AWC 3-6" to 60" depth	0.00		
		EC 8 to 16 mmhos/cm	0.88		
106:					
Centerville, 0-2% slopes	90	Poor		Poor	
		SAR >13	0.00	AASHTO GI >8	0.00
		Clay content >40%	0.00	LEP 3 to 9	0.68
		OM of .5 to 1%	0.50		
107:					
Centerville, 2-5% slopes	90	Poor		Poor	
		SAR >13	0.00	AASHTO GI >8	0.00
		Clay content >40%	0.00	LEP 3 to 9	0.68
		OM of .5 to 1%	0.50		
108:					
Colpien	85	Fair		Fair	
		SAR from 4 to 13	0.78	LEP 3 to 9	0.25
		K factor <.10	0.99		
109:					
Crosscreek	70	Poor		Fair	
		OM <.5%	0.00	LEP 3 to 9	0.25
		SAR from 4 to 13	0.78	Depth to pan 40-60"	0.58
Kai	15	Poor		Poor	
		OM <.5%	0.00	Depth to pan <40"	0.00
		Maximum pH >8.5	0.00	LEP 3 to 9	0.25
		AWC <3" to 60" depth	0.00		
		SAR >13	0.00		
		EC <8 mmhos/cm	0.99		
		K factor <.10	0.99		
110:					
Delhi	95	Poor		Poor	
		OM <.5%	0.00	LEP >9	0.00
		WEG = 1 or 2	0.00		
		AWC 3-6" to 60" depth	0.99		
111:					
Delvar	85	Fair		Fair	
		Clay content 27-40%	0.76	LEP 3 to 9	0.56
		SAR from 4 to 13	0.78		
112:					
Dumps	100	Not rated		Not rated	
113:					
Excelsior	85	Poor		Poor	
		OM <.5%	0.00	LEP >9	0.00
		SAR >13	0.00		
		Maximum pH >8.5	0.00		
		K factor .10-.35	0.90		
		EC 8 to 16 mmhos/cm	0.97		

Table 17.--Construction Materials (Part 2)--Continued

Map symbol and soil name	Pct.	Potential as a source of reclamation material		Potential as a source of roadfill	
		Rating class and limiting features	Value	Rating class and limiting features	Value
114:					
Exeter, 0-2% slopes	85	Poor		Poor	
		OM <.5%	0.00	Depth to pan <40"	0.00
		AWC 3-6" to 60" depth	0.47	LEP 3 to 9	0.16
115:					
Exeter, 2-5% slopes	85	Poor		Poor	
		OM <.5%	0.00	Depth to pan <40"	0.00
		AWC 3-6" to 60" depth	0.47	LEP 3 to 9	0.16
116:					
Flamen	85	Fair		Fair	
		SAR from 4 to 13	0.78	LEP 3 to 9	0.03
				Depth to pan 40-60"	0.58
117:					
Gambogy	85	Fair		Poor	
		SAR from 4 to 13	0.78	LEP >9	0.00
118:					
Gambogy	50	Fair		Poor	
		SAR from 4 to 13	0.78	LEP >9	0.00
Biggriz	35	Poor		Fair	
		Maximum pH >8.5	0.00	LEP 3 to 9	0.21
		SAR >13	0.00	AASHTO GI 5 to 8	0.22
		OM of .5 to 1%	0.18		
		K factor <.10	0.99		
119:					
Gareck	70	Poor		Poor	
		OM <.5%	0.00	LEP >9	0.00
		Maximum pH >8.5	0.00		
		SAR < 4	1.00		
Garces	15	Poor		Fair	
		OM <.5%	0.00	LEP 3 to 9	0.25
		Maximum pH >8.5	0.00		
		AWC <3" to 60" depth	0.00		
		SAR >13	0.00		
		EC 8 to 16 mmhos/cm	0.50		
		K factor .10-.35	0.68		
120:					
Gepford	85	Poor		Poor	
		Clay content >40%	0.00	AASHTO GI >8	0.00
		SAR >13	0.00	LEP 3 to 9	0.66
		EC 8 to 16 mmhos/cm	0.88		
121:					
Gepford, partially drained, sandy substratum	85	Poor		Poor	
		SAR >13	0.00	AASHTO GI >8	0.00
		Clay content >40%	0.00	LEP 3 to 9	0.75
		EC 8 to 16 mmhos/cm	0.88		
		AWC 3-6" to 60" depth	0.97		
122:					
Grangeville	90	Good		Poor	
				LEP >9	0.00

Table 17.--Construction Materials (Part 2)--Continued

Map symbol and soil name	Pct.	Potential as a source of reclamation material		Potential as a source of roadfill	
		Rating class and limiting features	Value	Rating class and limiting features	Value
123:					
Grangeville, saline-sodic	90	Poor		Poor	
		Maximum pH >8.5	0.00	LEP >9	0.00
		SAR >13	0.00		
		OM <.5%	0.00		
124:					
Hanford	85	Poor		Poor	
		OM <.5%	0.00	LEP >9	0.00
		SAR <4	1.00		
125:					
Houser fine sandy loam	85	Poor		Fair	
		AWC <3" to 60" depth	0.00	LEP 3 to 9	0.75
		Maximum pH >8.5	0.00		
		SAR >13	0.00		
		EC >16 mmhos/cm	0.00		
		OM of .5 to 1%	0.50		
		K factor <.10	0.99		
126:					
Houser silty clay	85	Poor		Poor	
		SAR >13	0.00	AASHTO GI >8	0.00
		Maximum pH >8.5	0.00	LEP 3 to 9	0.75
		Clay content >40%	0.00		
		EC >16 mmhos/cm	0.00		
		OM <.5%	0.00		
		AWC 3-6" to 60" depth	0.71		
		K factor <.10	0.99		
127:					
Kimberlina	85	Poor		Poor	
		OM <.5%	0.00	LEP >9	0.00
		SAR >13	0.00		
		AWC 3-6" to 60" depth	0.17		
128:					
Lethent	85	Poor		Fair	
		OM <.5%	0.00	LEP 3 to 9	0.75
		Maximum pH >8.5	0.00		
		AWC <3" to 60" depth	0.00		
		SAR >13	0.00		
		EC 8 to 16 mmhos/cm	0.01		
		K factor .10-.35	0.68		
129:					
Nahrub	85	Poor		Fair	
		Maximum pH >8.5	0.00	LEP 3 to 9	0.75
		EC >16 mmhos/cm	0.00		
		OM <.5%	0.00		
		AWC <3" to 60" depth	0.00		
		SAR >13	0.00		
		K factor .10-.35	0.90		
130:					
Nord	85	Fair		Poor	
		SAR from 4 to 13	0.90	LEP >9	0.00
		K factor <.10	0.99		
131:					
Pits	100	Not rated		Not rated	

Table 17.--Construction Materials (Part 2)--Continued

Map symbol and soil name	Pct.	Potential as a source of reclamation material		Potential as a source of roadfill	
		Rating class and limiting features	Value	Rating class and limiting features	Value
132:					
Quonal	70	Poor		Poor	
		Maximum pH >8.5	0.00	AASHTO GI >8	0.00
		Clay content >40%	0.00	Depth to pan 40-60"	0.58
		SAR >13	0.00	LEP 3 to 9	0.58
		OM of .5 to 1%	0.50		
Lewis	15	Poor		Poor	
		AWC <3" to 60" depth	0.00	Depth to pan <40"	0.00
		Maximum pH >8.5	0.00	LEP 3 to 9	0.75
		SAR >13	0.00		
		EC >16 mmhos/cm	0.00		
		OM of .5 to 1%	0.50		
		K factor .10-.35	0.90		
133:					
Remnoy	85	Poor		Poor	
		OM <.5%	0.00	Depth to pan <40"	0.00
		Maximum pH >8.5	0.00	LEP 3 to 9	0.25
		AWC <3" to 60" depth	0.00		
		SAR >13	0.00		
		EC 8 to 16 mmhos/cm	0.50		
		K factor .10-.35	0.90		
134:					
Riverwash	100	Not rated		Not rated	
135:					
San Joaquin	85	Poor		Poor	
		OM <.5%	0.00	AASHTO GI >8	0.00
		Clay content >40%	0.00	Depth to pan <40"	0.00
		AWC 3-6" to 60" depth	0.00	LEP 3 to 9	0.43
		K factor <.10	0.99		
136:					
Seville	85	Poor		Poor	
		Clay content >40%	0.00	AASHTO GI >8	0.00
		AWC 3-6" to 60" depth	0.50	Depth to pan <40"	0.00
				LEP 3 to 9	0.68
137:					
Tagus	85	Poor		Poor	
		OM <.5%	0.00	LEP >9	0.00
		SAR from 4 to 13	0.90		
		K factor <.10	0.99		
138:					
Tujunga	85	Poor		Poor	
		WEG = 1 or 2	0.00	LEP >9	0.00
		OM <.5%	0.00		
		AWC 3-6" to 60" depth	0.11		
		Sand fraction 75 to 85%	0.88		
139:					
Wasco	85	Poor		Poor	
		OM <.5%	0.00	LEP >9	0.00
		AWC 3-6" to 60" depth	0.80		

Table 17.--Construction Materials (Part 2)--Continued

Map symbol and soil name	Pct.	Potential as a source of reclamation material		Potential as a source of roadfill	
		Rating class and limiting features	Value	Rating class and limiting features	Value
140:					
Westcamp	85	Poor		Poor	
		OM <.5%	0.00	AASHTO GI >8	0.00
		SAR >13	0.00	LEP 3 to 9	0.28
		Maximum pH >8.5	0.00		
		K factor .10-.35	0.68		
		EC 8 to 16 mmhos/cm	0.88		
141:					
Posochanet	85	Poor		Poor	
		Maximum pH >8.5	0.00	AASHTO GI >8	0.00
		SAR >13	0.00	LEP 3 to 9	0.51
		EC >16 mmhos/cm	0.00		
		OM <.5%	0.00		
		K factor .10-.35	0.90		
142:					
Wutchumna, 15-50% slopes	55	Fair		Poor	
		Clay content 27-40%	0.32	Slopes >25%	0.00
		AWC 3-6" to 60" depth	0.35	Depth to bedrock <40"	0.00
				AASHTO GI >8	0.00
				LEP 3 to 9	0.55
Wutchumna, 5-15% slopes	15	Fair		Poor	
		Clay content 27-40%	0.32	Depth to bedrock <40"	0.00
		AWC 3-6" to 60" depth	0.35	AASHTO GI >8	0.00
				LEP 3 to 9	0.55
Rock outcrop	15	Not rated		Not rated	
143:					
Yettem	85	Poor		Poor	
		OM <.5%	0.00	LEP >9	0.00
144:					
Youd	85	Poor		Poor	
		EC >16 mmhos/cm	0.00	Depth to pan <40"	0.00
		AWC <3" to 60" depth	0.00	LEP >9	0.00
		SAR >13	0.00		
		OM <.5%	0.00		
		K factor .10-.35	0.90		
145:					
Water, perennial	---	Not rated		Not rated	

The interpretation for *reclamation material* evaluates the following soil properties at varying depths in the soil: the content of sand, clay, and rock fragments; the Wind Erodibility Group (WEG); the available water capacity (AWC); soil pH; salinity (EC); amount of sodium (SAR); carbonates; and susceptibility of the soil to erosion by water (K factor).

The interpretation for *roadfill* evaluates the following soil properties at varying depths in the soil: shrink-swell potential expressed as linear extensibility percent (LEP), depth to bedrock or a cemented pan, wetness, slope, soil strength expressed as AASHTO Group Index Number (AASHTO GIN), and content of rock fragments.

Table 18.--Water Management

(The information in this table is based on Pacific Southwest MLRA Office interpretations. It indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the potential limitation. The rating is based on the imitation with the highest value. Only the three highest value limitations are listed. There may be more limitations. Fine-earth fractions and rock fragments are reported on a weight basis. An explanataion of the rating criteria and of the abbreviations used in describing the limitations is given at the end of the table.)

Map symbol and soil name	Pct.	Embankments, dikes, and levees		Pond reservoir areas	
		Limitation	Value	Limitation	Value
101:					
Akers	60	Severe		Moderate	
		Very high piping potential	1.00	Permeability .6-2"/hr (some seepage)	0.53
Akers, saline-sodic	25	Severe		Slight	
		Very high piping potential	1.00		
102:					
Armona	85	Severe		Moderate	
		Very high piping potential	1.00	Permeability .6-2"/hr (some seepage)	0.28
		EC >16 mmhos/cm	1.00		
		Shrink-swell (LEP 3-6)	0.50		
103:					
Atesh	65	Moderate		Severe	
		Thin layer	0.11	Permeability >2"/hr (seepage)	1.00
		Low piping potential	0.02	Depth to pan 20 to 60"	0.11
Jerryslu	20	Severe		Severe	
		Thin layer	1.00	Permeability >2"/hr (seepage)	1.00
		Very high piping potential	1.00	Depth to pan 20 to 60"	0.86
		EC 8-16 mmhos/cm	0.03		
104:					
Biggriz	55	Severe		Slight	
		Very high piping potential	1.00		
		Shrink-swell (LEP 3-6)	0.50		
Biggriz, saline-sodic	30	Severe		Slight	
		Very high piping potential	1.00		
		Shrink-swell (LEP 3-6)	0.50		
105:					
Calgro	60	Moderate		Severe	
		Thin layer	0.85	Permeability >2"/hr (seepage)	1.00
		High piping potential	0.22	Depth to pan 20 to 60"	0.85
Calgro, saline-sodic	25	Severe		Severe	
		Very high piping potential	1.00	Permeability >2"/hr (seepage)	1.00
		Thin layer	0.85	Depth to pan 20 to 60"	0.85
		EC 8-16 mmhos/cm	0.12		
106:					
Centerville, 0-2% slopes	90	Severe		Slight	
		Shrink-swell (LEP >6)	1.00		
		Thin layer	0.03		
107:					
Centerville, 2-5% slopes	90	Severe		Moderate	
		Shrink-swell (LEP >6)	1.00	Slopes of 2 to 7%	0.08
		Thin layer	0.03		

Table 18.--Water Management--Continued

Map symbol and soil name	Pct.	Embankments, dikes, and levees		Pond reservoir areas	
		Limitation	Value	Limitation	Value
108:					
Colpien	85	Severe		Slight	
		Very high piping potential	1.00		
		Shrink-swell (LEP 3-6)	0.50		
109:					
Crosscreek	70	Moderate		Moderate	
		Shrink-swell (LEP 3-6)	0.50	Permeability .6-2"/hr (some seepage)	0.28
		High piping potential	0.22		
		Thin layer	0.11	Depth to pan 20 to 60"	0.10
Kai	15	Severe		Severe	
		Thin layer	1.00	Permeability >2"/hr (seepage)	1.00
		Very high piping potential	1.00	Depth to pan 20 to 60"	0.85
		Shrink-swell (LEP 3-6)	0.50		
110:					
Delhi	95	Moderate		Severe	
		Possible seepage problem	0.50	Permeability >2"/hr (seepage)	1.00
111:					
Delvar	85	Severe		Moderate	
		Very high piping potential	1.00	Slopes of 2 to 7%	0.66
		Shrink-swell (LEP 3-6)	0.50	Permeability .6-2"/hr (some seepage)	0.28
112:					
Dumps	100	Not rated		Not rated	
113:					
Excelsior	85	Severe		Moderate	
		Very high piping potential	1.00	Permeability .6-2"/hr (some seepage)	0.53
		EC 8-16 mmhos/cm	0.03		
114:					
Exeter, 0-2% slopes	85	Moderate		Severe	
		Thin layer	0.85	Permeability >2"/hr (seepage)	1.00
		Shrink-swell (LEP 3-6)	0.50	Depth to pan 20 to 60"	0.85
115:					
Exeter, 2-5% slopes	85	Moderate		Severe	
		Thin layer	0.85	Permeability >2"/hr (seepage)	1.00
		Shrink-swell (LEP 3-6)	0.50	Depth to pan 20 to 60"	0.85
				Slopes of 2 to 7%	0.08
116:					
Flamen	85	Moderate		Moderate	
		Shrink-swell (LEP 3-6)	0.50	Permeability .6-2"/hr (some seepage)	0.53
		High piping potential	0.22		
		Thin layer	0.11	Depth to pan 20 to 60"	0.10
117:					
Gambogy	85	Severe		Severe	
		Very high piping potential	1.00	Permeability >2"/hr (seepage)	1.00
118:					
Gambogy	50	Severe		Severe	
		Very high piping potential	1.00	Permeability >2"/hr (seepage)	1.00

Table 18.--Water Management--Continued

Map symbol and soil name	Pct.	Embankments, dikes, and levees		Pond reservoir areas	
		Limitation	Value	Limitation	Value
118:					
Biggriz	35	Severe		Slight	
		Very high piping potential	1.00		
		Shrink-swell (LEP 3-6)	0.50		
119:					
Gareck	70	Severe		Severe	
		High piping potential	1.00	Permeability >2"/hr (seepage)	1.00
		Shrink-swell (LEP 3-6)	0.50		
Garces	15	Severe		Slight	
		Thin layer	1.00		
		Very high piping potential	1.00		
		EC 8-16 mmhos/cm	0.50		
120:					
Gepford	85	Severe		Slight	
		Shrink-swell (LEP >6)	1.00		
		Very high piping potential	1.00		
		Wetness between 2 and 4'	0.24		
121:					
Gepford, partially drained, sandy substratum	85	Severe		Severe	
		Shrink-swell (LEP >6)	1.00	Permeability >2"/hr (seepage)	1.00
		Wetness between 2 and 4'	0.24		
		Thin layer	0.22		
122:					
Grangeville	90	Slight		Severe	
				Permeability >2"/hr (seepage)	1.00
123:					
Grangeville, saline-sodic	90	Severe		Severe	
		Very high piping potential	1.00	Permeability >2"/hr (seepage)	1.00
124:					
Hanford	85	Moderate		Severe	
		Possible seepage problem	0.50	Permeability >2"/hr (seepage)	1.00
125:					
Houser fine sandy loam	85	Severe		Slight	
		Thin layer	1.00		
		EC >16 mmhos/cm	1.00		
126:					
Houser silty clay	85	Severe		Slight	
		Shrink-swell (LEP >6)	1.00		
		EC >16 mmhos/cm	1.00		
127:					
Kimberlina	85	Severe		Slight	
		Very high piping potential	1.00		
128:					
Lethent	85	Severe		Slight	
		Thin layer	1.00		
		EC >16 mmhos/cm	0.99		
		Shrink-swell (LEP 3-6)	0.50		

Table 18.--Water Management--Continued

Map symbol and soil name	Pct.	Embankments, dikes, and levees		Pond reservoir areas	
		Limitation	Value	Limitation	Value
129:					
Nahrub	85	Severe		Slight	
		Shrink-swell (LEP >6)	1.00		
		Thin layer	1.00		
		EC >16 mmhos/cm	1.00		
130:					
Nord	85	Slight		Severe	
		Low piping potential	0.10	Permeability >2"/hr (seepage)	1.00
131:					
Pits	100	Not rated		Not rated	
132:					
Quonal	70	Severe		Severe	
		Very high piping potential	1.00	Permeability >2"/hr (seepage)	1.00
		Shrink-swell (LEP >6)	1.00	Depth to pan 20 to 60"	0.10
		Thin layer	0.11		
Lewis	15	Severe		Moderate	
		Thin layer	1.00	Depth to pan 20 to 60"	0.85
		EC >16 mmhos/cm	1.00		
		Shrink-swell (LEP 3-6)	0.50		
133:					
Ramnoy	85	Severe		Severe	
		Thin layer	1.00	Depth to pan <20"	1.00
		Very high piping potential	1.00		
		EC 8-16 mmhos/cm	0.50		
134:					
Riverwash	100	Not rated		Not rated	
135:					
San Joaquin	85	Severe		Moderate	
		Shrink-swell (LEP >6)	1.00	Depth to pan 20 to 60"	0.85
		Thin layer	0.85		
136:					
Seville	85	Severe		Severe	
		Shrink-swell (LEP >6)	1.00	Permeability >2"/hr (seepage)	1.00
		Thin layer	0.85	Depth to pan 20 to 60"	0.85
137:					
Tagus	85	Slight		Severe	
		Low piping potential	0.10	Permeability >2"/hr (seepage)	1.00
138:					
Tujunga	85	Severe		Severe	
		Seepage problem	1.00	Permeability >2"/hr (seepage)	1.00
139:					
Wasco	85	Slight		Severe	
				Permeability >2"/hr (seepage)	1.00
140:					
Westcamp	85	Severe		Slight	
		Shrink-swell (LEP >6)	1.00		
		Very high piping potential	1.00		
		EC 8-16 mmhos/cm	0.12		

Table 18--Water Management--Continued

Map symbol and soil name	Pct.	Embankments, dikes, and levees		Pond reservoir areas	
		Limitation	Value	Limitation	Value
141:					
Posochanet	85	Severe		Slight	
		Very high piping potential	1.00		
		Shrink-swell (LEP >6)	1.00		
		EC >16 mmhos/cm	1.00		
142:					
Wutchumna, 15-50% slopes	55	Severe		Severe	
		Shrink-swell (LEP >6)	1.00	Slopes > 7%	1.00
		Thin layer	0.85	Depth to bedrock from 20-60"	0.85
Wutchumna, 5-15% slopes	15	Severe		Severe	
		Shrink-swell (LEP >6)	1.00	Slopes >7%	1.00
		Thin layer	0.85	Depth to bedrock from 20-60"	0.85
Rock outcrop	15	Not rated		Not rated	
143:					
Yettem	85	Slight		Severe	
				Permeability >2"/hr (seepage)	1.00
144:					
Youd	85	Severe		Severe	
		Very high piping potential	1.00	Depth to pan < 20"	1.00
		Thin layer	1.00	Permeability .6-2"/hr (some seepage)	0.32
		EC >16 mmhos/cm	1.00		
145:					
Water, perennial	---	Not rated		Not rated	

The interpretation for embankments, *dikes, and levees* evaluates the following soil properties at varying depths in the soil: ponding; wetness; depth to a restrictive layer; content of rock fragments more than 3 inches in size; salinity (EC); Unified classes for a high content of organic matter (PT, OL, and OH); Unified classes for soils that are hard to pack (MH and CH); permeability that is too high, allowing seepage; piping as determined by Atterberg limits of liquid limit (LL) and plasticity index (PI); sodium content (SAR); and gypsum content.

The interpretation for *pond reservoir areas* evaluates the following soil properties at varing depths in the soil: slope, depth to hard or soft bedrock, depth to a cemented pan, a marly texture, gypsum content, and permeability that is too high, allowing seepage.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey.

Soil properties are determined by field examination of the soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine physical and chemical soil characteristics. These results are reported in tables 24 and 25.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties are shown in tables. They include engineering index properties, physical and chemical properties, and pertinent soil and water features.

Engineering Index Properties

Table 19 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under the heading "Soil Series and Their Morphology".

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (ASTM, 2001) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 2000).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

Rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The

estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of particle-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical Properties

Table 20 shows estimates of some physical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Particle size is the effective diameter of a soil particle as measured by sedimentation, sieving, or micrometric methods. Particle sizes are expressed as classes with specific effective diameter class limits. The broad classes are sand, silt, and clay, ranging from the larger to the smaller.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In table 20, the estimated clay content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of sand, silt, and clay affects the physical behavior of a soil. Particle size is important for engineering and agronomic interpretations, for determination of soil hydrologic qualities, and for soil classification.

The amount and kind of clay affect the fertility and physical condition of the soil and the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3- or 1/10-bar (33kPa or 10kPa) moisture tension. Weight is determined after the soil is dried at 105 degrees C. In the table, the estimated moist bulk density of each soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. Depending on soil texture, a bulk density of more than 1.4 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Saturated hydraulic conductivity refers to the ability of a soil to transmit water or air. The term "permeability," as used in soil surveys, indicates saturated hydraulic conductivity (K_{sat}). The estimates in the table indicate the rate of water movement, in micrometers per second (um/sec), when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each soil layer. The capacity varies, depending on soil properties that affect retention of water. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Linear extensibility refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. It is an expression of the volume change between the water content of the clod at 1/3- or 1/10-bar tension (33kPa or 10kPa tension) and oven dryness. The volume change is reported in the table as percent change for the whole soil. Volume change is influenced by the amount and type of clay minerals in the soil.

Linear extensibility is used to determine the shrink-swell potential of soils. The shrink-swell potential is low if the soil has a linear extensibility of less than 3 percent; moderate if 3 to 6 percent; high if 6 to 9 percent; and very high if more than 9 percent. If the linear extensibility is more than 3, shrinking and swelling can cause damage to buildings, roads, and other structures and to plant roots. Special design commonly is needed.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 20, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained by returning crop residue to the soil. Organic matter has a positive effect on available water capacity, water infiltration, soil organism activity, and tilth. It is a source of nitrogen and other nutrients for crops and soil organisms.

Erosion factors are shown in table 20 as the K factor (Kw and Kf) and the T factor. Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and permeability. Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor Kw indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Erosion factor Kf indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their susceptibility to wind erosion in cultivated areas. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible. The groups are as follows:

1. Coarse sands, sands, fine sands, and very fine sands.
2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, ash material, and sapric soil material.
3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams.

4L. Calcareous loams, silt loams, clay loams, and silty clay loams.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay.
5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material.
6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay.
7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material.
8. Soils that are not subject to wind erosion because of rock fragments on the surface or because of surface wetness.

Wind erodibility index is a numerical value indicating the susceptibility of soil to wind erosion, or the tons per acre per year that can be expected to be lost to wind erosion. There is a close correlation between wind erosion and the texture of the surface layer, the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and frozen soil layers also influence wind erosion.

Chemical Properties

Table 21 shows estimates of some chemical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table and table 20, the estimated clay content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay affect the fertility and physical condition of the soil and the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Cation-exchange capacity is the total amount of extractable bases that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. Soils having a low cation-exchange capacity hold fewer cations and may require more frequent applications of fertilizer than soils having a high cation-exchange capacity. The ability to retain cations reduces the hazard of ground-water pollution.

Soil reaction is a measure of acidity or alkalinity. The pH of each soil horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in

selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Calcium carbonate equivalent is the percent of carbonates, by weight, in the fraction of the soil less than 2 millimeters in size. The availability of plant nutrients is influenced by the amount of carbonates in the soil. Incorporating nitrogen fertilizer into calcareous soils helps to prevent nitrite accumulation and ammonium-N volatilization.

Gypsum is expressed as a percent, by weight, of hydrated calcium sulfates in the fraction of the soil less than 20 millimeters in size. Gypsum is partially soluble in water. Soils that have a high content of gypsum may collapse if the gypsum is removed by percolating water.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Sodium adsorption ratio (SAR) is a measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration. Soils that have SAR values of 13 or more may be characterized by an increased dispersion of organic matter and clay particles, reduced permeability and aeration, and a general degradation of soil structure.

Water Features

Table 22 gives estimates of various water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

The *months* in the table indicate the portion of the year in which the feature is most likely to be a concern.

Water table refers to a saturated zone in the soil. Table 22 indicates, by month, depth to the top (*upper limit*) and base (*lower limit*) of the saturated zone in most years. Estimates of the upper and lower limits are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors or mottles (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

Ponding is standing water in a closed depression. Unless a drainage system is installed, the water is removed only by percolation, transpiration, or evaporation. Table 22 indicates *surface water depth* and the *duration* and *frequency* of ponding. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. Frequency is expressed as none, rare, occasional, and frequent. *None* means that ponding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of ponding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs, on the average, once or less in 2 years (the chance of ponding is 5 to 50 percent in any year); and *frequent* that it occurs, on the average, more than once in 2 years (the chance of ponding is more than 50 percent in any year).

Flooding is the temporary inundation of an area caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short

periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

Duration and *frequency* are estimated. Duration is expressed as *extremely brief* if 0.1 hour to 4 hours, *very brief* if 4 hours to 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. Frequency is expressed as none, very rare, rare, occasional, frequent, and very frequent. *None* means that flooding is not probable; *very rare* that it is very unlikely but possible under extremely unusual weather conditions (the chance of flooding is less than 1 percent in any year); *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is 1 to 5 percent in any year); *occasional* that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); *frequent* that it is likely to occur often under normal weather conditions (the chance of flooding is more than 50 percent in any year but is less than 50 percent in all months in any year); and *very frequent* that it is likely to occur very often under normal weather conditions (the chance of flooding is more than 50 percent in all months of any year).

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered is local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

Soil Features

Table 23 gives estimates of various soil features. The estimates are used in land use planning that involves engineering considerations.

A *restrictive layer* is a nearly continuous layer that has one or more physical, chemical, or thermal properties that significantly impede the movement of water and air through the soil or that restrict roots or otherwise provide an unfavorable root environment. Examples are bedrock, cemented layers, dense layers, and frozen layers. The table indicates the hardness and thickness of the restrictive layer, both of which significantly affect the ease of excavation. *Depth to top* is the vertical distance from the soil surface to the upper boundary of the restrictive layer.

Potential for frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel or concrete in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the steel or concrete in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate,* or *high,* is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion also is expressed as *low, moderate,* or *high.* It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Physical and Chemical Analyses of Selected Soils

The results of chemical and physical analyses of the Atesh and the Jerryslu soils are shown in tables 24 and 25. A typical pedon of the Atesh and Jerryslu soils is described in the section "Soil Series and Their Morphology." The pedon of the Atesh soils is the typical pedon for the official series description.

Figure 12 is representative of the "native" Jerryslu soils. Figure 13 is a thin section of the Btkqm2 horizon in these soils. It shows the illuvial clay deposited along channel walls.

Figure 12.—A typical profile of the Jerryslu soils.

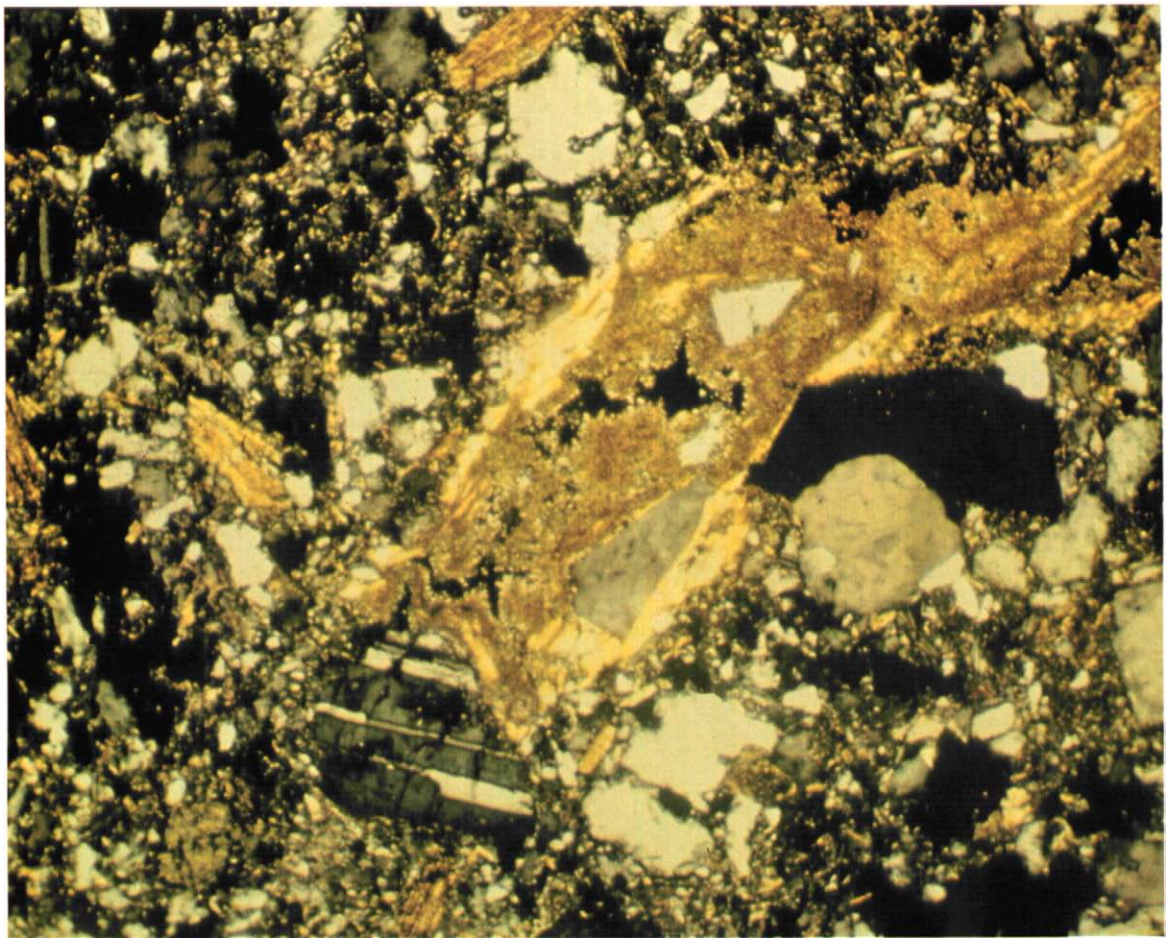

Figure 13.—Thin section photomicrograph of the Btkqm2 horizon (42-50 inches) of the Jerryslu pedon under cross-polarized light. Oriented, illuvial clay was initially deposited along channel walls, followed by nearly complete infilling with silica and calcium carbonate.

The Jerryslu pedon has a very high amount of exchangeable sodium, a large amount of organic matter in the surface layer because of dispersion by sodium, strong columnar structure because of high amounts of sodium, a high soil reaction, and a high electrical conductivity.

The Atesh soils formed in the mechanically and chemically altered remnants of the Jerryslu soils. Compared to the Jerryslu pedon, the Atesh pedon has a much lower amount of exchangeable sodium, has less organic matter in the surface layer but a more uniform distribution of the organic matter because of mixing, and has moderate subangular blocky structure, a lower soil reaction, and a lower electrical conductivity.

Soil samples were analyzed by the Soil Survey Laboratory, National Soil Survey Center, Natural Resources Conservation Service, Lincoln, Nebraska. Most determinations were made on soil material smaller than 2 millimeters in diameter. Measurements reported as percent or quantity of unit weight were calculated on an ovendry basis. The methods used in obtaining the data are indicated in the list that follows. The codes in parentheses refer to published methods (USDA, 1996).

Clay—(fraction less than 0.002 mm) pipette extraction, weight percentages of material less than 2 mm (3A1).

Silt—(0.002-0.05 mm fraction) pipette extraction, weight percentages of all material less than 2 mm (3A1).

Sand—(0.05-2.0 mm fraction) weight percentages of material less than 2 mm (3A1).

Carbonate clay—(fraction less than 0.002 mm) pipette extraction, weight percentages of material less than 2 mm (3A1d).

Coarse materials—(2-75 mm fraction) weight estimates of the percentages of all material less than 75 mm (3B1).

Coarse materials—(2-250 mm fraction) volume estimates of the percentages of all material greater than 2 mm (3B2).
Organic carbon (OC)—wet combustion. Walkley-Black modified acid-dichromate, ferric sulfate titration (6A1c).
Total nitrogen—Kjeldahl, ammonia steam distillation titrator (6B3a).
Extractable phosphorus—Bray P-1 (6S3).
Total sulfur—LECO SC-132 Sulfur Analyzer (6R3b).
Sesquioxides—dithionate-citrate extract, atomic absorption, Perkin-Elmer AA 5000; iron (6C2b), aluminum (6G7a), manganese (6D2a).
Ratios and estimates to total clay—cation-exchange capacity, 15-bar water (8D1).
Moist bulk density (Db)—of less than 2 mm material, compliant cavity (4A5).
Bulk density (Db)—of less than 2 mm material, 1/3 bar (4A1d), ovendry (4A1h).
Linear extensibility (LEP)—change in clod dimension based on whole soil (4D1).
Water retained—pressure extraction, percentage of ovendry weight of less than 2 mm material; 1/3 or 1/10 bar, natural clod (4B1c), 15 bars, air dry (4B2a).
Water-retention difference (WRD)—between 1/3 bar and 15 bars for whole soil (4C1).
Extractable cations—ammonium acetate pH 7.0, atomic absorption, Perkin-Elmer AA 5000; calcium (6N2e), magnesium (6O2d), sodium (6P2b), potassium (6Q2b).
Cation-exchange capacity (CEC)—sum of cations (5A3a).
Cation-exchange capacity (CEC)—ammonium acetate, pH 7.0, steam distillation (5A8b).
Ion exchange analyses—NH4OAc, pH 7.0, sodium (5D2).
Sodium adsorption ratio (SAR)—(5E).
Base saturation—sum of cations, TEA, pH 8.2 (5C3).
Base saturation—ammonium acetate, pH 7.0 (5C1).
Carbonate as calcium carbonate—(fraction less than 2 mm [80 mesh]) manometric (6E1g).
Carbonate as calcium carbonate—(fraction less than 20 mm) manometric (6E4).
Gypsum—precipitation in acetone (fraction less than 2 mm) (6F1a).
Gypsum—precipitation in acetone (fraction less than 20 mm) (6F4).
Reaction (pH)—saturated paste (8C1b).
Reaction (pH)—calcium chloride (8C1f).
Reaction (pH)—1:1 water dilution (8C1f).
Soluble ions—saturated paste, atomic absorption, Perkins-Elmer AA 5000; calcium (6N1b), magnesium (6O1b), sodium (6P1b) and potassium (6Q1b).
Soluble ions—acid titration, saturated paste; carbonate (6I1b), bicarbonate (6J1b).
Soluble ions—anion chromatograph, saturated paste; fluoride (6U1a); chloride (6K1c), sulfate (6L1c); nitrite (6W1a), nitrate (6M1c).
Saturation percentage—percentage of water to reach saturation (8A).
Estimated total salts—estimated from electrical conductivity of saturated paste (8D5).
Electrical conductivity (EC)—saturation extract (8A3a).
Predict—salt prediction test (8I).

Table 19.--Engineering Index Properties

(Absence of an entry indicates that the data were not estimated.)

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
101:												
Akers	0-16	Fine sandy loam	ML, SM	A-4	0	0	100	100	70-85	40-55	20-30	NP-5
	16-60	Fine sandy loam, silt loam, loam	CL, CL-ML, ML	A-4	0	0	100	95-100	75-90	50-70	20-30	NP-10
Akers, saline-sodic	0-15	Fine sandy loam	ML, SM	A-4	0	0	100	100	70-85	40-55	20-30	NP-5
	15-60	Fine sandy loam, silt loam, loam	CL, ML	A-4	0	0	100	95-100	75-90	50-70	20-30	NP-10
102:												
Armona	0-11	Sandy loam	SM	A-4	0	0	90-100	90-100	60-70	35-50	25-30	NP-5
	11-53	Stratified sandy loam to clay loam	CL	A-6, A-7	0	0	90-100	90-100	85-100	60-85	30-45	10-20
	53-60	Stratified sandy loam to silty clay	CL, SC	A-6	0	0	100	100	70-100	40-90	25-40	10-20
103:												
Atesh	0-14	Sandy loam	CL-ML, SC-SM	A-4	0	0	100	75-100	55-80	35-60	20-25	5-10
	14-36	Coarse sandy loam, sandy loam, loam	CL-ML, SC-SM	A-2, A-4	0	0	100	75-100	50-85	25-70	20-25	5-10
	36-43	Stratified loamy coarse sand to gravelly sandy loam	SC-SM, SM	A-1, A-2, A-4	0	0	100	50-100	30-75	20-50	15-25	NP-10
	43-49	Cemented	---	---	---	---	---	---	---	---	---	---
	49-92	Coarse sandy loam, sandy loam	SC-SM	A-2, A-4	0	0	100	85-100	50-75	20-50	15-20	5-10
	92-99	Stratified coarse sand to fine sand	SP	A-1, A-3, A-2	0	0	100	75-100	40-70	0-15	---	NP

Table 19.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
103:												
Jerryslu	0-1	Loam	CL, ML	A-4	0	0	100	100	80-95	60-85	25-35	5-10
	1-4	Very fine sandy loam, loam	CL-ML, ML	A-4	0	0	100	100	60-90	40-70	15-25	NP-10
	4-35	Clay loam, sandy clay loam, loam	CL, SC	A-6	0	0	100	100	80-95	40-80	30-40	10-20
	35-55	Indurated	---	---	---	---	---	---	---	---	---	---
	55-79	Stratified loamy sand to loam	SM	A-2	0	0	100	100	50-75	15-35	15-25	NP-5
104:												
Biggriz	0-14	Loam	CL, CL-ML	A-4, A-6	0	0	100	95-100	80-95	60-75	25-40	5-15
	14-50	Loam, clay loam	CL, CL-ML	A-5, A-6, A-4, A-7	0	0	100	95-100	80-95	60-80	25-45	5-20
	50-65	Sandy loam, sandy clay loam, loam	CL-ML, CL, SC, SC-SM	A-5, A-6, A-4, A-7	0	0	100	95-100	75-95	40-75	25-45	5-20
Biggriz, saline-sodic	0-14	Loam	CL, CL-ML	A-4, A-6	0	0	100	95-100	80-95	60-75	25-40	5-15
	14-50	Loam, clay loam	CL, CL-ML	A-4, A-6	0	0	100	95-100	80-95	60-80	25-40	5-20
	50-65	Sandy loam, sandy clay loam, loam	CL-ML, SC, CL, SC-SM	A-4, A-6	0	0	100	95-100	75-95	40-75	25-40	5-20
105:												
Calgro	0-7	Sandy loam	SC-SM	A-2, A-4	0	0	100	90-100	55-70	25-40	15-25	5-10
	7-25	Sandy loam, loam, fine sandy loam	SC-SM	A-2, A-4	0	0	100	90-100	55-80	25-50	15-25	5-10
	25-33	Indurated	---	---	---	---	---	---	---	---	---	---
	33-53	Gravelly loamy sand	SM	A-1	0	0	65-85	55-75	25-50	10-20	---	NP-5
	53-60	Indurated	---	---	---	---	---	---	---	---	---	---
Calgro, saline-sodic	0-8	Sandy loam	SC-SM	A-2, A-4	0	0	100	90-100	55-70	25-40	15-25	5-10
	8-24	Sandy loam, loam, fine sandy loam	SC-SM	A-2, A-4	0	0	100	90-100	55-80	25-50	15-25	5-10
	24-33	Indurated	---	---	---	---	---	---	---	---	---	---
	33-52	Gravelly loamy sand	SM	A-1	0	0	65-85	55-75	25-50	10-20	---	NP-5
	52-60	Indurated	---	---	---	---	---	---	---	---	---	---

Table 19.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
106:												
Centerville, 0-2% slopes-------	0-7	Clay	CH	A-7	0	0	100	100	90-100	75-95	50-65	25-40
	7-48	Sandy clay, clay, clay loam	CH, CL, SC	A-7	0	0	100	100	85-95	45-90	40-65	20-40
	48-60	Stratified gravelly sandy clay loam to gravelly clay	GC, SC	A-6, A-7	0	0	60-85	50-75	40-65	35-50	35-55	15-25
107:												
Centerville, 2-5% slopes-------	0-7	Clay	CH	A-7	0	0	100	100	90-100	75-95	50-65	25-40
	7-48	Sandy clay, clay, clay loam	CH, CL, SC	A-7	0	0	100	100	85-95	45-90	40-65	20-40
	48-60	Stratified gravelly sandy clay loam to gravelly clay	GC, SC	A-6, A-7	0	0	60-85	50-75	40-65	35-50	35-55	15-25
108:												
Colpien-------------------------	0-6	Loam	CL-ML, ML	A-4	0	0	100	100	70-90	60-80	25-35	5-10
	6-24	Loam, clay loam	CL-ML, ML	A-4	0	0	100	100	70-90	60-80	25-35	5-10
	24-60	Loam, clay loam	CL-ML, ML	A-4	0	0	100	100	70-90	60-80	25-35	5-10
	60-65	Sandy loam, loam, clay loam	ML, SM	A-4	0	0	100	100	50-90	40-70	20-35	NP-10
109:												
Crosscreek----------------------	0-11	Loam	CL-ML, ML	A-4	0	0	85-100	75-100	65-90	50-70	20-35	5-10
	11-17	Sandy loam, loam, gravelly loam	CL, CL-ML, SC-SM, SC	A-2, A-6, A-4	0	0	60-100	50-100	35-80	20-60	20-40	5-15
	17-55	Sandy loam, loam, sandy clay loam	CL-ML, SC, CL, SC-SM	A-4, A-6	0	0	85-100	75-100	50-80	35-60	20-40	5-15
	55-60	Cemented	---	---	---	---	---	---	---	---	---	---
Kai-----------------------------	0-6	Loam	CL-ML	A-4	0	0	100	100	60-90	55-85	20-30	5-10
	6-39	Loam, silt loam, clay loam	CL	A-6	0	0	100	100	65-100	60-90	25-35	10-20
	39-46	Cemented	---	---	---	---	---	---	---	---	---	---
	46-65	Stratified sandy loam to silt loam	CL, CL-ML, SC-SM, SC	A-4, A-6	0	0	100	100	60-100	35-80	20-35	5-15

Table 19.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
110:												
Delhi	0-11	Loamy sand	SM	A-2	0	0	100	100	50-80	15-35	---	NP
	11-48	Loamy sand, loamy fine sand	SM	A-2	0	0	100	100	50-80	15-35	---	NP
	48-72	Sand, loamy sand, fine sand	SM, SP-SM	A-2, A-1, A-3	0	0	100	100	40-80	5-35	---	NP
111:												
Delvar	0-12	Clay loam	CL	A-6, A-7	0	0	85-100	75-100	70-100	55-80	30-45	15-25
	12-19	Clay	CH, CL	A-7	0	0	85-100	75-100	70-100	60-90	45-60	20-30
	19-28	Clay	CH, CL	A-7	0	0	85-100	75-100	70-100	60-90	45-60	20-30
	28-42	Clay	CH, CL	A-7	0	0	85-100	75-100	70-100	60-90	45-60	20-30
	42-60	Sandy loam, sandy clay loam, clay loam	CL, SC-SM, CL-ML, SC	A-4, A-6	0	0	85-100	75-100	50-100	35-80	25-45	5-20
112:												
Dumps.												
113:												
Excelsior	0-8	Fine sandy loam	SM	A-4	0	0	100	100	70-85	35-50	25-30	NP-5
	8-36	Stratified loamy sand to sandy loam	SM	A-2, A-4	0	0	100	100	50-70	30-50	25-30	NP-5
	36-60	Stratified sandy loam to silt loam	ML, CL-ML, SC-SM, SM	A-4	0	0	100	100	60-90	35-70	20-30	NP-10
114:												
Exeter, 0-2% slopes	0-9	Loam	CL-ML, ML	A-4	0	0	95-100	85-100	70-95	50-60	15-30	NP-10
	9-26	Sandy clay loam, loam	CL, SC	A-6	0	0	95-100	85-100	70-90	35-65	25-40	10-20
	26-28	Clay loam, sandy clay loam	CL	A-6	0	0	95-100	85-100	75-90	65-80	35-40	15-20
	28-46	Indurated	---	---	---	---	---	---	---	---	---	---
	46-72	Stratified very gravelly loamy coarse sand to gravelly loam	GM, SM	A-1, A-2	0	0	45-85	35-75	25-50	15-35	15-25	NP-5

Table 19.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
115:												
Exeter, 2-5% slopes	0-9	Loam	CL-ML, ML	A-4	0	0	95-100	85-100	70-95	50-60	15-30	NP-10
	9-26	Sandy clay loam, loam	CL, SC	A-6	0	0	95-100	85-100	70-90	35-65	25-40	10-20
	26-28	Clay loam, sandy clay gravelly loam	CL	A-6	0	0	95-100	85-100	75-90	65-80	35-40	15-20
	28-46	Indurated	---	---	---	---	---	---	---	---	---	---
	46-72	Stratified very gravelly loamy coarse sand to loam	GM, SM	A-1, A-2	0	0	45-85	35-75	25-50	15-35	15-25	NP-5
116:												
Flamen	0-17	Loam	CL, ML, CL-ML	A-4	0	0	85-100	75-100	65-90	55-80	25-35	5-10
	17-28	Loam, sandy loam, clay loam	CL-ML, SC, CL, SC-SM	A-4, A-6	0	0	85-100	75-100	65-90	40-80	25-35	5-15
	28-43	Loam, sandy loam, clay loam	CL-ML, SC, CL, SC-SM	A-4, A-6	0	0	85-100	75-100	65-90	40-80	25-35	5-15
	43-72	Cemented	---	---	---	---	---	---	---	---	---	---
117:												
Gambogy	0-6	Loam	ML	A-4, A-6	0	0	95-100	90-100	75-90	55-75	30-40	5-15
	6-19	Stratified loam to clay loam	CL, ML	A-5, A-4, A-6, A-7	0	0	95-100	90-100	75-100	55-80	30-45	5-20
	19-47	Stratified sandy loam to clay loam	CL, ML, SM, SC	A-5, A-6, A-4, A-7	0	0	95-100	90-100	55-100	35-80	30-45	5-20
	47-72	Stratified sandy loam to loam	ML, SM	A-2, A-4	0	0	95-100	90-100	55-90	30-75	20-35	NP-10
118:												
Gambogy	0-6	Loam	ML	A-4, A-6	0	0	95-100	90-100	75-90	55-75	30-40	5-15
	6-19	Stratified loam to clay loam	CL, ML	A-5, A-4, A-6, A-7	0	0	95-100	90-100	75-100	55-80	30-45	5-20
	19-47	Stratified sandy loam to clay loam	ML, CL, SC, SM	A-4, A-7, A-5, A-6	0	0	95-100	90-100	55-100	35-80	30-45	5-20
	47-72	Stratified sandy loam to loam	ML, SM	A-2, A-4	0	0	95-100	90-100	55-90	30-75	20-35	NP-10

Table 19.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
118:												
Biggriz	0-14	Loam	CL, CL-ML	A-4, A-6	0	0	100	95-100	80-95	60-75	25-40	5-15
	14-50	Loam, clay loam	CL, CL-ML	A-4, A-6	0	0	100	95-100	80-95	60-80	25-40	5-20
	50-65	Sandy loam, sandy clay loam, loam	CL-ML, CL, SC, SC-SM	A-4, A-6	0	0	100	95-100	75-95	40-75	25-40	5-20
119:												
Gareck	0-6	Sandy loam	CL-ML, SC-SM	A-4	0	0	100	100	60-80	35-60	20-25	5-10
	6-28	Loam	CL-ML, ML	A-4	0	0	100	100	70-90	60-80	25-35	5-10
	28-47	Sandy clay loam, clay loam	CL, SC	A-6	0	0	100	100	40-90	35-80	25-40	10-20
	47-62	Stratified loamy sand to sandy clay loam	CL-ML, SC-SM	A-2, A-4	0	0	100	85-100	55-80	25-60	20-25	5-10
Garces	0-4	Loam	CL-ML	A-4	0	0	100	100	85-100	50-85	20-30	5-10
	4-14	Clay loam, silty clay loam	CL	A-6	0	0	100	100	85-100	65-85	30-40	10-20
	14-21	Sandy clay loam, loam	CL, SC	A-6	0	0	100	100	80-95	35-60	30-40	10-20
	21-29	Loam	CL, CL-ML	A-4, A-6	0	0	100	100	60-90	50-85	25-35	5-15
	29-62	Stratified sandy loam to clay loam	ML, SM	A-4	0	0	100	100	60-95	35-60	20-35	NP-10
120:												
Gepford	0-21	Silty clay	CH, CL	A-7	0	0	100	100	95-100	90-95	40-60	20-35
	21-50	Clay, silty clay	CH, CL	A-7	0	0	100	100	90-100	75-95	40-70	20-40
	50-72	Stratified loam to clay	CL	A-6, A-7	0	0	100	100	90-100	70-85	30-45	10-20
121:												
Gepford, partially drained, sandy substratum	0-23	Silty clay	CH, CL	A-7	0	0	100	100	95-100	90-95	40-60	20-35
	23-46	Clay, silty clay	CH, CL	A-7	0	0	100	100	90-100	75-95	40-70	20-40
	46-60	Fine sand, loamy fine sand	SM	A-2, A-4	0	0	100	100	65-90	20-40	---	NP

Table 19.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
122:												
Grangeville	0-16	Sandy loam	SM	A-4	0	0	100	95-100	60-85	35-50	20-30	NP-5
	16-27	Sandy loam, fine sandy loam, loam	ML, SM	A-4	0	0	100	95-100	60-95	35-60	20-35	NP-10
	27-67	Stratified loamy sand to silt loam	SM	A-2, A-4	0	0	100	95-100	60-95	25-50	15-25	NP-5
123:												
Grangeville, saline-sodic	0-5	Fine sandy loam	SM	A-4	0	0	100	95-100	60-85	35-50	20-30	NP-5
	5-80	Stratified loamy sand to silt loam	SM	A-2, A-4	0	0	100	95-100	60-95	25-50	15-25	NP-5
124:												
Hanford	0-6	Sandy loam	SM	A-4	0	0	95-100	90-100	50-75	35-50	20-30	NP-5
	6-30	Fine sandy loam, sandy loam, coarse sandy loam	SM	A-4	0	0	95-100	90-100	50-75	35-50	20-30	NP-5
	30-60	Loamy sand, coarse sandy loam, sandy loam	SM	A-1, A-2	0	0	85-100	75-100	40-60	15-35	---	NP
125:												
Houser fine sandy loam	0-7	Fine sandy loam	SM	A-4	0	0	100	100	70-85	35-50	20-30	NP-5
	7-60	Clay, silty clay	CH, CL	A-7	0	0	100	100	90-100	75-97	40-65	20-35
126:												
Houser silty clay	0-7	Silty clay	CH, CL	A-7	0	0	100	100	90-100	75-95	40-65	20-35
	7-60	Clay, silty clay	CH, CL	A-7	0	0	100	100	90-100	75-97	40-65	20-35
127:												
Kimberlina	0-4	Fine sandy loam	SM	A-2, A-4	0	0	80-100	75-100	40-70	25-50	20-30	NP-5
	4-58	Fine sandy loam, sandy loam	SM	A-2, A-4	0	0	80-100	75-100	40-70	25-50	20-30	NP-5
	58-72	Stratified loam to sandy clay loam	CL-ML, SC, CL, SC-SM	A-4, A-6	0	0	80-100	75-100	50-90	35-60	20-35	5-15

Table 19.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
128:												
Lethent	0-7	Silt loam	ML	A-4	0	0	100	100	90-100	70-85	30-40	5-10
	7-35	Silty clay loam, clay, silty clay	CH, CL	A-7	0	0	100	100	90-100	70-95	40-60	15-30
	35-65	Clay loam, silty clay loam	CL	A-6, A-7	0	0	100	100	90-100	70-80	30-45	10-20
129:												
Nahrub	0-9	Silt loam	ML	A-4	0	0	100	100	95-100	70-85	30-40	5-10
	9-32	Clay, clay loam	CH, CL	A-7	0	0	100	100	90-100	75-95	40-60	20-30
	32-66	Clay, silty clay, silty clay loam	CH, CL	A-7	0	0	100	100	90-100	70-95	40-60	20-30
130:												
Nord	0-11	Fine sandy loam	ML, SM	A-4	0	0	100	100	70-85	35-55	20-30	NP-5
	11-38	Stratified sandy loam to loam	ML, CL-ML, SC-SM, SM	A-4	0	0	100	100	60-95	35-70	20-30	NP-10
	38-50	Stratified loamy coarse sand to coarse sandy loam	SM	A-2	0	0	100	100	25-60	20-50	15-20	NP
	50-72	Stratified sandy loam to silt loam	ML, SC-SM, CL-ML, SM	A-4	0	0	100	100	60-95	35-70	20-30	NP-10
131:												
Pits.												
132:												
Quonal	0-7	Silty clay	CH	A-7	0	0	85-100	75-100	70-100	65-100	50-55	25-30
	7-16	Silty clay, clay, gravelly clay	CH, GC	A-7	0	0	60-100	50-100	45-100	40-100	50-55	25-30
	16-41	Silty clay, clay, gravelly clay	CH, GC	A-7	0	0	60-100	50-100	45-100	40-100	50-55	25-30
	41-44	Duripan	---	---	---	---	---	---	---	---	---	---
	44-62	Stratified sandy loam to silty clay loam	CL, SC	A-6	0	0	85-100	75-100	65-90	40-80	25-40	10-20

Table 19.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
132:												
Lewis	0-5	Silty clay loam	CL	A-6, A-7	0	0	100	95-100	90-100	65-80	30-45	10-20
	5-25	Clay loam, clay	CH, CL	A-7	0	0	100	100	90-100	75-95	40-60	20-30
	25-39	Cemented	---	---	---	---	---	---	---	---	---	---
	39-60	Stratified sandy loam to clay loam	CL-ML	A-4	0	0	100	95-100	60-90	50-60	20-30	5-10
133:												
Remnoy	0-3	Silt loam	ML	A-4	0	0	100	100	90-100	60-85	25-35	NP-10
	3-17	Clay loam	CL	A-6, A-7	0	0	100	100	90-100	70-80	30-45	10-20
	17-23	Indurated	---	---	---	---	---	---	---	---	---	---
	23-60	Stratified sandy loam to silt loam	ML, SM	A-4	0	0	100	100	60-100	35-70	25-35	NP-10
134:												
Riverwash.												
135:												
San Joaquin	0-10	Loam	CL-ML, ML	A-4	0	0	95-100	95-100	75-90	50-60	15-30	NP-10
	10-15	Sandy clay loam	SC	A-6	0	0	95-100	95-100	70-90	35-50	30-40	10-20
	15-29	Clay loam, clay	CL	A-7	0	0	95-100	95-100	80-95	55-70	40-50	25-35
	29-34	Indurated	---	---	---	---	---	---	---	---	---	---
136:												
Seville	0-6	Clay	CH, CL	A-7	0	0	100	100	90-100	75-95	40-60	20-35
	6-29	Clay	CH, CL	A-7	0	0	100	100	90-100	75-95	40-65	20-40
	29-44	Cemented	---	---	---	---	---	---	---	---	---	---
	44-60	Stratified loamy coarse sand to sandy loam	SM	A-4	0	0	100	100	55-70	35-50	15-25	NP-5
137:												
Tagus	0-17	Loam	ML	A-4	0	0	100	100	70-85	50-65	20-30	NP-5
	17-40	Loam, fine sandy loam, sandy loam	ML, SM	A-4	0	0	100	100	70-90	40-65	20-30	NP-5
	40-63	Loam, fine sandy loam, sandy loam	ML, SM	A-4	0	0	100	100	60-85	35-55	20-30	NP-5
138:												
Tujunga	0-14	Loamy sand	SM	A-2	0	0	100	85-95	35-50	10-25	---	NP
	14-70	Stratified coarse sand to loamy sand	SM	A-2	0	0-5	90-100	75-95	35-50	10-25	---	NP

Table 19.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
139:												
Wasco	0-9	Sandy loam	SM	A-2, A-4	0	0	80-100	75-100	45-65	25-40	20-25	NP-5
	9-60	Coarse sandy loam	SM	A-2, A-4	0	0	80-100	75-100	35-65	25-40	20-25	NP-5
140:												
Westcamp	0-5	Silt loam	CL-ML, ML	A-4	0	0	100	100	85-100	60-90	25-35	5-10
	5-33	Stratified fine sandy loam to silty clay loam	CL, ML	A-6, A-7	0	0	100	100	90-100	85-95	30-45	10-15
	33-60	Stratified silty clay loam to silty clay	CH, CL	A-7	0	0	100	100	95-100	85-95	40-60	15-35
141:												
Posochanet	0-5	Silt loam	ML	A-4	0	0	100	100	95-100	70-85	30-40	5-10
	5-33	Stratified fine sandy loam to silty clay loam	CL	A-6	0	0	100	100	90-100	85-95	30-40	10-15
	33-60	Stratified silty clay loam to silty clay	CH, CL	A-7	0	0	100	100	95-100	85-95	40-55	15-30
142:												
Wutchumna, 15-50% slopes	0-4	Gravelly clay loam	CL, GC	A-6	0	0-15	60-85	50-75	40-65	35-55	30-40	15-20
	4-18	Gravelly clay loam	CL, GC	A-6, A-7	0	0-15	60-85	50-75	40-65	35-55	35-45	15-20
	18-35	Gravelly clay	CL, GC	A-7	0	0-15	60-85	50-75	40-65	35-60	45-65	20-30
	35-45	Unweathered bedrock	---	---	---	---	---	---	---	---	---	---
Wutchumna, 5-15% slopes	0-4	Gravelly clay loam	CL, GC	A-6	0	0-15	60-85	50-75	40-65	35-55	30-40	15-20
	4-18	Gravelly clay loam	CL, GC	A-6, A-7	0	0-15	60-85	50-75	40-65	35-55	35-45	15-20
	18-35	Gravelly clay	CL, GC	A-7	0	0-15	60-85	50-75	40-65	35-60	45-65	20-30
	35-45	Unweathered bedrock	---	---	---	---	---	---	---	---	---	---
Rock outcrop.												

Table 19.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
143:												
Yettem	0-13	Sandy loam	SM	A-2	0	0	100	100	55-70	25-35	20-30	NP-5
	13-63	Sandy loam, coarse sandy loam, fine sandy loam	SM	A-2, A-4	0	0	100	100	55-85	25-50	20-30	NP-5
144:												
Youd	0-9	Loam	CL-ML, ML	A-4	0	0	100	100	85-95	50-75	25-35	5-10
	9-32	Cemented	---	---	---	---	---	---	---	---	---	---
	32-60	Stratified sand to silt loam	SC-SM, SM	A-4	0	0	100	100	60-90	35-50	20-30	NP-10
145:												
Water, perennial.												

Table 20.--Physical Properties of the Soils

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodibility index" apply only to the surface layer. Absence of an entry indicates that data were not estimated.)

Map symbol and soil name	Depth	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
								Kw	Kf	T		
	In	*Pct*	*g/cc*	*um/sec*	*In/in*	*Pct*	*Pct*					
101:												
Akers	0-16	8-18	1.50-1.70	14.11-42.34	0.13-0.15	0.0-2.9	0.5-1.0	.32	.32	5	3	86
	16-60	8-18	1.60-1.70	4.23-14.11	0.13-0.21	0.0-2.9	0.1-1.0	.37	.37			
Akers, saline-sodic	0-15	8-18	1.50-1.70	4.23-14.11	0.12-0.14	0.0-2.9	0.5-1.0	.32	.32	5	3	86
	15-60	8-18	1.60-1.70	1.41-4.23	0.12-0.20	0.0-2.9	0.1-1.0	.37	.37			
102:												
Armona	0-11	5-20	1.40-1.50	14.11-42.34	0.02-0.10	0.0-2.9	1.0-2.0	.24	.24	5	3	86
	11-53	18-35	1.40-1.60	1.41-14.11	0.02-0.14	3.0-5.9	0.1-0.5	.43	.43			
	53-60	8-45	1.50-1.70	0.42-1.41	0.02-0.14	3.0-5.9	0.1-0.5	.28	.28			
103:												
Atesh	0-14	10-20	1.40-1.60	14.11-42.34	0.10-0.13	0.0-2.9	0.3-1.0	.20	.24	3	3	86
	14-36	10-18	1.40-1.60	4.23-14.11	0.07-0.16	0.0-2.9	0.1-1.0	.17	.20			
	36-43	4-16	1.50-1.80	14.11-42.34	0.06-0.10	0.0-2.9	0.1-1.0	.15	.20			
	43-49	---	1.60-1.90	0.07-0.42	---	---	---	---	---			
	49-92	8-18	1.40-1.60	14.11-42.34	0.09-0.13	0.0-2.9	0.1-0.5	.17	.20			
	92-99	1-6	1.40-1.60	141.14-141.14	0.03-0.08	0.0-2.9	0.1-0.5	.02	.02			
Jerryslu	0-1	5-20	1.50-1.60	1.41-4.23	0.07-0.14	0.0-2.9	1.0-3.0	.43	.43	2	4L	86
	1-4	5-20	1.40-1.55	4.23-14.11	0.14-0.17	0.0-2.9	0.4-1.0	.32	.32			
	4-35	18-35	1.40-1.55	0.42-1.41	0.07-0.14	3.0-5.9	0.1-0.5	.32	.32			
	35-55	---	---	0.07-0.42	---	---	---	---	---			
	55-79	5-18	1.40-1.55	14.11-42.34	0.05-0.10	0.0-2.9	0.0-0.5	.28	.28			
104:												
Biggriz	0-14	18-27	1.45-1.55	4.23-14.11	0.13-0.16	0.0-2.9	0.3-1.0	.37	.37	5	4L	86
	14-50	18-33	1.40-1.55	1.41-4.23	0.14-0.17	3.0-5.9	0.3-1.0	.32	.32			
	50-65	18-33	1.45-1.55	1.41-4.23	0.12-0.17	3.0-5.9	0.3-1.0	.28	.28			
Biggriz, saline-sodic	0-14	18-27	1.45-1.55	4.23-14.11	0.11-0.13	0.0-2.9	0.3-1.0	.37	.37	5	4L	86
	14-50	18-33	1.40-1.55	1.41-4.23	0.11-0.13	3.0-5.9	0.3-1.0	.32	.32			
	50-65	18-33	1.45-1.55	1.41-4.23	0.10-0.13	3.0-5.9	0.3-1.0	.28	.28			
105:												
Calgro	0-7	8-18	1.30-1.50	14.11-42.34	0.11-0.13	0.0-2.9	0.4-1.0	.20	.20	2	3	86
	7-25	8-18	1.20-1.40	4.23-14.11	0.11-0.18	0.0-2.9	0.3-1.0	.32	.32			
	25-33	---	---	0.07-1.41	---	---	---	---	---			
	33-53	2-12	1.30-1.50	42.34-141.14	0.04-0.06	0.0-2.9	0.0-0.3	.10	.10			
	53-60	---	---	0.07-1.41	---	---	---	---	---			
Calgro, saline-sodic	0-8	8-18	1.30-1.50	4.23-14.11	0.09-0.12	0.0-2.9	0.4-1.0	.20	.20	2	3	86
	8-24	8-18	1.20-1.40	4.23-14.11	0.09-0.16	0.0-2.9	0.3-1.0	.32	.32			
	24-33	---	---	0.07-1.41	---	---	---	---	---			
	33-52	2-12	1.30-1.50	42.34-141.14	0.02-0.05	0.0-2.9	0.0-0.3	.10	.10			
	52-60	---	---	0.07-1.41	---	---	---	---	---			
106:												
Centerville, 0-2% slopes	0-7	40-60	1.25-1.35	0.42-1.41	0.12-0.15	6.0-8.9	1.0-2.0	.20	.20	5	4	86
	7-48	35-60	1.25-1.40	0.42-1.41	0.12-0.15	6.0-8.9	0.5-1.0	.24	.24			
	48-60	27-50	1.35-1.55	0.42-4.23	0.07-0.09	3.0-5.9	0.1-0.5	.20	.20			
107:												
Centerville, 2-5% slopes	0-7	40-60	1.25-1.35	0.42-1.41	0.12-0.15	6.0-8.9	1.0-2.0	.20	.20	5	4	86
	7-48	35-60	1.25-1.40	0.42-1.41	0.12-0.15	6.0-8.9	0.5-1.0	.24	.24			
	48-60	27-50	1.35-1.55	0.42-4.23	0.07-0.09	3.0-5.9	0.1-0.5	.20	.20			

Table 20.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
								Kw	Kf	T		
	In	*Pct*	*g/cc*	*um/sec*	*In/in*	*Pct*	*Pct*					
108:												
Colpien	0-6	18-27	1.40-1.50	4.23-14.11	0.14-0.18	0.0-2.9	1.0-3.0	.37	.37	5	5	56
	6-24	18-31	1.40-1.55	1.41-4.23	0.14-0.21	3.0-5.9	1.0-3.0	.32	.32			
	24-60	18-31	1.40-1.55	1.41-4.23	0.14-0.21	3.0-5.9	0.5-2.0	.32	.32			
	60-65	10-30	1.40-1.55	1.41-42.34	0.10-0.21	3.0-5.9	0.2-0.5	.28	.28			
109:												
Crosscreek	0-11	18-27	1.40-1.60	4.23-14.11	0.14-0.18	3.0-5.9	0.5-1.0	.32	.37	3	4L	86
	11-17	18-35	1.40-1.60	1.41-14.11	0.06-0.18	3.0-5.9	0.5-1.0	.15	.24			
	17-55	18-35	1.40-1.60	1.41-4.23	0.10-0.18	3.0-5.9	0.1-0.5	.20	.24			
	55-60	---	---	0.07-0.42	---	---	---	---	---			
Kai	0-6	8-18	1.45-1.55	4.23-14.11	0.14-0.18	0.0-2.9	0.4-0.8	.37	.37	2	5	56
	6-39	18-35	1.40-1.55	1.41-4.23	0.10-0.21	3.0-5.9	0.2-0.5	.32	.32			
	39-46	0-0	---	0.07-0.42	---	---	---	---	---			
	46-65	10-27	1.45-1.60	4.23-42.34	0.10-0.20	3.0-5.9	0.1-0.5	.24	.24			
110:												
Delhi	0-11	0-5	1.60-1.70	42.34-141.14	0.06-0.10	0.0-2.9	0.5-1.0	.24	.24	5	2	134
	11-48	0-5	1.60-1.70	42.34-141.14	0.06-0.10	0.0-2.9	0.0-0.5	.24	.24			
	48-72	0-5	1.60-1.70	42.34-141.14	0.05-0.10	0.0-2.9	0.0-0.5	.20	.20			
111:												
Delvar	0-12	27-40	1.40-1.50	1.41-4.23	0.16-0.18	3.0-5.9	1.0-3.0	.28	.32	5	6	48
	12-19	40-55	1.40-1.50	0.42-1.41	0.11-0.14	6.0-8.9	1.0-2.0	.10	.15			
	19-28	40-55	1.40-1.50	0.42-1.41	0.11-0.14	6.0-8.9	1.0-2.0	.10	.15			
	28-42	40-55	1.40-1.50	0.42-1.41	0.11-0.14	6.0-8.9	0.4-1.0	.10	.15			
	42-60	15-35	1.45-1.60	1.41-14.11	0.10-0.13	3.0-5.9	0.0-0.5	.24	.28			
112:												
Dumps.												
113:												
Excelsior	0-8	5-18	1.50-1.55	4.23-14.11	0.08-0.13	0.0-2.9	0.5-1.0	.32	.32	5	3	86
	8-36	5-18	1.60-1.70	4.23-14.11	0.08-0.12	0.0-2.9	0.0-0.5	.24	.24			
	36-60	8-18	1.45-1.60	0.42-1.41	0.05-0.15	0.0-2.9	0.0-0.5	.43	.43			
114:												
Exeter, 0-2% slopes	0-9	10-20	1.45-1.55	4.23-14.11	0.14-0.16	0.0-2.9	0.4-1.0	.32	.32	2	5	56
	9-26	18-27	1.40-1.50	4.23-14.11	0.14-0.18	3.0-5.9	0.2-0.5	.32	.32			
	26-28	27-35	1.40-1.50	1.41-4.23	0.14-0.17	3.0-5.9	0.2-0.5	.32	.32			
	28-46	---	---	0.07-0.42	---	---	---	---	---			
	46-72	2-15	1.50-1.75	4.23-141.14	0.03-0.18	0.0-2.9	0.1-0.5	.10	.17			
115:												
Exeter, 2-5% slopes	0-9	10-20	1.45-1.55	4.23-14.11	0.14-0.16	0.0-2.9	0.4-1.0	.32	.32	2	5	56
	9-26	18-27	1.40-1.50	4.23-14.11	0.14-0.18	3.0-5.9	0.2-0.5	.32	.32			
	26-28	27-35	1.40-1.50	1.41-4.23	0.14-0.17	3.0-5.9	0.2-0.5	.32	.32			
	28-46	---	---	0.07-0.42	---	---	---	---	---			
	46-72	2-15	1.50-1.75	4.23-141.14	0.03-0.18	0.0-2.9	0.1-0.5	.10	.17			
116:												
Flamen	0-17	18-27	1.45-1.55	4.23-14.11	0.14-0.17	0.0-2.9	2.0-3.0	.32	.37	3	5	56
	17-28	18-30	1.40-1.60	4.23-14.11	0.10-0.19	3.0-5.9	2.0-3.0	.32	.37			
	28-43	18-30	1.40-1.60	4.23-14.11	0.10-0.19	3.0-5.9	1.0-2.0	.32	.37			
	43-72	---	1.60-1.90	0.42-1.41	---	---	---	---	---			
117:												
Gambogy	0-6	18-27	1.45-1.60	4.23-14.11	0.13-0.16	0.0-2.9	1.0-3.0	.32	.32	5	4L	86
	6-19	18-35	1.45-1.55	1.41-4.23	0.13-0.17	3.0-5.9	1.0-3.0	.28	.28			
	19-47	18-35	1.45-1.55	4.23-14.11	0.11-0.16	0.0-2.9	1.0-2.0	.28	.28			
	47-72	8-20	1.45-1.60	14.11-42.34	0.10-0.14	0.0-2.9	0.5-1.0	.20	.20			

Table 20.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
								Kw	Kf	T		
	In	*Pct*	*g/cc*	*um/sec*	*In/in*	*Pct*	*Pct*					
118:												
Gambogy	0-6	18-27	1.45-1.60	4.23-14.11	0.13-0.16	0.0-2.9	1.0-3.0	.32	.32	5	4L	86
	6-19	18-35	1.45-1.55	1.41-4.23	0.13-0.17	3.0-5.9	1.0-3.0	.28	.28			
	19-47	18-35	1.45-1.55	4.23-14.11	0.11-0.16	0.0-2.9	1.0-2.0	.28	.28			
	47-72	8-20	1.45-1.60	14.11-42.34	0.10-0.14	0.0-2.9	0.5-1.0	.20	.20			
Biggriz	0-14	18-27	1.45-1.55	4.23-14.11	0.11-0.13	0.0-2.9	0.3-1.0	.37	.37	5	4L	86
	14-50	18-33	1.40-1.55	1.41-4.23	0.11-0.13	3.0-5.9	0.3-1.0	.32	.32			
	50-65	18-33	1.45-1.55	1.41-4.23	0.10-0.13	3.0-5.9	0.3-1.0	.28	.28			
119:												
Gareck	0-6	10-20	1.40-1.60	14.11-42.34	0.10-0.13	0.0-2.9	0.3-0.8	.24	.24	5	3	86
	6-28	18-27	1.40-1.60	4.23-14.11	0.14-0.18	0.0-2.9	0.1-0.5	.28	.28			
	28-47	20-30	1.40-1.55	1.41-4.23	0.13-0.20	3.0-5.9	0.1-0.5	.32	.32			
	47-62	3-30	1.40-1.60	4.23-42.34	0.07-0.16	0.0-2.9	0.1-0.5	.17	.20			
Garces	0-4	10-18	1.45-1.55	1.41-4.23	0.11-0.16	0.0-2.9	0.2-0.5	.49	.49	5	5	56
	4-14	27-35	1.35-1.50	0.07-0.42	0.07-0.13	3.0-5.9	0.2-0.5	.43	.43			
	14-21	20-35	1.40-1.55	0.07-0.42	0.07-0.13	3.0-5.9	0.1-0.5	.37	.37			
	21-29	20-27	1.45-1.55	0.07-0.42	0.07-0.14	3.0-5.9	0.1-0.5	.37	.37			
	29-62	10-30	1.50-1.60	1.41-4.23	0.05-0.14	0.0-2.9	0.1-0.5	.28	.28			
120:												
Gepford	0-21	50-60	1.25-1.45	0.07-0.42	0.08-0.13	6.0-8.9	1.0-2.0	.28	.28	5	7	38
	21-50	50-60	1.25-1.40	0.07-0.42	0.08-0.13	6.0-8.9	0.2-0.5	.28	.28			
	50-72	25-45	1.30-1.50	1.41-4.23	0.08-0.16	3.0-5.9	0.2-0.5	.32	.32			
121:												
Gepford, partially drained, sandy substratum	0-23	50-60	1.25-1.45	0.07-1.41	0.08-0.15	6.0-8.9	1.0-2.0	.28	.28	5	7	38
	23-46	50-60	1.25-1.40	0.07-1.41	0.08-0.15	6.0-8.9	0.2-0.5	.28	.28			
	46-60	1-5	1.60-1.70	14.11-141.14	0.03-0.10	0.0-2.9	0.1-0.5	.15	.15			
122:												
Grangeville	0-16	8-18	1.50-1.60	14.11-42.34	0.12-0.14	0.0-2.9	1.0-2.0	.32	.32	5	3	86
	16-27	8-18	1.45-1.60	14.11-42.34	0.12-0.15	0.0-2.9	0.3-0.8	.32	.32			
	27-67	8-18	1.45-1.65	14.11-42.34	0.08-0.10	0.0-2.9	0.1-0.4	.32	.32			
123:												
Grangeville, saline-sodic	0-5	8-18	1.50-1.60	14.11-42.34	0.12-0.14	0.0-2.9	1.0-2.0	.32	.32	5	3	86
	5-80	8-18	1.45-1.65	4.23-42.34	0.08-0.10	0.0-2.9	0.1-2.0	.32	.32			
124:												
Hanford	0-6	7-18	1.40-1.60	14.11-42.34	0.10-0.15	0.0-2.9	0.5-1.0	.32	.32	5	3	86
	6-30	7-18	1.40-1.60	14.11-42.34	0.10-0.15	0.0-2.9	0.1-0.5	.32	.32			
	30-60	5-15	1.40-1.60	42.34-141.14	0.07-0.10	0.0-2.9	0.1-0.5	.20	.24			
125:												
Houser fine sandy loam	0-7	5-20	1.50-1.60	14.11-42.34	0.12-0.15	0.0-2.9	0.5-1.0	.28	.28	5	3	86
	7-60	40-60	1.25-1.50	0.07-0.42	0.01-0.14	6.0-8.9	0.1-0.5	.37	.37			
126:												
Houser silty clay	0-7	40-60	1.25-1.50	0.07-0.42	0.01-0.14	6.0-8.9	0.5-1.0	.37	.37	5	4	86
	7-60	40-60	1.25-1.50	0.07-0.42	0.01-0.14	6.0-8.9	0.1-0.5	.37	.37			
127:												
Kimberlina	0-4	6-18	1.50-1.60	14.11-42.34	0.02-0.08	0.0-2.9	0.3-0.5	.24	.37	5	3	86
	4-58	10-18	1.50-1.60	1.41-4.23	0.02-0.08	0.0-2.9	0.1-0.4	.24	.37			
	58-72	10-25	1.45-1.55	1.41-4.23	0.02-0.12	3.0-5.9	0.1-0.3	.37	.43			
128:												
Lethent	0-7	20-27	1.40-1.55	1.41-4.23	0.12-0.14	0.0-2.9	0.4-0.7	.43	.43	2	6	48
	7-35	35-55	1.40-1.55	0.07-0.42	0.06-0.10	6.0-8.9	0.2-0.7	.49	.49			
	35-65	30-40	1.40-1.55	0.07-0.42	0.06-0.12	3.0-5.9	0.1-0.5	.49	.49			

Table 20.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
								Kw	Kf	T		
	In	*Pct*	*g/cc*	*um/sec*	*In/in*	*Pct*	*Pct*					
129:												
Nahrub	0-9	20-27	1.30-1.50	1.41-4.23	0.12-0.14	0.0-2.9	0.3-0.5	.43	.43	5	4L	86
	9-32	35-50	1.00-1.20	0.07-0.42	0.08-0.13	6.0-8.9	0.2-0.5	.37	.37			
	32-66	35-50	1.00-1.20	0.07-0.42	0.08-0.13	6.0-8.9	0.2-0.4	.37	.37			
130:												
Nord	0-11	10-18	1.50-1.60	4.23-14.11	0.10-0.13	0.0-2.9	1.0-2.0	.28	.28	5	3	86
	11-38	10-18	1.50-1.60	4.23-14.11	0.11-0.15	0.0-2.9	1.0-2.0	.37	.37			
	38-50	2-12	1.55-1.70	14.11-141.14	0.05-0.12	0.0-2.9	0.2-0.5	.17	.17			
	50-72	10-18	1.50-1.60	4.23-14.11	0.11-0.15	0.0-2.9	0.0-0.5	.37	.37			
131:												
Pits.												
132:												
Quonal	0-7	40-50	1.40-1.50	0.42-1.41	0.11-0.17	6.0-8.9	0.5-1.0	.32	.32	3	4	86
	7-16	40-50	1.25-1.50	0.42-1.41	0.09-0.16	6.0-8.9	0.5-1.0	.28	.24			
	16-41	40-50	1.25-1.50	0.07-0.42	0.09-0.16	6.0-8.9	0.5-0.8	.28	.24			
	41-44	---	---	0.07-0.42	---	---	---	---	---			
	44-62	18-35	1.40-1.60	1.41-42.34	0.08-0.16	3.0-5.9	0.1-0.5	.28	.28			
Lewis	0-5	27-30	1.40-1.50	1.41-4.23	0.15-0.18	3.0-5.9	0.5-1.0	.43	.43	2	6	48
	5-25	35-60	1.40-1.55	0.42-1.41	0.06-0.13	6.0-8.9	0.3-1.0	.32	.32			
	25-39	---	---	0.07-0.42	---	---	---	---	---			
	39-60	15-30	1.50-1.60	1.41-4.23	0.06-0.09	3.0-5.9	0.1-0.3	.32	.32			
133:												
Ramnoy	0-3	10-25	1.45-1.55	1.41-4.23	0.08-0.12	0.0-2.9	0.4-0.5	.43	.43	1	4L	86
	3-17	27-35	1.40-1.50	0.42-1.41	0.09-0.13	3.0-5.9	0.3-0.5	.32	.32			
	17-23	---	---	0.42-1.41	---	---	---	---	---			
	23-60	7-15	1.45-1.60	1.41-4.23	0.08-0.11	0.0-2.9	0.1-0.3	.32	.32			
134:												
Riverwash.												
135:												
San Joaquin	0-10	15-25	1.50-1.60	4.23-14.11	0.14-0.16	0.0-2.9	0.5-1.0	.37	.37	2	5	56
	10-15	20-30	1.50-1.60	1.41-4.23	0.16-0.17	0.0-2.9	0.3-0.5	.28	.28			
	15-29	35-50	1.50-1.65	0.07-0.42	0.04-0.06	6.0-8.9	0.2-0.5	.24	.24			
	29-34	---	---	0.07-0.42	---	---	---	---	---			
136:												
Seville	0-6	40-60	1.25-1.45	0.42-1.41	0.14-0.17	6.0-8.9	1.0-2.0	.20	.20	2	4	86
	6-29	40-60	1.25-1.45	0.42-1.41	0.14-0.16	6.0-8.9	0.5-1.0	.24	.24			
	29-44	---	---	0.07-0.42	---	---	---	---	---			
	44-60	3-15	1.50-1.70	14.11-42.34	0.03-0.12	0.0-2.9	0.1-0.5	.28	.28			
137:												
Tagus	0-17	10-18	1.50-1.65	14.11-42.34	0.13-0.15	0.0-2.9	1.0-2.0	.32	.32	5	5	56
	17-40	10-18	1.60-1.70	4.23-14.11	0.13-0.15	0.0-2.9	0.2-0.6	.37	.37			
	40-63	10-18	1.50-1.70	14.11-42.34	0.12-0.15	0.0-2.9	0.1-0.5	.37	.37			
138:												
Tujunga	0-14	0-5	1.55-1.65	42.34-141.14	0.03-0.08	0.0-2.9	0.5-0.8	.17	.17	5	2	134
	14-70	0-5	1.55-1.65	42.34-141.14	0.02-0.08	0.0-2.9	0.1-0.4	.20	.20			
139:												
Wasco	0-9	8-18	1.50-1.60	14.11-42.34	0.08-0.11	0.0-2.9	0.4-0.5	.28	.24	5	3	86
	9-60	8-18	1.50-1.60	14.11-42.34	0.06-0.09	0.0-2.9	0.1-0.5	.28	.24			

Table 20.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
								Kw	Kf	T		
	In	*Pct*	*g/cc*	*um/sec*	*In/in*	*Pct*	*Pct*					
140:												
Westcamp----------	0-5	10-27	1.45-1.55	4.23-14.11	0.06-0.16	0.0-2.9	0.5-1.0	.43	.43	5	6	48
	5-33	18-35	1.45-1.60	0.42-4.23	0.06-0.17	0.0-2.9	0.2-0.5	.49	.49			
	33-60	35-55	1.35-1.50	0.07-0.42	0.06-0.16	6.0-8.9	0.2-0.5	.32	.32			
141:												
Posochanet----------	0-5	18-27	1.30-1.45	1.41-4.23	0.12-0.14	0.0-2.9	0.5-1.0	.43	.43	5	6	48
	5-33	18-35	1.10-1.50	0.42-1.41	0.13-0.16	3.0-5.9	0.2-0.5	.43	.43			
	33-60	30-50	1.00-1.20	0.42-1.41	0.13-0.16	6.0-8.9	0.2-0.5	.43	.43			
142:												
Wutchumna, 15-50% slopes----------	0-4	27-32	1.40-1.50	1.41-4.23	0.11-0.18	3.0-5.9	2.0-3.0	.17	.32	2	7	38
	4-18	32-40	1.40-1.50	1.41-4.23	0.11-0.18	3.0-5.9	1.0-2.0	.17	.32			
	18-35	40-60	1.25-1.45	0.42-1.41	0.09-0.14	6.0-8.9	0.5-1.0	.10	.20			
	35-45	---	---	0.42-1.41	---	---	---	---	---			
Wutchumna, 5-15% slopes----------	0-4	27-32	1.40-1.50	1.41-4.23	0.11-0.18	3.0-5.9	2.0-3.0	.17	.32	2	7	38
	4-18	32-40	1.40-1.50	1.41-4.23	0.11-0.18	3.0-5.9	1.0-2.0	.17	.32			
	18-35	40-60	1.25-1.45	0.42-1.41	0.09-0.14	6.0-8.9	0.5-1.0	.10	.20			
	35-45	---	---	0.42-1.41	---	---	---	---	---			
Rock outcrop.												
143:												
Yettem----------	0-13	5-18	1.50-1.60	14.11-42.34	0.09-0.11	0.0-2.9	1.0-2.0	.24	.24	5	3	86
	13-63	5-18	1.50-1.60	14.11-42.34	0.09-0.13	0.0-2.9	0.2-0.5	.24	.24			
144:												
Youd----------	0-9	12-18	1.50-1.60	1.40-4.00	0.05-0.12	0.0-2.9	0.4-0.5	.43	.43	1	4L	86
	9-32	---	---	0.07-1.41	0.00-0.00	---	---	---	---			
	32-60	7-20	1.45-1.70	1.00-14.11	0.08-0.15	0.0-2.9	0.1-0.3	.43	.43			
145:												
Water, perennial.												

Table 21.--Chemical Properties of the Soils

(Soil properties are measured or inferred from direct observations in the field or laboratory. Laboratory data for selected pedons are given in tables 24 and 25. Absence of an entry indicates that data were not estimated.)

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	*Pct*	*meq/100g*	*pH*	*Pct*	*Pct*	*mmhos/cm*	
101:								
Akers	0-16	8-18	5.0-15	7.4-8.4	1-10	0-2	0.0-4.0	1-5
	16-60	8-18	5.0-15	7.4-8.4	1-10	0-2	0.0-4.0	1-12
Akers, saline-sodic	0-15	8-18	5.0-15	7.4-8.4	1-10	0-2	2.0-8.0	1-13
	15-60	8-18	5.0-15	7.9-9.0	1-10	0-2	4.0-8.0	13-30
102:								
Armona	0-11	5-20	5.0-15	7.4-9.0	1-5	0-3	2.0-8.0	2-13
	11-53	18-35	10-20	7.4-9.0	1-5	0-3	2.0-30.0	13-80
	53-60	8-45	10-20	7.4-9.0	1-5	0-3	2.0-30.0	13-80
103:								
Atesh	0-14	10-20	10-20	7.4-9.0	1-5	0-5	0.0-2.0	1-8
	14-36	10-18	10-20	7.4-9.0	1-10	0-5	0.0-2.0	1-8
	36-43	4-16	10-20	7.4-9.0	1-10	0-5	0.0-2.0	1-8
	43-49	---	---	---	---	---	---	---
	49-92	8-18	5.0-15	7.4-9.0	1-5	0-5	0.0-4.0	1-8
	92-99	1-6	0.0-5.0	7.4-9.0	1-5	0-5	0.0-4.0	1-8
Jerryslu	0-1	5-20	5.0-15	7.9-11.0	1-5	0-5	2.0-16.0	1-13
	1-4	5-20	5.0-15	7.9-11.0	1-5	0-5	2.0-16.0	13-300
	4-35	18-35	10-20	8.5-11.0	1-5	0-5	2.0-16.0	13-310
	35-55	---	---	---	---	---	---	---
	55-79	5-18	5.0-15	7.9-11.0	1-5	0-5	2.0-16.0	13-100
104:								
Biggriz	0-14	18-27	10-15	7.4-8.4	1-5	0-1	0.0-4.0	1-13
	14-50	18-33	10-20	7.4-8.4	2-10	0-1	0.0-4.0	1-13
	50-65	18-33	10-20	7.9-9.6	2-10	0-1	0.0-4.0	1-13
Biggriz, saline-sodic	0-14	18-27	10-15	7.9-9.0	1-5	0-1	4.0-8.0	13-50
	14-50	18-33	10-20	7.9-9.6	2-10	0-1	4.0-8.0	13-200
	50-65	18-33	10-20	8.5-9.6	2-10	0-1	4.0-8.0	13-100
105:								
Calgro	0-7	8-18	5.0-15	7.4-8.4	0-2	0	0.0-4.0	1-12
	7-25	8-18	5.0-15	7.4-8.4	0-2	0	0.0-4.0	1-12
	25-33	---	---	---	---	---	---	---
	33-53	2-12	5.0-10	7.4-8.4	1-2	0	0.0-4.0	1-12
	53-60	---	---	---	---	---	---	---
Calgro, saline-sodic	0-8	8-18	5.0-15	7.9-11.0	1-4	0	2.0-8.0	13-100
	8-24	8-18	5.0-15	7.9-11.0	1-4	0	4.0-16.0	13-100
	24-33	---	---	---	---	---	---	---
	33-52	2-12	5.0-10	7.9-11.0	1-4	0	4.0-16.0	13-100
	52-60	---	---	---	---	---	---	---
106:								
Centerville, 0-2% slopes	0-7	40-60	20-30	6.6-8.4	0-3	0	0.0-8.0	13-40
	7-48	35-60	20-30	7.4-8.4	1-5	0	0.0-8.0	13-40
	48-60	27-50	15-30	7.4-8.4	0-5	0	0.0-8.0	13-40
107:								
Centerville, 2-5% slopes	0-7	40-60	20-30	6.6-8.4	0-3	0	0.0-8.0	13-40
	7-48	35-60	20-30	7.4-8.4	1-5	0	0.0-8.0	13-40
	48-60	27-50	15-30	7.4-8.4	0-5	0	0.0-8.0	13-40

Table 21.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	*Pct*	*meq/100g*	*pH*	*Pct*	*Pct*	*mmhos/cm*	
108:								
Colpien	0-6	18-27	10-20	6.6-8.4	0	0	0.5-4.0	1-12
	6-24	18-31	10-20	6.6-8.4	0-5	0	0.5-4.0	1-12
	24-60	18-31	10-20	6.6-8.4	1-5	0	0.5-4.0	1-12
	60-65	10-30	10-15	6.6-8.4	0-5	0	0.5-4.0	1-12
109:								
Crosscreek	0-11	18-27	5.0-10	6.6-9.9	1-10	1-5	1.0-12.0	1-13
	11-17	18-35	5.0-10	6.6-9.9	1-10	1-5	1.0-12.0	1-13
	17-55	18-35	5.0-10	6.6-9.9	1-10	1-5	1.0-12.0	1-13
	55-60	---	---	---	---	---	---	---
Kai	0-6	8-18	5.0-15	6.6-8.4	0-5	0	0.0-8.0	13-20
	6-39	18-35	10-20	8.5-11.0	0-10	0	1.0-16.0	13-80
	39-46	0-0	---	---	---	---	---	---
	46-65	10-27	5.0-15	7.9-9.0	0-10	0	0.0-8.0	4-13
110:								
Delhi	0-11	0-5	5.0-10	6.1-7.8	0	0	0	0
	11-48	0-5	5.0-10	6.1-7.8	0	0	0	0
	48-72	0-5	5.0-10	6.1-7.8	0	0	0	0
111:								
Delvar	0-12	27-40	15-25	6.1-8.4	0-1	0-1	0.0-4.0	1-8
	12-19	40-55	20-35	6.6-8.4	0-2	0-1	1.0-8.0	2-13
	19-28	40-55	20-35	6.6-8.4	5-10	0-1	1.0-8.0	2-13
	28-42	40-55	20-35	6.6-8.4	2-10	0-1	1.0-8.0	2-13
	42-60	15-35	10-25	7.4-8.4	1-8	0-1	1.0-8.0	13-20
112:								
Dumps.								
113:								
Excelsior	0-8	5-18	5.0-15	7.9-9.0	0-2	0	0.0-8.0	1-13
	8-36	5-18	5.0-15	8.5-9.6	1-2	0	0.0-8.0	13-25
	36-60	8-18	5.0-15	8.5-9.6	1-3	0	2.0-16.0	13-80
114:								
Exeter, 0-2% slopes	0-9	10-20	5.0-15	6.1-8.4	0	0	0.0-2.0	0
	9-26	18-27	10-25	6.6-8.4	0	0	0.0-2.0	0
	26-28	27-35	10-25	6.6-8.4	0	0	0.0-2.0	0
	28-46	---	---	---	---	---	---	---
	46-72	2-15	0.0-5.0	7.4-8.4	0-5	0	0.0-2.0	0
115:								
Exeter, 2-5% slopes	0-9	10-20	5.0-15	6.1-8.4	0	0	0.0-2.0	0
	9-26	18-27	10-25	6.6-8.4	0	0	0.0-2.0	0
	26-28	27-35	10-25	6.6-8.4	0	0	0.0-2.0	0
	28-46	---	---	---	---	---	---	---
	46-72	2-15	0.0-5.0	7.4-8.4	0-5	0	0.0-2.0	0
116:								
Flamen	0-17	18-27	10-20	6.1-7.3	0-2	0	0.0-2.0	1-12
	17-28	18-30	10-20	6.1-8.4	0-2	0	0.0-2.0	1-12
	28-43	18-30	10-20	6.1-8.4	0-2	0	0.0-2.0	1-12
	43-72	---	---	---	---	---	---	---
117:								
Gambogy	0-6	18-27	10-20	7.4-8.4	0-3	0-1	0.0-4.0	1-12
	6-19	18-35	10-20	7.4-8.4	1-3	0-1	0.0-4.0	1-12
	19-47	18-35	5.0-20	7.4-8.4	1-3	0-1	0.0-4.0	1-12
	47-72	8-20	5.0-10	7.4-8.4	1-3	0-1	0.0-4.0	1-12

Table 21.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	*Pct*	*meq/100g*	*pH*	*Pct*	*Pct*	*mmhos/cm*	
118:								
Gambogy	0-6	18-27	10-20	7.4-8.4	0-3	0-1	0.0-4.0	1-12
	6-19	18-35	10-20	7.4-8.4	1-3	0-1	0.0-4.0	1-12
	19-47	18-35	5.0-20	7.4-8.4	1-3	0-1	0.0-4.0	1-12
	47-72	8-20	5.0-10	7.4-8.4	1-3	0-1	0.0-4.0	1-12
Biggriz	0-14	18-27	10-15	7.9-9.0	1-5	0-1	4.0-8.0	13-50
	14-50	18-33	10-20	7.9-9.6	2-10	0-1	4.0-8.0	13-200
	50-65	18-33	10-20	8.5-9.6	2-10	0-1	4.0-8.0	13-100
119:								
Gareck	0-6	10-20	5.0-15	6.6-8.4	1-3	0-5	0.0-2.0	0-8
	6-28	18-27	10-20	7.4-8.4	1-5	0-5	0.0-4.0	0-8
	28-47	20-30	5.0-20	7.4-8.4	1-5	0-5	0.0-4.0	0-8
	47-62	3-30	5.0-20	7.4-11.0	1-5	0-5	0.0-4.0	0-8
Garces	0-4	10-18	10-20	7.4-9.0	0-5	0-3	2.0-8.0	1-25
	4-14	27-35	10-20	7.9-9.6	0-5	0-3	8.0-16.0	13-100
	14-21	20-35	10-20	7.9-9.6	0-5	0-3	8.0-16.0	13-100
	21-29	20-27	10-20	7.9-9.6	0-5	0-3	8.0-16.0	13-100
	29-62	10-30	10-20	7.9-9.6	0-5	0-3	4.0-16.0	13-100
120:								
Gepford	0-21	50-60	20-30	7.4-9.0	1-5	0-2	2.0-15.0	2-30
	21-50	50-60	20-30	7.4-9.0	5-15	0-2	4.0-15.0	13-50
	50-72	25-45	5.0-15	7.4-9.0	5-15	0-2	4.0-15.0	13-50
121:								
Gepford, partially drained, sandy substratum	0-23	50-60	20-30	7.4-9.0	1-5	0-2	2.0-15.0	2-30
	23-46	50-60	20-30	7.4-9.0	5-15	0-2	4.0-15.0	13-50
	46-60	1-5	5.0-15	7.4-9.0	5-15	0-2	4.0-15.0	13-50
122:								
Grangeville	0-16	8-18	5.0-15	7.4-8.4	0-5	0-1	0.0-2.0	0-4
	16-27	8-18	5.0-15	7.4-8.4	0-5	0-1	0.0-2.0	0-4
	27-67	8-18	5.0-15	6.6-8.4	0-5	0-1	0.0-2.0	0-4
123:								
Grangeville, saline-sodic	0-5	8-18	5.0-15	8.5-11.0	0-5	0-1	2.0-8.0	2-12
	5-80	8-18	5.0-15	8.5-11.0	0-5	0-1	4.0-8.0	13-100
124:								
Hanford	0-6	7-18	5.0-15	5.6-7.8	0-1	0	0.0-2.0	0-7
	6-30	7-18	5.0-15	5.6-7.8	0	0	0.0-2.0	0-7
	30-60	5-15	5.0-15	5.6-7.8	0-2	0	0.0-2.0	0-7
125:								
Houser fine sandy loam	0-7	5-20	5.0-15	7.9-8.4	1-3	0-3	1.0-16.0	4-13
	7-60	40-60	20-30	7.9-9.6	0-5	0-3	4.0-30.0	13-60
126:								
Houser silty clay	0-7	40-60	20-30	7.9-9.0	0-5	0-3	4.0-30.0	13-60
	7-60	40-60	20-30	7.9-9.6	0-5	0-3	4.0-30.0	13-60
127:								
Kimberlina	0-4	6-18	5.0-15	7.9-8.4	1-5	0-5	4.0-8.0	13-30
	4-58	10-18	5.0-15	7.9-8.4	1-5	0-5	4.0-8.0	13-30
	58-72	10-25	5.0-15	7.9-8.4	1-5	0-5	4.0-8.0	13-30
128:								
Lethent	0-7	20-27	5.0-15	7.9-11.0	0-5	0-5	1.0-30.0	13-200
	7-35	35-55	10-20	7.9-11.0	1-5	0-5	1.0-30.0	13-200
	35-65	30-40	10-20	7.9-11.0	0-5	0-5	1.0-30.0	13-200

Table 21.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	*Pct*	*meq/100g*	*pH*	*Pct*	*Pct*	*mmhos/cm*	
129:								
Nahrub	0-9	20-27	5.0-15	7.9-11.0	0-14	0-5	1.0-16.0	2-80
	9-32	35-50	10-20	7.9-11.0	1-10	0-5	8.0-30.0	30-300
	32-66	35-50	10-20	7.9-11.0	1-10	0-5	8.0-30.0	30-300
130:								
Nord	0-11	10-18	5.0-15	6.6-8.4	0-4	0	0.0-2.0	2-10
	11-38	10-18	5.0-15	6.6-8.4	0-4	0	0.0-2.0	2-10
	38-50	2-12	5.0-15	6.6-8.4	0-4	0	0.0-2.0	2-10
	50-72	10-18	5.0-15	6.6-8.4	0-4	0	0.0-2.0	2-10
131:								
Pits.								
132:								
Quonal	0-7	40-50	30-40	7.4-9.6	1-10	1-5	0.0-8.0	0-4
	7-16	40-50	30-40	7.4-9.6	1-10	1-5	0.0-8.0	0-13
	16-41	40-50	30-40	7.4-9.6	1-10	1-5	0.0-8.0	13-50
	41-44	---	---	---	---	---	---	---
	44-62	18-35	15-20	7.9-9.6	5-10	1-5	0.0-8.0	13-50
Lewis	0-5	27-30	10-20	7.9-9.6	1-4	0	4.0-16.0	13-100
	5-25	35-60	10-20	8.5-9.6	1-8	0	8.0-40.0	13-100
	25-39	---	---	---	---	---	---	---
	39-60	15-30	10-20	7.9-9.6	1-8	0	4.0-40.0	13-200
133:								
Remnoy	0-3	10-25	10-20	8.5-11.0	0-10	0-3	2.0-16.0	2-13
	3-17	27-35	10-20	8.5-11.0	0-10	0-3	8.0-16.0	13-100
	17-23	---	---	---	---	---	---	---
	23-60	7-15	10-20	8.5-11.0	0-10	0-3	8.0-16.0	13-100
134:								
Riverwash.								
135:								
San Joaquin	0-10	15-25	12-18	6.6-7.8	0-1	0	0	0
	10-15	20-30	15-18	6.6-7.8	0-1	0	0	0
	15-29	35-50	22-30	6.6-7.8	0-1	0	0	0
	29-34	---	---	---	---	---	---	---
136:								
Seville	0-6	40-60	20-30	6.6-8.4	0-5	0	0.0-2.0	0-4
	6-29	40-60	20-30	7.4-9.0	0-10	0	0.0-2.0	0-4
	29-44	---	---	---	---	---	---	---
	44-60	3-15	5.0-10	7.4-8.4	0-10	0	0.0-2.0	0-4
137:								
Tagus	0-17	10-18	5.0-15	7.4-7.8	0-1	0	0.0-2.0	0-5
	17-40	10-18	5.0-15	7.9-8.4	6-10	0	0.0-2.0	0-12
	40-63	10-18	5.0-15	7.9-9.0	1-3	0	0.0-2.0	0-12
138:								
Tujunga	0-14	0-5	0.0-5.0	6.1-7.3	0	0	0	0
	14-70	0-5	0.0-5.0	6.1-7.3	0	0	0	0
139:								
Wasco	0-9	8-18	5.0-15	6.6-7.8	0	0	0.0-2.0	0
	9-60	8-18	5.0-15	6.6-8.4	0-5	0	0.0-2.0	0

Table 21.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	*Pct*	*meq/100g*	*pH*	*Pct*	*Pct*	*mmhos/cm*	
140:								
Westcamp	0-5	10-27	15-25	7.4-9.6	1-3	0-5	2.0-16.0	2-13
	5-33	18-35	15-25	7.9-9.6	1-14	0-5	2.0-16.0	13-100
	33-60	35-55	15-25	7.9-9.6	1-14	0-5	4.0-16.0	13-100
141:								
Posochanet	0-5	18-27	20-30	7.9-9.0	0-5	0-5	4.0-8.0	2-13
	5-33	18-35	20-30	7.9-9.9	1-5	0-5	4.0-8.0	13-50
	33-60	30-50	20-30	7.9-9.9	1-5	0-5	4.0-30.0	13-50
142:								
Wutchumna, 15-50% slopes	0-4	27-32	15-20	6.6-7.3	0	0	0	0
	4-18	32-40	15-25	6.6-7.3	0	0	0	0
	18-35	40-60	25-35	6.6-7.8	0	0	0	0
	35-45	---	---	---	---	---	---	---
Wutchumna, 5-15% slopes	0-4	27-32	15-20	6.6-7.3	0	0	0	0
	4-18	32-40	15-25	6.6-7.3	0	0	0	0
	18-35	40-60	25-35	6.6-7.8	0	0	0	0
	35-45	---	---	---	---	---	---	---
Rock outcrop.								
143:								
Yettem	0-13	5-18	5.0-15	5.6-7.8	0	0	0.0-2.0	0-5
	13-63	5-18	5.0-15	6.6-8.4	0-5	0	0.0-2.0	0-5
144:								
Youd	0-9	12-18	5.0-15	5.6-8.4	0-5	0-3	4.0-16.0	13-50
	9-32	---	---	---	---	---	---	---
	32-60	7-20	5.0-15	6.6-9.0	0-5	0-3	2.0-16.0	1-50
145:								
Water, perennial.								

Table 22.--Water Features

(Depth of layers is in feet. See text for definitions of terms used in this table. Estimates of the frequency of ponding and flooding apply to the whole year rather than to individual months. Absence of an entry indicates that the feature is not a concern or that data were not estimated.)

Map symbol and soil name	Hydrologic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			Ft	Ft	Ft				
101:									
Akers	B	Jan-Dec	---	---	---	---	None	Brief	Very rare
Akers, saline-sodic	B	Jan-Dec	---	---	---	---	None	Brief	Very rare
102:									
Armona	C	Jan-Dec	3.0-5.0	>6.0	---	---	None	Brief	Rare
103:									
Atesh	C	Jan-Dec	---	---	---	---	None	Brief	Rare
Jerryslu	C	Jan-Dec	---	---	---	---	None	Brief	Rare
104:									
Biggriz	B	Jan-Dec	---	---	---	---	None	Brief	Rare
Biggriz, saline-sodic	B	Jan-Dec	---	---	---	---	None	Brief	Rare
105:									
Calgro	C	Jan-Dec	---	---	---	---	None	Brief	Very rare
Calgro, saline-sodic	C	Jan-Dec	---	---	---	---	None	Brief	Very rare
106:									
Centerville	B	Jan-Dec	---	---	---	---	None	Brief	Very rare
107:									
Centerville	B	Jan-Dec	---	---	---	---	None	Brief	Very rare
108:									
Colpien	B	Jan-Dec	---	---	---	---	None	Brief	Rare
109:									
Crosscreek	B	Jan-Dec	---	---	---	---	None	Brief	Very rare
Kai	C	Jan-Dec	---	---	---	---	None	Brief	Very rare
110:									
Delhi	A	Jan-Dec	---	---	---	---	None	Brief	Very rare
111:									
Delvar	C	Jan-Dec	---	---	---	---	None	Brief	Very rare
112:									
Dumps.									
113:									
Excelsior	B	Jan-Dec	---	---	---	---	None	Brief	Rare
114:									
Exeter	C	Jan-Dec	---	---	---	---	None	Brief	Very rare
115:									
Exeter	C	Jan-Dec	---	---	---	---	None	Brief	Very rare

Table 22.--Water Features--Continued

Map symbol and soil name	Hydrologic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			Ft	*Ft*	*Ft*				
116:									
Flamen	C	Jan-Dec	---	---	---	---	None	Brief	Very rare
117:									
Gambogy	B	Jan-Dec	---	---	---	---	None	Brief	Rare
118:									
Gambogy	B	Jan-Dec	---	---	---	---	None	Brief	Rare
Biggriz	B	Jan-Dec	---	---	---	---	None	Brief	Rare
119:									
Gareck	B	Jan-Dec	---	---	---	---	None	Brief	Rare
Garces	D	Jan-Dec	---	---	---	---	None	Brief	Rare
120:									
Gepford	D	Jan-Dec	2.5-4.0	>6.0	---	---	None	Brief	Rare
121:									
Gepford, partially drained, sandy substratum	D	Jan-Dec	2.5-4.0	>6.0	---	---	None	Brief	Rare
122:									
Grangeville	B	Jan-Dec	---	---	---	---	None	Brief	Rare
123:									
Grangeville, saline-sodic	B								
		January	4.0-6.0	>6.0	---	---	None	Brief	Rare
		February	4.0-6.0	>6.0	---	---	None	Brief	Rare
		March	4.0-6.0	>6.0	---	---	None	Brief	Rare
		April	4.0-6.0	>6.0	---	---	None	Brief	Rare
		May-Dec	---	---	---	---	None	Brief	Rare
124:									
Hanford	B	Jan-Dec	---	---	---	---	None	Brief	Very rare
125:									
Houser	D	Jan-Dec	---	---	---	---	None	Brief	Rare
126:									
Houser	D	Jan-Dec	---	---	---	---	None	Brief	Rare
127:									
Kimberlina	B	Jan-Dec	---	---	---	---	None	Brief	Rare
128:									
Lethent	D	Jan-Dec	---	---	---	---	None	Brief	Rare
129:									
Nahrub	D	Jan-Dec	---	---	---	---	None	Brief	Rare
130:									
Nord	B	Jan-Dec	---	---	---	---	None	Brief	Very rare
131:									
Pits									

Table 22.--Water Features--Continued

Map symbol and soil name	Hydrologic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			Ft	*Ft*	*Ft*				
132:									
Quonal	B	Jan-Dec	---	---	---	---	None	Brief	Very rare
Lewis	D	Jan-Dec	---	---	---	---	None	Brief	Very rare
133:									
Remnoy	D	Jan-Dec	---	---	---	---	None	Brief	Rare
134:									
Riverwash	---	Jan-Dec	---	---	---	---	None	Very long	Frequent
135:									
San Joaquin	D	Jan-Dec	---	---	---	---	None	Brief	Very rare
136:									
Seville	D	Jan-Dec	---	---	---	---	None	Brief	Very rare
137:									
Tagus	B	Jan-Dec	---	---	---	---	None	Brief	Very rare
138:									
Tujunga	A	Jan-Dec	---	---	---	---	None	Brief	Rare
139:									
Wasco	B	Jan-Dec	---	---	---	---	None	Brief	Very rare
140:									
Westcamp	C	Jan-Dec	4.0-6.0	>6.0	---	---	None	Brief	Rare
141:									
Posochanet	C	Jan-Dec	---	---	---	---	None	Brief	Rare
142:									
Wutchumna, 15-50% slopes	D	Jan-Dec	---	---	---	---	None	---	None
Wutchumna, 5-15% slopes	D	Jan-Dec	---	---	---	---	None	---	None
Rock outcrop.									
143:									
Yettem	B	Jan-Dec	---	---	---	---	None	Brief	Very rare
144:									
Youd	D	Jan-Dec	---	---	---	---	None	Brief	Rare
145:									
Water, perennial.									

Table 23.--Soil Features

(See text for definitions of terms used in this table. Absence of an entry indicates that the feature is not a concern or that data were not estimated.)

Map symbol and soil name	Restrictive layer				Potential for frost action	Risk of corrosion	
	Kind	Depth to top	Thickness	Hardness		Uncoated steel	Concrete
		In	*In*				
101:							
Akers	---	---	---	---	Low	High	Low
Akers, saline-sodic	---	---	---	---	Low	High	High
102:							
Armona	---	---	---	---	Low	High	High
103:							
Atesh	Duripan	40-60	0-40	Weakly cemented	Low	High	High
Jerryslu	Natric	3-12	8-36	Noncemented	Low	High	Low
	Duripan	20-40	4-10	Indurated			
104:							
Biggriz	---	---	---	---	Low	High	Moderate
Biggriz, saline-sodic	---	---	---	---	Low	High	Moderate
105:							
Calgro	Duripan	20-40	4-35	Indurated	Low	High	Low
Calgro, saline-sodic	Duripan	20-40	4-35	Indurated	Low	High	Low
106:							
Centerville, 0-2% slopes	Dense material	48-60	10-20	Noncemented	Low	High	Low
107:							
Centerville, 2-5% slopes	Dense material	48-60	10-20	Noncemented	Low	High	Low
108:							
Colpien	---	---	---	---	Low	High	Low
109:							
Crosscreek	Duripan	40-60	5-20	Weakly cemented	Low	High	High
Kai	Natric	4-12	14-36	Noncemented	Low	High	Low
	Duripan	20-40	4-10	Strongly cemented			
110:							
Delhi	---	---	---	---	Low	Moderate	Low
111:							
Delvar	---	---	---	---	Low	High	Low
112:							
Dumps.							
113:							
Excelsior	---	---	---	---	Low	High	High
114:							
Exeter, 0-2% slopes	Duripan	20-40	6-30	Indurated	Low	High	Low
115:							
Exeter, 2-5% slopes	Duripan	20-40	6-30	Indurated	Low	High	Low
116:							
Flamen	Duripan	40-60	4-30	Strongly cemented	Low	High	Low

Table 23.--Soil Features--Continued

Map symbol and soil name	Restrictive layer				Potential for frost action	Risk of corrosion	
	Kind	Depth to top	Thickness	Hardness		Uncoated steel	Concrete
		In	*In*				
117:							
Gambogy	---	---	---	---	Low	High	Moderate
118:							
Gambogy	---	---	---	---	Low	High	Moderate
Biggriz	---	---	---	---	Low	High	Moderate
119:							
Gareck	---	---	---	---	Low	High	High
Garces	Natric	2-13	13-51	Noncemented	Low	High	Moderate
120:							
Gepford	---	---	---	---	Low	High	High
121:							
Gepford, partially drained, sandy substratum	Strongly contrasting textural stratification	40-50	10-20	Noncemented	Low	High	High
122:							
Grangeville	---	---	---	---	Low	High	Low
123:							
Grangeville, saline-sodic	---	---	---	---	Low	High	Low
124:							
Hanford	---	---	---	---	Low	Moderate	Moderate
125:							
Houser fine sandy loam	Strongly contrasting textural stratification	5-30	30-55	Noncemented	Low	High	High
126:							
Houser silty clay	---	---	---	---	Low	High	High
127:							
Kimberlina	---	---	---	---	Low	High	High
128:							
Lethent	Strongly contrasting textural stratification Natric	5-10	24-31	Noncemented	Low	High	High
129:							
Nahrub	Strongly contrasting textural stratification	5-30	30-55	Noncemented	Low	High	High
130:							
Nord	---	---	---	---	Low	High	Low
131:							
Pits.							

Table 23.--Soil Features--Continued

Map symbol and soil name	Restrictive layer				Potential for frost action	Risk of corrosion	
	Kind	Depth to top	Thickness	Hardness		Uncoated steel	Concrete
		In	*In*				
132:							
Quonal	Duripan	40-60	2-20	Strongly cemented	Low	High	High
Lewis	Natric	2-6	2-24	Noncemented	Low	High	High
	Duripan	20-40	2-20	Strongly cemented			
133:							
Remnoy	Natric	2-9	6-17	Noncemented	Low	High	High
	Duripan	10-20	4-15	Indurated			
134:							
Riverwash.							
135:							
San Joaquin	Duripan	20-40	2-40	Indurated	Low	Moderate	Moderate
136:							
Seville	Duripan	20-40	4-20	Weakly cemented	Low	High	Low
137:							
Tagus	---	---	---	---	Low	High	Low
138:							
Tujunga	---	---	---	---	Low	Moderate	Low
139:							
Wasco	---	---	---	---	Low	High	Low
140:							
Westcamp	---	---	---	---	Low	High	High
141:							
Posochanet	---	---	---	---	Low	High	High
142:							
Wutchumna, 15-50% slopes	Bedrock (lithic)	20-40	---	Indurated	Low	High	Low
Wutchumna, 5-15% slopes	Bedrock (lithic)	20-40	---	Indurated	Low	High	Low
Rock outcrop.							
143:							
Yettem	---	---	---	---	Low	High	Moderate
144:							
Youd	Duripan	8-20	12-40	Strongly cemented	---	High	High
145:							
Water, perennial.							

Table 24.--Atesh Laboratory Tables

S92CA-107-002 (TULARE COUNTY, CALIFORNIA)

MAP SYMBOL: 103
SOIL NAME: ATESH-JERRYSLU ASSOCIATION, 0 TO 2 PERCENT SLOPES
CLASSIFICATION: COARSE-LOAMY, MIXED, SUPERACTIVE, CALCAREOUS, THERMIC SODIC TORRIARENTS

SSL - PROJECT 93P 39, (CP93CA052) CA-TULARE WEST
- PEDON 93P 246, SAMPLES 93P 1968- 1982

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NATURAL RESOURCES CONSERVATION SERVICE
NATIONAL SOIL SURVEY CENTER
SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA 68508-3866

			(- - -TOTAL - - -)				(- -CLAY- -)	(- -SILT- -)			(- - - - - -SAND- - - - - -)				(-COARSE FRACTIONS(MM)-)				(>2MM)
			CLAY	SILT	SAND	FINE	CO3	FINE	COARSE	VF	F	M	C	VC	- - - - WEIGHT - - - -				WT
SAMPLE	DEPTH	HORIZON	LT	.002	.05	LT	LT	.002	.02	.05	.10	.25	.5	1	2	5	20	.1-	PCT OF
NO.	(IN)		.002	-.05	-2	.0002	.002	-.02	-.05	-.10	-.25	-.50	-1	-2	-5	-20	-75	75	WHOLE
			<- - - - - - - - - - - - PCT OF <2MM					(3A1)			- - - - - - - - - - - - ->				<- PCT OF <75MM(3B1)->			SOIL
93P1968S	0-2	Ap1	14.2	29.9	55.9	3.8	2.2	13.1	16.8	14.9	24.4	11.1	4.2	1.3	1	TR	---	42	1
93P1969S	2-6	Ap2	12.9	28.4	58.7	3.5	1.2	12.5	15.9	13.6	25.8	13.5	4.4	1.4	1	---	---	46	1
93P1970S	6-14	Ap3	6.8	25.4	67.8	1.6	1.5	14.8	10.6	13.4	26.8	17.6	7.0	3.0	2	TR	---	55	2
93P1971S	14-23	Ap4	5.0	26.7	68.3	0.9	1.8	15.3	11.4	13.6	27.7	17.4	6.4	3.2	1	TR	---	55	1
93P1972S	23-28	Ap5	5.4	37.1	57.5	0.8	2.8	24.4	12.7	14.2	21.4	12.2	6.7	3.0	1	---	---	44	1
93P1973S	28-36	Ap6	4.2	30.7	65.1	0.7	0.9	18.7	12.0	9.1	17.4	16.8	13.1	8.7	2	TR	---	57	2
93P1974S	36-43	Ap7	4.4	28.4	67.2	---	0.6	14.6	13.8	10.3	15.6	15.9	15.7	9.7	4	1	---	59	5
93P1975S	43-49	2Btkqymb	7.4	21.1	71.5	1.6	0.3	11.0	10.1	8.5	14.8	17.0	18.8	12.4	4	TR	---	64	4
93P1976S	49-58	2Btkqyb	11.2	38.5	50.3	2.1		24.9	13.6	8.4	12.1	13.0	11.6	5.2	3	TR	---	44	3
93P1977S	58-71	2Btkqb1	7.4	29.6	63.0	1.5	0.9	15.8	13.8	9.9	16.9	17.0	12.2	7.0	8	1	---	57	9
93P1978S	71-83	2Btkq2	3.9	25.4	70.7	0.8	0.9	12.7	12.7	12.8	15.2	18.2	15.5	9.0	3	1	---	60	4
93P1979S	83-92	2Btkb	4.3	23.9	71.8	0.9	0.6	13.2	10.7	6.5	10.7	17.8	20.6	16.2	8	TR	---	68	8
93P1980S	92-100	3C	1.7	3.3	95.0	0.8	0.6	2.1	1.2	1.6	14.2	26.8	28.5	23.9	15	1	---	94	16

	ORGN	TOTAL	EXTR	TOTAL	(- - DITH-CIT - -)			(RATIO/CLAY)		(ATTERBERG)		(- BULK DENSITY -)			COLE	(- - -WATER CONTENT - - -)				WRD
	C	N	P	S	EXTRACTABLE			CEC	15 BAR	- LIMITS -		FIELD MOIST	1/3 BAR	OVEN DRY	WHOLE SOIL	FIELD MOIST	1/10 BAR	1/3 BAR	15 BAR	WHOLE SOIL
DEPTH					FE	AL	MN			LL	PI									
(IN)	6A1c	6B3a	6S3	6R3b	6C2b	6G7a	6D2a	8D1	8D1	4F1	4F	4A5	4A1d	4A1h	4D1	4B4	4B1c	4B1c	4B2a	4C1
	PCT	<2MM	PPM	<- PERCENT	OF	<2MM	-->			PCT	<0.4MM	<- - G/CC - - ->			CM/CM	<- - -PCT OF <2MM - ->				CM/CM
0-2	0.83	0.107	16	---	0.3	TR	TR	1.06	0.52			1.48	1.53	0.011			15.4	7.4	0.12	
2-6	0.50	0.046	15					1.12	0.50			1.44	1.54	0.023			16.4	6.4	0.14	
6-14	0.13	0.035	---	---	0.3	TR	---	1.94	0.96			1.50	1.52	0.004			15.8	6.5	0.14	
14-23	0.10	0.005	---					2.80	1.32			1.38	1.40	0.005			17.9	6.6	0.15	
23-28	0.13	0.035	1	---	0.3	TR	TR	3.20	1.22			1.39	1.39	---			20.1	6.6	0.19	
28-36	0.06		---					3.24	1.05			1.67	1.67	---			13.2	4.4	0.15	
36-43	0.06		---		0.2	TR	TR	2.32	0.95			1.76	1.83	0.013			11.1	4.2	0.12	
43-49	0.08		TR					2.01	0.95			1.60	1.60	---			15.5	7.0	0.13	
49-58	0.03		9		0.4	0.1	TR	2.38	0.83			1.67	1.77	0.019			15.3	9.3	0.10	
58-71	0.04							2.01	0.80			1.75	1.90	0.026			13.2	5.9	0.12	
71-83	0.04				0.2	TR	TR	2.97	1.36			1.57	1.58	0.002			15.3	5.3	0.15	
83-92	0.03							2.07	1.00			1.56	1.80	0.046			13.3	4.3	0.13	
92-100	0.02				0.1	0.3	---	1.53	0.82									1.4		

AVERAGES, DEPTH 25-91: PCT CLAY 3 PCT .1-75mm 54
ANALYSES: S = ALL ON SIEVED <2mm BASIS G = <2mm ON GROUND <75mm BASIS P = FABRIC ON <75mm FRACTION

Table 24.--Atesh Laboratory Tables--Continued

DEPTH (IN)	(- NH4OAC EXTRACTABLE BASES -) CA 5B5a 6N2e	MG 5B5a 6O2d	NA 5B5a 6P2b	K 5B5a 6Q2b	SUM BASES	ACID-ITY 6H5a	(- -CEC- -) SUM CATS 5A3a	NH4-OAC 5A8b	EXCH NA 5D2	SAR 5E	BASE SATURATION SUM 5C3	NH4OAC 5C1	CARBONATE AS CACO3 <2MM 6E1g	<20MM 6E4	CASO4 AS GYPSUM <2MM 6F1a	<20MM 6F4	(- - - -PH - - -) SAT PASTE 8C1b	CACL2 .01M 1:2 8C1f	H2O 1:1 8C1f
	<- - - - - - - - - - -MEQ / 100 G - - - - - - - - - - ->								PCT		<- -PCT- >		<- -PCT ->		<- -PCT ->				
0-2		1.7	4.0	0.4				15.0	25	2	100	100	1		---		7.9	7.5	8.0
2-6		1.3	3.5	0.2				14.4	24	2	100	100	1		---		8.0	7.6	8.2
6-14		2.0	2.3	TR				13.2	18		100	100	4		---			7.8	8.6
14-23		2.5	2.5	0.2				14.0	17	5	100	100	4		---		8.6	8.0	8.8
23-28		2.9	3.4	TR				17.3	19	6	100	100	9		---		8.8	8.1	9.0
28-36		2.3	2.4	TR				13.6	16	5	100	100	2		---		8.7	8.0	8.8
36-43		1.8	2.1	TR				10.2	19	5	100	100	2		---		8.7	7.9	8.8
43-49		2.4	4.5	TR				14.9	29	5	100	100	8		---		8.6	7.9	8.9
49-58	21.3	1.6	3.8	0.1	26.8	---	26.8	26.7	14	5	100	100	---		---		8.4	7.8	8.7
58-71		2.0	1.9	TR				14.9	12	5	100	100	2		---		8.4	7.9	8.7
71-83		2.1	1.2	TR				11.6	9	5	100	100	2		---		8.4	7.9	8.7
83-92		1.6	0.9	TR				8.9	8	5	100	100	1		---		8.3	7.8	8.6
92-100		0.9	0.4	TR				2.6	15		100	100	1		---			7.9	9.0

DEPTH (IN)	(- - - - - - - - - -WATER EXTRACTED FROM SATURATED PASTE- - - - - - - - - - - -) CA 6N1b	MG 6O1b	NA 6P1b	K 6Q1b	CO3 6I1b	HCO3 6J1b	F 6U1a	CL 6K1c	SO4 6L1c	NO2 6W1a	NO3 6M1c	H2O 8A	TOTAL SALTS EST. 8D5	PRED. ELEC. COND. 8A3a	ELEC. COND. 8I
	< - - - - - - - - - - - - - - - -MEQ / LITER - - - - - - - - - - - - - - - ->											<- -PCT- ->		MMHOS /cm	MMHOS /cm
0-2	9.4	1.4	4.8	0.1	---	12.0	0.1	0.9	1.8	TR	0.2	38.1	TR	1.28	0.45
2-6	4.3	0.6	2.7	0.1	---	4.8	0.1	0.4	0.7	TR	0.5	36.2	TR	0.69	0.30
6-14															0.23
14-23	1.4	0.4	4.4	---	---	2.9	0.2	0.8	1.3	0.1	0.2	38.6	TR	0.58	0.27
23-28	1.1	0.3	5.3	0.1	---	3.2	0.4	0.7	1.5	TR	0.1	41.2	TR	0.62	0.34
28-36	1.0	0.3	4.4		---	2.4	0.4	0.8	1.7	---	TR	30.5	TR	0.58	0.26
36-43	1.0	0.3	4.1		---	2.3	0.5	0.7	1.4	---	0.1	31.4	TR	0.53	0.25
43-49	1.0	0.3	4.1		---	2.5	0.4	0.6	1.3	---	TR	37.6	TR	0.53	0.27
49-58	0.9	0.3	4.2	0.1	---	2.1	0.3	0.9	1.6	---	TR	36.9	TR	0.55	0.26
58-71	1.2	0.3	4.6		---	2.0	0.3	1.3	2.3	---	TR	32.8	TR	0.65	0.27
71-83	1.8	0.4	5.0	TR		1.7	0.1	1.9	2.7	---	0.1	32.7	TR	0.79	0.28
83-92	2.2	0.5	5.5	0.1		1.6	0.1	2.0	4.0	---	0.1	29.4	TR	0.87	0.28

MMHOS/CM OF 1:2 WATER EXTRACT (8I) & EXCH NA AS EXTRACTABLE NA FOR LAYER 3
ANALYSES: S = ALL ON SIEVED <2mm BASIS

Table 25.--Jerryslu Laboratory Tables

S92CA-107-001 (TULARE COUNTY, CALIFORNIA)

MAP SYMBOL: 103
SOIL NAME: ATESH-JERRYSLU ASSOCIATION, 0 TO 2 PERCENT SLOPES
CLASSIFICATION: FINE-LOAMY, MIXED, SUPERACTIVE, THERMIC TYPIC NATRIDURIDS

SSL - PROJECT 93P 39, (CP93CA052) CA-TULARE WEST
- PEDON 93P 245, SAMPLES 93P 1954- 1967

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
NATIONAL SOIL SURVEY CENTER
SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA 68508-3866

			(- - -TOTAL - - -)				(- -CLAY- -)	(- -SILT- -)			(- - - - - -SAND- - - - - -)				(-COARSE FRACTIONS(MM)-)				(>2MM)
			CLAY	SILT	SAND	FINE	CO3	FINE	COARSE	VF	F	M	C	VC	- - - - WEIGHT - - - -				WT
SAMPLE	DEPTH	HORIZON	LT	.002	.05	LT	LT	.002	.02	.05	.10	.25	.5	1	2	5	20	.1-	PCT OF
NO.	(IN)		.002	-.05	-2	.0002	.002	-.02	-.05	-.10	-.25	-.50	-1	-2	-5	-20	-75	75	WHOLE
			<- - - - - - - - - - - - PCT OF <2MM					(3A1)			- - - - - - - - - - - - ->				<- PCT OF <75MM(3B1)->			SOIL
93P1954S	0-1	A	8.8	44.7	46.5	2.2	1.6	19.9	24.8	16.1	18.4	8.9	2.6	0.5	TR	---	---	30	---
93P1955S	1-3	E1	5.7	39.7	54.6	1.5	1.5	14.1	25.6	18.2	23.0	10.2	2.8	0.4	---	---	---	36	---
93P1956S	3-4	E2	13.9	35.8	50.3	4.9	3.4	12.4	23.4	16.3	21.1	10.1	2.6	0.2	---	---	---	34	---
93P1957S	4-9	Btkn1	25.1	26.9	48.0	13.0	1.2	11.7	15.2	12.3	21.2	11.6	2.5	0.4	TR	---	---	36	---
93P1958S	9-12	Btkn2	16.2	30.2	53.6	6.6	1.5	16.1	14.1	13.4	21.0	15.2	3.6	0.4	TR	---	---	40	---
93P1959S	12-17	Btkn3	16.7	48.4	34.9	5.7	0.6	25.3	23.1	13.5	12.3	6.9	1.8	0.4	TR	---	---	21	---
93P1960S	17-29	Btkn4	17.3	49.1	33.6	5.4	1.2	27.0	22.1	16.6	11.1	3.7	1.6	0.6	TR	---	---	17	TR
93P1961S	29-35	Btkn5	18.0	37.8	44.2	4.9	1.2	23.6	14.2	9.1	15.6	11.4	6.1	2.0	TR	TR	---	35	TR
93P1962S	35-41	Btkqm1	11.1	28.5	60.4	2.9	0.6	14.2	14.3	13.5	18.8	13.7	10.4	4.0	9	24	2	65	35
93P1963S	41-50	Btkqm2	14.0	28.5	57.5	4.8	1.5	13.2	15.3	12.1	18.5	12.4	9.0	5.5	2	1	---	47	3
93P1964S	50-55	Btkqm3	12.7	20.7	66.6	3.7	2.1	9.9	10.8	8.8	16.9	13.9	15.4	11.6	14	27	8	78	49
93P1965S	55-64	Btk	15.9	22.7	61.4	4.7	2.1	10.7	12.0	10.6	20.7	13.6	10.3	6.2	6	1	---	54	7
93P1966S	64-72	2Bkq	10.9	19.7	69.4	3.2	2.1	9.6	10.1	11.2	20.5	15.9	12.1	9.7	8	1	---	62	9
93P1967S	72-79	2Bq	6.3	20.1	73.6	2.4	1.8	9.9	10.2	9.5	21.6	17.9	14.7	9.9	11	1	---	68	12

	ORGN	TOTAL	EXTR	TOTAL	(- - DITH-CIT - -)			(RATIO/CLAY)		(ATTERBERG)		(- BULK DENSITY -)			COLE	(- - -WATER CONTENT - - -)				WRD
	C	N	P	S	EXTRACTABLE				15	- LIMITS -		FIELD	1/3	OVEN	WHOLE	FIELD	1/10	1/3	15	WHOLE
DEPTH					FE	AL	MN	CEC	BAR	LL	PI	MOIST	BAR	DRY	SOIL	MOIST	BAR	BAR	BAR	SOIL
(IN)	6A1c	6B3a	6S3	6R3b	6C2b	6G7a	6D2a	8D1	8D1	4F1	4F	4A5	4A1d	4A1h	4D1	4B4	4B1c	4B1c	4B2a	4C1
	PCT	<2MM	PPM	<- PERCENT	OF	<2MM	-->			PCT	<0.4MM	<- - G/CC - - ->			CM/CM	<- - -PCT OF <2MM - ->				CM/CM
0-1	1.99	0.202	3	0.02	0.3	TR	---	1.44	0.59			1.89	1.97	0.014		17.3	5.2	0.23		
1-3	0.43	0.038	9					1.16	0.35			1.63	1.67	0.008		12.1	2.0	0.16		
3-4	0.27	0.043	---	0.03	0.3	TR		0.66	0.35			1.72	1.80	0.015		11.0	4.8	0.11		
4-9	0.13	0.010	---					0.65	0.39			1.66	1.76	0.018		13.8	9.9	0.06		
9-12	0.04	0.005	29		0.6	TR	---	0.84	0.40			1.45	1.51	0.014		17.7	6.5	0.16		
12-17	0.04		18					1.04	0.44			1.28	1.30	0.005		20.8	7.4	0.17		
17-29	0.05		24		0.9	0.1	TR	1.06	0.49			1.31	1.33	0.005		26.7	8.5	0.24		
29-35	0.06				0.6	0.1	TR	0.94	0.41			1.52	1.54	0.004		16.3	7.3	0.14		
35-41	0.05				0.2	TR	---	0.85	0.48			1.56	1.57	0.002		12.8	5.3	0.09		
41-50	0.01							0.71	0.41			1.73	1.78	0.009		10.8	5.7	0.09		
50-55	0.04				0.3	TR	---	0.83	0.36			1.99	2.00	0.001		7.8	4.6	0.04		
55-64	0.01							0.77	0.43			1.81	1.86	0.009		13.0	6.9	0.11		
64-72	0.01				0.3	TR	---	0.93	0.46			1.81	1.84	0.005		7.6	5.0	0.04		
72-79	---							1.06	0.65			1.77	1.78	0.002		8.7	4.1	0.07		

AVERAGES, DEPTH 10-60: PCT CLAY 18 PCT .1-75MM 27

Table 25.--Jerryslu Laboratory Tables--Continued

DEPTH (IN)	(- NH4OAC EXTRACTABLE BASES -) CA 5B5a 6N2e	MG 5B5a 6O2d	NA 5B5a 6P2b	K 5B5a 6Q2b	SUM BASES	ACID-ITY 6H5a	(- -CEC- -) SUM CATS 5A3a	NH4-OAC 5A8b	EXCH NA 5D2 PCT	SAR 5E	BASE SATURATION SUM 5C3	NH4OAC 5C1	CARBONATE AS CACO3 <2MM 6E1g	<20MM 6E4	CASO4 AS GYPSUM <2MM 6F1a	<20MM 6F4	(- - - -PH - - -) SAT PASTE 8C1b	CACL2 .01M 8C1f 1:2	H2O 8C1f 1:1
	<- - - - - - - - - - -MEQ / 100 G - - - - - - - - - - ->										<- -PCT- >		<- -PCT ->		<- -PCT ->				
0-1		1.4	6.0	1.4				12.7	41	7	100	100	1		---		6.9	7.3	7.8
1-3		1.1	5.9	0.4				6.6	76	17	100	100	2		---		7.8	7.9	8.5
3-4		1.7	17.9	0.6				9.2	140	170	100	100	4		---		9.2	9.1	9.5
4-9		1.6	31.6	1.0				16.4	142	307	100	100	2		---		10.1	9.7	10.0
9-12		0.5	23.7	0.4				13.6	140	152	100	100	1		---		10.2	9.7	10.1
12-17		0.7	25.9	0.4				17.3	112	203	100	100	1		---		10.3	9.7	10.1
17-29		2.0	30.1	0.4				18.4	115	256	100	100	1		TR		10.3	9.8	10.2
29-35		1.8	27.4	0.6				16.9	124	202	100	100	2		---		10.2	9.9	10.2
35-41		2.6	16.5	0.2				9.4	147	94	100	100	5	7	---		8.9	8.7	9.3
41-50		1.7	12.3	0.1				10.0	98	36	100	100	2		---		8.1	8.1	8.6
50-55		2.4	9.5	0.2				10.5	74	20	100	100	3	3	---		8.1	8.0	8.3
55-64		2.8	7.8	0.4				12.2	55	11	100	100	2		---		8.0	7.9	8.1
64-72		2.4	3.0	0.3				10.1	22	5	100	100	1		---		8.0	7.8	8.2
72-79	12.1	1.3	0.8	TR	14.2		14.2	6.7	11	3	100	100	TR		---		8.1	7.7	8.3

DEPTH (IN)	(- - - - - - - - - - -WATER EXTRACTED FROM SATURATED PASTE- - - - - - - - - - - -) CA 6N1b	MG 6O1b	NA 6P1b	K 6Q1b	CO3 6I1b	HCO3 6J1b	F 6U1a	CL 6K1c	SO4 6L1c	NO2 6W1a	NO3 6M1c	H2O 8A	TOTAL SALTS EST. 8D5	PRED. ELEC. COND. 8A3a MMHOS /cm	ELEC. COND. 8I MMHOS /cm
	< - - - - - - - - - - - - - -MEQ / LITER - - - - - - - - - - - ->											<- -PCT- ->			
0- 1	11.1	2.1	17.5	2.0	---	16.9	2.6	7.2	2.8	---	---	48.8	0.1	2.70	0.83
1- 3	5.3	0.9	29.8	1.0	---	9.0	0.5	19.9	5.9	---	---	28.1	0.1	3.30	0.74
3- 4	2.2	0.3	190.6	1.6	---	10.4	---	113.3	54.9	---	---	26.6	0.4	16.00	4.06
4- 9	0.8	0.2	216.8	1.1	24.5	11.3	---	127.2	49.2	---	---	38.1	0.6	17.80	4.83
9- 12	1.0	0.3	122.8	0.4	13.6	9.1	---	68.1	28.6	---	TR	38.6	0.3	10.90	3.16
12- 17	0.6	0.2	128.6	0.2	13.0	9.1	---	72.7	29.7	---	TR	51.3	0.5	11.40	3.86
17- 29	0.6	0.2	162.0	0.2	16.8	11.3	---	87.4	40.5	---	---	54.9	0.6	14.00	4.66
29- 35	0.9	0.3	156.6	0.3	11.6	11.1	---	80.6	37.2	---	---	40.6	0.5	13.80	3.72
35- 41	1.3	0.4	87.0	0.2	---	3.7	---	63.1	20.5	---	---	30.6	0.2	7.68	1.88
41- 50	9.7	2.4	89.0	0.1	---	1.1	---	76.6	21.5	---	---	28.7	0.2	8.57	1.96
50- 55	9.6	2.4	48.0	0.1	---	1.0	---	51.8	7.7	---	---	37.1	0.2	5.60	1.47
55- 64	9.5	2.2	26.6	0.1	---	1.1	---	35.7	2.6	---	---	40.0	0.1	3.75	1.13
64- 72	7.1	1.6	10.9	0.1	---	1.0	---	16.7	1.2	---	TR	66.8	0.1	2.10	0.58
72- 79	4.3	1.0	4.5	0.1	---	0.9	0.1	9.2	0.3	---	TR	27.9	TR	1.09	0.30

ANALYSES: S = ALL ON SIEVED <2mm BASIS

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (USDA, 1998 and 1999). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 26 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Twelve soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Alfisols.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Xeralf (*Xer*, meaning dry, plus *alf*, from Alfisols).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; type of saturation; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Durixeralfs (*Dur*, meaning duripan, plus *xeralf*, the suborder of the Alfisols that has a xeric moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic subgroup is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other taxonomic class. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Durixeralfs.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle size, mineral content, soil temperature regime, soil depth, and reaction. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, superactive, thermic Typic Durixeralfs.

SERIES. The series consists of soils within a family that have horizons similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. Characteristics of the soil and the material in which it formed are identified for each series. A pedon, a small three-dimensional area of soil that is typical of the taxonomic unit in the survey area is described. The detailed description of each soil horizon follows standards in the "Soil Survey Manual" (USDA, 1993). Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" (USDA, 1999) and in "Keys to Soil Taxonomy" (USDA, 1998). Unless otherwise indicated, colors in the descriptions are for dry soil. Following the pedon description is the range of important characteristics of the soils in the taxonomic unit.

The map units of each taxonomic unit are described in the section "Detailed Soil Map Units."

Akers Series

The Akers series consists of very deep, well drained soils that formed in alluvium derived from granitic rock sources. These soils are on fan remnants. The elevation is 225 to 350 feet. The mean annual precipitation is 8 to 12 inches, and the mean annual temperature is 62 to 65 degrees F. The frost-free period is 225 to 300 days. Slopes are 0 to 2 percent.

Table 26.--Classification of the Soils

(An asterisk in the first column indicates a taxadjunct to the series. See text for a description of those characteristics that are outside the range of the series.)

Soil name	Family or higher taxonomic class
Akers	Coarse-loamy, mixed, superactive, thermic Calcic Haploxerepts
Armona	Fine-loamy, mixed, superactive, calcareous, thermic Fluvaquentic Endoaquolls
Atesh	Coarse-loamy, mixed, superactive, calcareous, thermic Sodic Torriarents
Biggriz	Fine-loamy, mixed, superactive, thermic Aquic Haploxerepts
Calgro	Coarse-loamy, mixed, superactive, thermic Typic Durixerepts
Centerville	Fine, smectitic, thermic Aridic Calcixererts
Colpien	Fine-loamy, mixed, superactive, thermic Calcic Pachic Haploxerolls
Crosscreek	Fine-loamy, mixed, superactive, calcareous, thermic Sodic Xerarents
Delhi	Mixed, thermic Typic Xeropsamments
Delvar	Fine, smectitic, thermic Calcic Pachic Argixerolls
Excelsior	Coarse-loamy, mixed, superactive, calcareous, thermic Typic Torrifluvents
Exeter	Fine-loamy, mixed, superactive, thermic Typic Durixeralfs
Flamen	Fine-loamy, mixed, superactive, thermic Calcic Pachic Haploxerolls
Gambogy	Fine-loamy, mixed, superactive, calcareous, thermic Cumulic Endoaquolls
Garces	Fine-loamy, mixed, superactive, thermic Typic Natrargids
Gareck	Fine-loamy, mixed, superactive, calcareous, thermic Sodic Torriarents
Gepford	Fine, smectitic, thermic Typic Natraquerts
Grangeville	Coarse-loamy, mixed, superactive, thermic Fluvaquentic Haploxerolls
Hanford	Coarse-loamy, mixed, superactive, nonacid, thermic Typic Xerorthents
Houser	Fine, smectitic, calcareous, thermic Vertic Fluvaquents
Jerryslu	Fine-loamy, mixed, superactive, thermic Typic Natridurids
Kai	Fine-loamy, mixed, superactive, thermic Natric Durixeralfs
Kimberlina	Coarse-loamy, mixed, superactive, calcareous, thermic Typic Torriorthents
Lethent	Fine, smectitic, thermic Typic Natrargids
Lewis	Fine, smectitic, thermic Natric Durixeralfs
Nahrub	Fine, smectitic, calcareous, thermic Vertic Torriorthents
Nord	Coarse-loamy, mixed, superactive, thermic Cumulic Haploxerolls
Posochanet	Fine-silty, mixed, superactive, thermic Sodic Haplocambids
Quonal	Fine, smectitic, calcareous, thermic Sodic Xerarents
Remnoy	Loamy, mixed, superactive, thermic, shallow Natric Durixeralfs
*San Joaquin	Fine, mixed, active, thermic Abruptic Durixeralfs
Seville	Fine, smectitic, thermic Aridic Durixererts
Tagus	Coarse-loamy, mixed, superactive, thermic Calcic Haploxerolls
Tujunga	Mixed, thermic Typic Xeropsamments
Wasco	Coarse-loamy, mixed, superactive, nonacid, thermic Typic Torriorthents
Westcamp	Fine-silty, mixed, superactive, calcareous, thermic Fluvaquentic Endoaquepts
Wutchumna	Fine, smectitic, thermic Mollic Haploxeralfs
Yettem	Coarse-loamy, mixed, superactive, thermic Entic Haploxerolls
Youd	Loamy, mixed, superactive, thermic, shallow Entic Durixerepts

Taxonomic class: Coarse-loamy, mixed, superactive, thermic Calcic Haploxerepts

Typical Pedon

Akers fine sandy loam, in an area of Akers-Akers, saline-sodic, complex, 0 to 2 percent slopes; in a leveled, fallow field at an elevation of 300 feet, near Visalia; 200 feet south of a dirt road along a vineyard, 950 feet west of Kaweah Road (Road 100) and 2,500 feet north of Caldwell Avenue (Avenue 280); 2,400 feet north and 1,300 feet west of the southeast corner of sec. 3, T. 19 S., R. 24 E., MDB&M; latitude 36 degrees, 18 minutes, 17 seconds north and longitude 119 degrees, 21 minutes, 10 seconds west; Visalia Quadrangle:

Ap1—0 to 7 inches; light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; common very fine, fine, and medium roots; common very fine and fine tubular, many very fine, fine, and medium irregular, and few coarse irregular pores; violently effervescent; disseminated carbonates; calcium carbonate

equivalent of 5 percent; moderately alkaline (pH 8.2); clear smooth boundary.

Ap2—7 to 16 inches; light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common very fine, fine, and medium roots; common very fine and fine tubular and irregular pores; violently effervescent; disseminated carbonates; calcium carbonate equivalent of 6 percent; moderately alkaline (pH 8.4); gradual wavy boundary.

Bw—16 to 27 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common very fine and fine roots; many very fine and fine tubular pores; violently effervescent; disseminated carbonates; calcium carbonate equivalent of 5 percent; moderately alkaline (pH 8.4); clear smooth boundary.

Bk1—27 to 42 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common very fine roots; many very fine and fine tubular pores; slightly effervescent; disseminated carbonates and carbonates that are segregated as common fine irregular soft masses; calcium carbonate equivalent of 1 percent; moderately alkaline (pH 8.3); gradual smooth boundary.

Bk2—42 to 60 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) moist; massive; hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine tubular pores; violently effervescent; disseminated carbonates and carbonates that are segregated as many fine and few medium irregular soft masses; calcium carbonate equivalent of 2 percent; moderately alkaline (pH 8.2).

Range in Characteristics

Electrical conductivity (EC): 0 to 4 dS/m in the nonsaline-nonsodic phase; 2 to 8 dS/m in the saline-sodic phase, with some part always greater than 4

Sodium adsorption ratio (SAR): 1 to 12 in the nonsaline-nonsodic phase; 1 to 30 in the saline-sodic phase, with some part always greater than 13

Reaction: Slightly alkaline or moderately alkaline in the nonsaline-nonsodic phase; slightly alkaline to strongly alkaline in the saline-sodic phase

A horizon:
- Color—10YR 6/2 or 6/3 or 2.5Y 6/2 dry; 10YR 4/2 or 4/3 or 2.5Y 4/2 moist

Bw horizon:
- Color—10YR 7/3, 6/2, 6/3, or 6/4 dry; 10YR 5/3, 4/2, 4/3, or 4/4 moist
- Texture—fine sandy loam, silt loam, or loam
- Content of clay—8 to 18 percent
- Effervescence—slightly effervescent to violently effervescent
- Content of rock fragments—0 to 3 percent gravel

Bk horizon:
- Color—10YR 7/3, 6/2, 6/3, or 6/4 dry; 10YR 5/3, 4/2, 4/3, or 4/4 moist
- Texture—fine sandy loam, silt loam, or loam
- Content of clay—8 to 18 percent
- Effervescence—slightly effervescent to violently effervescent; few to many fine to medium soft masses of carbonate
- Content of rock fragments—0 to 3 percent gravel

Armona Series

The Armona series consists of very deep, poorly drained soils that formed in mixed alluvium derived from granitic rock sources. These soils are artificially drained and are on basin rims and flood plains. The elevation is 190 to 250 feet. The mean annual precipitation is 7 to 8 inches, and the mean annual temperature is 63 to 66 degrees F. The frost-free period is 250 to 275 days. Slopes are 0 to 1 percent.

Taxonomic class: Fine-loamy, mixed, superactive, thermic Fluvaquentic Endoaquolls

Typical Pedon

Armona sandy loam, partially drained, 0 to 1 percent slopes; in an area under irrigated cultivation, at an elevation of 200 feet; about 4.5 miles south-southeast of Corcoran; 70 feet north and 120 feet east of the center of sec. 7, T. 22 S., R. 23 E., MDB&M; latitude 36 degrees, 1 minute, 45 seconds north and longitude 119 degrees, 31 minutes, 33 seconds west; Corcoran Quadrangle:

Ap1—0 to 7 inches; olive gray (5Y 5/2) sandy loam, very dark gray (5Y 3/1) moist; moderate coarse prismatic and moderate medium subangular blocky structure; slightly hard, very friable, sticky and plastic; common very fine and few fine roots; few very fine tubular pores; strongly effervescent; disseminated carbonates; electrical conductivity (EC) of 2.0 dS/m; sodium adsorption ratio (SAR)

of 11; slightly alkaline (pH 7.8); abrupt smooth boundary.

Ap2—7 to 11 inches; olive gray (5Y 5/2) sandy loam, dark olive gray (5Y 3/2) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; few very fine and fine roots; few very fine tubular pores; strongly effervescent; disseminated carbonates and carbonates that are segregated as few fine filaments and irregular soft masses; few fine distinct recent redoximorphic iron accumulations, dark reddish brown (5YR 3/4) moist; electrical conductivity (EC) of 3.2 dS/m; sodium adsorption ratio (SAR) of 13; moderately alkaline (pH 8.0); abrupt smooth boundary.

2Bkngl—11 to 15 inches; light olive gray (5Y 6/2) sandy clay loam, dark gray (5Y 4/1) moist; moderate coarse subangular blocky structure; hard, friable, sticky and plastic; few very fine roots; few very fine tubular pores; strongly effervescent; disseminated carbonates and carbonates that are segregated as common fine soft masses and irregular filaments; common fine distinct recent redoximorphic iron concentrations, olive (5Y 4/4) moist; electrical conductivity (EC) of 4.6 dS/m; sodium adsorption ratio (SAR) of 40; moderately alkaline (pH 8.1); abrupt wavy boundary.

2Bkng2—15 to 23 inches; light olive gray (5Y 6/2) sandy clay loam, gray (5Y 5/1) moist; weak medium subangular blocky structure; hard, very friable, sticky and plastic; few very fine roots; moderate very fine tubular pores; strongly effervescent; disseminated carbonates and carbonates that are segregated as common fine irregular soft masses and filaments; many fine distinct recent redoximorphic iron concentrations, olive (5Y 4/4) moist; electrical conductivity (EC) of 3.7 dS/m; sodium adsorption ratio (SAR) of 31; moderately alkaline (pH 8.4); clear smooth boundary.

3Bkng3—23 to 41 inches; light olive gray (5Y 6/2) sandy loam, olive gray (5Y 5/2) moist; massive; hard, very friable, slightly sticky and slightly plastic; few very fine roots; common very fine tubular pores; slightly effervescent; disseminated carbonates that are strongly effervescent; carbonates that are segregated as common fine irregular soft masses and filaments; many fine distinct recent redoximorphic iron concentrations, olive (5Y 4/4) moist; electrical conductivity (EC) of 3.3 dS/m; sodium adsorption ratio (SAR) of 34; strongly alkaline (pH 8.8); abrupt smooth boundary.

3Bkng4—41 to 48 inches; light olive gray (5Y 6/2) loam, olive gray (5Y 5/2) moist; massive; hard, very friable, sticky and plastic; few very fine tubular pores; slightly effervescent; disseminated carbonates that are strongly effervescent; carbonates that are segregated as few fine irregular soft masses and filaments; common fine distinct recent redoximorphic iron concentrations, olive (5Y 4/4) moist; electrical conductivity (EC) of 2.2 dS/m; sodium adsorption ratio (SAR) of 31; strongly alkaline (pH 9.0); abrupt smooth boundary.

4Bkng5—48 to 53 inches; light gray (5Y 7/1) sandy clay loam, olive gray (5Y 5/2) moist; massive; hard, very friable, sticky and plastic; common very fine tubular pores; strongly effervescent; disseminated carbonates that are violently effervescent; carbonates that are segregated as many medium irregular soft masses and filaments and common medium irregular concretions; few fine distinct recent redoximorphic iron concentrations, olive (5Y 4/3) moist; electrical conductivity (EC) of 3.8 dS/m; sodium adsorption ratio (SAR) of 41; strongly alkaline (pH 9.0); abrupt smooth boundary.

5Bng—53 to 60 inches; light olive gray (5Y 6/2) sandy loam, olive gray (5Y 5/2) moist; massive; hard, very friable, nonsticky and nonplastic; few very fine tubular pores; very slightly effervescent; disseminated carbonates; common fine distinct recent redoximorphic iron concentrations, olive brown (2.5Y 3/4) moist; few 1- to 5-mm recent redoximorphic manganese concretions; electrical conductivity (EC) of 3.1 dS/m; sodium adsorption ratio (SAR) of 47; strongly alkaline (pH 8.9).

Range in Characteristics

Soil wetness: Saturated in some part most of the year

Depth to stratified alluvium: 11 to 14 inches

Electrical conductivity (EC): 2 to 8 dS/m in the upper part; 2 to 30 dS/m in the lower part

Sodium adsorption ratio (SAR): 2 to 13 in the upper part; 13 to 80 in the lower part

A horizon:

Color—2.5Y 5/2 or 5Y 5/2 dry; 2.5Y 3/2 or 5Y 3/1 or 3/2 moist

Reaction—slightly alkaline to strongly alkaline

B horizon:

Color—5Y 6/2 or 7/1 dry; 5Y 4/1, 4/2, 5/1, or 5/2 moist

Texture—stratified sandy loam to clay loam in the upper part; stratified sandy loam to silty clay in the lower part

Content of clay—18 to 35 percent in the upper part; 8 to 45 percent in the lower part
Redoximorphic accumulations, concentrations, and depletions of iron and manganese—faint to prominent
Reaction—slightly alkaline to strongly alkaline
Other features—as much as 15 percent durinodes below a depth of 40 inches in some pedons

Atesh Series

The Atesh series consists of moderately well drained soils that are deep to a duripan. These soils are on fan remnants and formed through the chemical and mechanical alteration of Jerryslu soils (fine-loamy, mixed, superactive, thermic Typic Natridurids), which originally formed in alluvium derived from granitic rock sources. Atesh soils commonly have a duripan. The original duripan has been mechanically removed to a depth of at least 40 inches, or it has been highly fractured and has been partially dissolved by the addition of chemicals and irrigation water. The elevation is 225 to 325 feet. The mean annual precipitation is 6 to 8 inches, and the mean annual temperature is 63 to 65 degrees F. The frost-free period is 250 to 275 days. Slopes are 0 to 2 percent.

Taxonomic class: Coarse-loamy, mixed, superactive, thermic Sodic Torriarents

Typical Pedon

Atesh sandy loam, in an area of Atesh-Jerryslu association, 0 to 2 percent slopes; in an irrigated almond orchard at an elevation of 235 feet; about 3 miles east of Allensworth State Park; about 338 feet west and 135 feet north of the center of sec. 1, T. 24 S., R. 24 E., MDB&M; latitude 35 degrees, 52 minutes, 14 seconds north and longitude 119 degrees, 19 minutes, 52 seconds west; Delano West Quadrangle:

Ap1—0 to 2 inches; very pale brown (10YR 7/3) sandy loam, dark yellowish brown (10YR 4/4) moist; weak very thick platy structure parting to moderate medium subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; few very fine and fine roots; common very fine tubular pores; 1 percent fine subangular blocky, weakly silica-cemented fragments of a displaced duripan that are hard and firm; strongly effervescent; disseminated carbonates; electrical conductivity (EC) of 1.28 dS/m; sodium adsorption ratio (SAR) of 2; moderately alkaline (pH 8.0); abrupt smooth boundary.

Ap2—2 to 6 inches; very pale brown (10YR 7/3) sandy loam, dark yellowish brown (10YR 4/4) moist; moderate fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; few very fine tubular and common very fine interstitial pores; 1 percent fine subangular blocky, weakly silica-cemented fragments of a displaced duripan that are hard and firm; strongly effervescent; disseminated carbonates; electrical conductivity (EC) of 1.28 dS/m; sodium adsorption ratio (SAR) of 2; moderately alkaline (pH 8.2); abrupt smooth boundary.

Ap3—6 to 14 inches; very pale brown (10YR 7/3) sandy loam, dark yellowish brown (10YR 4/4) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; few very fine and fine and common medium roots; few very fine tubular and common very fine interstitial pores; 1 percent fine subangular blocky, weakly silica-cemented fragments of a displaced duripan that are hard and firm; strongly effervescent; disseminated carbonates; electrical conductivity (EC) of 0.69 dS/m; sodium adsorption ratio (SAR) of 5; strongly alkaline (pH 8.6); clear smooth boundary.

Ap4—14 to 23 inches; very pale brown (10YR 7/3) sandy loam, yellowish brown (10YR 5/4) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; few very fine and fine and common medium to very coarse roots; many very fine tubular and common very fine interstitial pores; 10 percent fine to very coarse angular blocky, strongly silica-cemented fragments of a displaced duripan; strongly effervescent; disseminated carbonates; electrical conductivity (EC) of 0.58 dS/m; sodium adsorption ratio (SAR) of 5; strongly alkaline (pH 8.8); clear smooth boundary.

Ap5—23 to 28 inches; very pale brown (10YR 7/3) sandy loam, yellowish brown (10YR 5/4) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine and fine and common medium roots; many very fine tubular and common very fine interstitial pores; very few thin and few moderately thick clay films lining pores and on faces of displaced fragments of a natric horizon; 10 percent fine to very coarse angular blocky strongly silica-cemented fragments of a displaced duripan; strongly effervescent; disseminated carbonates and carbonates that are segregated as common fine filaments and soft masses; electrical conductivity (EC) of 0.62 dS/m; sodium adsorption ratio (SAR) of 6; strongly alkaline (pH 9.0); abrupt diffuse boundary.

Ap6—28 to 36 inches; very pale brown (10YR 7/4)

coarse sandy loam, yellowish brown (10YR 5/6) moist; massive; slightly hard, very friable, nonsticky and nonplastic; very few fine roots; many very fine tubular pores; common moderately thick clay films lining pores of displaced fragments of a natric horizon; 3 percent fine angular blocky, strongly silica-cemented fragments of a displaced duripan; strongly effervescent; disseminated carbonates and carbonates that are segregated as common fine filaments and soft masses; electrical conductivity (EC) of 0.58 dS/m; sodium adsorption ratio (SAR) of 5; strongly alkaline (pH 8.8); abrupt smooth boundary.

Ap7—36 to 43 inches; light yellowish brown (10YR 6/4) loamy coarse sand, dark yellowish brown (10YR 4/4) moist; massive; hard and firm; common very fine tubular pores; common moderately thick clay films in root channels and lining pores of displaced fragments of a natric horizon; 90 percent highly fractured (fractures 2 to 3.5 inches apart) remnant weakly silica-cemented duripan material that has been mechanically fractured (ripper shank gouges occur at 2 foot intervals) and partially dissolved by chemicals and irrigation water; slightly effervescent; disseminated carbonates that are strongly effervescent; carbonates that are segregated as common fine filaments and soft masses; electrical conductivity (EC) of 0.53 dS/m; sodium adsorption ratio (SAR) of 5; strongly alkaline (pH 8.8); abrupt smooth boundary.

2Btkqymb—43 to 49 inches; a pale brown (10YR 6/3) duripan that is 85 percent weakly silica-cemented and 15 percent strongly silica-cemented, has been partially dissolved by chemicals and irrigation water, and has 90 percent continuous silica laminar caps less than 1 mm thick; dark yellowish brown (10YR 4/4) moist; massive; hard and firm; common very fine tubular pores; 25 percent fine rounded durinodes that are extremely hard and extremely firm; many moderately thick of clay films lining pores and coating the laminar cap; common fine gypsum crystals; strongly effervescent; disseminated carbonates and carbonates that are segregated as many fine and medium seams and filaments; abrupt smooth boundary.

2Btkqyb—49 to 58 inches; very pale brown (10YR 7/3) coarse sandy loam, dark yellowish brown (10YR 4/4) moist; massive; very hard, friable, slightly sticky and slightly plastic; many very fine tubular pores; 15 percent fine rounded durinodes that are hard and firm; common moderately thick clay films lining pores and few thin clay films bridging sand grains; few 1/4- to 1 1/2-inch pockets of gypsum; slightly effervescent; disseminated carbonates that are strongly effervescent; carbonates that are segregated as common fine soft masses, seams, and filaments; electrical conductivity (EC) of 0.53 dS/m; sodium adsorption ratio (SAR) of 5; strongly alkaline (pH 8.7); abrupt smooth boundary.

2Btkqb1—58 to 71 inches; pale brown (10YR 6/3) sandy loam that is 80 percent weakly silica-cemented, dark yellowish brown (10YR 4/4) moist; massive; very hard, firm, slightly sticky and slightly plastic; many very fine and few fine tubular pores; few thin clay films lining pores and bridging sand grains; slightly effervescent; disseminated carbonates that are strongly effervescent; carbonates that are segregated as common fine filaments; electrical conductivity (EC) of 0.65 dS/m; sodium adsorption ratio (SAR) of 5; strongly alkaline (pH 8.7); clear smooth boundary.

2Btkqb2—71 to 83 inches; very pale brown (10YR 7/3) sandy loam, dark yellowish brown (10YR 4/4) moist; massive; very hard, friable, slightly sticky and slightly plastic; many very fine and few fine tubular pores; 20 percent fine rounded durinodes that are hard and firm; few thin clay films bridging sand grains; slightly effervescent; disseminated carbonates that are strongly effervescent; carbonates that are segregated as few fine filaments; electrical conductivity (EC) of 0.79 dS/m; sodium adsorption ratio (SAR) of 5; strongly alkaline (pH 8.7); clear smooth boundary.

2Btkb—83 to 92 inches; very pale brown (10YR 7/3) sandy loam, dark yellowish brown (10YR 4/4) moist; massive; soft, very friable, nonsticky and nonplastic; many very fine and few fine tubular pores; common thin clay films bridging sand grains; slightly effervescent; disseminated carbonates that are strongly effervescent; carbonates that are segregated as few fine filaments; electrical conductivity (EC) of 0.87 dS/m; sodium adsorption ratio (SAR) of 5; strongly alkaline (pH 8.6); abrupt smooth boundary.

3C—92 to 100 inches; very pale brown (10YR 7/3) coarse sand, brown (10YR 5/3) moist; single grain; loose, nonsticky and nonplastic; many very fine interstitial pores; strongly alkaline (pH 9.0).

Range in Characteristics

Depth to duripan fragments: 0 to 40 inches

Depth to displaced fragments of a natric horizon: 0 to 40 inches; some part has at least 3 percent fragments of the original natric horizon.

Depth to the 2B horizon: 40 to 60 inches

Salinity: 0 to 4 dS/m

Sodium adsorption ratio (SAR): 1 to 8

A horizon:
- Color—10YR 6/3, 6/4, 7/3, or 7/4 dry; 10YR 4/4, 4/6, 5/4, or 5/6 moist
- Texture—sandy loam, coarse sandy loam, or loam in the upper part; stratified loamy coarse sand to gravelly sandy loam in the lower part
- Content of clay—10 to 20 percent in the upper part; 4 to 16 percent in the lower part
- Content of rock fragments—0 to 15 percent gravel-size duripan fragments in the upper part; 0 to 35 percent in the lower part (not arranged in any discernible order); some part always has at least 3 percent duripan fragments.
- Effervescence—slightly effervescent to violently effervescent
- Calcium carbonate equivalent—1 to 10 percent
- Reaction—slightly alkaline to strongly alkaline

2B horizon:
- Color—10YR 5/3, 5/4, 6/3, 6/4, 7/3, or 7/4 dry; 10YR 3/3, 3/4, 4/3, 4/4, 5/3, or 5/4 moist
- Texture—coarse sandy loam or sandy loam
- Content of clay—8 to 18 percent
- Effervescence—slightly effervescent to violently effervescent
- Calcium carbonate equivalent—1 to 5 percent
- Reaction—slightly alkaline to strongly alkaline

Biggriz Series

The Biggriz series consists of very deep, somewhat poorly drained soils that formed in alluvium derived mainly from granitic rock sources. These soils are artificially drained. They are on fan remnants. The elevation is 190 to 270 feet. The mean annual precipitation is 6 to 8 inches, and the mean annual temperature is 63 to 66 degrees F. The frost-free period is 250 to 300 days. Slopes are 0 to 2 percent.

Taxonomic class: Fine-loamy, mixed, superactive, thermic Aquic Haploxerepts

Typical Pedon

Biggriz loam, in an area of Biggriz-Biggriz, saline-sodic, complex, 0 to 2 percent slopes; in a fallow field at an elevation of 222 feet; about 1 mile south of Waukena, near the intersection of Road 28 and Avenue 184; about 1,500 feet west and 100 feet north of the southeast corner of sec. 5, T. 21 S., R. 23 E., MDB&M; latitude 36 degrees, 7 minutes, 40 seconds north and longitude 119 degrees, 30 minutes, 8 seconds west; Waukena Quadrangle:

Ap1—0 to 6 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; moderate medium and coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; common very fine tubular pores; strongly effervescent; disseminated carbonates; electrical conductivity (EC) of 1.7 dS/m; sodium adsorption ratio (SAR) of 3; moderately alkaline (pH 7.9); abrupt smooth boundary.

Ap2—6 to 14 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; moderate fine and coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; few fine and common very fine tubular pores; strongly effervescent; disseminated carbonates; electrical conductivity (EC) of 0.8 dS/m; sodium adsorption ratio (SAR) of 4; moderately alkaline (pH 8.2); abrupt smooth boundary.

Bt—14 to 25 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; moderate coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; few very fine tubular pores; few thin clay films bridging sand grains, on faces of peds, and lining pores; strongly effervescent; disseminated carbonates; electrical conductivity (EC) of 0.6 dS/m; sodium adsorption ratio (SAR) of 3; moderately alkaline (pH 8.2); clear smooth boundary.

Btkg1—25 to 34 inches; grayish brown (2.5Y 5/2) loam, very dark grayish brown (2.5Y 3/2) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine tubular pores; few thin clay films bridging sand grains, on faces of peds, and lining pores; strongly effervescent; disseminated carbonates and carbonates that are segregated as few fine irregular filaments and soft masses; electrical conductivity (EC) of 0.6 dS/m; sodium adsorption ratio (SAR) of 4; few fine prominent redoximorphic concentrations, dark brown (7.5YR 4/4) moist, and few fine prominent redoximorphic depletions, greenish gray (5GY 5/1) moist; moderately alkaline (pH 8.2); clear wavy boundary.

Btkg2—34 to 50 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic and moderate medium subangular blocky structure; hard, very friable, slightly sticky and slightly plastic; few very fine roots; common very fine tubular pores; few thin and very few moderately thick clay films bridging sand grains, on faces of peds, and lining pores;

violently effervescent; disseminated carbonates and carbonates that are segregated as common fine filaments, soft masses, and concretions; electrical conductivity (EC) of 0.6 dS/m; sodium adsorption ratio (SAR) of 7; few fine prominent redoximorphic depletions, greenish gray (5GY 5/1) moist; moderately alkaline (pH 8.4); clear smooth boundary.

Btkg3—50 to 58 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak coarse subangular blocky structure; hard, very friable, sticky and slightly plastic; common very fine tubular pores; very few thin clay films bridging mineral grains, lining pores, and on faces of peds; violently effervescent; disseminated carbonates and carbonates that are segregated as many fine and medium filaments and soft masses and common fine concretions; electrical conductivity (EC) of 0.5 dS/m; sodium adsorption ratio (SAR) of 6; few fine prominent redoximorphic depletions, greenish gray (5GY 6/1) moist; strongly alkaline (pH 8.7); clear smooth boundary.

Btkng—58 to 65 inches; grayish brown (2.5Y 5/2) sandy clay loam, grayish brown (2.5Y 5/2) moist; weak coarse subangular blocky structure; hard, friable, sticky and slightly plastic; common very fine tubular pores; few thin clay films bridging mineral grains, lining pores, and on faces of peds; violently effervescent; disseminated carbonates and carbonates that are segregated as many fine and medium filaments and soft masses and common fine concretions; electrical conductivity (EC) of 0.4 dS/m; sodium adsorption ratio (SAR) of 4; common fine prominent redoximorphic depletions, greenish gray (5GY 6/1) moist, and redoximorphic concentrations, dark yellowish brown (10YR 4/6) moist; few fine manganese concretions; strongly alkaline (pH 9.1).

Range in Characteristics

Secondary carbonates: Few to many fine and medium filaments, soft masses, and concretions at a depth of 10 to 30 inches.

Content of clay in the particle-size control section: Averages 18 to 33 percent

Electrical conductivity (EC): 0 to 4 dS/m in the nonsaline-nonsodic phase; 4 to 8 dS/m in the saline-sodic phase

Sodium adsorption ratio (SAR): 1 to 13 in the nonsaline-nonsodic phase; 13 to 200 in the saline-sodic phase; highly variable because of the degree of reclamation practices

Content of organic matter: 0.3 to 1 percent

A horizon:

Color—2.5Y 5/2, 6/2, or 7/2 dry; 2.5Y 3/2, 4/2, or 5/2 moist

Calcium carbonate equivalent—1 to 5 percent

Reaction—slightly alkaline to strongly alkaline

B horizon:

Color—2.5Y 5/2 or 6/2 dry; 2.5Y 3/2, 4/2, or 5/2 moist

Texture—loam to clay loam in the upper part; sandy loam, sandy clay loam, or loam in the lower part (the sandy loam commonly occurring below a depth of 40 inches)

Content of clay—18 to 33 percent; the clay increase relative to the A horizon is always less than 20 percent.

Clay films—very few to common thin to moderately thick clay films lining pores, on faces of peds, and bridging sand grains

Calcium carbonate equivalent—2 to 10 percent

Redoximorphic features—few to many fine to medium, distinct or prominent redoximorphic concentrations and/or redoximorphic depletions in at least some part of the horizon but never directly underlying the mollic epipedon

Reaction—slightly alkaline to very strongly alkaline; highly variable because of reclamation practices

Calgro Series

The Calgro series consists of moderately well drained soils that formed in alluvium derived from granitic rock sources. These soils are moderately deep to a duripan. They are on fan remnants. The elevation is 250 to 480 feet. The mean annual precipitation is 8 to 12 inches, and the mean annual temperature is 62 to 65 degrees F. The frost-free period is 250 to 300 days. Slopes are 0 to 2 percent.

Taxonomic class: Coarse-loamy, mixed, superactive, thermic Typic Durixerepts

Typical Pedon

Calgro sandy loam, in an area of Calgro-Calgro, saline-sodic, complex, 0 to 2 percent slopes; in a leveled alfalfa field at an elevation of 313 feet; 1 mile southwest of Monson; 3/4 mile west of Road 108 and 1/2 mile south of Avenue 384; about 2,600 feet south and 1,200 feet east of the northwest corner of sec. 2, T. 17 S., R. 24 E., MDB&M; latitude 36 degrees, 28 minutes, 48 seconds north and longitude 119 degrees, 20 minutes, 37 seconds west; Monson Quadrangle:

Ap1—0 to 2 inches; brown (10YR 5/3) sandy loam,

dark brown (10YR 3/3) moist; moderate thin platy structure; slightly hard, very friable, slightly sticky and nonplastic; few very fine, fine, and medium roots; common very fine tubular and many very fine vesicular pores; slightly alkaline (pH 7.8); clear smooth boundary.

Ap2—2 to 7 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 3/3) moist; weak fine subangular blocky structure; hard, friable, nonsticky and nonplastic; common fine and medium roots; common very fine and fine tubular pores; moderately alkaline (pH 8.0); gradual smooth boundary.

Bw—7 to 25 inches; yellowish brown (10YR 5/4) sandy loam, dark yellowish brown (10YR 3/4) moist; weak fine subangular blocky structure; hard, friable, nonsticky and nonplastic; few medium and common very fine and fine roots; common very fine and fine tubular pores; moderately alkaline (pH 8.0); abrupt smooth boundary.

2Bqkm—25 to 33 inches; a yellowish brown (10YR 5/4), slightly fractured, indurated duripan with silica laminae 1/16 to 1/8 inch thick; brown (10YR 4/3) moist; massive; extremely hard and extremely firm; few very fine roots in fractures; few fine to very coarse tubular pores; fractures 1/16 to 1/8 inch thick and more than 4 inches apart; slightly effervescent matrix with 25 percent violently effervescent spots; 25 percent manganese coatings on pan surface 1/8 to 1/4 inch thick, dark grayish brown (10YR 4/2) and very dark brown (10YR 2/2) moist; clear wavy boundary.

2Bqk—33 to 53 inches; pale brown (10YR 6/3) gravelly loamy sand, dark yellowish brown (10YR 4/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; common fine and few medium roots; few very fine tubular pores; few thin clay films lining pores; 30 percent coarse and very coarse angular blocky duripan pieces that are extremely hard and extremely firm; slightly effervescent; disseminated carbonates; moderately alkaline (pH 8.4); abrupt smooth boundary.

3Bqkm—53 to 60 inches; a yellowish brown (10YR 5/4), slightly fractured, indurated duripan, dark yellowish brown (10YR 3/4) moist; massive; extremely hard and extremely firm; 25 percent manganese coatings on faces of peds 1/8 to 1/4 inch thick, dark grayish brown (10YR 4/2) and very dark brown (10YR 2/2) moist; slightly effervescent matrix with 35 percent violently effervescent, white (10YR 8/2) pockets.

Range in Characteristics

Depth to a duripan: 20 to 40 inches

Reaction: Slightly alkaline to moderately alkaline in the nonsaline-nonsodic phase; moderately alkaline to very strongly alkaline in the saline-sodic phase

A horizon:
- Color—10YR 5/3, 5/4, or 6/3 dry; 10YR 3/3, 3/4, or 4/3 moist
- Content of clay—8 to 18 percent
- Content of organic matter—0 to 1 percent
- Effervescence—noneffervescent to strongly effervescent

Bw horizon:
- Color—10YR 5/3, 5/4, or 6/3 dry; 10YR 3/3, 3/4, or 4/3 moist
- Texture—sandy loam, fine sandy loam, or loam
- Content of clay—8 to 18 percent
- Content of organic matter—0 to 1 percent
- Effervescence—noneffervescent to strongly effervescent

2Bqkm horizon:
- Color—10YR 5/4 or 6/4 dry; 10YR 4/3 or 4/4 moist
- Structure—platy or massive
- Effervescence—noneffervescent to violently effervescent

2Bqk horizon:
- Color—10YR 5/4, 6/3, or 6/4 dry; 10YR 3/4, 4/3, or 4/4 moist
- Effervescence—slightly effervescent to violently effervescent
- Content of rock fragments—15 to 30 percent, dominantly gravel-size duripan fragments

Centerville Series

The Centerville series consists of very deep, well drained soils that formed in alluvium derived mainly from granitic rock sources. These soils are on fan remnants. The elevation is 300 to 600 feet. The mean annual precipitation is 9 to 12 inches, and the mean annual temperature is 62 to 65 degrees F. The frost-free period is 250 to 300 days. Slopes are 0 to 5 percent.

Taxonomic class: Fine, smectitic, thermic Aridic Calcixererts

Typical Pedon

Centerville clay, 2 to 5 percent slopes; in an area under irrigated cultivation, at an elevation of 490 feet; about 3 miles north of Ducor; 190 feet south and 84

feet west of the northeast corner of sec. 16, T. 23 S., R. 27 E., MDB&M; latitude 35 degrees, 56 minutes, 5 seconds north and longitude 119 degrees, 3 minutes, 22 seconds west; Ducor Quadrangle:

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; strong very coarse prismatic structure parting to strong medium prismatic; very hard, very firm, very sticky and very plastic; common very fine and fine roots; common very fine tubular pores; 50 percent pressure faces on peds; electrical conductivity (EC) of 1 dS/m; sodium adsorption ratio (SAR) of 14; slightly alkaline (pH 7.5); abrupt wavy boundary.

Bss1—7 to 12 inches; dark brown (7.5YR 4/2) clay, dark brown (7.5YR 3/2) moist; moderate coarse prismatic structure parting to moderate medium angular blocky; hard, firm, very sticky and very plastic; common very fine, fine, and medium roots; common very fine and few fine tubular pores; common slickensides on faces of peds; electrical conductivity (EC) of 3 dS/m; sodium adsorption ratio (SAR) of 19; slightly alkaline (pH 7.6); clear smooth boundary.

Bss2—12 to 22 inches; dark brown (7.5YR 4/2) clay, dark brown (7.5YR 3/2) moist; weak medium prismatic structure; hard, very firm, sticky and very plastic; few very fine and fine and common medium and coarse roots; many very fine and few fine tubular pores; common slickensides on faces of peds; slightly effervescent; disseminated carbonates; electrical conductivity (EC) of 2 dS/m; sodium adsorption ratio (SAR) of 32; slightly alkaline (pH 7.8); clear wavy boundary.

Btkss1—22 to 31 inches; mixed matrix that is 65 percent brown (10YR 5/3) and 35 percent brown (7.5YR 5/4) clay, 65 percent dark brown (7.5YR 3/2) and 35 percent strong brown (7.5YR 4/6) moist; moderate medium prismatic structure; hard, firm, sticky and plastic; common very fine, fine, and medium roots; many very fine and few fine tubular pores; few moderately thick clay films on faces of peds and lining pores; few slickensides on faces of peds; strongly effervescent; disseminated carbonates and carbonates that are segregated as few fine rounded concretions and irregular filaments; electrical conductivity (EC) of 2 dS/m; sodium adsorption ratio (SAR) of 13; slightly alkaline (pH 7.8); clear wavy boundary.

Btkss2—31 to 42 inches; mixed matrix that is 85 percent brown (7.5YR 5/4) and 15 percent brown (7.5YR 5/2) clay loam, 85 percent dark brown (7.5YR 4/4) and 15 percent dark brown (7.5YR 3/2) moist; moderate medium prismatic structure parting to moderate medium angular blocky; hard, firm, sticky and plastic; few very fine, fine, and medium roots; many very fine and few fine tubular pores; many moderately thick clay films on faces of peds and lining pores; few slickensides on faces of peds; 4 percent very dark gray (5YR 3/1) manganese stains; strongly effervescent; disseminated carbonates that are violently effervescent; carbonates that are segregated as common fine irregular filaments and medium irregular masses; electrical conductivity (EC) of 3 dS/m; sodium adsorption ratio (SAR) of 13; slightly alkaline (pH 7.5); clear wavy boundary.

Btkss3—42 to 48 inches; brown (7.5YR 5/4) clay loam, dark brown (7.5YR 4/4) moist; weak medium prismatic structure parting to moderate medium angular blocky; hard, firm, sticky and plastic; few very fine, fine, and medium roots; common very fine and few fine tubular pores; few thick and many moderately thick clay films on faces of peds and lining pores; common slickensides on faces of peds; 4 percent very dark gray (5YR 3/1) manganese stains; strongly effervescent; disseminated carbonates that are violently effervescent; carbonates that are segregated as common fine irregular filaments and medium irregular masses; electrical conductivity (EC) of 4 dS/m; sodium adsorption ratio (SAR) of 13; moderately alkaline (pH 7.9); abrupt smooth boundary.

2Btkd—48 to 60 inches; light yellowish brown (10YR 6/4) gravelly sandy clay loam, yellowish brown (10YR 5/6) moist; massive; hard, firm, sticky and plastic; many very fine tubular pores; common moderately thick and few thin clay films lining pores; 5 percent very dark gray (5YR 3/1) manganese stains; strongly effervescent; disseminated carbonates that are violently effervescent; carbonates that are segregated as common fine irregular masses; electrical conductivity (EC) of 2 dS/m; sodium adsorption ratio (SAR) of 13; 25 percent gravel; moderately alkaline (pH 8.0).

Range in Characteristics

Electrical conductivity (EC): 0 to 8 dS/m
Sodium adsorption ratio (SAR): 13 to 40

A horizon:

Color—10YR 3/2, 4/2, 4/3, 5/2, or 5/3 or 7.5YR 3/2, 4/2, 5/3, or 5/4 dry; 10YR 2/2, 3/2, or 3/3 or 7.5YR 3/2 or 4/2 moist

Reaction—neutral to moderately alkaline

Bss and Btkss horizons:
Color—10YR 5/2, 5/3, or 6/2, 7.5YR 3/2, 4/2, 4/4, 5/2, or 5/4, or 5YR 3/2, 3/3, 3/4, 4/2, 4/3, 4/4, or 5/3 dry; 10YR 3/2, 3/3, 4/2, or 4/3, 7.5YR 3/2, 4/2, 4/4, or 4/6, or 5YR 3/2, 3/3, 4/2, 4/4, or 5/4 moist
Texture—clay loam, sandy clay, or clay
Content of clay—35 to 60 percent
Reaction—slightly alkaline or moderately alkaline

2Btd horizon:
Color—10YR 6/2 or 6/4 or 7.5YR 4/6, 5/2, 5/4, or 5/6 dry; 10YR 5/4 or 5/6 or 7.5YR 4/2, 4/4, or 4/6 moist
Texture—stratified gravelly sandy clay loam to gravelly clay
Content of clay—averages 27 to 50 percent
Content of rock fragments—15 to 35 percent gravel
Reaction—slightly alkaline or moderately alkaline

Colpien Series

The Colpien series consists of very deep, moderately well drained soils that formed in alluvium derived mainly from granitic rock sources. These soils are on fan remnants. The elevation is 220 to 550 feet. The mean annual precipitation is 8 to 12 inches, and the mean annual temperature is 62 to 65 degrees F. The frost-free period is 250 to 300 days. Slopes are 0 to 2 percent.

Taxonomic class: Fine-loamy, mixed, superactive, thermic Calcic Pachic Haploxerolls

Typical Pedon

Colpien loam, 0 to 2 percent slopes; in an area under irrigated cultivation, at an elevation of 245 feet; about 5 miles southwest of Tulare; about 2,300 feet east and 85 feet south of the northwest corner of sec. 26, T. 20 S., R. 23 E., MDB&M; latitude 36 degrees, 9 minutes, 30 seconds north and longitude 119 degrees, 26 minutes, 55 seconds west; Paige Quadrangle:

Ap—0 to 6 inches; dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist; moderate medium and coarse subangular blocky structure; hard, friable, slightly sticky and plastic; few very fine and fine roots; many very fine interstitial pores; electrical conductivity (EC) of 0.7 dS/m; sodium adsorption ratio (SAR) of 3; neutral (pH 6.8); abrupt smooth boundary.

Bt1—6 to 13 inches; dark gray (10YR 4/1) clay loam, very dark gray (10YR 3/1) moist; moderate medium and coarse subangular blocky structure; hard, friable, sticky and plastic; few very fine and fine roots; common very fine interstitial and few very fine tubular pores; few thin clay films on faces of peds; slightly effervescent; disseminated carbonates; electrical conductivity (EC) of 0.5 dS/m; sodium adsorption ratio (SAR) of 3; slightly alkaline (pH 7.5); clear smooth boundary.

Bt2—13 to 24 inches; dark gray (10YR 4/1) clay loam, very dark gray (10YR 3/1) moist; weak coarse and moderate medium subangular blocky structure; hard, friable, sticky and plastic; common very fine interstitial and few very fine and fine tubular pores; common thin clay films bridging sand grains, on faces of peds, and lining pores; slightly effervescent; disseminated carbonates; electrical conductivity (EC) of 2.5 dS/m; sodium adsorption ratio (SAR) of 5; moderately alkaline (pH 8.0); abrupt smooth boundary.

Btk1—24 to 31 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium subangular blocky structure; hard, very friable, sticky and plastic; few very fine interstitial and common very fine and few fine tubular pores; common moderately thick clay films on faces of peds and lining pores; strongly effervescent; disseminated carbonates and carbonates that are segregated as common irregularly shaped fine filaments and soft masses; electrical conductivity (EC) of 0.7 dS/m; sodium adsorption ratio (SAR) of 2; moderately alkaline (pH 8.2); gradual wavy boundary.

Btk2—31 to 42 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak medium subangular blocky structure; hard, very friable, slightly sticky and plastic; few very fine interstitial and common very fine and few fine tubular pores; few moderately thick clay films on faces of peds and lining pores and few thin clay films bridging sand grains, on faces of peds, and lining pores; strongly effervescent; disseminated carbonates and carbonates that are segregated as common irregularly shaped fine filaments and soft masses; few fine prominent relict redoximorphic iron accumulations, yellowish brown (10YR 5/6) moist; few 3- to 5-mm relict redoximorphic manganese concretions; electrical conductivity (EC) of 0.5 dS/m; sodium adsorption ratio (SAR) of 2; moderately alkaline (pH 8.3); gradual wavy boundary.

Btk3—42 to 51 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak medium subangular blocky structure; hard, very friable, slightly sticky and slightly plastic; few very fine interstitial and common very fine and few fine

tubular pores; very few moderately thick clay films on faces of peds and lining pores and few thin clay films bridging sand grains, on faces of peds, and lining pores; strongly effervescent; disseminated carbonates and carbonates that are segregated as few fine irregularly shaped filaments and soft masses; few fine prominent iron accumulations, yellowish brown (10YR 5/6) moist; few 3- to 5-mm relict redoximorphic manganese concretions; electrical conductivity (EC) of 0.5 dS/m; sodium adsorption ratio (SAR) of 2; moderately alkaline (pH 8.3); clear smooth boundary.

Bt′—51 to 60 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak medium subangular blocky structure; hard, very friable, slightly sticky and slightly plastic; few very fine and fine tubular pores; few thin clay films bridging sand grains, on faces of peds, and lining pores; slightly effervescent; disseminated carbonates; common fine prominent relict redoximorphic iron accumulations, yellowish brown (10YR 5/6) moist; few 3- to 5-mm relict redoximorphic manganese concretions; electrical conductivity (EC) of 0.5 dS/m; sodium adsorption ratio (SAR) of 2; slightly alkaline (pH 7.8); abrupt smooth boundary.

C—60 to 65 inches; light brownish gray (2.5Y 6/2) sandy loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, slightly sticky and nonplastic; few very fine interstitial and tubular pores; few fine distinct relict redoximorphic iron accumulations, yellowish brown (10YR 5/4) moist; electrical conductivity (EC) of 0.5 dS/m; sodium adsorption ratio (SAR) of 2; slightly alkaline (pH 7.8).

Range in Characteristics

Thickness of the mollic epipedon: 20 to 40 inches
Depth to carbonates: 6 to 10 inches
Content of clay in the particle-size control section: 18 to 31 percent
Carbonates: Upper part—none; subsoil—few to many filaments, threads, or soft masses; segregated secondary carbonates to a depth of 60 inches in some pedons
Electrical conductivity (EC): 0.5 to 4.0 dS/m
Sodium adsorption ratio (SAR): 1 to 12
Reaction: Neutral to moderately alkaline

A horizon:
Color—10YR 4/1 or 4/2, 5Y 5/1, or 2.5Y 5/2 dry; 10YR 3/1 or 3/2, 5Y 3/1, or 2.5Y 3/2 moist
Content of clay—18 to 27 percent

B horizon:
Color—10YR 4/1, 4/2, 5/2, or 6/3, 2.5Y 5/2, 6/2, 6/4, or 7/2, or 5Y 5/1, 5/2, 6/3, or 6/4 dry; 10YR 3/1, 3/2, or 4/3, 2.5Y 3/2, 4/2, 4/4, or 5/4, or 5Y 3/1, 3/2, 4/3, or 4/4 moist
Texture—loam or clay loam
Content of clay—18 to 31 percent; clay increase relative to the A horizon is always less than 20 percent.

C horizon:
Color—10YR 5/4 or 6/4 or 2.5Y 6/2, 6/3, or 6/4 dry; 10YR 4/4 or 2.5Y 4/2, 4/3, or 4/4 moist
Texture—sandy loam, loam, or clay loam
Content of clay—10 to 30 percent
Reaction—neutral to moderately alkaline

Crosscreek Series

The Crosscreek series consists of deep, well drained soils that formed through the mechanical and chemical alteration of Kai soils (fine-loamy, mixed, superactive, thermic Natric Durixeralfs), which originally formed in alluvium derived from granitic rocks. Crosscreek soils are on fan remnants. They commonly have a duripan. The original duripan has been removed to a depth of at least 40 inches, or it has been highly fractured and has been partially dissolved by the addition of chemicals and irrigation water. The elevation is 225 to 400 feet. The mean annual precipitation is 8 to 12 inches, and the mean annual temperature is 62 to 65 degrees F. The frost-free period is 250 to 300 days. Slopes are 0 to 2 percent.

Taxonomic class: Fine-loamy, mixed, superactive, calcareous, thermic Sodic Xerarents

Typical Pedon

Crosscreek loam, in an area of Crosscreek-Kai association, 0 to 2 percent slopes; in a leveled alfalfa field at an elevation of 290 feet; about 2 miles southeast of Tulare; 250 feet south and 1,600 feet east of the northwest corner of sec. 20, T. 20 S., R. 25 E., MDB&M; latitude 36 degrees, 10 minutes, 48 seconds north and longitude 119 degrees, 17 minutes, 24 seconds west; Tulare Quadrangle:

Ap1—0 to 11 inches; light gray (10YR 7/2) loam, brown (10YR 5/3) moist; moderate fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine and fine roots; few very fine tubular pores; few very thin organic coatings on faces of peds; few very thin

displaced clay films on faces of peds; 10 percent fine to very coarse, subangular blocky, strongly cemented, extremely hard and extremely firm fragments of a displaced duripan mixed throughout the horizon; violently effervescent; disseminated carbonates; moderately alkaline (pH 8.4); abrupt wavy boundary.

Ap2—11 to 17 inches; light brownish gray (10YR 6/2) gravelly loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; common very fine tubular pores; 35 percent massive, strongly cemented fragments of a displaced duripan that are rigid and brittle when wet mixed throughout the horizon in no discernable pattern; violently effervescent; disseminated carbonates and carbonates that are segregated as common very fine filaments; moderately alkaline (pH 8.4); clear irregular boundary.

Ap3—17 to 55 inches; 90 percent pale brown (10YR 6/3) loam, brown (10YR 4/3) moist, and 10 percent light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; many very fine tubular pores; 10 percent fine to very coarse, subangular blocky, strongly cemented, extremely hard and extremely firm fragments of a displaced duripan mixed throughout the horizon; violently effervescent; disseminated carbonates and carbonates that are segregated as few very fine filaments; moderately alkaline (pH 8.2); clear wavy boundary.

2Bkqmb—55 to 60 inches; a pale brown (10YR 6/3), silica- and lime-cemented duripan, brown (10YR 4/3) moist; massive; rigid; violently effervescent; disseminated carbonates and carbonates that are segregated as few very fine filaments; brittle when wet.

Range in Characteristics

Depth to a duripan: 40 to 60 inches
Depth to an identifiable ripped duripan: 10 to 40 inches
Original depth to a duripan before ripping: 20 to 40 inches
Reaction: Neutral to very strongly alkaline; highly variable because of the degree of reclamation
Electrical conductivity (EC): 1 to 12 dS/m
Sodium adsorption ratio (SAR): 1 to 13
Other features: In some pedons 5 to 10 percent elongated durinodes 1/4 to 1 inch thick

Particle-size control section:
Content of clay—18 to 35 percent
Content of rock fragments—0 to 35 percent gravel-size duripan fragments that are not arranged in any discernable order; some part of the control section has at least 3 percent duripan fragments.

Ap horizon:
Color—10YR 5/4, 6/2, 6/3, 7/2, or 7/3 or 7.5YR 5/2 or 6/4 dry; 10YR 3/3, 3/4, 4/2, 4/3, 4/4, 5/3, or 5/4 or 7.5YR 3/2, 3/4, or 4/4 moist; highly variable color because of mixing
Texture—loam in the upper part; sandy clay loam, sandy loam, loam, or gravelly loam in the lower part
Effervescence—slightly effervescent to violently effervescent
Carbonates—disseminated and segregated as few to many soft masses, filaments, or threads

Delhi Series

The Delhi series consists of very deep, somewhat excessively drained soils that formed in wind-modified alluvium derived from granitic rock sources. These soils are on alluvial fans and flood plains. The elevation is 300 to 375 feet. The mean annual precipitation is 10 to 12 inches, and the mean annual temperature is 62 to 65 degrees F. The frost-free period is 225 to 300 days. Slopes are 0 to 2 percent.

Taxonomic class: Mixed, thermic Typic Xeropsamments

Typical Pedon

Delhi loamy sand, 0 to 2 percent slopes; in a leveled, fallow field at an elevation of 310 feet; about 2 miles northeast of Kingsburg; about 130 feet east and 55 feet north of the southeast corner of sec. 17, T. 16 S., R. 23 E.; MDB&M; latitude 36 degrees, 32 minutes, 2 seconds north and longitude 119 degrees, 28 minutes, 59 seconds west; Reedley Quadrangle:

Ap1—0 to 6 inches; light brownish gray (10YR 6/2) loamy sand, dark grayish brown (10YR 4/2) moist; moderate medium and coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; few very fine tubular and common irregular pores; slightly acid (pH 6.5); clear smooth boundary.

Ap2—6 to 11 inches; light brownish gray (10YR 6/2) loamy sand, dark grayish brown (10YR 4/2) moist; weak very thick platy and moderate medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; few very fine tubular and common irregular pores; slightly acid (pH 6.4); clear smooth boundary.

C1—11 to 30 inches; pale brown (10YR 6/3) loamy

sand, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; many fine irregular pores; a 3- to 5-mm stratum of brown (10YR 5/3), slightly compacted loamy sand at a depth of 14 inches; slightly acid (pH 6.1); gradual smooth boundary.

C2—30 to 48 inches; pale brown (10YR 6/3) loamy sand, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; many fine irregular pores; neutral (pH 7.0); gradual smooth boundary.

C3—48 to 72 inches; pale brown (10YR 6/3) loamy sand, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic; many fine irregular pores; neutral (pH 7.2).

Range in Characteristics

Reaction: Slightly acid to slightly alkaline

A horizon:

Color—10YR 6/2 or 6/3 dry; 10YR 4/2 or 4/3 moist

C horizon:

Color—10YR 6/3, 6/4, 7/3, or 7/4 dry; 10YR 4/3, 4/4, or 5/4 moist

Texture—loamy fine sand, loamy sand, or sand

Sand fraction—0 to 5 percent very coarse sand; 35 percent or less coarse and very coarse sands

Delvar Series

The Delvar series consists of very deep, moderately well drained soils that formed in mixed alluvium derived mainly from granitic and metasedimentary rocks. These soils are on fan remnants. The elevation is 400 to 600 feet. The mean annual precipitation is 8 to 12 inches, and the mean annual temperature is 62 to 65 degrees F. The frost-free period is 250 to 300 days. Slopes are 2 to 9 percent.

Taxonomic class: Fine, smectitic, thermic Calcic Pachic Argixerolls

Typical Pedon

Delvar clay loam, 2 to 9 percent slopes; in a vineyard at an elevation of 560 feet; about 2 miles east of Richgrove, at the intersection of the Tulare and Kern County line and Highway 65; approximately 50 feet north and 200 feet east of the southwest corner of sec. 33, T. 24 S., R. 27 E., MDB&M; latitude 35 degrees, 47 minutes, 28 seconds north and longitude 199 degrees, 4 minutes, 12 seconds west; Richgrove Quadrangle:

Ap1—0 to 4 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium subangular blocky structure; very hard, friable, sticky and plastic; common very fine roots; few very fine tubular and common very fine interstitial pores; 3 percent gravel; electrical conductivity (EC) of 2.0 dS/m; sodium adsorption ratio (SAR) of 3; slightly acid (pH 6.2); clear smooth boundary.

Ap2—4 to 12 inches; dark grayish brown (10YR 4/2) clay loam, dark brown (7.5YR 3/2) moist; moderate medium subangular blocky structure: very hard, friable, sticky and very plastic; common fine and very fine roots; common very fine tubular and few very fine interstitial pores; 2 percent gravel; electrical conductivity (EC) of 1.4 dS/m; sodium adsorption ratio (SAR) of 4; slightly acid (pH 6.2); gradual smooth boundary.

Bt—12 to 19 inches; brown (10YR 4/3) clay, dark brown (7.5YR 3/2) moist; moderate medium subangular blocky structure; very hard, friable, very sticky and very plastic; common fine and very fine and few coarse roots; common very fine and few fine tubular pores; common thin clay films lining pores and on faces of peds; 2 percent gravel; electrical conductivity (EC) of 1.6 dS/m; sodium adsorption ratio (SAR) of 4; neutral (pH 6.6); clear smooth boundary.

Btk1—19 to 28 inches; brown (10YR 4/3) clay, dark brown (7.5YR 3/2) moist; weak medium subangular blocky structure; very hard, friable, very sticky and very plastic; few very fine roots; common very fine tubular pores; common moderately thick clay films lining pores and on faces of peds; 2 percent gravel; strongly effervescent; carbonates that are segregated as common fine and medium soft masses; electrical conductivity (EC) of 2.3 dS/m; sodium adsorption ratio (SAR) of 9; moderately alkaline (pH 8.0); clear smooth boundary.

Btk2—28 to 34 inches; brown (10YR 4/3) clay, dark yellowish brown (10YR 3/4) moist; weak coarse subangular blocky structure; very hard, friable, very sticky and very plastic; few very fine roots; common very fine tubular pores; common moderately thick clay films lining pores and on faces of peds; 2 percent gravel; strongly effervescent; carbonates that are segregated as few fine filaments; electrical conductivity (EC) of 3.6 dS/m; sodium adsorption ratio (SAR) of 10; moderately alkaline (pH 8.0); clear smooth boundary.

Btk3—34 to 42 inches; brown (10YR 4/3) clay, dark brown (7.5YR 3/4) moist; moderate medium subangular blocky structure; very hard, friable,

very sticky and very plastic; few very fine roots; few very fine interstitial and common very fine tubular pores; common moderately thick clay films lining pores and on faces of peds; 2 percent gravel; strongly effervescent; carbonates that are segregated as common fine filaments; electrical conductivity (EC) of 6.0 dS/m; sodium adsorption ratio (SAR) of 10; few medium faint dark yellowish brown (10YR 4/4) redoximorphic concentrations, dark brown (7.5YR 4/4) moist; moderately alkaline (pH 8.0); abrupt wavy boundary.

2Btkn—42 to 60 inches; yellowish brown (10YR 5/4) sandy loam, dark brown (7.5YR 4/4) moist; weak medium subangular blocky structure; hard and very hard, friable (with 15 percent brittle fragments that slake in 10 percent hydrochloric acid), sticky and slightly plastic; common very fine tubular pores; few thick and common moderately thick clay films lining pores and on faces of peds; 5 percent gravel; strongly effervescent; carbonates that are segregated as common fine filaments; electrical conductivity (EC) of 4.4 dS/m; sodium adsorption ratio (SAR) of 13; moderately alkaline (pH 8.0).

Range in Characteristics

Thickness of the mollic epipedon: 20 to 40 inches
Calcium carbonate equivalent: 0 to 10 percent
Content of clay in the particle-size control section: 40 to 55 percent

A horizon:
- Color—10YR 4/2, 4/3, or 5/3 dry; 10YR 3/2, 3/3, or 4/2 moist
- Texture—sandy clay loam or clay loam
- Content of clay—27 to 40 percent
- Content of rock fragments—0 to 15 percent gravel
- Electrical conductivity—0 to 4 dS/m
- Sodium adsorption ratio—1 to 8
- Reaction—slightly acid to moderately alkaline; highly variable because of chemical amendments added to the soils, such as sulfuric acid, which acidifies the soils

Bt, Btk, and 2Btkn horizons:
- Color—10YR 4/2, 4/3, 5/2, or 5/3 or 7.5YR 4/4, 5/4, or 6/4 dry; 10YR 3/2, 3/3, or 4/2 or 7.5YR 4/4, 4/6, or 5/4 moist
- Texture—dominantly clay in the upper part and sandy loam, sandy clay loam, or clay loam in the lower part; in some pedons thin strata of sandy clay in the upper part
- Content of clay—40 to 55 percent in the upper part; 15 to 35 percent in the lower part
- Content of rock fragments—0 to 15 percent gravel
- Electrical conductivity—1 to 8 dS/m
- Sodium adsorption ratio—2 to 13 in the upper part; 13 to 20 in the lower part
- Reaction—neutral to moderately alkaline; highly variable because of chemical amendments added to the soils, such as sulfuric acid, which acidifies the soils

Excelsior Series

The Excelsior series consists of very deep, well drained soils that formed in mixed alluvium derived mainly from granitic rock sources. These soils are on alluvial fans. The elevation is 205 to 275 feet. The mean annual precipitation is 7 to 8 inches, and the mean annual temperature is 62 to 64 degrees F. The frost-free period is 250 to 275 days. Slopes are 0 to 1 percent.

Taxonomic class: Coarse-loamy, mixed, superactive, calcareous, thermic Typic Torrifluvents

Typical Pedon

Excelsior fine sandy loam, 0 to 1 percent slopes; in an area under irrigated cultivation, at an elevation of 210 feet; about 1 mile southwest of Alpaugh; 2,100 feet north and 1,000 feet west of the southeast corner of sec. 32, T. 23 S., R. 23 E.; MDB&M; latitude 35 degrees, 52 minutes, and 51 seconds north and longitude 119 degrees, 30 minutes, and 12 seconds west; Hacienda Ranch NE Quadrangle:

Ap—0 to 8 inches; light brownish gray (2.5Y 6/2) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; weak fine and medium subangular blocky clods; soft, friable, nonsticky and nonplastic; few coarse and many very fine, fine, and medium roots; few very fine, fine, and medium tubular pores; 1 to 2 percent small shell fragments; strongly effervescent; disseminated carbonates; moderately alkaline (pH 8.3); clear wavy boundary.

C1—8 to 21 inches; strata that are 60 percent light gray (2.5Y 7/2) sandy loam, dark grayish brown (2.5Y 4/2) moist, and 40 percent loamy sand with the same colors; massive; soft, very friable and friable, nonsticky and nonplastic; few coarse and common very fine, fine, and medium roots; common very fine, fine, and medium tubular pores; 5 percent 1- to 10-mm shell fragments; 15 percent very hard fine brown (7.5YR 5/4) iron and manganese nodules; strongly effervescent; disseminated carbonates; strongly alkaline (pH 8.7); clear wavy boundary.

2C2—21 to 25 inches; light gray (2.5Y 7/2) sandy loam, dark grayish brown (2.5Y 4/2) moist;

massive; soft, very friable, nonsticky and nonplastic; few fine and medium roots; common very fine, fine, and medium tubular pores; 5 percent 1- to 10-mm shell fragments; 15 to 30 percent very hard, very fine, fine, and medium black (10YR 2/1) and brown (7.5YR 5/4) iron and manganese nodules; strongly effervescent; disseminated carbonates; strongly alkaline (pH 8.6); clear wavy boundary.

3C3—25 to 36 inches; light gray (2.5Y 7/2) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; massive; soft, friable, nonsticky and nonplastic; common very fine, fine, and medium tubular pores; 5 percent 1- to 10-mm shell fragments, discontinuous lens of loamy sand 1 to 2 mm thick; strongly effervescent; disseminated carbonates; strongly alkaline (pH 8.5); gradual smooth boundary.

4C4—36 to 50 inches; light gray (2.5Y 7/2) silt loam, dark grayish brown (2.5Y 4/2) moist; massive; soft, friable, nonsticky and nonplastic; common very fine, fine, and medium tubular pores; 5 percent 1- to 10-mm shell fragments; strongly effervescent; disseminated carbonates; strongly alkaline (pH 8.5); gradual smooth boundary.

5C5—50 to 60 inches; light gray (2.5Y 7/2) loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few medium and common very fine and fine tubular pores; 2 percent 1- to 10-mm shell fragments; strongly effervescent; disseminated carbonates; strongly alkaline (pH 8.5).

Range in Characteristics

Electrical conductivity (EC): 0 to 8 dS/m in the upper part; 2 to 16 dS/m in the lower part

Sodium adsorption ratio (SAR): 1 to 13 in the upper part; 13 to 80 in the lower part

A horizon:

Color—2.5Y 7/2 or 6/2 dry; 2.5Y 5/2 or 4/2 moist

Reaction—moderately alkaline or strongly alkaline

C horizon:

Color—2.5Y 7/2 or 6/2 dry; 2.5Y 5/2 or 4/2 moist

Texture—stratified loamy sand to fine sandy loam in the upper part; stratified sandy loam to silt loam in the lower part

Reaction—strongly alkaline or very strongly alkaline

Exeter Series

The Exeter series consists of moderately well drained soils that formed in alluvium derived mainly from granitic rock sources. These soils are moderately deep to a duripan. They are on alluvial fans and fan remnants. The elevation is 250 to 575 feet. The mean annual precipitation is 8 to 12 inches, and the mean annual temperature is 62 to 65 degrees F. The frost-free period is 250 to 300 days. Slopes are 0 to 5 percent.

Taxonomic class: Fine-loamy, mixed, superactive, thermic Typic Durixeralfs

Typical Pedon

Exeter loam, 0 to 2 percent slopes; in a wheat field at an elevation of 519 feet; about 1 mile northwest of Ducor; 1,850 feet south and 2,300 feet west of the northeast corner of sec. 28, T. 23 S., R. 27 E., MDB&M; latitude 35 degrees, 54 minutes, 3 seconds north and longitude 119 degrees, 3 minutes, 37 seconds west; Ducor Quadrangle:

Ap1—0 to 6 inches; yellowish brown (10YR 5/4) loam, dark yellowish brown (10YR 4/4) moist; moderate medium and coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine and few fine roots; few very fine, fine, and medium tubular pores; 4 percent gravel; slightly acid (pH 6.3); abrupt smooth boundary.

Ap2—6 to 9 inches; yellowish brown (10YR 5/4) loam, dark yellowish brown (10YR 4/4) moist; moderate coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine roots, mainly on top of a plowpan; few very fine, fine, and medium tubular pores; 4 percent gravel; slightly acid (pH 6.1); abrupt smooth boundary.

Bt1—9 to 16 inches; light yellowish brown (10YR 6/4) loam, dark yellowish brown (10YR 4/4) moist; strong very coarse prismatic structure; very hard, firm, slightly sticky and slightly plastic; few very fine roots, mainly on faces of peds; few fine and common very fine tubular pores; few thin clay films bridging mineral grains and very few thin clay films on faces of peds and lining pores; 6 percent gravel; neutral (pH 6.9); clear smooth boundary.

Bt2—16 to 21 inches; light yellowish brown (10YR 6/4) loam, dark yellowish brown (10YR 4/4) moist; strong very coarse prismatic and moderate coarse subangular blocky structure; hard, firm, slightly sticky and slightly plastic; few very fine roots; common very fine and fine tubular pores; few thin clay films bridging mineral grains and very few thin clay films on faces of peds and lining pores; 2 percent gravel; slightly alkaline (pH 7.5); clear smooth boundary.

Bt3—21 to 26 inches; reddish yellow (7.5YR 6/6) loam,

strong brown (7.5YR 4/6) moist; strong medium and very coarse prismatic structure; very hard, firm, sticky and plastic; few very fine roots; common very fine and fine tubular pores; few thin clay films bridging mineral grains and common moderately thick clay films on faces of peds and lining pores; 7 percent gravel; slightly alkaline (pH 7.8); abrupt smooth boundary.

Bt4—26 to 28 inches; strong brown (7.5YR 5/6) clay loam, strong brown (7.5YR 4/6) moist; strong medium and very coarse prismatic and fine subangular blocky structure; very hard, firm, sticky and plastic; few very fine roots, mainly on the pan surface; common very fine and few fine tubular pores; many moderately thick clay films lining pores and on faces of peds; 5 percent gravel; slightly alkaline (pH 7.6); abrupt smooth boundary.

Btqm1—28 to 32 inches; a yellowish red (5YR 5/6), indurated duripan, yellowish red (5YR 4/6) moist; massive; common very fine tubular pores; few thin clay films bridging mineral grains, common moderately thick clay films lining pores, and continuous clay films on fracture faces; 10 percent manganese concretions; abrupt smooth boundary.

Btqm2—32 to 35 inches; a reddish yellow (7.5YR 6/6), indurated duripan, strong brown (7.5YR 5/8) moist; massive; common very fine tubular pores; few thin clay films bridging mineral grains and many moderately thick clay films lining pores and on fracture faces; 20 percent manganese concretions; clear smooth boundary.

Btqm3—35 to 46 inches; a strong brown (7.5YR 5/6), strongly cemented duripan, strong brown (7.5YR 4/6) moist; weak coarse angular blocky structure; common very fine tubular and few fine interstitial pores; few thin clay films bridging mineral grains and common moderately thick clay films lining pores and on fracture faces; 5 percent manganese concretions; abrupt smooth boundary.

2Btq—46 to 56 inches; reddish yellow (7.5YR 6/6) gravelly coarse sandy loam, strong brown (7.5YR 4/6) moist; massive; very hard, firm, slightly sticky and nonplastic; many very fine and fine interstitial pores; common thin clay films bridging mineral grains and few moderately thick clay films lining pores; 20 percent gravel; slightly effervescent; disseminated carbonates; moderately alkaline (pH 8.2); abrupt smooth boundary.

2Bt1—56 to 66 inches; reddish yellow (7.5YR 6/6) very gravelly coarse sandy loam, strong brown (7.5YR 5/6) moist; massive; hard, very friable, slightly sticky and nonplastic; many very fine and fine interstitial pores; common thin clay films bridging mineral grains; 40 percent gravel; slightly effervescent; disseminated carbonates and carbonates that are segregated as few fine soft masses; moderately alkaline (pH 8.2); abrupt smooth boundary.

2Bt2—66 to 70 inches; reddish yellow (7.5YR 6/6) gravelly loamy coarse sand, strong brown (7.5YR 5/6) moist; massive; soft, loose, nonsticky and nonplastic; many very fine and fine interstitial pores; few thin clay films bridging mineral grains; 20 percent gravel; moderately alkaline (pH 8.3); abrupt wavy boundary.

2Btk—70 to 72 inches; reddish yellow (7.5YR 6/6) gravelly coarse sandy loam, strong brown (7.5YR 5/6) moist; massive; hard, very friable, nonsticky and nonplastic; many very fine and fine interstitial pores; many thin clay films bridging mineral grains and few moderately thick clay films lining pores; 40 percent gravel; slightly effervescent; disseminated carbonates and carbonates that are segregated as few fine soft masses; strongly alkaline (pH 8.5).

Range in Characteristics

Depth to a duripan: 20 to 40 inches

Content of rock fragments: 0 to 10 percent throughout the solum

A horizon:

- Color—10YR 5/4, 6/2, 6/3, or 6/4 dry; 10YR 3/4, 4/2, 4/3, or 4/4 moist
- Reaction—slightly acid to moderately alkaline

Bt horizon:

- Color—10YR 5/4, 6/2, 6/3, or 6/4 or 7.5YR 5/4, 5/6, or 6/6 dry; 10YR 3/4, 4/2, 4/3, or 4/4 or 7.5YR 4/3 or 4/6 moist
- Texture—loam, sandy clay loam, or clay loam
- Content of clay—18 to 35 percent
- Reaction—neutral to moderately alkaline

Btqm horizon:

- Color—5YR 5/6 or 7.5YR 5/4, 5/6, or 6/6 dry
- Carbonates—in some pedons the duripan is capped with a thin layer of carbonates or carbonates may be segregated as few fine seams or filaments in fine fractures; a noncalcareous matrix

2Bt and 2Btk horizons (occurring in some pedons):

- Texture—stratified very gravelly loamy coarse sand to gravelly loam
- Content of rock fragments—15 to 50 percent gravel
- Content of clay—2 to 15 percent
- Carbonates—may be present as few soft masses or disseminated

Flamen Series

The Flamen series consists of moderately well drained soils that formed in alluvium derived mainly from granitic rock sources. These soils are deep to a duripan. They are on fan remnants. The elevation is 260 to 550 feet. The mean annual precipitation is 8 to 12 inches, and the mean annual temperature is 62 to 65 degrees F. The frost-free period is 250 to 300 days. Slopes are 0 to 2 percent.

Taxonomic class: Fine-loamy, mixed, superactive, thermic Calcic Pachic Haploxerolls

Typical Pedon

Flamen loam, 0 to 2 percent slopes; in an area under irrigated cultivation, at an elevation of 370 feet; about 3 miles southwest of Exeter; about 2,112 feet west and 528 feet south of the center of sec. 20, T. 19 S., R. 26 E., MDB&M; latitude 36 degrees, 15 minutes, 35 seconds north and longitude 119 degrees, 11 minutes, 15 seconds west; Exeter Quadrangle:

Ap1—0 to 7 inches; dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist; moderate medium and coarse subangular blocky structure; very hard, friable, sticky and plastic; few very fine, fine, and medium roots; few very fine and few fine tubular pores; slightly acid (pH 6.5); abrupt smooth boundary.

Ap2—7 to 17 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; moderate coarse subangular blocky structure; very hard, friable, sticky and plastic; few very fine, fine, and medium roots; common very fine and few fine tubular pores; slightly acid (pH 6.4); clear wavy boundary.

Btk—17 to 28 inches; brown (7.5YR 4/2) loam, dark brown (7.5YR 3/2) moist; moderate medium and coarse subangular blocky structure; very hard, friable, sticky and plastic; few very fine, fine, and medium roots; common very fine and few fine tubular pores; few thin clay films lining pores and on faces of peds; slightly effervescent; disseminated carbonates; slightly acid (pH 6.5); gradual wavy boundary.

Btkq—28 to 43 inches; mixed matrix that is 50 percent light brown (7.5YR 6/4) loam between furrows from ripper and 50 percent pinkish gray (7.5YR 6/2) loam within furrows from ripper, brown (7.5YR 4/4 and 7.5YR 4/2, respectively) moist; moderate medium and coarse subangular blocky structure; very hard, friable, sticky and plastic; few very fine and fine roots; common very fine tubular pores; few thin clay films lining pores and on faces of peds; 10 percent coarse subangular, strongly cemented fragments of a duripan displaced by mechanical ripping of the underlying horizon; slightly effervescent; disseminated carbonates that are strongly effervescent; carbonates that are segregated as common fine filaments; slightly alkaline (pH 7.4); clear wavy boundary.

2Btqkm1—43 to 63 inches; a pinkish gray (7.5YR 6/2), strongly lime- and silica-cemented duripan with fine fractures that are 5 to 10 inches apart; dark brown (7.5YR 3/2) moist; massive; few very fine roots in fractures; many moderately thick clay films in fractures and common thin clay films lining pores; strongly effervescent; carbonates that are segregated as common fine seams and filaments; clear wavy boundary.

2Btqkm2—63 to 72 inches; a pale brown (10YR 6/3), strongly lime- and silica-cemented duripan, dark brown (10YR 3/3) moist; massive; strongly effervescent; carbonates that are segregated as common medium seams and filaments.

Range in Characteristics

Thickness of the mollic epipedon: 20 to 40 inches
Depth to a duripan: 40 to 60 inches

Ap horizon:
- Color—10YR 4/1, 4/2, 5/2, or 5/3 dry; 10YR 3/1, 3/2, or 3/3 moist
- Content of clay—18 to 27 percent
- Effervescence—noneffervescent to slightly effervescent
- Content of rock fragments—0 to 15 percent duripan fragments that are displaced from the underlying layer
- Reaction—slightly acid or neutral

Btk horizon:
- Color—10YR 3/2, 4/2, 4/3, 5/3, 5/4, or 6/4 or 7.5YR 4/2, 5/2, 5/3, 6/2, or 6/4 dry; 10YR 2/2, 3/2, 3/3, 4/3, or 4/4 or 7.5YR 3/2, 4/2, 4/3, or 4/4 moist
- Texture—loam, sandy loam, or clay loam
- Content of clay—18 to 30 percent; the clay increase relative to the Ap1 and Ap2 horizons is always less than 20 percent.
- Content of rock fragments—0 to 15 percent duripan fragments that are displaced from the underlying layer
- Reaction—slightly acid to moderately alkaline; variability resulting from applications of soil amendments

2Btqkm horizon:
- Color—10YR 5/3 or 7.5YR 6/2 or 6/3 dry; 10YR 3/3 or 3/4 or 7.5YR 3/2 or 3/3 moist

Gambogy Series

The Gambogy series consists of very deep, poorly drained soils that formed in mixed alluvium derived mainly from granitic rock sources. These soils are artificially drained and are on alluvial fans and flood plains. The elevation is 190 to 270 feet. The mean annual precipitation is 6 to 8 inches, and the mean annual temperature is 63 to 66 degrees F. The frost-free period is 250 to 300 days. Slopes are 0 to 2 percent.

Taxonomic class: Fine-loamy, mixed, superactive, calcareuos, thermic Cumulic Endoaquolls

Typical Pedon

Gambogy loam, drained, 0 to 1 percent slopes; in an irrigated wheat field at an elevation of 247 feet; about 12 miles southwest of Visalia, near the intersection of Road 28 and Avenue 264; about 1,400 feet south and 2,700 feet west of the northeast corner of sec. 19, T. 19 S., R. 23 E., MDB&M; latitude 36 degrees, 15 minutes, 56 seconds north and longitude 119 degrees, 31 minutes, 07 seconds west; Remnoy Quadrangle:

Ap1—0 to 6 inches; grayish brown (2.5Y 5/2) loam, very dark grayish brown (2.5Y 3/2) moist; moderate medium and coarse subangular blocky structure; slightly hard, friable, slightly sticky and plastic; common very fine roots; few very fine tubular pores; strongly effervescent; disseminated carbonates; slightly alkaline (pH 7.6); abrupt smooth boundary.

Ap2—6 to 12 inches; grayish brown (2.5Y 5/2) clay loam, very dark grayish brown (2.5Y 3/2) moist; moderate coarse subangular blocky structure; slightly hard, friable, sticky and plastic; few fine and common very fine roots; few very fine tubular pores; strongly effervescent; disseminated carbonates; slightly alkaline (pH 7.6); abrupt smooth boundary.

Ap3—12 to 19 inches; grayish brown (2.5Y 5/2) loam, very dark grayish brown (2.5Y 3/2) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and plastic; few very fine roots; few very fine interstitial and tubular pores; strongly effervescent; disseminated carbonates; slightly alkaline (pH 7.6); clear smooth boundary.

Btg1—19 to 28 inches; dark grayish brown (2.5Y 4/2) loam, black (2.5Y 2/2) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and plastic; few very fine and fine roots; few fine and common very fine tubular pores; common thin black (2.5Y 2/2) (moist) clay films bridging mineral grains and on faces of peds and few thin clay films lining pores; strongly effervescent; disseminated carbonates and carbonates that are segregated as few fine filaments; few fine prominent redoximorphic concentrations, yellowish brown (10YR 5/6) moist; 3 percent 2- to 5-mm redoximorphic manganese concretions; 1 percent 2- to 4-mm pebbles; slightly alkaline (pH 7.6); clear smooth boundary.

Btg2—28 to 33 inches; grayish brown (2.5Y 5/2) sandy loam, dark grayish brown (2.5Y 4/2) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and plastic; few very fine and fine roots; common very fine tubular and interstitial pores; common thin black (2.5Y 2/2) (moist) clay films bridging mineral grains and on faces of peds and few thin clay films lining pores; slightly effervescent; disseminated carbonates; common fine faint redoximorphic stains, very dark grayish brown (2.5Y 3/2) moist, and prominent redoximorphic concentrations, strong brown (7.5YR 5/6) moist; 8 percent 1- to 10-mm redoximorphic manganese concretions; slightly alkaline (pH 7.7); abrupt wavy boundary.

Btg3—33 to 47 inches; grayish brown (2.5Y 5/2) sandy loam, dark grayish brown (2.5Y 4/2) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine tubular and few fine and common very fine interstitial pores; common thin black (2.5Y 2/2) (moist) clay films bridging mineral grains and on faces of peds; slightly effervescent; disseminated carbonates; common fine prominent redoximorphic concentrations, strong brown (7.5YR 4/6) moist; 6 percent 1- to 10-mm manganese concretions; slightly alkaline (pH 7.7); clear smooth boundary.

C1—47 to 55 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 4/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; many very fine interstitial pores; common fine prominent redoximorphic concentrations, strong brown (7.5YR 5/6) moist; slightly alkaline (pH 7.6); clear smooth boundary.

C2—55 to 72 inches; brown (10YR 5/3) sandy loam, dark yellowish brown (10YR 4/4) moist; massive; soft, very friable, nonsticky and nonplastic; many very fine interstitial pores; common fine prominent redoximorphic concentrations, yellowish brown (10YR 5/8) moist; slightly alkaline (pH 7.7).

Range in Characteristics

Thickness of the mollic epipedon: 25 to 60 inches

Content of clay in the particle-size control section: 18 to 35 percent
Electrical conductivity (EC): 0 to 4 dS/m
Sodium adsorption ratio (SAR): 1 to 12
Depth to redoximorphic features: 19 to 36 inches
Other features: No C horizon in some pedons

A horizon:
Color—2.5Y 5/2 or 5Y 4/1 or 5/1 dry; 2.5Y 3/2 or 5Y 3/1 moist
Texture—loam in the upper part; stratified loam and clay loam in the lower part
Content of clay—18 to 27 percent in the upper part; 18 to 35 percent in the lower part
Depth to carbonates—0 to 10 inches
Calcium carbonate equivalent—0 to 3 percent
Reaction—slightly alkaline or moderately alkaline
Content of organic matter—1 to 3 percent

B horizon:
Color—2.5Y 4/2, 5/2, 6/2, or 7/2 or 5Y 5/1, 5/2, or 6/2 dry; 2.5Y 2/2, 3/2, 4/2, or 5/2 or 5Y 3/1, 4/1, 4/2, or 5/2 moist
Texture—stratified sandy loam to clay loam
Content of clay—18 to 35 percent; the clay increase relative to the A horizon is less than 20 percent.
Calcium carbonate equivalent—1 to 3 percent
Reaction—slightly alkaline or moderately alkaline
Content of organic matter—1 to 2 percent

C horizon:
Color—10YR 4/2, 5/3, 5/4, or 6/2 dry; 10YR 3/2, 4/2, 4/3, or 4/4 moist
Texture—stratified sandy loam to loam
Content of clay—8 to 20 percent
Calcium carbonate equivalent—1 to 3 percent
Reaction—slightly alkaline or moderately alkaline
Content of organic matter: 0.5 to 1 percent

Garces Series

The Garces series consists of very deep, well drained soils that formed in alluvium derived from granitic rock sources. These soils are on fan remnants. The elevation is 210 to 390 feet. The mean annual precipitation is 6 to 8 inches, and the mean annual temperature is 62 to 65 degrees F. The frost-free period is 250 to 275 days. Slopes are 0 to 2 percent.

Taxonomic class: Fine-loamy, mixed, superactive, thermic Typic Natrargids

Typical Pedon

Garces loam, in an area of Gareck-Garces association, 0 to 2 percent slopes; in a native field at an elevation of 218 feet; about 3.5 miles south of Allensworth State Park; 700 feet south and 1,500 feet west of the northeast corner of sec. 29, T. 24 S., R. 24 E., MDB&M; latitude 35 degrees, 49 minutes, 2 seconds north and longitude 119 degrees, 23 minutes, 49 seconds west; Allensworth Quadrangle:

A—0 to 1 inch; light brownish gray (2.5Y 6/2) loam, very dark grayish brown (2.5Y 3/2) moist; weak thin platy structure; soft, friable, nonsticky and slightly plastic; many very fine and fine roots; few medium, common fine, and many very fine interstitial pores; few shell fragments; slightly effervescent; disseminated carbonates; slightly alkaline (pH 7.5); clear smooth boundary.

E—1 to 4 inches; light gray (2.5Y 7/2) loam, dark grayish brown (2.5Y 4/2) moist; strong coarse and very coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many very fine and few fine roots; many very fine tubular pores; few shell fragments; slightly alkaline (pH 7.5); clear smooth boundary.

Btknz1—4 to 14 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; strong coarse and very coarse columnar structure parting to moderate fine and medium subangular blocky; very hard, firm, sticky and plastic; common very fine roots on faces of peds; common very fine and few fine and medium tubular pores; common thin clay films on faces of peds and bridging sand grains; strongly effervescent; disseminated carbonates and carbonates that are segregated as many fine, medium, and coarse irregular soft masses and few fine rounded concretions; strongly alkaline (pH 9.0); clear wavy boundary.

Btknz2—14 to 21 inches; light yellowish brown (2.5Y 6/4) loam, grayish brown (2.5Y 5/2) moist; weak medium prismatic structure parting to moderate fine subangular blocky; slightly hard, friable, slightly sticky and plastic; few very fine roots; many very fine and common fine tubular pores; few thin clay films on faces of peds; slightly effervescent; disseminated carbonates that are strongly effervescent; carbonates that are segregated as common fine and medium irregular soft masses and few fine round concretions; strongly alkaline (pH 8.7); clear wavy boundary.

Btnz—21 to 29 inches; light yellowish brown (2.5Y 6/4) and light gray (2.5Y 7/2) loam, grayish brown (2.5Y 5/2) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and plastic; few very fine roots; common very fine tubular pores; few fine distinct

very dark grayish brown (2.5Y 3/2) redoximorphic iron-manganese depletions; strongly alkaline (pH 8.5); clear wavy boundary.

Bknyz1—29 to 42 inches; light gray (2.5Y 7/2) loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, friable, nonsticky and slightly plastic; common very fine tubular pores; common fine and medium gypsum veins; slightly effervescent; disseminated carbonates; few fine very dark grayish brown (2.5Y 3/2) redoximorphic iron-manganese depletions; moderately alkaline (pH 8.2); gradual wavy boundary.

Bknyz2—42 to 56 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; massive; very hard, firm, sticky and plastic; many very fine, fine, and medium tubular pores; few fine gypsum veins; slightly effervescent; disseminated carbonates; few fine black (10YR 2/1) redoximorphic iron-manganese depletions; moderately alkaline (pH 8.3); clear wavy boundary.

Bknyz3—56 to 62 inches; light yellowish brown (2.5Y 6/4) loam, light olive brown (2.5Y 5/4) moist; massive; very hard, firm, slightly sticky and plastic; many very fine and common fine tubular pores; slightly effervescent; disseminated carbonates and carbonates that are segregated as few fine, medium, and coarse irregular soft masses; few fine distinct dark grayish brown (10YR 4/2) redoximorphic depletions and yellowish brown (10YR 5/6) redoximorphic accumulations; moderately alkaline (pH 8.3).

Range in Characteristics

Electrical conductivity: 2 to 8 dS/m in the upper part; 4 to 16 dS/m in the lower part

Sodium adsorption ration: 1 to 25 in the upper part; 13 to 100 in the lower part

A horizon:

Color—2.5Y 6/2 or 7/2 dry; 2.5Y 3/2, 4/2, or 4/4 moist

Effervescence—noneffervescent to strongly effervescent

B horizon:

Color—2.5Y 6/2, 6/4, or 7/2 dry; 2.5Y 5/2 or 5/4 moist

Texture—clay loam, sandy clay loam, silty clay loam, or loam underlain by stratified sandy loam to clay loam

Content of clay—averages 20 to 35 percent

Effervescence—slightly effervescent to violently effervescent; disseminated carbonates and carbonates that are segregated as few or common fine, medium, and coarse irregular soft masses and filaments

Gareck Series

The Gareck series consists of very deep, well drained soils that formed through the chemical and mechanical alteration of Garces soils (fine-loamy, mixed, superactive, thermic Typic Natrargids), which originally formed in alluvium derived from granitic rock sources. Gareck soils are on fan remnants. Reclamation has destroyed the original natric horizon. The elevation is 210 to 390 feet. The mean annual precipitation is 6 to 8 inches, and the mean annual temperature is 62 to 65 degrees F. The frost-free period is 250 to 275 days. Slopes are 0 to 2 percent.

Taxonomic class: Fine-loamy, mixed, superactive, calcareous, thermic Sodic Torriarents

Typical Pedon

Gareck sandy loam, in an area of Gareck-Garces association, 0 to 2 percent slopes, under irrigated cultivation, at an elevation of 278 feet; about 10 miles south of Pixley; about 200 feet north and 80 feet west of the southeast corner of sec. 20, T. 24 S., R. 25 E., MDB&M; latitude 35 degrees, 49 minutes, 19 seconds north and longitude 119 degrees, 17 minutes, 8 seconds west; Delano West Quadrangle:

Ap1—0 to 6 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 4/3) moist; weak coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine roots; common very fine tubular and interstitial pores; slightly effervescent; disseminated carbonates; moderately alkaline (pH 8.2); gradual smooth boundary.

Ap2—6 to 17 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; weak coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine roots; common very fine and few fine tubular and few very fine interstitial pores; few thin clay films lining pores in fragments of a displaced natric horizon; 5 percent subangular fragments of the displaced natric horizon; strongly effervescent; disseminated carbonates; moderately alkaline (pH 8.4); clear smooth boundary.

Ap3—17 to 28 inches; light yellowish brown (10YR 6/4) loam, dark yellowish brown (10YR 4/4) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; few very fine roots; common very fine tubular and few very fine interstitial pores; common moderately thick clay

films lining pores and on faces of fragments of a displaced natric horizon; 5 percent subangular fragments of the displaced natric horizon; strongly effervescent; disseminated carbonates and carbonates segregated as few fine irregular soft masses; moderately alkaline (pH 8.3); gradual smooth boundary.

Ap4—28 to 47 inches; light yellowish brown (10YR 6/4) sandy clay loam, dark yellowish brown (10YR 4/4) moist; weak coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine tubular and interstitial pores; few thin clay films bridging sand grains and on faces of fragments of a displaced natric horizon; 5 percent angular blocky fragments of the displaced natric horizon; strongly effervescent; disseminated carbonates and carbonates segregated as common fine seams, filaments, and irregular soft masses; moderately alkaline (pH 8.4); clear smooth boundary.

2Bk—47 to 62 inches; light gray (10YR 7/2) sandy loam, yellowish brown (10YR 5/4) moist; weak medium subangular blocky structure; hard, friable, nonsticky and nonplastic; common very fine tubular and interstitial pores; 5 percent gravel; strongly effervescent; disseminated carbonates and carbonates segregated as common fine irregular soft masses; moderately alkaline (pH 8.4).

Range in Characteristics

Depth to displaced fragments: 4 to 8 inches
Electrical conductivity (EC): 0 to 4 dS/m
Sodium adsorption ratio (SAR): 0 to 8
Other features: In some pedons crystals of gypsum in the Ap or 2Bk horizon where gypsum has been added to the soils

Ap1 horizon:
- Color—10YR 5/2, 5/3, 6/2, 6/3, 7/2, or 7/3 dry; 10YR 3/2, 3/3, 4/2, 4/3, 5/2, or 5/3 moist; many pedons darkened by the addition of large amounts of organic matter, but lacking enough organic carbon for the horizon to be a mollic epipedon
- Content of clay—10 to 20 percent
- Texture—commonly sandy loam, but varies greatly because of surface mixing and land leveling
- Effervescence—slightly effervescent to violently effervescent
- Calcium carbonate equivalent—1 to 3 percent
- Reaction—neutral to moderately alkaline

Ap2, Ap3, and Ap4 horizons:
- Color—10YR 5/3, 5/4, 6/3, or 6/4 dry; 10YR 3/3, 3/4, 4/3, or 4/4 moist
- Texture—loam, sandy clay loam, or clay loam
- Content of clay—18 to 30 percent
- Clay films—few to many thin to moderately thick on displaced faces of peds, lining pores, and bridging sand grains of displaced aggregates, from a destroyed natric horizon
- Effervescence—slightly effervescent to violently effervescent
- Calcium carbonate equivalent—1 to 5 percent
- Reaction—slightly alkaline or moderately alkaline

2Bk horizon:
- Color—10YR 6/2, 6/3, 6/4, 7/2, 7/3, or 7/4 dry; 10YR 4/2, 4/3, 4/4, 5/2, 5/3, or 5/4 moist
- Texture—stratified loamy sand to sandy clay loam
- Content of clay—averages 8 to 18 percent and ranges from 3 to 30 percent
- Effervescence—strongly effervescent to violently effervescent
- Calcium carbonate equivalent—1 to 5 percent
- Content of rock fragments—0 to 10 percent
- Reaction—dominantly slightly alkaline or moderately alkaline, but ranges to very strongly alkaline in some pedons; highly variable because of the degree of reclamation

Gepford Series

The Gepford series consists of very deep, poorly drained soils that formed in mixed alluvium derived mainly from granitic rock sources. These soils are artificially drained and are on flood plains and basin rims. The elevation is 190 to 220 feet. The mean annual precipitation is 6 to 7 inches, and the mean annual temperature is 63 to 66 degrees F. The frost-free period is 250 to 275 days. Slopes are 0 to 1 percent.

Taxonomic class: Fine, smectitic, thermic Typic Natraquerts

Typical Pedon

Gepford silty clay, partially drained, 0 to 1 percent slopes; in an area under irrigated cultivation, at an elevation of 193 feet; about 4.5 miles north-northwest of Alpaugh; 0.3 mile east of Road 16 on Avenue 88 and 200 feet north into a field; 200 feet north and 1,900 feet east of the southwest corner of sec. 6, T. 23 S., R. 23 E., MDB&M; latitude 36 degrees, 57 minutes,

5 seconds north and longitude 119 degrees, 31 minutes, 48 seconds west; Hacienda Ranch Northeast Quadrangle:

Ap1—0 to 7 inches; gray (5Y 5/1) silty clay, very dark gray (5Y 3/1) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, sticky and slightly plastic; many very fine roots; many very fine, fine, and medium interstitial pores; violently effervescent; disseminated carbonates that are strongly effervescent; carbonates that are segregated as common fine rounded nodules; common fine shell fragments; many fine filaments of gypsum; few fine faint redoximorphic iron depletions, dark olive gray (5Y 3/2) moist, and few fine distinct redoximorphic iron accumulations, dark brown (7.5YR 3/4) moist; common fine and medium rounded and irregular nodules of iron and manganese; electrical conductivity (EC) of 2 dS/m; sodium adsorption ratio (SAR) of 6; strongly alkaline (pH 8.5); clear smooth boundary.

Ap2—7 to 13 inches; gray (5Y 5/1) silty clay, very dark gray (5Y 3/1) moist; moderate fine and medium granular structure; slightly hard, friable, sticky and plastic; common very fine and fine roots; many very fine and fine and common medium interstitial and common very fine and fine tubular pores; violently effervescent; disseminated carbonates that are strongly effervescent; carbonates that are segregated as common fine rounded nodules; common fine shell fragments; many fine filaments of gypsum; few fine faint redoximorphic iron depletions, dark olive gray (5Y 3/2) moist, and few fine distinct redoximorphic iron accumulations, dark brown (7.5YR 3/4) moist; common fine and medium rounded and irregular nodules of iron and manganese; electrical conductivity (EC) of 2 dS/m; sodium adsorption ratio (SAR) of 14; strongly alkaline (pH 8.6); gradual smooth boundary.

Ap3—13 to 21 inches; gray (5Y 5/1) silty clay, very dark gray (5Y 3/1) moist; moderate fine granular structure; hard, firm, very sticky and plastic; common very fine roots; common very fine and fine interstitial and few very fine, fine, and medium tubular pores; strongly effervescent; disseminated carbonates and carbonates that are segregated as common fine rounded nodules; many fine filaments of gypsum; few fine distinct redoximorphic iron accumulations, olive (5Y 4/3) moist, and redoximorphic iron depletions, olive gray (5Y 5/2) and black (N 2/0) moist; common fine and medium rounded and irregular nodules of iron and manganese; electrical conductivity (EC) of 4 dS/m; sodium adsorption ratio (SAR) of 18; strongly alkaline (pH 8.6); clear smooth boundary.

Bkg1—21 to 31 inches; light olive gray (5Y 6/2) clay, olive gray (5Y 5/2) moist; massive; hard, firm, sticky and plastic; few very fine roots; common very fine and fine tubular and interstitial pores; slightly effervescent; disseminated carbonates that are strongly effervescent; carbonates that are segregated as common fine irregular soft masses; common fine prominent iron depletions, very dark gray (N 3/0) moist; few fine prominent yellowish red (5YR 4/6) (moist), many fine faint olive (5Y 5/3) (moist), and few fine prominent olive brown (2.5Y 4/4) (moist) redoximorphic iron accumulations; few fine and medium rounded and irregular nodules of iron and manganese; common pressure faces and wedge-shaped aggregates, which are tilted at a 30-degree angle; electrical conductivity (EC) of 4 dS/m; sodium adsorption ratio (SAR) of 28; strongly alkaline (pH 8.8); clear smooth boundary.

Bkg2—31 to 46 inches; light yellowish brown (2.5Y 6/4) silty clay, olive brown (2.5Y 4/4) moist; massive; hard, friable, sticky and slightly plastic; few very fine roots; common very fine and fine tubular and interstitial pores; slightly effervescent; disseminated carbonates that are strongly effervescent; carbonates that are segregated as common fine irregular soft masses; common medium and large gray (5Y 5/1) (moist) and few fine and medium prominent black (N 2/0) (moist) redoximorphic iron depletions; common medium and large olive (5Y 5/3) (moist) and few fine and medium prominent yellowish red (5YR 5/6) (moist) redoximorphic iron accumulations; common pressure faces and wedge-shaped aggregates, which are tilted at a 30-degree angle; electrical conductivity (EC) of 5 dS/m; sodium adsorption ratio (SAR) of 34; strongly alkaline (pH 8.8); clear smooth boundary.

2Bkg3—46 to 50 inches; light gray (5Y 7/2) silty clay, olive gray (5Y 5/2) moist; massive; very hard, firm, sticky and plastic; many very fine and fine interstitial pores; strongly effervescent; disseminated carbonates and carbonates that are segregated as few fine irregular soft masses; few fine prominent redoximorphic iron accumulations, light olive brown (2.5Y 5/4) moist; redoximorphic iron depletions, very dark gray (N 3/0) moist; electrical conductivity (EC) of 5 dS/m; sodium adsorption ratio (SAR) of 38; strongly alkaline (pH 8.7); clear smooth boundary.

2Bkg4—50 to 72 inches; light gray (5Y 7/2) clay, olive

gray (5Y 5/2) moist; massive; very hard, firm, sticky and very plastic; common very fine and fine interstitial and few very fine tubular pores; strongly effervescent; disseminated carbonates and carbonates that are segregated as few fine irregular soft masses; few fine prominent redoximorphic iron accumulations, strong brown (7.5YR 5/6) moist; few fine prominent iron depletions, very dark grayish brown (2.5Y 3/2) moist; electrical conductivity (EC) of 5 dS/m; sodium adsorption ratio (SAR) of 23; strongly alkaline (pH 8.5).

Range in Characteristics

Soil wetness: Moist in some part all of the time and saturated in some part for up to 4 months each year

Content of organic matter: 1 to 2 percent in the surface horizon; decreasing irregularly with increasing depth

Carbonates: 1 to 5 percent in the surface horizon and 5 to 15 percent in the lower horizons; disseminated and segregated as nodules and soft masses

Electrical conductivity (EC): 2 to 15 dS/m

Sodium adsorption ratio (SAR): 2 to 30 in the upper part; 13 to 50 in the lower part

Reaction: Slightly alkaline to strongly alkaline; typically increasing in alkalinity with increasing depth; highly variable because of the addition of gypsum; significantly lowered where a significant amount of gypsum has been added

A horizon:

Color—5Y 5/1 or 5/2 dry; 5Y 3/1 or 3/2 moist

Cracks—when the soils are dry, 1/4 to 1 inch wide and extending to a depth of as much as 29 inches

B horizon:

Color—2.5Y 6/4 or 5Y 5/1, 5/2, 6/2, or 7/2 dry; 2.5Y 4/4 or 5Y 3/1, 3/2, 4/1, 4/2, or 5/2 moist

Texture—clay or silty clay in the upper part; stratified fine sand to clay in the lower part

Wedge-shaped aggregates—tilted at least 10 degrees

Grangeville Series

The Grangeville series consists of very deep, somewhat poorly drained soils that formed in alluvium derived mainly from granitic rock sources. These soils are artificially drained and are on alluvial fans and flood plains. The elevation is 190 to 410 feet. The mean annual precipitation is 8 to 12 inches, and the mean annual temperature is 62 to 64 degrees F. The frost-free period is 250 to 275 days. Slopes are 0 to 2 percent.

Taxonomic class: Coarse-loamy, mixed, superactive, thermic Fluvaquentic Haploxerolls

Typical Pedon

Grangeville sandy loam, drained, 0 to 2 percent slopes; in a dryland pasture at an elevation of 405 feet; about 3 miles southwest of Woodlake; 1,250 feet south and 45 feet west of the northeast corner of sec. 14, T. 18 S., R. 26 E., MDB&M; latitude 36 degrees, 21 minutes, 48 seconds north and longitude 119 degrees, 06 minutes, 55 seconds west; Rocky Hill Quadrangle:

Ap1—0 to 9 inches; brown (10YR 5/3) sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine, fine, and medium roots; many very fine and fine irregular pores; slightly effervescent; disseminated carbonates and carbonates that are segregated as few fine rounded soft masses; 2 percent 2- to 25-mm pebbles; moderately alkaline (pH 8.0); clear smooth boundary.

Ap2—9 to 16 inches; brown (10YR 5/3) sandy loam, very dark grayish brown (10YR 3/2) moist; massive; slightly hard, friable, slightly sticky and nonplastic; common very fine, fine, and medium and many coarse roots; many very fine tubular pores; slightly effervescent; disseminated carbonates that are strongly effervescent; carbonates that are segregated as few fine seams; few fine lenses of loamy sand; common fine distinct redoximorphic iron depletions, dark gray (10YR 4/1) moist, and redoximorphic iron accumulations, dark brown (7.5YR 3/4) moist; slightly alkaline (pH 7.8); clear smooth boundary.

Bg—16 to 27 inches; light brownish gray (10YR 6/2) loam, very dark grayish brown (10YR 3/2) moist; massive; soft, friable, slightly sticky and plastic; many very fine, fine, medium, and coarse roots; many very fine tubular and many very fine and fine irregular pores; strongly effervescent; carbonates that are segregated as few fine filaments; few fine lenses of loamy sand; few medium prominent light olive brown (2.5Y 5/4) (moist) and common fine distinct brown (7.5YR 4/4) (moist) relict redoximorphic iron accumulations; slightly alkaline (pH 7.8); clear smooth boundary.

2C1—27 to 33 inches; light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; massive, soft, friable, slightly sticky and

slightly plastic; many very fine and fine and common medium roots; common very fine and fine tubular pores; many medium faint dark brown (10YR 3/3) (moist) and common fine prominent dark brown (7.5YR 3/4) (moist) relict redoximorphic iron accumulations; neutral (pH 7.0); clear smooth boundary.

2C2—33 to 67 inches; light brownish gray (10YR 6/2) sandy loam, dark grayish brown (10YR 4/2) moist; massive; soft, very friable, nonsticky and slightly plastic; many very fine and fine and common medium roots; common very fine and fine tubular pores; many medium faint relict redoximorphic iron accumulations, dark brown (10YR 3/3) moist; neutral (pH 6.7).

Range in Characteristics

Carbonates: In all parts from 10 to 20 inches
Relict redoximorphic features: Within a depth of 30 inches

A horizon:
Color—10YR 5/2 or 5/3 dry; 10YR 3/2 or 3/3 moist
Reaction—slightly alkaline or moderately alkaline in the nonsaline-nonsodic phase; moderately alkaline to very strongly alkaline in the saline-sodic phase

Bg horizon:
Color—10YR 5/2 or 6/2 dry; 10YR 3/2 or 4/3 moist
Texture—sandy loam, fine sandy loam, or loam
Reaction—slightly alkaline or moderately alkaline in the nonsaline-nonsodic phase; moderately alkaline to very strongly alkaline in the saline-sodic phase

2C horizon:
Color—10YR 5/2, 5/3, 6/2, or 7/2 dry; 10YR 3/2, 3/3, 4/2, 4/3, or 5/3 moist
Texture—stratified loamy sand to silt loam
Reaction—neutral to moderately alkaline in the nonsaline-nonsodic phase; moderately alkaline to very strongly alkaline in the saline-sodic phase

Hanford Series

The Hanford series consists of very deep, well drained soils that formed in alluvium derived mainly from granitic rock sources. These soils are on flood plains. The elevation is 225 to 500 feet. The mean annual precipitation is 9 to 12 inches, and the mean annual temperature is 62 to 65 degrees F. The frost-free period is 250 to 280 days. Slopes are 0 to 2 percent.

Taxonomic class: Coarse-loamy, mixed, superactive, nonacid, thermic Typic Xerorthents

Typical Pedon

Hanford sandy loam, 0 to 2 percent slopes; in an area under irrigated cultivation, at an elevation of 295 feet; about 0.75 mile west of New London; 1,250 feet north and 1,450 feet east of the southwest corner of sec. 2, T. 17 S., R. 23 E., MDB&M; latitude 36 degrees, 28 minutes, 38 seconds north and longitude 119 degrees, 27 minutes, 02 seconds west; Traver Quadrangle:

Ap—0 to 6 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 4/3) moist; slightly hard, friable, nonsticky and nonplastic; common very fine and fine roots; few very fine tubular pores; slightly effervescent; disseminated carbonates; weak medium plates formed by equipment compaction in the upper 3 inches; slightly alkaline (pH 7.5); clear wavy boundary.

C1—6 to 30 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; common very fine and few fine and medium tubular pores; neutral (pH 7.3); gradual wavy boundary.

C2—30 to 60 inches; light yellowish brown (10YR 6/4) sandy loam, dark yellowish brown (10YR 4/4) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine and few fine and medium tubular pores; slightly alkaline (pH 7.4).

Range in Characteristics

Particle-size control section:
Texture—sandy loam, coarse sandy loam, or fine sandy loam
Content of clay—averages 7 to 18 percent
Carbonates—secondary free carbonates occurring only where amendments were added; commonly resulting in slight effervescence; disseminated in the surface layer

A horizon:
Color—10YR 5/2, 5/3, 6/2, or 6/3 dry; 10YR 3/2, 3/3, 4/2, or 4/3 moist
Content of clay—7 to 18 percent

C horizon:
Color—10YR 6/3, 6/4, or 7/3 dry; 10YR 3/3, 3/4, 4/3, 4/4, or 5/3 moist
Texture—coarse sandy loam, sandy loam, fine sandy loam, or loam in the upper part; loamy sand, coarse sandy loam, or sandy loam in the lower part

Content of clay—7 to 18 percent in the upper part; 5 to 15 percent in the lower part

Houser Series

The Houser series consists of very deep, somewhat poorly drained soils that formed in mixed alluvium derived mainly from granitic rock sources. These soils are artificially drained and are on basin rims. The elevation is 190 to 220 feet. The mean annual precipitation is 6 to 7 inches, and the mean annual temperature is 62 to 65 degrees F. The frost-free period is 260 to 275 days. Slopes are 0 to 1 percent.

Taxonomic class: Fine, smectitic, calcareous, thermic Vertic Fluvaquents

Typical Pedon

Houser silty clay, drained, 0 to 1 percent slopes; in a fallow field at an elevation of 200 feet; about 2.5 miles west-northwest of Alpaugh; 500 feet east of the county line; 500 feet east and 2,750 feet north of the southwest corner of sec. 30, T. 23 S., R. 23 E., MDB&M; latitude 36 degrees, 53 minutes, 44 seconds north and longitude 119 degrees, 32 minutes, 8 seconds west; Hacienda Ranch Quadrangle:

Ap—0 to 7 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate thick platy structure parting to moderate coarse subangular blocky; slightly hard, very friable, very sticky and plastic; few very fine roots; common fine tubular pores; violently effervescent; disseminated carbonates; few fine prominent light yellowish brown (10YR 6/4) redoximorphic iron concentrations, dark yellowish brown (10YR 4/4) moist; electrical conductivity (EC) of 2.0 dS/m; sodium adsorption ratio (SAR) of 3.0; common very fine shell fragments; moderately alkaline (pH 7.9); clear wavy boundary.

Bnzyg1—7 to 20 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; very hard, friable, sticky and very plastic; few very fine roots; common very fine and fine tubular pores; strongly effervescent; disseminated carbonates; many thin filaments of gypsum; common very fine shell fragments; common fine and medium prominent light reddish brown (2.5YR 6/4) redoximorphic iron concentrations, dark yellowish brown (10YR 4/4) moist; electrical conductivity (EC) of 4.0 dS/m; sodium adsorption ratio (SAR) of 20; strongly alkaline (pH 8.6); clear smooth boundary.

Bknzyg2—20 to 39 inches; light brownish gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 5/2) moist; very hard, friable, very sticky and very plastic; common fine tubular pores; common slickensides on faces of peds; common manganese stains on faces of peds; strongly effervescent; disseminated carbonates and carbonates that are segregated as common fine soft masses and common very fine thin filaments; few fine prominent light yellowish brown (2.5Y 6/4) redoximorphic iron concentrations, olive gray (5Y 4/2) moist; massive; electrical conductivity (EC) of 7.0 dS/m; sodium adsorption ratio (SAR) of 36; strongly alkaline (pH 8.6); clear wavy boundary.

Bknzyg3—39 to 45 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, very sticky and very plastic; common very fine tubular pores; common slickensides on faces of peds; many manganese stains on faces of peds; slightly effervescent; disseminated carbonates and carbonates that are segregated as few very fine irregular soft masses; few fine prominent light yellowish brown (2.5Y 6/4) redoximorphic iron concentrations, olive brown (2.5Y 4/4) moist; electrical conductivity (EC) of 6 dS/m; sodium adsorption ratio (SAR) of 36; moderately alkaline (pH 8.3); abrupt wavy boundary.

Bknzy4—45 to 50 inches; light gray (2.5Y 7/2) silty clay, grayish brown (2.5Y 5/2) moist; massive; slightly hard, very friable, nonsticky and nonplastic; common very fine tubular pores; slightly effervescent; disseminated carbonates; electrical conductivity (EC) of 6 dS/m; sodium adsorption ratio (SAR) of 20; moderately alkaline (pH 8.4); clear wavy boundary.

Bknzy5—50 to 60 inches; light gray (2.5Y 7/2) silty clay, grayish brown (2.5Y 5/2) moist; massive; hard, friable, sticky and plastic; common very fine tubular pores; slightly effervescent; disseminated carbonates and carbonates that are segregated as few very fine soft masses; electrical conductivity (EC) of 4 dS/m; sodium adsorption ratio (SAR) of 20; moderately alkaline (pH 8.3).

Range in Characteristics

Electrical conductivity (EC): 1 to 30 dS/m in the surface layer; 4 to 30 dS/m in the lower part of the profile

Effervescence: Slightly effervescent to violently effervescent with disseminated carbonates throughout to a depth of 20 inches; below a depth of 20 inches, noneffervescent to violently effervescent with both disseminated and segregated carbonates

Other features: Vertical cracks, 1/2 to 1 inch wide, extending from the surface to a depth of 20 inches at some time in most years; in some pedons, a few nonintersecting slickensides or wedge-shaped aggregates; gypsum crystals below a depth of 30 inches in some pedons (a result of additions of gypsum)

A horizon:
Color—2.5Y 6/2 or 5Y 6/2 dry; 2.5Y 4/2 or 5Y 4/2 moist
Texture—fine sandy loam or silty clay
Reaction—moderately alkaline or strongly alkaline

B horizon:
Color—2.5Y 6/2 or 7/2 or 5Y 6/2 dry; 2.5Y 4/2 or 5/2 or 5Y 4/2 moist
Texture—clay or silty clay with thin strata of silt loam or silty clay loam
Reaction—moderately alkaline to very strongly alkaline

Jerryslu Series

The Jerryslu series consists of moderately well drained, saline-sodic soils that rest abruptly on an indurated, carbonate- and silica-cemented duripan. These soils are moderately deep to a duripan. They formed in alluvium derived from granitic rock sources. They are on fan remnants and basin rims. The elevation is 225 to 325 feet. The mean annual precipitation is 6 to 8 inches, and the mean annual temperature is 63 to 65 degrees F. The frost-free period is 250 to 275 days. Slopes are 0 to 2 percent.

Taxonomic class: Fine-loamy, mixed, superactive, thermic Typic Natridurids

Typical Pedon

Jerryslu loam, in an area of Atesh-Jerryslu association, 0 to 2 percent slopes; in a native field at an elevation of 240 feet; about 3 miles east of Allensworth State Park; 234 feet north and 315 feet east of the southeast corner of sec. 1, T. 24 S., R. 24 E., MDB&M; latitude 35 degrees, 52 minutes, 15 seconds north and longitude 119 degrees, 19 minutes, 44 seconds west; Delano West Quadrangle:

A—0 to 1 inch; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; strong thick platy structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine and few fine tubular and many very fine interstitial pores; strongly effervescent; disseminated carbonates; electrical conductivity (EC) of 2.7 dS/m; sodium adsorption ratio (SAR) of 7; moderately alkaline (pH 7.9); abrupt smooth boundary.

E1—1 to 3 inches; light gray (10YR 7/2) very fine sandy loam, brown (10YR 5/3) moist; strong very thick platy structure; hard, very friable, nonsticky and nonplastic; common very fine roots; many very fine and few fine tubular and many very fine interstitial pores; strongly effervescent; disseminated carbonates; electrical conductivity (EC) of 3.3 dS/m; sodium adsorption ratio (SAR) of 17; strongly alkaline (pH 8.5); abrupt smooth boundary.

E2—3 to 4 inches; light gray (10YR 7/2) loam, brown (10YR 5/3) moist; strong coarse columnar structure parting to strong medium columnar; extremely hard, friable, slightly sticky and slightly plastic; common very fine roots on faces of peds; many very fine and few fine tubular and many very fine interstitial pores; very few thin clay films lining pores and bridging sand grains; strongly effervescent; disseminated carbonates; electrical conductivity (EC) of 16.0 dS/m; sodium adsorption ratio (SAR) of 170; very strongly alkaline (pH 9.5); abrupt smooth boundary.

Btkn1—4 to 9 inches; yellowish brown (10YR 5/4) sandy clay loam, dark yellowish brown (10YR 4/4) moist; strong coarse columnar structure parting to strong medium columnar; hard, firm, sticky and plastic; common very fine roots on faces of peds; many very fine and few fine tubular and many very fine interstitial pores; common thin clay films bridging sand grains and common moderately thick clay films lining pores and on faces of peds; strongly effervescent; disseminated carbonates; electrical conductivity (EC) of 17.8 dS/m; sodium adsorption ratio (SAR) of 307; very strongly alkaline (pH 10.0); abrupt wavy boundary.

Btkn2—9 to 12 inches; light yellowish brown (10YR 6/4) sandy clay loam, dark yellowish brown (10YR 4/4) moist; weak coarse angular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine roots; many very fine and few fine tubular and many very fine interstitial pores; few thin clay films bridging sand grains and very few thin clay films lining pores and on faces of peds; strongly effervescent; disseminated carbonates; electrical conductivity (EC) of 10.9 dS/m; sodium adsorption ratio (SAR) of 152; very strongly alkaline (pH 10.1); clear smooth boundary.

Btkn3—12 to 17 inches; light yellowish brown (10YR 6/4) loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure; slightly

hard, very friable, slightly sticky and slightly plastic; few very fine roots; many very fine and few fine tubular and many very fine interstitial pores; very few thin clay films bridging sand grains and lining pores; strongly effervescent; disseminated carbonates; electrical conductivity (EC) of 11.4 dS/m; sodium adsorption ratio (SAR) of 203; very strongly alkaline (pH 10.1); clear smooth boundary.

Btkn4—17 to 29 inches; light yellowish brown (10YR 6/4) loam, dark yellowish brown (10YR 4/4) moist; weak coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; common very fine and few medium tubular and many very fine interstitial pores; few thin clay films bridging sand grains, lining pores, and on faces of peds; common fine and medium distinct strong brown (7.5YR 5/6) redoximorphic iron concentrations, strong brown (7.5YR 4/6) moist; strongly effervescent; disseminated carbonates; electrical conductivity (EC) of 14.0 dS/m; sodium adsorption ratio (SAR) of 246; very strongly alkaline (pH 10.2); clear smooth boundary.

Btkn5—29 to 35 inches; light yellowish brown (10YR 6/4) loam, yellowish brown (10YR 5/4) moist; moderate coarse angular blocky structure; hard, friable, slightly sticky and slightly plastic; many very fine and few fine tubular and many very fine interstitial pores; few thin clay films bridging sand grains and few moderately thick clay films lining pores and on faces of peds; strongly alkaline; disseminated carbonates; electrical conductivity (EC) of 13.8 dS/m; sodium adsorption ratio (SAR) of 202; very strongly alkaline (pH 10.2); clear smooth boundary.

Btkqm1—35 to 42 inches; a light gray (10YR 7/2), silica- and carbonate-indurated duripan with a continuous laminar cap 1/8 inch thick; dark grayish brown (10YR 4/2) moist; massive; extremely hard and extremely firm; many very fine and few fine and medium tubular pores; common thin clay films lining pores and on fracture planes; strongly effervescent; disseminated carbonates and carbonates that are segregated as common fine seams; brittle when wet; abrupt smooth boundary.

Btkqm2—42 to 50 inches; a light brownish gray (10YR 6/2), silica- and carbonate-indurated duripan, dark grayish brown (10YR 4/2) moist; massive; extremely hard and extremely firm; many very fine and few fine and medium tubular pores; common thin clay films lining pores and on fracture planes; strongly effervescent; disseminated carbonates and carbonates that are segregated as common fine seams and filaments; brittle when wet; clear smooth boundary.

Btkqm3—50 to 55 inches; a pale brown (10YR 6/3), strongly silica- and carbonate-cemented duripan, brown (10YR 4/3) moist; massive; extremely hard and extremely firm; common very fine and few fine tubular pores; common thin clay films lining pores and on fracture planes; strongly effervescent; disseminated carbonates and carbonates that are segregated as many fine seams and filaments; clear smooth boundary.

Btk—55 to 64 inches; light yellowish brown (10YR 6/4) sandy loam, dark yellowish brown (10YR 4/4) moist; moderate medium subangular blocky structure; very hard, friable, slightly sticky and slightly plastic; common very fine tubular and interstitial pores; common moderately thick clay films on faces of peds and lining pores; strongly effervescent; disseminated carbonates and carbonates that are segregated as common fine seams and filaments; electrical conductivity (EC) of 3.8 dS/m; sodium adsorption ratio (SAR) of 11; moderately alkaline (pH 8.1); clear wavy boundary.

2Bkq—64 to 72 inches; light yellowish brown (10YR 6/4) sandy loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure; hard, very friable, nonsticky and nonplastic; few very fine tubular and common very fine interstitial pores; 10 percent fine silica- and carbonate-cemented nodules that are very hard and very firm; strongly effervescent; disseminated carbonates and carbonates that are segregated as few fine seams; electrical conductivity (EC) of 2.1 dS/m; sodium adsorption ratio (SAR) of 5; moderately alkaline (pH 8.2); abrupt smooth boundary.

2Bq—72 to 79 inches; light yellowish brown (10YR 6/4) sandy loam, brown (10YR 4/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine tubular and many very fine interstitial pores; 10 percent discontinuous lenses of strongly silica-cemented loamy sand that are very hard and very firm; electrical conductivity (EC) of 1.1 dS/m; sodium adsorption ratio (SAR) of 3; moderately alkaline (pH 8.3).

Range in Characteristics

Thickness of the solum and depth to a duripan: 20 to 40 inches

Electrical conductivity (EC): Generally 2 to 16 dS/m; slightly higher in some thin layers

Sodium adsorption ratio (SAR): 13 to 310

Other features: No E horizon in some pedons

A horizon:
- Color—10YR 6/2, 6/3, 7/2, or 8/2 dry; 10YR 4/2, 4/3, 5/2, 5/3, or 6/3 moist
- Content of clay—5 to 20 percent
- Effervescence—slightly effervescent to violently effervescent; both disseminated and segregated carbonates
- Reaction—moderately alkaline to very strongly alkaline

E horizon:
- 10YR 6/2, 6/3, 7/2, or 8/2 dry; 10YR 4/2, 4/3, 5/2, 5/3, or 6/3 moist
- Content of clay—5 to 20 percent
- Effervescence—slightly effervescent to violently effervescent; both disseminated and segregated carbonates
- Reaction—moderately alkaline to very strongly alkaline

Btkn horizon:
- Color—10YR 4/3, 5/3, 5/4, 6/3, 6/4, 7/3, or 7/4 dry; 10YR 3/3, 3/4, 4/3, 5/3, or 5/4 moist
- Texture—loam, clay loam, or sandy clay loam
- Content of clay—18 to 35 percent
- Structure—moderate to strong columnar or prismatic; commonly parting to blocky
- Effervescence—strongly effervescent to violently effervescent; both disseminated and segregated carbonates
- Reaction—strongly alkaline or very strongly alkaline

Bkqm horizon:
- Color—10YR 5/3, 5/4, 6/2, 6/3, 7/2, 7/3, or 8/3 dry; 10YR 3/3, 4/2, 4/3, 5/3, or 5/4 moist
- Cementation below the laminar cap—generally strongly cemented but varies in hardness
- Structure—platy or massive

Underlying B horizon:
- Color—10YR 6/2, 6/4, 7/2, 7/3, or 8/3 dry; 10YR 4/3, 4/4, 5/2, 5/4, or 6/3 moist
- Texture—stratified loamy sand to loam
- Content of clay—5 to 18 percent

Kai Series

The Kai series consists of moderately well drained soils on fan remnants. These soils are moderately deep to a duripan. They formed in alluvium derived mainly from granitic rocks. The elevation is 225 to 400 feet. The mean annual precipitation is 8 to 12 inches, and the mean annual temperature is 62 to 65 degrees F. The frost-free period is 250 to 300 days. Slopes are 0 to 2 percent.

Taxonomic class: Fine-loamy, mixed, superactive, thermic Natric Durixeralfs

Typical Pedon

Kai loam, in an area of Crosscreek-Kai association, 0 to 2 percent slopes; in a hummocky dryland pasture at an elevation of 285 feet; about 4 miles north of Visalia; about 1,950 feet north and 400 feet west of the southeast corner of sec. 1, T. 18 S., R. 24 E., MDB&M; latitude 36 degrees, 23 minutes, 27 seconds north and longitude 119 degrees, 19 minutes, 4 seconds west; Monson Quadrangle:

A—0 to 5 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; moderate thick platy structure; hard, friable, nonsticky and nonplastic; many very fine and fine roots; few very fine tubular pores; electrical conductivity (EC) of 0.4 dS/m; sodium adsorption ratio (SAR) of 13; neutral (pH 6.9); abrupt wavy boundary.

E—5 to 6 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; strong fine and medium columnar structure; very hard, friable, slightly sticky and slightly plastic; common very fine roots; few very fine tubular pores; electrical conductivity (EC) of 1.6 dS/m; sodium adsorption ratio (SAR) of 16; neutral (pH 7.2); abrupt wavy boundary.

Btkn1—6 to 12 inches; grayish brown (10YR 5/2) silt loam, dark brown (10YR 3/3) moist; strong fine to coarse prismatic structure; very hard, friable, slightly sticky and slightly plastic; common very fine roots; few very fine tubular pores; many thin and few moderately thick dark gray (10YR 4/1) clay films on faces of peds and bridging sand grains, very dark gray (10YR 3/1) moist; tongues of material from the overlying horizon extending as much as 2 inches into this horizon; common very fine bleached sand grains; violently effervescent; carbonates that are segregated as common very fine soft masses; electrical conductivity (EC) of 1.6 dS/m; sodium adsorption ratio (SAR) of 16; very strongly alkaline (pH 9.8); clear smooth boundary.

Btkn2—12 to 18 inches; grayish brown (10YR 5/2) clay loam, dark brown (10YR 3/3) moist; moderate medium angular blocky structure; hard, friable, sticky and plastic; few very fine roots; common very fine and few fine tubular pores; many thin and few moderately thick dark gray (10YR 4/1) clay films on faces of peds and lining pores, very dark gray (10YR 3/1) moist; slightly effervescent; disseminated carbonates that are violently

effervescent; carbonates that are segregated as common very fine soft masses; electrical conductivity (EC) of 3.1 dS/m; sodium adsorption ratio (SAR) of 34; very strongly alkaline (pH 10.3); clear smooth boundary.

Btkn3—18 to 32 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and common fine and medium tubular pores; few thin clay films on faces of peds and lining pores; strongly effervescent; disseminated carbonates that are violently effervescent; carbonates that are segregated as common fine soft masses and filaments; electrical conductivity (EC) of 5.0 dS/m; sodium adsorption ratio (SAR) of 58; very strongly alkaline (pH 10.4); clear wavy boundary.

Bkn—32 to 39 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; many very fine and common fine and medium tubular pores; violently effervescent; disseminated carbonates and carbonates that are segregated as common fine soft masses and filaments; electrical conductivity (EC) of 5.5 dS/m; sodium adsorption ratio (SAR) of 52; very strongly alkaline (10.2); abrupt wavy boundary.

Bqkm—39 to 46 inches; a light gray (5Y 7/2), strongly silica-cemented duripan, olive gray (5Y 5/2) moist; strong medium platy structure parting to moderate very thin platy; extremely hard, extremely firm; few very fine tubular pores; common fine prominent yellowish brown (10YR 5/6) (moist) iron masses, which are relict redoximorphic features; violently effervescent; carbonates that are segregated as common fine soft masses and filaments of carbonates; brittle when wet; abrupt wavy boundary.

Btq—46 to 65 inches; brown (10YR 5/3), continuously weakly silica-cemented loam, dark brown (10YR 4/3) moist; massive; very hard, very firm; common very fine tubular pores; many thin and moderately thick yellowish brown (10YR 5/4) clay films on faces of peds and lining pores, dark yellowish brown (10YR 4/4) moist; common very thin black (10YR 2/1) manganese stains (relict redoximorphic features) on faces of peds; slightly effervescent; disseminated carbonates; electrical conductivity (EC) of 0.5 dS/m; sodium adsorption ratio (SAR) of 8; brittle when wet; 10 percent pockets of material that is similar to the matrix but is noncemented and has a slightly lighter color value; moderately alkaline (pH 8.2); abrupt wavy boundary.

Bqkm´—65 inches; an indurated duripan that cannot be excavated with a backhoe; extremely hard and extremely firm.

Range in Characteristics

Depth to a natric horizon: 4 to 8 inches
Depth to a duripan: 20 to 40 inches
Other features: No Bkn horizon in some pedons; no Btq horizon in some pedons

A and E horizons:
- Content of clay—8 to 18 percent
- Reaction—neutral to moderately alkaline

Btkn and Bkn horizons:
- Color—10YR 5/2, 5/3, or 6/2 dry; 10YR 3/2, 3/3, or 4/3 moist
- Texture—silt loam, loam, or clay loam
- Content of clay—18 to 35 percent
- Effervescence—noneffervescent to violently effervescent
- Electrical conductivity—1 to 16 dS/m
- Sodium adsorption ratio—13 to 80
- Reaction—strongly alkaline or very strongly alkaline

Btq horizon:
- Texture—stratified sandy loam to silt loam
- Content of clay—10 to 27 percent
- Cementation—50 to 100 percent weak silica cementation
- Effervescence—noneffervescent to violently effervescent
- Reaction—moderately alkaline or strongly alkaline

Kimberlina Series

The Kimberlina series consists of very deep, well drained soils that formed in mixed alluvium derived mainly from granitic rock sources. These soils are on flood plains and alluvial fans. The elevation is 190 to 350 feet. The mean annual precipitation is 6 to 8 inches, and the mean annual temperature is 62 to 65 degrees F. The frost-free period is 250 to 300 days. Slopes are 0 to 2 percent.

Taxonomic class: Coarse-loamy, mixed, superactive, calcareous, thermic Typic Torriorthents

Typical Pedon

Kimberlina fine sandy loam, 0 to 2 percent slopes; in an idle field at an elevation of 220 feet; about 4.5 miles south-southwest of Allensworth; 2,500 feet south and 114 feet west of the northeast corner of sec. 31, T. 24 S., R. 24 E., MDB&M; latitude 35 degrees, 47 minutes, 52 seconds north and longitude 119 degrees,

24 minutes, 37 seconds west; Allensworth Quadrangle:

A—0 to 4 inches; light gray (2.5Y 7/2) fine sandy loam, grayish brown (2.5Y 5/2) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; few very fine irregular pores; few shell fragments; strongly effervescent; disseminated carbonates; electrical conductivity (EC) of 4.0 dS/m; moderately alkaline (pH 7.9); clear smooth boundary.

C1—4 to 13 inches; light gray (2.5Y 7/2) fine sandy loam, grayish brown (2.5Y 5/2) moist; massive; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; few very fine and fine irregular pores; few fine shell fragments; strongly effervescent; disseminated carbonates; electrical conductivity (EC) of 4.2 dS/m; moderately alkaline (pH 7.9); clear smooth boundary.

C2—13 to 22 inches; light gray (2.5Y 7/2) fine sandy loam, grayish brown (2.5Y 5/2) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine and few fine roots; few very fine tubular and few very fine and fine irregular pores; few fine shell fragments; strongly effervescent; disseminated carbonates; electrical conductivity (EC) of 4.0 dS/m; moderately alkaline (pH 8.4); gradual smooth boundary.

C3—22 to 40 inches; light gray (2.5Y 7/2) fine sandy loam, grayish brown (2.5Y 5/2) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine roots; few very fine tubular and few very fine and fine irregular pores; few shell fragments; strongly effervescent; disseminated carbonates; electrical conductivity (EC) of 4.0 dS/m; moderately alkaline (pH 8.4); gradual smooth boundary.

C4—40 to 58 inches; light gray (2.5Y 7/2) fine sandy loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots; common very fine and fine tubular pores; strongly effervescent; disseminated carbonates; electrical conductivity (EC) of 8 dS/m; moderately alkaline (pH 7.9); clear smooth boundary.

2Cyk—58 to 72 inches; grayish brown (2.5Y 5/2) silt loam, very dark grayish brown (2.5Y 3/2) moist; massive; hard, friable, slightly sticky and plastic; common very fine and fine tubular pores; common fine gypsum crystals; strongly effervescent; disseminated carbonates and carbonates that are segregated as few fine irregular soft masses and few fine concretions; electrical conductivity (EC) of 8 dS/m; moderately alkaline (pH 7.9).

Range in Characteristics

Calcium carbonate: 0 to 5 percent, disseminated
Content of rock fragments: 0 to 15 percent, generally less than 2 inches in diameter
Content of organic matter: Less than 0.5 percent; decreasing regularly with increasing depth
Gypsum: In some pedons few or common gypsum crystals, added as a soil amendment

A horizon:
Color—2.5Y 6/2 or 7/2 dry; 2.5Y 4/2 or 5/2 moist
Reaction—neutral to moderately alkaline

C horizon:
Color—2.5Y 5/2, 6/2, 6/3, 6/4, or 7/2 dry; 2.5Y 3/2, 4/2, 4/4, 5/2, or 5/3 moist
Texture—sandy loam or fine sandy loam
Content of clay—averages 10 to 18 percent
Carbonates—generally disseminated; in some pedons a few fine segregations; in some pedons carbonates only in the 10- to 20-inch zone

2C horizon (if it occurs):
Color—similar to that of the C horizon
Texture—stratified silt loam to sandy clay loam
Carbonates—few segregated filaments, soft masses, or threads in some pedons

Lethent Series

The Lethent series consists of very deep, moderately well drained soils that formed in mixed alluvium derived mainly from granitic rock sources. These soils are on fan remnants. The elevation is 190 to 250 feet. The mean annual precipitation is 6 to 8 inches, and the mean annual temperature is 63 to 66 degrees F. The frost-free period is 250 to 300 days. Slopes are 0 to 1 percent.

Taxonomic class: Fine, smectitic, thermic Typic Natrargids

Typical Pedon

Lethent silt loam, 0 to 1 percent slopes; in an area under irrigated cultivation, at an elevation of 204 feet; about 5 miles south of Alpaugh; 1,580 feet north and 2,440 feet east of the southwest corner of sec. 26, T. 24 S., R. 23 E., MDB&M; latitude 35 degrees, 48 minutes, 32 seconds north and longitude 119 degrees, 27 minutes, 18 seconds west; Allensworth Quadrangle:

Ap—0 to 7 inches; light gray (2.5Y 7/2) silt loam, grayish brown (2.5Y 5/2) moist; moderate fine and medium subangular blocky structure; hard, firm,

slightly sticky and plastic; common very fine and fine roots; many very fine, fine, medium, and coarse interstitial pores; few fine shell fragments; strongly effervescent; disseminated carbonates and carbonates that are segregated as few fine irregular concretions; electrical conductivity (EC) of 8.0 dS/m; sodium adsorption ratio (SAR) of 58; strongly alkaline (pH 8.9); clear smooth boundary.

Btkn1—7 to 12 inches; light brownish gray (2.5Y 6/2) silty clay loam, olive gray (5Y 4/2) moist; moderate coarse columnar structure parting to strong fine, medium, and coarse angular blocky; very hard, firm, sticky and plastic; common very fine roots on faces of peds; common fine and medium irregular pores; many thin and common moderately thick clay films on faces of peds; slightly effervescent; disseminated carbonates and carbonates that are segregated as few fine irregular soft masses and few fine irregular concretions; electrical conductivity (EC) of 24 dS/m; sodium adsorption ratio (SAR) of 117; strongly alkaline (pH 9.0); clear smooth boundary.

Btkn2—12 to 16 inches; light brownish gray (2.5Y 6/2) clay, olive gray (5Y 4/2) moist; moderate coarse prismatic structure parting to moderate fine and medium subangular blocky; very hard, very firm, sticky and very plastic; common very fine roots on faces of peds; common very fine, fine, and medium irregular pores; continuous thin, common moderately thick, and few thick clay films on faces of peds; slightly effervescent; disseminated carbonates and carbonates that are segregated as common fine and medium irregular soft masses and few fine irregular concretions; electrical conductivity (EC) of 23 dS/m; sodium adsorption ratio (SAR) of 140; strongly alkaline (pH 9.0); clear wavy boundary.

Btkn3—16 to 25 inches; pale olive (5Y 6/3) clay, olive (5Y 4/3) moist; weak coarse prismatic structure parting to moderate medium and coarse subangular blocky; very hard, very firm, sticky and very plastic; common very fine roots on faces of peds; common very fine, fine, and medium irregular pores; many thin and common moderately thick clay films on faces of peds; slightly effervescent; disseminated carbonates and carbonates that are segregated as common fine and medium irregular soft masses and few fine irregular concretions; electrical conductivity (EC) of 19 dS/m; sodium adsorption ratio (SAR) of 120; strongly alkaline (pH 9.0); gradual wavy boundary.

Btkn4—25 to 35 inches; pale olive (5Y 6/3) silty clay, olive (5Y 4/3) moist; moderate fine subangular blocky structure; very hard, firm, sticky and plastic; few very fine roots; common very fine tubular and few very fine irregular pores; common thin clay films lining pores and few moderately thick clay films on faces of peds; slightly effervescent; disseminated carbonates and carbonates that are segregated as common fine, medium, and coarse irregular soft masses; few fine prominent olive yellow (2.5Y 6/6) and light olive brown (2.5Y 5/6) redoximorphic iron accumulations and common fine distinct very dark gray (5Y 3/1) and dark olive gray (5Y 3/2) redoximorphic depletions; electrical conductivity (EC) of 20 dS/m; sodium adsorption ratio (SAR) of 150; strongly alkaline (pH 9.0); gradual wavy boundary.

Ck—35 to 52 inches; pale olive (5Y 6/3) clay loam, olive (5Y 5/3) moist; moderate fine subangular blocky structure; very hard, friable, sticky and plastic; common very fine tubular and few very fine irregular pores; electrical conductivity (EC) of 20; sodium adsorption ratio (SAR) of 150; slightly effervescent; carbonates that are segregated as common fine, medium, and coarse irregular soft masses; common fine distinct redoximorphic iron accumulations, very dark gray (5Y 3/1) dry and moist; strongly alkaline (pH 8.9); gradual wavy boundary.

Cy—52 to 65 inches; pale olive (5Y 6/3) silty clay loam, olive (5Y 5/3) moist; moderate fine subangular blocky structure; very hard, friable, sticky and plastic; common very fine tubular and few very fine irregular pores; common fine and medium filaments and soft masses of gypsum; few fine distinct yellowish brown (10YR 5/6) redoximorphic iron concentrations, dark yellowish brown (10YR 4/6) moist, and common fine distinct redoximorphic iron depletions, very dark gray (5Y 3/1) dry and moist; electrical conductivity (EC) of 30 dS/m; sodium adsorption ratio (SAR) of 93; moderately alkaline (pH 8.2).

Range in Characteristics

Reaction: Moderately alkaline to very strongly alkaline
Electrical conductivity (EC): 1 to 30 dS/m

A horizon:
- Color—2.5Y 5/2, 6/2, or 7/2 dry; 2.5Y 4/2 or 5/2 moist
- Effervescence—in most pedons slightly effervescent to strongly effervescent with disseminated carbonates, but noneffervescent in some pedons

Btn horizon:
- Color—2.5Y 5/2 or 6/2 or 5Y 6/1, 6/2, or 6/3 dry; 2.5Y 3/2 or 4/2 or 5Y 3/2, 4/2, or 4/3 moist

Texture—clay loam, silty clay loam, clay, or silty clay
Content of clay—averages 35 to 55 percent
Effervescence—slightly effervescent to violently effervescent; carbonates disseminated or segregated as filaments and soft masses
Sodium adsorption ratio (SAR)—13 to 200
Gypsum—occurring in some pedons

C horizon:
Texture—clay loam or silty clay loam
Content of clay—30 to 40 percent
Gypsum—not occurring in some pedons

Lewis Series

The Lewis series consists of moderately well drained soils that formed in alluvium derived from mixed rock sources. These soils are moderately deep to a duripan. They are on fan remnants. The elevation is 280 to 400 feet. The mean annual precipitation is 9 to 12 inches, and the mean annual temperature is 62 to 65 degrees F. The frost-free period is 250 to 300 days. Slopes are 0 to 2 percent.

Taxonomic class: Fine, smectitic, thermic Natric Durixeralfs

Typical Pedon

Lewis silty clay loam, in an area of Quonal-Lewis association, 0 to 2 percent slopes; in a native field at an elevation of 317 feet; about 7 miles east of Tulare; 250 feet south and 2,250 feet west of the northeast corner of sec. 7, T. 20 S., R. 26 E., MDB&M; latitude 36 degrees, 15 minutes, 35 seconds north and longitude 119 degrees, 11 minutes, 47 seconds west; Cairns Corner Quadrangle:

A—0 to 5 inches; light brownish gray (10YR 6/2) silty clay loam, dark grayish brown (10YR 4/2) moist; strong very thick platy structure; very hard, very friable, slightly sticky and slightly plastic; common very fine roots; common very fine and few fine and medium tubular pores; strongly effervescent; disseminated carbonates; electrical conductivity (EC) of 12.0 dS/m; sodium adsorption ratio (SAR) of 80; very strongly alkaline (pH 9.2); abrupt smooth boundary.

E—5 to 6 inches; light brownish gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate coarse prismatic structure; very hard, very friable, very sticky and plastic; few very fine roots; common very fine tubular pores; violently effervescent; disseminated carbonates; electrical conductivity (EC) of 14.0 dS/m; sodium adsorption ratio (SAR) of 80; very strongly alkaline (pH 9.4); clear smooth boundary.

Btn—6 to 13 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate coarse prismatic structure parting to moderate medium angular blocky; very hard, very friable, very sticky and plastic; few very fine roots; common very fine tubular pores; many very thin clay films on faces of peds and lining pores; violently effervescent; disseminated carbonates; few very fine redoximorphic manganese stains on faces of peds; electrical conductivity (EC) of 24.8 dS/m; sodium adsorption ratio (SAR) of 90; very strongly alkaline (pH 9.4); abrupt wavy boundary.

Btkn—13 to 25 inches; pale brown (10YR 6/3) clay loam, brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate medium angular blocky; hard, very friable, sticky and plastic; common very fine tubular pores; 10 percent durinodes 1/2 to 1 inch in diameter; many very thin clay films on faces of peds and lining pores; common thin coatings of carbonate on faces of peds; electrical conductivity (EC) of 14.0 dS/m; sodium adsorption ratio (SAR) of 53; very strongly alkaline (pH 9.6); abrupt wavy boundary.

2Bqkm1—25 to 28 inches; mixed matrix that is light brownish gray (10YR 6/2) to light yellowish brown (10YR 6/4), continuously weakly silica-cemented sandy loam, dark grayish brown (10YR 4/2) to dark yellowish brown (10YR 4/4) moist; massive with about 30 percent strong thin platy structure; very hard, very firm, nonsticky and nonplastic; 10 percent durinodes 1/2 to 1 inch in diameter; 40 to 80 percent continuous strong silica cementation in bands; common very thin clay films in fractures; common thin coatings of carbonates; many very fine redoximorphic manganese stains on plates; electrical conductivity (EC) of 12.1 dS/m; sodium adsorption ratio (SAR) of 60; very strongly alkaline (pH 9.6); abrupt wavy boundary.

2Bqkm2—28 to 39 inches; mixed matrix that is a light brownish gray (10YR 6/2) to light yellowish brown (10YR 6/4), strongly silica-cemented duripan with a laminar cap 1/16 to 1/8 inch thick; dark grayish brown (10YR 4/2) to dark yellowish brown (10YR 4/4) moist; strong medium platy structure; extremely hard, extremely firm; common thin coatings of carbonate on plates; brittle when wet; clear wavy boundary.

3Bqk—39 to 60 inches; mixed matrix that is light brownish gray (10YR 6/2) to light yellowish brown (10YR 6/4) sandy loam, dark grayish brown (10YR 4/2) to dark yellowish brown (10YR 4/4) moist; massive; slightly hard, very friable,

nonsticky and nonplastic; 30 percent discontinuous weak silica cementation and 10 percent discontinuous strong silica cementation; strongly effervescent; disseminated carbonates and carbonates that are segregated as many very fine, fine, and medium filaments and soft masses and 10 percent concretions 1/2 to 1 inch in diameter; electrical conductivity (EC) of 10.6 dS/m; sodium adsorption ratio (SAR) of 90; very strongly alkaline (pH 9.4).

Range in Characteristics

Depth to a duripan: 20 to 40 inches

A horizon:
- Color—10YR 5/2, 6/2, 6/3, or 7/2 dry; 10YR 3/2, 3/3, 4/2, 4/3, or 5/2 moist
- Effervescence—slightly effervescent to strongly effervescent
- Reaction—moderately alkaline to very strongly alkaline

E, Btn, and Btkn horizons:
- Color—10YR 5/2, 5/3, 5/4, 6/2, 6/3, or 6/4 or 7.5YR 5/6 or 6/4 dry; 10YR 3/2, 3/3, 3/4, 4/2, 4/3, 4/4, or 5/4 or 7.5YR 4/4 moist
- Texture—clay loam or clay
- Content of clay—35 to 60 percent
- Effervescence—noneffervescent to violently effervescent matrix; segregated carbonates ranging from thin coatings on faces of peds to soft masses and concretions
- Secondary silica—0 to 20 percent durinodes.
- Sodium adsorption ratio—greater than 13
- Reaction—strongly alkaline or very strongly alkaline

B horizon (in some pedons):
- Color—similar to that of the Btn horizon
- Texture—sandy clay loam or clay loam

2Bqkm horizon:
- Color—10YR 4/3, 5/3, 5/4, 6/2, 6/3, or 6/4 dry; 10YR 3/3, 3/4, 4/2, 4/3, or 4/4 moist
- Effervescence—noneffervescent to violently effervescent

3Bq and 3Bqk horizons:
- Color—10YR 6/2, 6/3, or 6/4 dry; 10YR 4/2, 4/3, or 4/4 moist
- Texture—sandy loam to clay loam
- Content of clay—15 to 30 percent
- Effervescence—strongly effervescent to violently effervescent
- Silica cementation—10 to 80 percent weak silica cementation, 0 to 20 percent durinodes, and 0 to 40 percent strong silica cementation
- Reaction—moderately alkaline to very strongly alkaline

Nahrub Series

The Nahrub series consists of very deep, somewhat poorly drained soils that formed in mixed alluvium derived mainly from granitic rock sources. These soils are artificially drained and are on basin rims. The elevation is 190 to 240 feet. The mean annual precipitation is 6 to 8 inches, and the mean annual temperature is 63 to 65 degrees F. The frost-free period is 250 to 300 days. Slopes are 0 to 1 percent.

Taxonomic class: Fine, smectitic, calcareous, thermic Vertic Torriorthents

Typical Pedon

Nahrub silt loam, overwashed, 0 to 1 percent slopes; in an area under irrigated cultivation, at an elevation of 204 feet; about 5.5 miles south of Alpaugh; 2,100 feet south and 1,600 feet west of the northeast corner of sec. 27, T. 24 S., R. 23 E., MDB&M; latitude 35 degrees, 48 minutes, 48 seconds north and longitude 119 degrees, 28 minutes, 8 seconds west; Allensworth Quadrangle:

Ap1—0 to 5 inches; light brownish gray (2.5Y 6/2) silt loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, very friable, sticky and slightly plastic; common very fine and fine roots; many very fine and fine and few medium interstitial pores; few shell fragments; violently effervescent; disseminated carbonates and carbonates that are segregated as few fine irregular concretions; electrical conductivity (EC) of 5 dS/m; sodium adsorption ratio (SAR) of 13; strongly alkaline (pH 8.9); clear smooth boundary.

Ap2—5 to 9 inches; light brownish gray (2.5Y 6/2) silt loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; common very fine and fine tubular and interstitial pores; few shell fragments; violently effervescent; disseminated carbonates and carbonates that are segregated as few fine irregular concretions; electrical conductivity (EC) of 13 dS/m; sodium adsorption ratio (SAR) of 26; strongly alkaline (pH 8.8); clear smooth boundary.

2C1—9 to 22 inches; light olive gray (5Y 6/2) clay, olive gray (5Y 4/2) moist; moderate coarse angular blocky structure; very hard, very firm, sticky and very plastic; common very fine roots on faces of peds; common very fine, fine, and medium

interstitial and common very fine tubular pores; slightly effervescent; disseminated carbonates and carbonates that are segregated as few fine rounded concretions; electrical conductivity (EC) of 13 dS/m; sodium adsorption ratio (SAR) of 80; very strongly alkaline (pH 9.5); clear wavy boundary.

2C2—22 to 32 inches; light olive gray (5Y 6/2) clay, olive gray (5Y 4/2) moist; weak coarse subangular blocky structure; very hard, very firm, sticky and very plastic; few very fine roots on faces of peds; common very fine interstitial and few very fine tubular pores; slightly effervescent; disseminated carbonates and carbonates that are segregated as common fine and medium soft masses and few fine rounded concretions; few fine distinct relict redoximorphic iron depletions, very dark gray (5Y 3/1) dry and moist; electrical conductivity (EC) of 19 dS/m; sodium adsorption ratio (SAR) of 63; very strongly alkaline (pH 9.9); clear wavy boundary.

2C3—32 to 46 inches; light olive gray (5Y 6/2) silty clay loam, olive gray (5Y 5/2) moist; weak coarse subangular blocky structure; very hard, very firm, sticky and plastic; few very fine roots on faces of peds; common very fine and fine interstitial and tubular pores; slightly effervescent; disseminated carbonates that are strongly effervescent; carbonates that are segregated as common fine, medium, and coarse soft masses; few fine distinct relict redoximorphic iron depletions, very dark gray (5Y 3/1) dry and moist, and redoximorphic iron concentrations, olive (5Y 5/6) moist; electrical conductivity (EC) of 18 dS/m; sodium adsorption ratio (SAR) of 110; very strongly alkaline (pH 9.6); gradual wavy boundary.

2C4—46 to 58 inches; pale olive (5Y 6/3) silty clay loam, olive (5Y 5/3) moist; weak fine and medium subangular blocky structure; very hard, firm, sticky and plastic; few very fine tubular and common very fine interstitial pores; slightly effervescent; disseminated carbonates and carbonates that are segregated as common fine and medium irregular soft masses; common fine distinct relict redoximorphic iron depletions, very dark gray (5Y 3/1) dry and moist; electrical conductivity (EC) of 22 dS/m; sodium adsorption ratio (SAR) of 125; very strongly alkaline (pH 9.5); clear wavy boundary.

2C5—58 to 66 inches; pale olive (5Y 6/3) silty clay loam, olive (5Y 5/3) moist; massive; hard, firm, sticky and plastic; common fine and medium filaments and soft masses of gypsum; common fine distinct relict redoximorphic iron depletions, very dark gray (5Y 3/1) dry and moist; electrical conductivity (EC) of 24 dS/m; sodium adsorption ratio (SAR) of 78; strongly alkaline (pH 8.8).

Range in Characteristics

Cracks: 1/4 inch to 2 inches wide, extending to a depth of 20 inches or more during the summer; horizontal spacing of 5 to 25 inches

Gypsum: In some pedons gypsum crystals within the profile, added as a soil amendment

A horizon:

Color—2.5Y 6/2, 6/4, or 7/2 dry; 2.5Y 4/2, 4/4, or 5/4 moist

Effervescence—noneffervescent to violently effervescent in the upper part; at least slightly effervescent in all parts

Calcium carbonate equivalent—0 to 14 percent

Electrical conductivity—1 to 16 dS/m

Sodium adsorption ratio—2 to 80

Reaction—moderately alkaline to very strongly alkaline

2C horizon:

Color—2.5Y 5/2 or 6/2 or 5Y 6/2 or 6/3 dry; 2.5Y 4/2, 4/4, 5/2, or 5/4 or 5Y 4/2, 4/3, 5/2, or 5/3 moist

Texture—clay loam, silty clay loam, silty clay, or clay

Content of clay—35 to 50 percent

Calcium carbonate equivalent—1 to 10 percent throughout the horizon

Electrical conductivity—8 to 30 dS/m; salinity typically increasing with increasing depth

Sodium adsorption ratio—30 to 300

Reaction—moderately alkaline to very strongly alkaline

Nord Series

The Nord series consists of very deep, well drained soils that formed in mixed alluvium derived mainly from granitic rock sources. These soils are on flood plains and alluvial fans. The elevation is 190 to 520 feet. The mean annual precipitation is 8 to 12 inches, and the mean annual temperature is 62 to 64 degrees F. The frost-free period is 250 to 275 days. Slopes are 0 to 2 percent.

Taxonomic class: Coarse-loamy, mixed, superactive, thermic Cumulic Haploxerolls

Typical Pedon

Nord fine sandy loam, 0 to 2 percent slopes; in a leveled fallow field at an elevation of 272 feet; near

Tulare; 700 feet north and 1,750 feet west of the southeast corner of sec. 5, T. 20 S., R. 24 E., MDB&M; latitude 39 degrees, 12 minutes, 45 seconds west and longitude 119 degrees, 23 minutes, 24 seconds north; Paige Quadrangle:

Ap1—0 to 11 inches; grayish brown (2.5Y 5/2) fine sandy loam, very dark gray (10YR 3/1) moist; moderate medium subangular blocky structure; soft, friable, slightly sticky and slightly plastic; common very fine roots; common very fine tubular and few very fine interstitial pores; neutral (pH 6.6); abrupt wavy boundary.

Ap2—11 to 16 inches; grayish brown (2.5Y 5/2) loam, very dark gray (10YR 3/1) moist; weak coarse subangular blocky structure; soft, friable, slightly sticky and slightly plastic; few very fine roots; common very fine interstitial and few very fine tubular pores; neutral (pH 7.2); abrupt smooth boundary.

C1—16 to 22 inches; grayish brown (2.5Y 5/2) fine sandy loam, very dark gray (10YR 3/1) moist; weak coarse subangular blocky structure; soft, friable, nonsticky and nonplastic; common very fine interstitial and tubular pores; slightly effervescent; disseminated carbonates and carbonates that are segregated as few fine irregularly shaped filaments; neutral (pH 7.2); gradual wavy boundary.

C2—22 to 32 inches; light brownish gray (2.5Y 6/2) fine sandy loam, very dark grayish brown (2.5Y 3/2) moist; weak coarse subangular blocky structure; soft, very friable, nonsticky and slightly plastic; common very fine interstitial pores; neutral (pH 7.2); abrupt smooth boundary.

Ab—32 to 38 inches; grayish brown (2.5Y 5/2) loam, very dark gray (10YR 3/1) moist; weak coarse subangular blocky structure; soft, friable, slightly sticky and slightly plastic; common very fine interstitial and few very fine tubular pores; neutral (pH 7.1); abrupt smooth boundary.

C´1—38 to 44 inches; grayish brown (2.5Y 5/2) coarse sandy loam, dark brown (10YR 3/3) moist; massive; loose when dry and moist, nonsticky and nonplastic when wet; many very fine interstitial pores; neutral (pH 7.2); abrupt smooth boundary.

C´2—44 to 50 inches; light brownish gray (2.5Y 6/2) coarse sandy loam, dark brown (10YR 3/3) moist; massive; loose when dry and moist, nonsticky and nonplastic when wet; many very fine interstitial pores; neutral (pH 7.2); abrupt smooth boundary.

2Btb—50 to 61 inches; grayish brown (2.5Y 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and plastic; common very fine interstitial and tubular pores; few thin clay films bridging sand grains, on faces of peds, and lining pores; neutral (pH 6.7); abrupt smooth boundary.

2C—61 to 72 inches; light brownish gray (10YR 6/2) loam, very dark grayish brown (10YR 3/2) moist; massive; hard, friable, slightly sticky and plastic; common very fine interstitial and common very fine and few fine tubular pores; slightly effervescent; disseminated carbonates; neutral (pH 6.9).

Range in Characteristics

Effervescence: Noneffervescent to violently effervescent; disseminated carbonates and carbonates that are segregated as few fine or common medium filaments and threads; always some carbonates in some part of the particle-size control section; in many areas the amount and distribution of carbonates have been altered by land modification.

Other features: No buried A horizon in some pedons; no buried 2Bt horizon in some pedons

A horizon:

Color—2.5Y 5/2 or 10YR 5/2 or 5/3 dry; 10YR 3/1, 3/2, or 3/3 moist

Texture—loam or fine sandy loam

Reaction—neutral to moderately alkaline

C horizon:

Color—2.5Y 5/2 or 6/2 or 10YR 5/3, 5/4, or 6/3 dry; 2.5Y 3/2 or 3/3 or 10YR 3/1, 3/2, 3/3, 4/2, or 4/3 moist; dry value of 5 and moist value of 3 occurring in the upper part of the horizon

Texture—dominantly loam, sandy loam, very fine sandy loam, or fine sandy loam; in some pedons strata of loamy coarse sand to coarse sandy loam; in some pedons strata of silt loam below a depth of 40 inches (unrelated to the overlying horizons)

Content of clay—10 to 18 percent

Reaction—neutral to moderately alkaline

Posochanet Series

The Posochanet series consists of very deep, moderately well drained soils that formed in stratified, mixed alluvium derived mainly from granitic rock sources. These soils are on fan skirts. The elevation is 200 to 215 feet. The mean annual precipitation is 6 to 8 inches, and the mean annual temperature is 62 to 65

degrees F. The frost-free period is 250 to 275 days. Slopes are 0 to 2 percent.

Taxonomic class: Fine-silty, mixed, superactive, thermic Sodic Haplocambids

Typical Pedon

Posochanet silt loam, 0 to 2 percent slopes; in an area under irrigated cultivation, at an elevation of 208 feet; about 1 mile south of Alpaugh; 1,500 feet north and 1,220 feet west of the southeast corner of sec. 4, T. 24 S., R. 23 E., MDB&M; latitude 35 degrees, 51 minutes, 59 seconds north and longitude 119 degrees, 29 minutes, 9 seconds west; Allensworth Quadrangle:

Ap1—0 to 5 inches; light brownish gray (2.5Y 6/2) silt loam, dark grayish brown (2.5Y 4/2) moist; moderate fine, medium, and coarse subangular blocky structure; slightly hard, very friable, nonsticky and slightly plastic; common very fine roots; many very fine, fine, medium, and coarse irregular pores; few fine shell fragments; violently effervescent; disseminated carbonates; electrical conductivity (EC) of 4 dS/m; moderately alkaline (pH 8.1); clear smooth boundary.

Ap2—5 to 14 inches; light brownish gray (2.5Y 6/2) silty clay loam, very dark grayish brown (2.5Y 3/2) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; common very fine and fine tubular and common very fine irregular pores; few fine shell fragments; violently effervescent; disseminated carbonates; electrical conductivity (EC) of 7 dS/m; strongly alkaline (pH 8.7); gradual smooth boundary.

Bw—14 to 23 inches; light brownish gray (2.5Y 6/2) silty clay loam with thin strata of silt loam; dark grayish brown (2.5Y 4/2) moist; weak fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine tubular and irregular pores; few shell fragments; strongly effervescent; disseminated carbonates; electrical conductivity (EC) of 8 dS/m; very strongly alkaline (pH 9.5); diffuse smooth boundary.

Bknz1—23 to 33 inches; light brownish gray (2.5Y 6/2) silty clay loam with thin strata of silt loam; dark grayish brown (2.5Y 4/2) moist; weak fine subangular blocky structure; hard, friable, sticky and slightly plastic; few very fine roots; common very fine tubular and irregular pores; few shell fragments; few fine prominent relict redoximorphic iron concentrations, strong brown (7.5YR 4/6) moist; strongly effervescent; disseminated carbonates; electrical conductivity (EC) of 8 dS/m; very strongly alkaline (pH 9.9); diffuse smooth boundary.

Bknz2—33 to 50 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak fine subangular blocky structure; hard, firm, sticky and plastic; few very fine roots; common very fine tubular and irregular pores; few fine shell fragments; few pressure faces; strongly effervescent; disseminated carbonates; few fine prominent relict redoximorphic iron accumulations, strong brown (7.5YR 4/6) moist; electrical conductivity (EC) of 12 dS/m; very strongly alkaline (pH 9.8); gradual smooth boundary.

Bknz3—50 to 61 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak fine subangular blocky structure; very hard, firm, sticky and plastic; few very fine roots; few very fine tubular and irregular pores; few pressure faces; few shell fragments; strongly effervescent; disseminated carbonates; few fine prominent relict redoximorphic manganese and iron accumulations, black (5Y 2.5/1) and strong brown (7.5YR 4/6) moist; electrical conductivity (EC) of 14 dS/m; very strongly alkaline (pH 9.8).

Range in Characteristics

Effervescence: Noneffervescent to violently effervescent; carbonates that are disseminated and/or segregated as filaments or soft masses; always some carbonates between depths of 10 and 20 inches; carbonate distribution within the profile has been affected by irrigation.

Electrical conductivity (EC): 4 to 8 dS/m in the upper part; 4 to 30 dS/m in the lower part

A horizon:

Color—2.5Y 6/2 dry; 2.5Y 4/2 moist

Reaction—moderately alkaline or strongly alkaline

Bw and Bknz horizons:

Color—2.5Y 6/2 or 7/2 dry; 2.5Y 4/2 or 5/2 moist

Texture—stratified fine sandy loam to silty clay loam in the upper part; stratified silty clay loam to silty clay in the lower part

Content of clay—18 to 35 percent in the upper part; 30 to 50 percent in the lower part

Reaction—moderately alkaline to very strongly alkaline

Quonal Series

The Quonal series consists of moderately well drained soils on fan remnants. These soils are deep to a duripan. They formed through the chemical and mechanical alteration of Lewis soils (fine, smectitic,

thermic Natric Durixeralfs), which originally formed in alluvium derived from mixed rock sources. The original duripan has been mechanically removed to a depth of at least 40 inches and has been partially dissolved by the addition of chemicals and irrigation water. Only fragments of the original duripan remain within a depth of 40 inches. The elevation is 280 to 400 feet. The mean annual precipitation is 9 to 12 inches, and the mean annual temperature is 62 to 65 degrees F. The frost-free period is 250 to 300 days. Slopes are 0 to 2 percent.

Taxonomic class: Fine, smectitic, calcareous, thermic Sodic Xerarents

Typical Pedon

Quonal silty clay, in an area of Quonal-Lewis association, 0 to 2 percent slopes, under irrigated cultivation, at an elevation of 317 feet; about 6 miles north of Woodville; 1,050 feet south and 2,125 feet east of the northwest corner of sec. 19, T. 20 S., R. 26 E., MDB&M; latitude 36 degrees, 10 minutes, 43 seconds north and longitude 119 degrees, 12 minutes, 3 seconds west; Cairns Corner Quadrangle:

Ap1—0 to 7 inches; grayish brown (10YR 5/2) silty clay, very dark grayish brown (10YR 3/2) moist; weak fine, medium, and coarse subangular blocky structure; very hard, friable, sticky and plastic; few very fine roots; common very fine and fine tubular pores; strongly effervescent; disseminated carbonates; electrical conductivity (EC) of 0.5 dS/m; sodium adsorption ratio (SAR) of 2; moderately alkaline (pH 8.3); gradual smooth boundary.

Ap2—7 to 9 inches; brown (10YR 4/3) clay, dark brown (10YR 3/3) moist; massive; extremely hard, firm, sticky and plastic; few very fine and fine roots; few very fine and fine tubular pores; few thin clay films lining pores in displaced fragments of a natric horizon; strongly effervescent; disseminated carbonates; electrical conductivity (EC) of 3.1 dS/m; sodium adsorption ratio (SAR) of 6; very strongly alkaline (pH 9.3); gradual smooth boundary.

Ap3—9 to 16 inches; brown (10YR 5/3) clay, dark brown (10YR 3/3) moist; massive; extremely hard, firm, sticky and plastic; few fine and very fine roots; common fine and very fine tubular pores; few thin clay films lining pores in displaced fragments of a natric horizon; strongly effervescent; disseminated carbonates; electrical conductivity (EC) of 4.1 dS/m; sodium adsorption ratio (SAR) of 12; common fine and medium faint relict redoximorphic depletions, very dark grayish brown (10YR 3/2) moist; very strongly alkaline (pH 9.2); gradual smooth boundary.

Ap4—16 to 20 inches; light yellowish brown (10YR 6/4) clay, dark yellowish brown (10YR 4/4) moist; massive; extremely hard, firm, sticky and plastic; few thin clay films on displaced fragments of a natric horizon; strongly effervescent; disseminated carbonates; electrical conductivity (EC) of 7.5 dS/m; sodium adsorption ratio (SAR) of 27; very strongly alkaline (pH 9.2); gradual smooth boundary.

Ap5—20 to 32 inches; yellowish brown (10YR 5/4) silty clay, dark yellowish brown (10YR 4/4) moist; weak fine and medium subangular blocky structure; extremely hard, firm, sticky and plastic; few very fine roots; common very fine tubular pores; common thin and moderately thick clay films coating faces of and in pores of displaced fragments of a natric horizon; strongly effervescent; disseminated carbonates; electrical conductivity (EC) of 5.9 dS/m; sodium adsorption ratio (SAR) of 35; common medium faint dark brown (10YR 3/3) relict redoximorphic depletions; very strongly alkaline (pH 9.7); clear wavy boundary.

Ap6—32 to 41 inches; yellowish brown (10YR 5/4) silty clay, dark yellowish brown (10YR 4/4) moist; strong fine and medium angular blocky structure; extremely hard, firm, sticky and plastic; common very fine tubular pores; few thin clay films lining pores in displaced fragments of a natric horizon; 15 percent very fine and fine subangular blocky duripan fragments that are extremely hard and extremely firm; violently effervescent; disseminated carbonates and carbonates that are segregated as many moderately thick coatings on faces of peds and as many fine and medium filaments; electrical conductivity (EC) of 7.4 dS/m; sodium adsorption ratio (SAR) of 50; very strongly alkaline (pH 9.9); abrupt wavy boundary.

2Bkqmb—41 to 44 inches; a light yellowish brown (10YR 6/4), strongly silica- and lime-cemented duripan with 50 percent discontinuous laminar cap 1/8 inch thick and with fractures 4 to 8 inches apart; dark yellowish brown (10YR 4/4) moist; massive; extremely hard, slightly rigid; strongly effervescent; disseminated carbonates and carbonates that are segregated as many fine and medium threads and many moderately thick coatings in fractures; brittle when wet; clear wavy boundary.

2Bkb1—44 to 50 inches; light yellowish brown (10YR 6/4) clay loam, dark yellowish brown (10YR 4/4) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and

slightly plastic; few very fine tubular pores; violently effervescent; disseminated carbonates and carbonates that are segregated as many fine and medium filaments and as many moderately thick coatings on faces of peds; electrical conductivity (EC) of 0.9 dS/m; sodium adsorption ratio (SAR) of 4; moderately alkaline (pH 8.3); gradual wavy boundary.

2Bkb2—50 to 62 inches; light yellowish brown (10YR 6/4) silty clay loam, dark yellowish brown (10YR 4/4) moist; moderate fine angular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine tubular pores; few thin and moderately thick clay films lining pores and on faces of peds; strongly effervescent; disseminated carbonates and carbonates that are segregated as few thin filaments and many moderately thick coatings on faces of peds; electrical conductivity (EC) of 0.8 dS/m; sodium adsorption ratio (SAR) of 2; moderately alkaline (pH 8.0).

Range in Characteristics

Depth to displaced fragments of a natric horizon: 0 to 40 inches; always at least 3 percent natric horizon fragments in some part

Depth to duripan fragments: 0 to 40 inches

Depth to a fractured, remnant duripan: 40 to 60 inches; before reclamation the depth to a duripan was 20 to 40 inches.

Electrical conductivity (EC): 0 to 8 dS/m

Depth to relict redoximorphic features: 8 to 18 inches

Ap horizon:
- Color—10YR 4/2, 4/3, 4/4, 5/2, 5/3, 5/4, 6/2, 6/3, or 6/4 dry; 10YR 3/2, 3/3, 3/4, 4/2, 4/3, or 4/4 moist
- Texture—dominantly silty clay in the upper part and silty clay, clay, or gravelly clay in the lower part; in some pedons thin strata of clay loam or silty clay loam in the upper part because of land leveling and the importing of soil material from other locations
- Content of clay—40 to 50 percent
- Content of rock fragments—0 to 15 percent gravel-size duripan fragments in the upper part and 0 to 35 percent in the lower part (not arranged in any discernable order); at least 3 percent duripan fragments in some part
- Effervescence—slightly effervescent to violently effervescent
- Calcium carbonate equivalent—1 to 10 percent
- Reaction—slightly alkaline to very strongly alkaline
- Sodium adsorption ratio (SAR)—0 to 13 in the upper part; 13 to 50 in the lower part
- Other features—highly variable soil reaction, salinity, or sodicity because of the degree of reclamation

2Bkqm horizon:
- Color—10YR 5/3, 5/4, 6/3, 6/4, or 7/2 dry; 10YR 3/3, 3/4, 4/3, 4/4, 5/3, 5/4, 6/3, or 6/4 moist
- Fractures—4 to 8 inches apart

2Bk horizon:
- Color—10YR 5/3, 5/4, 6/3, 6/4, 7/3, or 7/4 dry; 10YR 3/3, 3/4, 4/3, 4/4, 5/3, or 5/4 moist
- Texture—stratified sandy loam to silty clay loam
- Content of clay—averages 18 to 35 percent and ranges from 15 to 39 percent
- Content of rock fragments—0 to 15 percent gravel-size duripan fragments
- Effervescence—strongly effervescent to violently effervescent
- Calcium carbonate equivalent—5 to 10 percent
- Reaction—moderately alkaline to very strongly alkaline
- Sodium adsorption ratio—13 to 50

Remnoy Series

The Remnoy series consists of somewhat poorly drained soils that formed in mixed alluvium derived mainly from granitic rock sources. These soils are shallow to a duripan. They are on fan remnants. The elevation is 190 to 300 feet. The mean annual precipitation is 7 to 8 inches, and the mean annual temperature is 62 to 65 degrees F. The frost-free period is 250 to 275 days. Slopes are 0 to 2 percent.

Taxonomic class: Loamy, mixed, superactive, thermic, shallow Natric Durixeralfs

Typical Pedon

Remnoy silt loam , 0 to 2 percent slopes; in a native field at an elevation of 273 feet; about 4 miles southeast of Traver; 3,850 feet north and 2,200 feet east of the southeast corner of sec. 36, T. 17 S., R. 23 E., MDB&M; latitude 36 degrees, 24 minutes, 37 seconds north and longitude 119 degrees, 25 minutes, 48 seconds west; Traver Quadrangle:

A—0 to 1 inch; light brownish gray (2.5Y 6/2) silt loam, very dark grayish brown (2.5Y 3/2) moist; strong thin platy structure; hard, firm, slightly sticky and slightly plastic; many very fine and common fine and medium roots; common very fine and fine tubular and few very fine interstitial pores; few fine distinct brownish yellow (10YR 6/6) redoximorphic iron concentrations, dark yellowish brown (10YR 4/6) moist; electrical conductivity (EC) of 4.3 dS/m;

sodium adsorption ratio (SAR) of 6; strongly alkaline (pH 8.5); clear wavy boundary.

E—1 to 3 inches; grayish brown (2.5Y 5/2) silt loam, dark grayish brown (2.5Y 4/2) moist; strong thin platy structure; slightly hard, firm, slightly sticky and slightly plastic; many very fine and common fine and medium roots matted along cracks and at the bottom of the horizon; common very fine and fine tubular pores; few fine distinct light yellowish brown (2.5Y 6/4) redoximorphic iron concentrations, olive brown (2.5Y 4/4) moist; electrical conductivity (EC) of 5.2 dS/m; sodium adsorption ratio (SAR) of 8; strongly alkaline (pH 8.6); clear wavy boundary.

Btn1—3 to 7 inches; light gray (2.5Y 7/2) clay loam, grayish brown (2.5Y 5/2) moist; moderate fine and medium columnar structure; hard, friable, sticky and plastic; common very fine and few fine roots matted along cracks and at the bottom of the horizon; common very fine interstitial and tubular and few fine tubular pores; few fine distinct light yellowish brown (2.5YR 6/4) redoximorphic iron concentrations, olive brown (2.5Y 4/4) moist; electrical conductivity (EC) of 8.0 dS/m; sodium adsorption ratio (SAR) of 15; strongly alkaline (pH 8.8); clear wavy boundary.

Btn2—7 to 12 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to moderate fine subangular blocky; very hard, firm, sticky and plastic; common very fine and few fine roots matted along faces of peds; common fine and very fine tubular pores; common thin and few moderately thick clay films on faces of peds and few thin clay films lining pores; few fine distinct light yellowish brown (2.5Y 6/4) redoximorphic iron concentrations, olive brown (2.5Y 4/4) moist; strongly effervescent; disseminated carbonates; electrical conductivity (EC) of 8.4 dS/m; sodium adsorption ratio (SAR) of 20; very strongly alkaline (pH 9.2); gradual wavy boundary.

Btn3—12 to 17 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate fine and medium subangular blocky structure; very hard, firm, sticky and plastic; few very fine and fine roots matted along faces of peds; common fine and few very fine tubular pores; few thin and moderately thick clay films on faces of peds and lining pores; few fine distinct light yellowish brown (2.5Y 6/4) redoximorphic iron concentrations, olive brown (2.5Y 4/4) moist; electrical conductivity (EC) of 9.0 dS/m; sodium adsorption ratio (SAR) of 22; very strongly alkaline (pH 9.2); abrupt wavy boundary.

Bqkm—17 to 23 inches; a light gray (2.5Y 7/2), lime- and silica-indurated duripan, grayish brown (2.5Y 5/2) moist; massive; few very fine roots matted at the top of the pan and in horizontal cracks in the pan; few fine tubular pores; brittle when wet; slightly effervescent; disseminated carbonates; few fine distinct light yellowish brown (2.5Y 6/4) redoximorphic iron concentrations, olive brown (2.5Y 4/4) moist; very strongly alkaline (pH 9.4); clear wavy boundary.

C—23 to 60 inches; pale yellow (2.5Y 7/4) sandy loam, olive brown (2.5Y 4/4) moist; massive; soft, very friable, nonsticky and nonplastic; common fine tubular pores; few fine distinct olive (5Y 5/6) redoximorphic iron concentrations, olive (5Y 4/4) moist; strongly effervescent; disseminated carbonates; electrical conductivity (EC) of 10.2 dS/m; sodium adsorption ratio (SAR) of 14; very strongly alkaline (pH 9.4).

Range in Characteristics

Depth to a duripan: 10 to 20 inches.
Carbonates: Disseminated or segregated as filaments, soft masses, or concretions
Reaction: Strongly alkaline or very strongly alkaline; saline-sodic below the E horizon
Redoximorphic iron concentrations: Few to many fine or medium distinct concentrations in the Btn horizon, the duripan, and the C horizon
Other features: In some pedons noneffervescent in the upper part of the A horizon, in the E horizon, and in the lower part of the C horizon

A horizon:
Color—2.5Y 6/2, 7/1, or 7/2 dry

Btn horizon
Color—2.5Y 5/2, 6/2, or 7/2 or 10YR 7/3 dry; 2.5Y 4/2, 5/2, or 4/4 or 10YR 4/3 moist
Content of clay—27 to 35 percent
Sodium adsorption ratio (SAR)—13 to 100

Bqkm horizon:
Color—2.5Y 6/2 or 7/2 dry

C horizon:
Color—2.5Y 7/2 or 7/4 dry
Texture—stratified sandy loam to silt loam
Content of clay—7 to 15 percent
Sodium adsorption ratio—13 to 100

San Joaquin Series

The San Joaquin series consists of moderately well drained soils that formed in mixed alluvium derived mainly from granitic rock sources. These soils are

moderately deep to a duripan. They are on fan remnants. The elevation is 300 to 500 feet. The mean annual precipitation is 10 to 12 inches, and the mean annual temperature is 60 to 63 degrees F. The frost-free period is 250 to 300 days. Slopes are 0 to 2 percent.

Taxonomic class: Fine, mixed, active, thermic Abruptic Durixeralfs

Typical Pedon

San Joaquin loam, 0 to 2 percent slopes; in an area under irrigated cultivation, at an elevation of 354 feet; about 2 miles northwest of Ivanhoe; 250 feet south and 2,600 feet east of the northwest corner of sec. 35, T. 17 S., R. 25 E., MDB&M; latitude 36 degrees, 24 minutes, 48 seconds north and longitude 119 degrees, 13 minutes, 57 seconds west; Woodlake Quadrangle:

Ap1—0 to 2 inches; yellowish brown (10YR 5/4) loam, dark brown (10YR 3/3) moist; strong thin platy structure; slightly hard, very friable, sticky and plastic; few very fine roots; few very fine tubular pores; slightly alkaline (pH 7.5); clear smooth boundary.

Ap2—2 to 10 inches; brown (7.5YR 5/4) loam, dark brown (7.5YR 3/4) moist; strong fine and medium subangular blocky structure; hard, friable, sticky and plastic; few fine and common medium roots; common very fine and fine tubular pores; 5 percent pressure faces on peds; neutral (pH 6.9); clear smooth boundary.

Bt1—10 to 15 inches; brown (7.5YR 5/4) sandy clay loam, dark brown (7.5YR 3/4) moist; strong medium and fine subangular blocky structure; hard, firm, sticky and plastic; few fine and common medium roots; common fine and few medium tubular pores; few thin and moderately thick clay films on faces of peds and lining pores; 10 percent pressure faces on peds; neutral (pH 6.9); abrupt wavy boundary.

2Bt2—15 to 29 inches; reddish brown (5YR 4/3) clay, dark reddish brown (5YR 3/4) moist; strong fine and medium subangular blocky structure; very hard, very firm, sticky and plastic; few fine roots matted on faces of peds and in pores; few fine tubular pores; 20 percent pressure faces on peds; neutral (pH 7.0); abrupt wavy boundary.

2Bqkm—29 to 34 inches; a reddish brown (5YR 4/3), indurated duripan with a laminar cap 1/16 to 1/8 inch thick; yellowish red (5YR 4/6) moist; moderate thin and medium platy structure; common thin coatings of carbonate in fractures; many thin redoximorphic coatings and stains of manganese; brittle when wet.

Range in Characteristics

Depth to a duripan: 20 to 40 inches

A horizon:
Color—10YR 5/4 or 7.5YR 5/4 dry; 10YR 3/3 or 4/3 or 7.5YR 3/4 moist
Reaction—neutral or slightly alkaline

Bt horizon:
Color—5YR 4/3, 5/4, or 6/4, 7.5YR 5/4 or 6/4, or 10YR 5/4 dry; 5YR 3/3, 3/4, 4/3, or 4/4, 7.5YR 3/4, or 10YR 4/4 moist
Texture—in the upper part, sandy clay loam with 20 to 30 percent clay; in the lower part, clay loam or clay with 35 to 50 percent clay
Reaction—neutral or slightly alkaline

2Bqkm horizon:
Color—5YR 4/3 or 5/4 or 10YR 6/4 dry; 5YR 3/3 or 4/6 or 7.5YR 4/4 moist

Remarks

The San Joaquin soils in this survey area are taxadjuncts to the series because they are not abruptic, because their surface layer has been mixed by tillage, and because their mean annual air temperature is slightly warmer than is typical. These differences, however, do not significantly affect use and management. No undisturbed profiles have been located in the survey area. The scientists were unable to dig past a depth of 34 inches with a backhoe.

Seville Series

The Seville series consists of moderately well drained soils that formed in alluvium derived mainly from basic igneous rock sources. These soils are moderately deep to a duripan. They are on fan remnants. The elevation is 300 to 490 feet. The mean annual precipitation is 10 to 12 inches, and the mean annual temperature is 62 to 65 degrees F. The frost-free period is 250 to 300 days. Slopes are 0 to 2 percent.

Taxonomic class: Fine, smectitic, thermic Aridic Durixererts

Typical Pedon

Seville clay, 0 to 2 percent slopes; in an area under irrigated cultivation, at an elevation of 350 feet; about 2 miles south of Yettem; 1,350 feet north and 300 feet west of the southeast corner of sec. 2, T. 17 S., R. 25 E., MDB&M; latitude 36 degrees, 28 minutes, 27 seconds and longitude 119 degrees, 13 minutes, 24 seconds; Ivanhoe Quadrangle:

Ap—0 to 6 inches; dark reddish gray (5YR 4/2) clay, dark reddish brown (5YR 3/2) moist; strong fine, medium, and coarse subangular blocky structure; very hard, friable, sticky and plastic; many very fine and few fine and coarse roots; few very fine tubular and interstitial pores; few pressure faces; neutral (pH 6.7); abrupt smooth boundary.

Bss1—6 to 16 inches; dark reddish gray (5YR 4/2) clay, dark reddish brown (5YR 3/2) moist; weak coarse prismatic and moderate medium subangular blocky structure; very hard, firm, sticky and plastic; common very fine and few coarse roots; common very fine tubular and interstitial pores; common pressure faces; neutral (pH 6.8); clear wavy boundary.

Bss2—16 to 25 inches; dark reddish gray (5YR 4/2) clay, dark reddish brown (5YR 3/3) moist; weak coarse prismatic and moderate medium subangular blocky structure; very hard, friable, sticky and plastic; few very fine roots; common very fine tubular and interstitial pores; common slickensides; few pressure faces; slightly effervescent; disseminated carbonates; slightly alkaline (pH 7.5); clear wavy boundary.

Bkss—25 to 29 inches; reddish brown (5YR 5/3) clay, reddish brown (5YR 4/3) moist; weak fine and medium subangular blocky structure; very hard, friable, sticky and plastic; few very fine roots; few very fine interstitial and tubular pores; common slickensides; strongly effervescent; disseminated carbonates and carbonates that are segregated as many soft filaments and concretions; slightly alkaline (pH 7.8); abrupt wavy boundary.

2Btqk—29 to 38 inches; a light reddish brown (5YR 6/4), weakly silica-cemented duripan, dark reddish brown (5YR 3/4) moist; strong thick platy structure; strongly effervescent; disseminated carbonates and carbonates that are segregated as many soft filaments and concretions in fractures; fractures occurring 5 to 10 inches apart; moderately alkaline (pH 8.1); abrupt smooth boundary.

2Btkqm—38 to 44 inches; a light reddish brown (5YR 6/4), weakly silica-cemented duripan, dark reddish brown (5YR 3/3) moist; massive; brittle when wet; strongly effervescent; carbonates that are segregated as common fine soft filaments in fractures; fractures occurring 5 to 10 inches apart; abrupt smooth boundary.

2Btk—44 to 51 inches; light reddish brown (5YR 6/3) coarse sandy loam, dark reddish brown (5YR 3/2) moist; moderate medium subangular blocky structure; very hard, very firm, slightly sticky and nonplastic; few very fine tubular and interstitial pores; very few thin clay films lining pores; strongly effervescent; disseminated carbonates and carbonates segregated as many fine soft filaments and soft masses and few medium concretions; moderately alkaline (pH 8.1); abrupt smooth boundary.

2C1—51 to 57 inches; reddish brown (5YR 5/3) sandy loam, dark reddish brown (5YR 3/4) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine interstitial pores; moderately alkaline (pH 8.2); abrupt smooth boundary.

2C2—57 to 60 inches; reddish brown (5YR 5/3) loamy coarse sand, dark reddish brown (5YR 3/4) moist; massive; loose when dry and moist, nonsticky and nonplastic when wet; common very fine and fine interstitial pores; strongly effervescent; carbonates that are segregated as soft masses; moderately alkaline (pH 8.4).

Range in Characteristics

Depth to a duripan: 20 to 40 inches.

Cracks: When the soils are dry, 1 cm or more wide and extending from the surface to a depth of 20 inches or more

Content of clay: 40 to 60 percent from the soil surface to the duripan

A horizon:

Color—7.5YR 5/2 or 5/4 or 5YR 4/2, 4/3, 4/4, 5/3, or 5/4 dry; commonly one or two units of value darker when moist

Reaction—neutral to moderately alkaline

Bss and Bkss horizons:

Color—5YR 3/2, 3/3, 3/4, 4/2, 4/3, 4/4, 5/3, or 5/4 or 2.5YR 3/4, 4/4, or 5/4 dry; commonly one or two units of value darker when moist

Effervescence—noneffervescent to violently effervescent

Reaction—neutral to strongly alkaline

2Btqk and 2Btkqm horizons:

Color—5YR 4/3, 4/4, 5/3, 5/4, 6/2, 6/3, 6/4, or 7/2, 7.5YR 6/2 or 7/2, or 10YR 6/2 dry; commonly one or two units of value darker when moist

Cementation—weakly cemented or strongly cemented, but not indurated in any layer

2C horizon (if it occurs):

Texture—loamy coarse sand with 3 percent clay to sandy loam with 15 percent clay

Tagus Series

The Tagus series consists of very deep, well drained soils that formed in alluvium derived from granitic rock sources. These soils are on fan remnants. The elevation is 230 to 400 feet. The mean annual precipitation is 9 to 12 inches, and the mean annual temperature is 62 to 65 degrees F. The frost-free period is 250 to 300 days. Slopes are 0 to 2 percent.

Taxonomic class: Coarse-loamy, mixed, superactive, thermic Calcic Haploxerolls

Typical Pedon

Tagus loam, 0 to 2 percent slopes; in a leveled, fallow field at an elevation of 260 feet; about 7 miles west of Tagus; about 0.3 mile north of avenue 264 on a dirt road (Road 46) and 250 feet east of the second row of almond trees; 1,400 feet east and 1,850 feet north of the southwest corner of sec. 15, T. 19 S., R. 23 E., MDB&M; latitude 26 degrees, 16 minutes, 27 seconds north and longitude 119 degrees, 28 minutes, 9 seconds west; Goshen Quadrangle:

Ap1—0 to 8 inches; grayish brown (2.5Y 5/2) loam, very dark grayish brown (2.5Y 3/2) moist; weak medium and fine subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; common medium, fine, and very fine roots; many medium, fine, and very fine tubular and many medium and fine interstitial pores; slightly alkaline (pH 7.4); clear wavy boundary.

Ap2—8 to 17 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium and fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common medium, fine, and very fine roots; many fine and very fine tubular pores; slightly alkaline (pH 7.7); clear wavy boundary.

Bk1—17 to 27 inches; brown (10YR 5/3) loam, dark grayish brown (2.5Y 4/2) moist; weak medium and fine subangular blocky structure; slightly hard, friable, slightly sticky and plastic; common medium, fine, and very fine roots; many fine and very fine tubular pores; slightly effervescent, disseminated carbonates that are strongly effervescent; carbonates that are segregated as common medium and fine irregular soft masses; moderately alkaline (pH 8.2); clear wavy boundary.

Bk2—27 to 40 inches; light yellowish brown (2.5Y 6/4) fine sandy loam, brown (10YR 4/3) moist; massive; slightly hard, friable, nonsticky and slightly plastic; common medium, fine, and very fine roots; many fine and very fine tubular pores; strongly effervescent; disseminated carbonates that are violently effervescent; carbonates that are segregated as common medium and fine irregular filaments and soft masses; moderately alkaline (pH 8.3); clear wavy boundary.

Bk3—40 to 63 inches; light yellowish brown (2.5Y 6/4) loam, brown (10YR 4/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; many fine and very fine tubular pores; slightly effervescent, disseminated carbonates that are strongly effervescent; carbonates that are segregated as few fine irregular filaments; strongly alkaline (pH 8.6).

Range in Characteristics

Thickness of the mollic epipedon: 10 to 20 inches.
Depth to soft, powdery secondary carbonates: 10 to 20 inches

A horizon:
- Color—10YR 4/1, 4/2, 4/3, 5/1, 5/2, or 5/3 or 2.5Y 4/2 or 5/2 dry; 10YR 2/1, 2/2, 3/1, 3/2, or 3/3 or 2.5Y 2/2 or 3/2 moist

Bk horizon:
- Color—10YR 4/2, 4/3, 4/4, 5/2, 5/3, 5/4, 6/2, 6/3, or 6/4 or 2.5Y 4/2, 4/4, 5/2, 5/4, 6/2, or 6/4 dry; 10YR 2/2, 3/3, 3/4, 4/2, 4/3, 4/4, 5/2, 5/3, or 5/4 or 2.5Y 3/2, 4/2, 4/4, 5/2, or 5/4 moist
- Texture—loam, fine sandy loam, or sandy loam
- Content of clay—10 to 18 percent
- Structure—subangular blocky or massive
- Calcium carbonate equivalent—6 to 10 percent in the upper part; 1 to 3 percent in the lower part
- Effervescence—slightly effervescent to violently effervescent; few to many fine and medium filaments, threads, and soft masses of carbonate
- Reaction—moderately alkaline or strongly alkaline

Tujunga Series

The Tujunga series consists of very deep, somewhat excessively drained soils that formed in alluvium derived from granitic rock sources. These soils are on flood plains. The elevation is 210 to 520 feet. The mean annual precipitation is 10 to 12 inches, and the mean annual temperature is 62 to 65 degrees F. The frost-free period is 250 to 300 days. Slopes are 0 to 2 percent.

Taxonomic class: Mixed, thermic Typic Xeropsamments

Typical Pedon

Tujunga loamy sand, 0 to 2 percent slopes; in a fallow field at an elevation of 403 feet; about 2 miles southwest of Woodlake; 850 feet north and 1,900 feet east of the southwest corner of sec. 2, T. 18 S., R. 26 E., MDB&M; latitude 36 degrees, 23 minutes, 13 seconds north and longitude 119 degrees, 7 minutes, 40 seconds west; Ivanhoe Quadrangle:

Ap—0 to 14 inches; brown (10YR 5/3) loamy sand, dark grayish brown (10YR 4/2) moist; massive; soft, very friable, nonsticky and nonplastic; many very fine and fine and few medium roots; many very fine tubular and many very fine and fine irregular pores; less than 1 percent 2- to 5-mm pebbles; neutral (pH 7.3); gradual smooth boundary.

C1—14 to 40 inches; yellowish brown (10YR 5/4) loamy coarse sand, dark grayish brown (10YR 4/2) moist; massive; soft, very friable, nonsticky and nonplastic; many very fine and few fine and medium roots; many very fine tubular and many very fine and fine irregular pores; 2 percent 2- to 5-mm pebbles; neutral (pH 7.3); gradual smooth boundary.

C2—40 to 47 inches; pale brown (10YR 6/3) sand, brown (10YR 4/3) moist; single grain; loose, nonsticky and nonplastic; many very fine roots; common fine tubular and many very fine irregular pores; 2 percent 2- to 4-mm pebbles; neutral (pH 7.2); gradual smooth boundary.

C3—47 to 54 inches; pale brown (10YR 6/3) coarse sand, brown (10YR 4/3) moist; single grain; loose, nonsticky and nonplastic; many very fine roots; many very fine irregular pores; 2 percent 2-mm pebbles; neutral (pH 7.2); gradual smooth boundary.

C4—54 to 70 inches; very pale brown (10YR 7/3) coarse sand, brown (10YR 5/3) moist; single grain; loose, nonsticky and nonplastic; many very fine irregular pores; 2 percent 2-mm pebbles; neutral (pH 7.0).

Range in Characteristics

Reaction: Slightly acid or neutral

A horizon:

Color—10YR 5/3 or 6/3 dry; 10YR 4/2 moist

C horizon:

Color—10YR 5/4, 6/2, 6/3, or 7/3 dry; 10YR 4/2, 4/3, or 5/3 moist

Texture—stratified coarse sand to loamy sand

Wasco Series

The Wasco series consists of very deep, well drained soils that formed in mixed alluvium derived mainly from granitic rock sources. These soils are on alluvial fans and flood plains. The elevation is 225 to 400 feet. The mean annual precipitation is 6 to 7 inches, and the mean annual temperature is 62 to 65 degrees F. The frost-free period is 250 to 275 days. Slopes are 0 to 2 percent.

Taxonomic class: Coarse-loamy, mixed, superactive, nonacid, thermic Typic Torriorthents

Typical Pedon

Wasco sandy loam, 0 to 2 percent slopes; in a fallow field at an elevation of 350 feet; about 5 miles east of Delano; 50 feet north and 2,300 feet west of the southeast corner of sec. 16, T. 24 S., R. 25 E., MDB&M; latitude 35 degrees, 47 minutes, 25 seconds north and longitude 119 degrees, 13 minutes, 18 seconds west; Delano East Quadrangle:

Ap1—0 to 5 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 3/3) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; common very fine interstitial pores; 5 percent gravel; neutral (pH 7.0); abrupt wavy boundary.

Ap2—5 to 9 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 3/3) moist; moderate medium platy structure; very hard, friable, slightly sticky and nonplastic; common very fine interstitial pores; common organic stains on faces of peds; 5 percent gravel; neutral (pH 6.8); clear smooth boundary.

C1—9 to 30 inches; brown (10YR 5/3) coarse sandy loam, dark brown (10YR 3/3) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; common very fine interstitial pores; common organic coatings on faces of peds; 5 percent gravel; neutral (pH 6.6); clear smooth boundary.

C2—30 to 50 inches; brown (10YR 5/3) coarse sandy loam, dark brown (10YR 3/3) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; common very fine interstitial pores; common organic coatings on faces of peds; 5 percent gravel; neutral (pH 7.3); clear smooth boundary.

C3—50 to 60 inches; pale brown (10YR 6/3) coarse sandy loam, brown (10YR 4/3) moist; massive; slightly hard, very friable, slightly sticky and

nonplastic; common very fine interstitial pores; 5 percent gravel; neutral (pH 7.1).

Range in Characteristics

Carbonates: In some pedons disseminated carbonates at a depth of 16 to 40 inches
Reaction: Neutral to moderately alkaline
Content of organic matter: Less than 0.5 percent in the upper part of the profile

A horizon:
Color—10YR 5/2, 5/3, 6/2, or 6/3 dry; 10YR 3/3 or 4/2 moist

C horizon:
Color—10YR 5/3, 5/4, or 6/3 dry; 10YR 3/3, 4/2, or 4/3 moist

Westcamp Series

The Westcamp series consists of very deep, somewhat poorly drained soils that formed in mixed alluvium derived mainly from granitic rock sources. These soils are artificially drained and are on basin rims and flood plains. The elevation is 190 to 220 feet. The mean annual precipitation is 6 to 7 inches, and the mean annual temperature is 62 to 65 degrees F. The frost-free period is 260 to 275 days. Slopes are 0 to 2 percent.

Taxonomic class: Fine-silty, mixed, superactive, calcareous, thermic Fluvaquentic Endoaquepts

Typical Pedon

Westcamp silt loam, partially drained, 0 to 2 percent slopes; in a fallow field at an elevation of 200 feet; about 3 miles southwest of Alpaugh; 1,500 feet west and 1,900 feet south of the northeast corner of sec. 31, T. 23 S., R. 23 E., MDB&M; latitude 35 degrees, 53 minutes, 10 seconds north and longitude 119 degrees, 31 minutes, 40 seconds west; Hacienda Ranch NE Quadrangle:

Ap—0 to 5 inches; grayish brown (2.5Y 5/2) silt loam, very dark grayish brown (2.5Y 3/2) moist; moderate medium platy structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots; common very fine tubular pores; many very fine and few fine and medium shell fragments; 1 percent gravel; violently effervescent; disseminated carbonates and carbonates that are segregated as common fine white (5Y 8/2) nodules; electrical conductivity (EC) of 2.0 dS/m; slightly alkaline (pH 7.7); clear wavy boundary.

Bkg1—5 to 9 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine tubular pores; many very fine and few fine and medium shell fragments; violently effervescent; disseminated carbonates and carbonates that are segregated as many fine white (2.5Y 8/2) soft masses and filaments and common fine nodules; few very fine prominent very dark gray (N 3/0) recent redoximorphic iron depletions and light yellowish brown (2.5Y 6/4) recent redoximorphic concentrations; electrical conductivity (EC) of 2.1 dS/m; moderately alkaline (pH 8.3); clear wavy boundary.

Bkg2—9 to 16 inches; light olive gray (5Y 6/2) silt loam, olive gray (5Y 4/2) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots; many very fine tubular pores; many very fine and few fine and medium shell fragments; violently effervescent; disseminated carbonates and carbonates that are segregated as many fine white (2.5Y 8/2) soft masses and filaments and common fine nodules; few very fine prominent very dark gray (N 3/0) recent redoximorphic iron depletions and light yellowish brown (2.5Y 6/4) recent redoximorphic accumulations; electrical conductivity (EC) of 2.6 dS/m; moderately alkaline (pH 8.1); clear wavy boundary.

Bkg3—16 to 33 inches; 70 percent grayish brown (2.5Y 5/2) and 30 percent light brownish gray (2.5Y 6/2) silty clay loam, 70 percent very dark grayish brown (2.5Y 3/2) and 30 percent dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and few fine and medium shell fragments; many very fine tubular pores; violently effervescent; disseminated carbonates and carbonates that are segregated as common fine nodules and many fine white (2.5Y 8/2) soft masses and filaments; few very fine prominent very dark gray (N 3/0) recent redoximorphic iron depletions and light gray (2.5Y 7/2) recent redoximorphic depletions; electrical conductivity (EC) of 3.2 dS/m; moderately alkaline (pH 8.1); clear smooth boundary.

2Bkg4—33 to 60 inches; dark gray (N 4/0) exped and grayish brown (2.5Y 5/2) inped silty clay loam, very dark gray (N 3/0) exped and very dark grayish brown (2.5Y 3/2) inped moist; moderate medium angular blocky structure; slightly hard, very friable, sticky and plastic; many very fine tubular pores; many very fine and few fine and medium shell fragments; violently effervescent; disseminated carbonates and carbonates that are

segregated as many fine white (2.5Y 8/2) soft masses and filaments and common coarse nodules; common very fine and fine prominent very dark gray (N 3/0) recent redoximorphic iron depletions and light gray (2.5Y 7/2) recent redoximorphic depletions; electrical conductivity (EC) of 5.0 dS/m; moderately alkaline (pH 8.4).

Range in Characteristics

Depth to the seasonal high water table: 4 to 6 feet
Electrical conductivity (EC): 2 to 16 dS/m

A horizon:
- Color—2.5Y 5/2, 6/2, or 7/2 dry; 2.5Y 3/2, 4/2, or 5/2 moist
- Reaction—slightly alkaline to very strongly alkaline
- Content of organic matter—0.5 to 1 percent

B horizon:
- Color—N 4/0, 2.5Y 4/2, 5/2, 6/2, or 7/2, or 5Y 6/2 dry; N 3/0, 2.5Y 3/2 or 4/2, or 5Y 4/2 moist
- Texture—stratified fine sandy loam to silty clay loam in the upper part; silty clay loam to silty clay in the lower part
- Content of clay—18 to 35 percent in the upper part; 35 to 55 percent in the lower part
- Reaction—moderately alkaline to very strongly alkaline
- Other features—in some pedons visible gypsum crystals within the profile where added to the soils

Wutchumna Series

The Wutchumna series consists of well drained soils that formed in residuum and colluvium weathered from metagabbro. These soils are moderately deep to bedrock. They are on the side slopes of hills. The elevation is 340 to 870 feet. The mean annual precipitation is 9 to 11 inches, and the mean annual temperature is 62 to 65 degrees F. The frost-free period is 250 to 300 days. Slopes are 5 to 50 percent.

Taxonomic class: Fine, smectitic, thermic Mollic Haploxeralfs

Typical Pedon

Wutchumna gravelly clay loam, in an area of Wutchumna-Rock outcrop association, 5 to 50 percent slopes; on a hillside at an elevation of 580 feet; about 2 miles east of the community of Ivanhoe; approximately 900 feet north and 1,700 feet west of the southeast corner of sec. 5, T. 18 S., R. 26 E., MDB&M; latitude 36 degrees, 23 minutes, 13 seconds north and longitude 119 degrees, 10 minutes, 30 seconds west; Ivanhoe Quadrangle:

A1—0 to 1 inch; brown (7.5YR 4/4) gravelly clay loam, dark brown (7.5YR 3/4) moist; moderate thin platy structure parting to moderate fine granular; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots; many very fine vesicular pores; 15 percent gravel; neutral (pH 6.8); abrupt wavy boundary.

A2—1 to 4 inches; brown (7.5YR 4/4) gravelly clay loam, dark brown (7.5YR 3/4) moist; weak very coarse subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots; many very fine and few fine and medium tubular pores; 15 percent gravel; neutral (pH 6.8); abrupt wavy boundary.

Bt1—4 to 12 inches; brown (7.5YR 4/4) gravelly clay loam, dark brown (7.5YR 3/4) moist; weak very coarse prismatic structure parting to moderate medium subangular blocky; slightly hard, very friable, sticky and slightly plastic; common very fine roots; many very fine and few fine and medium tubular pores; few thin clay films on faces of peds; few very fine prominent black (N 2/0) manganese stains on faces of peds; 15 percent gravel; neutral (pH 7.2); clear wavy boundary.

Bt2—12 to 18 inches; brown (7.5YR 4/4) gravelly clay loam, dark brown (7.5YR 3/4) moist; weak very coarse prismatic structure parting to moderate medium subangular blocky; slightly hard, very friable, sticky and slightly plastic; common very fine roots; many very fine and few fine and medium tubular pores; common thin clay films on faces of peds and few thin clay films lining pores; common very fine prominent black (N 2/0) manganese stains on faces of peds; 15 percent gravel; neutral (pH 7.2); clear wavy boundary.

Bt3—18 to 27 inches; reddish brown (5YR 4/4) gravelly clay, dark reddish brown (5YR 3/4) moist; weak medium subangular blocky structure; hard, friable, very sticky and very plastic; common very fine roots; common very fine and fine tubular pores; common thin clay films on faces of peds and lining pores; common very fine prominent black (N 2/0) manganese stains on faces of peds and pebbles; 20 percent gravel and 10 percent cobbles; slightly alkaline (pH 7.4); abrupt wavy boundary.

Bt4—27 to 35 inches; yellowish red (5YR 5/6) gravelly clay, yellowish red (5YR 4/6) moist; moderate medium subangular blocky structure; hard, firm, very sticky and very plastic; few very fine roots; common very fine and fine tubular pores; many

very thin and moderately thick clay films on faces of peds and lining pores; common very fine prominent black (N 2/0) manganese stains on faces of peds and pebbles; 20 percent gravel and 10 percent cobbles; slightly alkaline (pH 7.4); abrupt wavy boundary.

2R—35 inches; metagabbro.

Range in Characteristics

Depth to an argillic horizon: 4 to 8 inches
Depth to bedrock: 20 to 40 inches
Reaction: Neutral or slightly alkaline
Particle-size control section:
Content of clay—32 to 60 percent; averages more than 35 percent
Texture—gravelly clay loam or gravelly clay
Content of rock fragments—15 to 35 percent (15 to 35 percent gravel and 0 to 10 percent cobbles)

Bt and 2Bt horizons:
Hue—7.5YR or 5YR
Other features—few or common manganese stains on faces of peds and pebbles

Yettem Series

The Yettem series consists of very deep, well drained soils that formed in alluvium derived from granitic rock sources. These soils are on alluvial fans and flood plains. The elevation is 225 to 530 feet. The mean annual precipitation is 9 to 12 inches, and the mean annual temperature is 62 to 65 degrees F. The frost-free period is 250 to 300 days. Slopes are 0 to 2 percent.

Taxonomic class: Coarse-loamy, mixed, superactive, thermic Entic Haploxerolls

Typical Pedon

Yettem sandy loam, 0 to 2 percent slopes; in an area under irrigated cultivation, at an elevation of 435 feet; about 0.5 mile west of Woodlake; 1/8 mile south of Avenue 344; about 600 feet south and 650 feet west of the northeast corner of sec. 35, T. 17 S., R. 26 E., MDB&M; latitude 36 degrees, 24 minutes, 44 seconds north and longitude 119 degrees, 7 minutes, 5 seconds west; Woodlake Quadrangle:

Ap1—0 to 3 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 3/3) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine, fine, medium, and coarse roots; many very fine, fine, medium, and coarse irregular and few very fine and fine tubular pores; slightly alkaline (pH 7.7); clear smooth boundary.

Ap2—3 to 8 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 3/3) moist; massive; soft, very friable, nonsticky and nonplastic; many very fine and fine and common medium and coarse roots; many very fine and fine and common medium tubular and many very fine and fine irregular pores; slightly alkaline (pH 7.7); clear smooth boundary.

Ap3—8 to 13 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 3/3) moist; massive; slightly hard, friable, nonsticky and nonplastic; common very fine and fine and few medium and coarse roots; few very fine and fine irregular pores; slightly alkaline (pH 7.7); clear smooth boundary.

C1—13 to 25 inches; yellowish brown (10YR 5/4) sandy loam, dark yellowish brown (10YR 3/4) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine and few fine, medium, and coarse roots; common very fine tubular and common very fine, fine, and medium irregular pores; less than 1 percent 2- to 5-mm pebbles; slightly alkaline (pH 7.7); gradual smooth boundary.

C2—25 to 37 inches; light yellowish brown (10YR 6/4) sandy loam, dark yellowish brown (10YR 4/4) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine and few fine and medium roots; common very fine tubular and many very fine and fine irregular pores; 1 percent 2- to 5-mm pebbles; slightly alkaline (pH 7.7); gradual smooth boundary.

C3—37 to 51 inches; light yellowish brown (10YR 6/4) sandy loam, dark yellowish brown (10YR 4/4) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine and coarse roots; few very fine tubular and common very fine and fine irregular pores; 1 percent 2- to 5-mm pebbles; slightly alkaline (pH 7.7); gradual smooth boundary.

C4—51 to 63 inches; light yellowish brown (10YR 6/4) sandy loam, dark yellowish brown (10YR 4/4) moist; single grain; loose, nonsticky and nonplastic; few very fine roots; common very fine and fine irregular pores; 1 percent 2- to 5-mm pebbles; slightly alkaline (pH 7.7).

Range in Characteristics

Content of organic matter: 1 to 2 percent in the upper 8 to 14 inches, decreasing regularly to a depth of

60 inches or more; less than 1 percent at a depth of 20 inches

A horizon:
Color—10YR 5/1, 5/2, or 5/3 dry; 10YR 3/1, 3/2, or 3/3 moist
Reaction—moderately acid to slightly alkaline

C horizon:
Color—10YR 5/4, 6/2, 6/4, 7/2, or 7/3 dry; 10YR 3/4, 4/2, 4/4, 5/2, or 5/3 moist
Texture—sandy loam, coarse sandy loam, or fine sandy loam
Content of clay—5 to 18 percent
Effervescence—noneffervescent to strongly effervescent
Reaction—neutral to moderately alkaline

Youd Series

The Youd series consists of somewhat poorly drained soils that formed in alluvium derived mainly from granitic rock sources. These soils are shallow to a duripan. They are on fan remnants. The elevation is 220 to 300 feet. The mean annual precipitation is 7 to 8 inches, and the mean annual temperature is 62 to 65 degrees F. The frost-free period is 250 to 275 days. Slopes are 0 to 1 percent.

Taxonomic class: Loamy, mixed, superactive, thermic, shallow Entic Durixerepts

Typical Pedon

Youd loam, 0 to 1 percent slopes; in a fallow field at an elevation of 267 feet; about 3 miles northwest of Goshen; 1,370 feet east and 50 feet north of southwest corner of sec. 3, T. 18 S., R. 23 E., MDB&M; latitude 36 degrees, 23 minutes, 11 seconds north and longitude 119 degrees 28 minutes, 5 seconds west; Traver Quadrangle:

Ap—0 to 9 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak fine subangular blocky structure; hard, firm, nonsticky and nonplastic; few very fine roots; many very fine and fine interstitial pores; electrical conductivity (EC) of 4.0 dS/m; slightly effervescent; disseminated carbonates; moderately alkaline (pH 8.2); abrupt smooth boundary.

Bqkm1—9 to 21 inches; a variegated light yellowish brown (10YR 6/4) and light gray (10YR 7/2), strongly silica-cemented duripan, dark yellowish brown (10YR 4/4) and olive brown (2.5Y 4/4) moist; few very fine to medium vertical fractures that are more than 4 inches apart; massive; extremely hard, slightly rigid, slightly sticky and nonplastic; few very fine and fine roots in cracks; many very fine and common fine tubular pores; 10 percent thin silica coatings on horizontal faces of the duripan; brittle when wet; electrical conductivity (EC) of 0.4 dS/m; strongly effervescent; disseminated carbonates; moderately alkaline (pH 8.3); diffuse smooth boundary.

Bqkm2—21 to 32 inches; a very pale brown (10YR 7/4), strongly silica-cemented duripan, dark yellowish brown (10YR 4/4) moist; massive; very hard, very firm, slightly sticky and nonplastic; many very fine tubular pores; 10 percent thin silica coatings on horizontal faces of the duripan; brittle when wet; slightly effervescent; disseminated carbonates and carbonates that are segregated as few fine filaments; moderately alkaline (pH 8.4); gradual smooth boundary.

Bqk1—32 to 43 inches; light brownish gray (2.5Y 6/2), continuously weakly silica-cemented sandy loam, olive brown (2.5Y 4/4) moist; massive; hard, friable, nonsticky and nonplastic; many very fine tubular pores; slightly effervescent; disseminated carbonates and carbonates that are segregated as few fine filaments; moderately alkaline (pH 8.4); diffuse smooth boundary.

Bqk2—43 to 54 inches; light brownish gray (2.5Y 6/2), continuously weakly silica-cemented loamy sand, olive brown (2.5Y 4/4) moist; massive; hard, friable, nonsticky and nonplastic; many very fine tubular pores; slightly effervescent; disseminated carbonates and carbonates that are segregated as few fine filaments; strongly alkaline (pH 8.6); gradual smooth boundary.

Bk—54 to 70 inches; light brownish gray (2.5Y 6/2) sandy loam, olive brown (2.5Y 4/4) moist; massive; soft, very friable, nonsticky and nonplastic; many very fine interstitial pores; strongly effervescent; disseminated carbonates; strongly alkaline (pH 8.9).

Range in Characteristics

Depth to a duripan: 10 to 20 inches
Electrical conductivity (EC): 4 to 16 dS/m above the duripan
Sodium adsorption ration (SAR): 13 to 50 above the duripan

A horizon:
Color—2.5Y 7/2 or 6/2 dry; 2.5Y 5/2 or 4/2 moist

Content of clay—12 to 18 percent
Reaction—moderately acid to moderately alkaline

Bqkm horizon:
Color—10YR 6/4, 7/2, or 7/4 dry; 10YR 4/4 or 4/6 or 2.5Y 4/4 moist

Bqk and Bk horizons:
Color—2.5Y 7/2 or 6/2 dry; 2.5Y 4/4, 5/2, or 6/2 moist
Texture—stratified sand to silt loam
Content of clay—averages 7 to 20 percent
Reaction—neutral to strongly alkaline

Formation of the Soils

Soil is generally defined as a natural growing medium for plants. It covers the surface of the earth as a three-dimensional body and is made up of organic and mineral material. Physical and chemical processes that result from the interaction of five soil-forming factors determine the characteristics and properties of the soil. These factors are climate, living organisms, time, topography, and parent material. *Climate* refers to the temperature and kind and amount of precipitation since the accumulation or exposure of the parent material. *Living organisms* are the plant cover and the organisms living in and on the soil. In farmed areas the cultivation methods and crops are also included. The age of the soil is determined by the length of *time* that the soil-forming factors have been operating. *Topography*, or slope and aspect, affects internal and external soil properties, such as drainage, aeration, susceptibility to erosion, and exposure to the sun and the wind. Finally, *parent material* influences the texture and structure of the soil as well as its mineralogical and chemical composition. The influence of any one of these factors varies from place to place; hence, soils may differ within short distances. The interaction of all the factors determines the kind of soil that forms.

The soil-forming factors combine and interrelate to create soil properties expressed in soil horizons. The important diagnostic horizons in the soils in the survey area are *mollic epipedons*; *calcic*, *cambic*, *argillic,* and *natric* subsurface horizons; and silica-indurated *duripans*. The Glossary defines these diagnostic horizons.

Climate

The survey area has a Mediterranean climate that is characterized by hot, dry summers and cool, moist winters. Most of the rainfall falls in the period November through April. The soil temperature regime is *thermic*, and the soil moisture regime is *xeric, aridic,* or *aquic*. The warm temperatures and moist soil conditions in spring permit rapid chemical reactions. During periods of rainfall, water carrying dissolved or suspended material moves through the soil. Weathering is limited in the cool winter months, but leaching processes become active with the onset of seasonal rainfall. Weathering is most active in spring and late in fall. In soils that have a high water table throughout most of the year, however, weathering can occur in summer and fall. Soils kept moist by irrigation may also have higher weathering rates.

The rainfall increases from an average of 6 to 8 inches in the southwestern part of the survey area to an average of 8 to 12 inches in the northeastern part. The air temperature ranges from an average of 63 to 66 degrees F in the southwestern part of the area to an average of 62 to 65 degrees F in the northwestern part. The growing season is longer in the eastern part, where the frost-free period is 250 to 300 days. In the western part of the area, the frost-free period is 250 to 275 days.

Native plant growth is rapid early in spring but ceases in June or July because of a lack of moisture and increased air temperature. During the winter the temperature never gets cold enough to keep grasses from growing, and by late spring there is commonly a large amount of growth. Because of this mild climate and long growing season, organic matter accumulates and the surface layer of the soils commonly has dark colors. These dark soils are Mollisols.

Living Organisms

The activities of living organisms, including soil flora, fauna, and humans, all influence the formation and morphology of soils. Flora, such as bacteria and fungi, help to decompose organic matter. Some bacteria add atmospheric nitrogen to the soil. Fauna, such as earthworms, small insects, and rodents, mix soil material through burrowing and tunneling. Abandoned tunnels commonly are filled with loose material from the overlying horizons and transmit water more readily than the surrounding undisturbed soil material.

Most of the survey area is irrigated cropland. The original vegetation had a large impact on the soils. This impact is still evident to some degree in most soils, especially in areas where soil modification by human activities is less intensive and in the few uncultivated areas that remain in the survey area. Kai,

Jerryslu, and Lewis soils are mapped exclusively in the uncultivated areas.

The dominant natural vegetation zone in the survey area was the tree-grassland savanna. This occurred on the more recent alluvial fans and flood plains associated with the major rivers, most notably the Kaweah River. California white oak was characteristic, with an understory of perennial grasses and shrubs. These tree-grassland savannas are unique to the survey area and occurred because of the high water table throughout these landforms and very slow velocity flooding. Today, the water table has dropped and the flooding is very rare or rare because of upstream diversions of water for agriculture and protection from flooding by dams, levees, and canals. The lush tree-grassland savanna had accumulations of organic matter that impart a dark color near the surface of mineral soils. Many of these soils have a mollic epipedon because of the high amount of organic matter and are classified as Mollisols. Grangeville, Nord, and Yettem soils typify the soils that have a mollic epipedon and are on the tree-grassland savanna.

Other natural vegetation zones in the survey area were grasslands and highly salt-tolerant plant communities.

The grasslands occurred on the fan remnants away from the major drainageways. Precipitation is the sole source of soil moisture on the fan remnants. There was not enough vegetation on the fan remnants to allow for the accumulation of organic matter needed to meet the requirements for a Mollisol. The soils of the grasslands are classified as Alfisols. Exeter soils typify the soils that do not have a mollic epipedon and are on fan remnants.

Highly salt-tolerant plant communities occurred on the basin rims and flood plains of the Tulare Lake Basin. The vegetation of the highly salt-tolerant communities was saltbush, pickleweed, and saltgrass. The soils are classified as Aridisols. Jerryslu soils typify the aridic soils on the rim of Tulare Lake Basin.

Human activities have influenced the formation of numerous soils in survey area. The activities that resulted in permanent chemical and physical modifications of the soils are described in the section "Altered Soils," which is under the heading "General Nature of the Survey Area." All of the survey area is under irrigated agriculture and has been altered by human activities to some degree.

Many of the soils on the more recent alluvial fans and flood plains associated with the major drainageways and the soils on the fan remnants formerly were, to some degree, more saline-sodic than they are today. In the soils with favorable permeability rates, only small inclusions of saline-sodic soils remain. Colpien, Flamen, Grangeville, Nord, Tagus, and Yettem soils originally had more salts and sodium than is typical today and had moderate salinity in extensive areas. Colpien soils have saline-sodic inclusions in all delineations, and it is evident from the study of mapped areas that much more of the acreage was at one time saline-sodic. Small areas of Grangeville soils still have enough salinity to warrant a separate saline-sodic map unit. Most occurrences of Grangeville soils are in the modified nonsaline-nonsodic map unit. Akers, Biggriz, and Calgro soils still exhibit much of their original salinity and sodicity and are mapped with both saline-sodic and nonsaline-nonsodic phases together in the same complex. The soils that are still saline-sodic are slowly or very slowly permeable because of clay or duripan layers that are too thick to be modified, or they are in areas where they are not yet modified. Quonal soils are an example of highly modified soils that remain strongly saline-sodic. Even though the duripan has been removed to a depth of at least 40 inches, these soils still have a high content of clay and are very slowly permeable in the clay layers. Many of the soils, especially the strongly saline-sodic soils on the basin rims and flood plains associated with Tulare Lake, undoubtedly have less salts and sodium today than they had in the past. The reduction in salts and sodium in almost all of the soils in the survey area is a direct result of irrigated agriculture, which is more fully described in the section "Saline-Sodic Soils," under the heading "Use and Management of the Soils."

The addition of organic matter associated with agriculture from manure and crop wastes has given many of the soils a color at the dark end of the range in characteristics. In 1994, about 1.7 million tons of manure was produced in the survey area, almost all of which was applied to cropland within the area. Exeter soils are an example of soils affected by this darkening of the surface layer. These soils have extensive areas with a dark surface layer because of the long-term addition of very large amounts of manure. It is common to see one very dark fallow field adjacent to a much lighter fallow field because more manure is applied to one field than the other. In areas where Exeter soils occur, lab tests have shown that even though the surface layer is dark, the content of organic matter is not high enough for the soils to meet the requirements of a Mollisol. Exeter soils are now classified as Alfisols.

Many of the duripans in the survey area that have not been mechanically removed (as described in the section "Altered Soils") have been chemically altered and softened by the addition of large amounts of

irrigation water, as well as farm chemicals and manure. In areas where high-calcium irrigation water has been applied, many of the duripans and other layers in the soils contain more calcium carbonate than is typical.

Geomorphic Surfaces

The landscape in the survey area is the result of erosional and constructional processes. These processes occurred in response to changes in climate, fluctuating sea levels, and tectonic activities. Cyclic periods of landscape stability and instability also occurred. Development of the current landscape in the area took place during the Pleistocene and Holocene Epochs. The more highly developed soils occur on stable landscapes.

Determining the exact age of most of the soils in the survey area is difficult. Relative ages can be estimated from the data available in other areas of the Sacramento-San Joaquin Valley. The age of soils also can also be estimated from the age of the geomorphic surface. However, buried *palesols* or exhumed *palesols* can occur on younger surfaces.

Many of the landforms within the survey area have been obscured because of land leveling associated with agriculture. Much has been inferred about landforms based on soil data, photo interpretation of both recent and old aerial photographs, and study of historical descriptions of the area.

The youngest geomorphic surfaces in the survey area are the alluvial fans and flood plains associated with the major rivers and streams. Under natural conditions, these were active surfaces which were commonly flooded. Because of upstream water diversions and dams, these surfaces are much more stable today. In the past they often changed as new channels were cut, old channels were abandoned, meanders migrated, and alluvial deposits moved downstream.

Typically all the changing of landscapes and moving of alluvium created stratified soils, such as Grangeville (Fluvaquentic Haploxerolls), Nord (Cumulic Haploxerolls), Tujunga (Typic Xeropsamments), Hanford (Typic Xerorthents), and Gambogy (Cumulic Endoaquolls) soils. Gambogy, Grangeville, and Nord soils historically received more moisture from a higher water table and produced more abundant vegetation, which accounts for the higher content of organic matter and the mollic epipedon. Nord soils are the most extensive soils in the survey area. Hanford soils historically had less moisture than Nord soils and thus lack a mollic epipedon. The sandy Tujunga soils are in the areas of the most recent and active deposition of alluvium, commonly in meandering, fluvial "stringers." Delhi soils, which also are sandy, occurred in areas of sand dunes that have now been leveled.

The parent material of these mineral soils is alluvium derived mainly from granitic rock sources, primarily granite and quartz monzonite. The dominantly coarse-loamy texture of the soils is inherited from the parent material. The landscape is nearly level, and most of the rock fragments were deposited upstream. Few rock fragments occur on these young geomorphic surfaces.

The oldest geomorphic surfaces in the survey area are stable fan remnants formed in the late Pleistocene Epoch. The landforms are far from rivers and streams or adjacent to the basin rim where recent alluvial deposition has not occurred.

Under natural conditions, these surfaces had mound-intermound microrelief and were dotted with vernal pools. Many of these areas were commonly ponded. As a result of land leveling, the depressions now occur only in a few native areas. During periods of abnormal precipitation, even with upstream diversions of water, these landscapes are subject to brief flooding.

Fan remnants occur in the eastern part of the survey area, adjacent to the foothills of the Sierra Nevada. Many of these fan remnants occur directly east of the soil survey boundary. These landscapes most commonly have silica-indurated duripans within 40 inches of the surface. Exeter soils, which are the third most extensive soils in the survey area, and Flamen soils are typical of the soils on fan remnants.

Exeter soils (Typic Durixeralfs) have a duripan. The soil particles are cemented with silica and smaller amounts of iron, manganese, and in some areas calcium to form a duripan. There are several sources for these cementing agents. Slow weathering of granitic parent material and the more rapid weathering of volcanic ash supply much of the silica. Water table fluctuations carry and deposit additional soluble silica, iron, and manganese.

The Exeter soils are on hummocky and rolling landforms. Where not removed by wind or water erosion, high-silica material was leached into the soils to a depth equal to the depth of wetting from precipitation. This depth was generally uniform across the rolling landscape. The depth from the surface to a duripan commonly is about the same at the top of a mound as it is in the depressional intermound area. Observations of native areas and other areas that have not been extensively ripped reveal that the duripan closely follows the contour of the rolling

landscape surface. Observations of leveled areas, transects, and trenches reveal a gently rolling duripan across the landscape.

Flamen soils (Calcic Pachic Haploxerolls) have a duripan at a depth of 40 to 60 inches. These soils may be remnant Exeter soils modified by floods that completely stripped away the material above the duripan. The surface of the duripan also underwent some partial stripping. As a result, the present-day duripan is typically indurated. More recent granitic alluvium was then deposited on this surface. The newly deposited material is old enough to have clay films, secondary carbonates, and a cambic horizon; however, it is younger than the underlying duripan, which formed at least 60,000 to 100,000 years ago.

The fan remnants have two distinct components. The first of these is the upper, more stable, and older component characterized by soils with a duripan that formed in alluvium derived mainly from granitic rock sources. Very small amounts of metasedimentary rocks occur in a narrow band along the front of the Sierra Nevada to the east of the survey area. The alluvium that weathered from metasedimentary rocks may have contributed to the formation of the upper fan remnant soils. These soils may also have been influenced by volcanic ash falls and eolian material. The second component is lower, less stable, and younger than the first and is characterized by soils that do not have a duripan and formed in more recent granitic alluvium.

Kai (Natric Durixeralfs), Calgro (Typic Durixerepts), and Crosscreek (Sodic Xerarents) soils are typical of the upper fan remnants.

Kai soils are on the most stable part of the fan remnants. They have a natric horizon underlain by a duripan. They formed in alluvium derived mainly from granitic rocks and are on fan remnants above alluvial fans. The fans historically had a high water table and a large concentration of salts and sodium, weathered from the sodium feldspars in the granitic alluvium. As a result of the fluctuating water table, many of the soils have a high content of salts and sodium. In addition, water perches on most of the slowly or very slowly permeable duripans. Under these conditions, salt and sodium tend to accumulate in the part of the soils above the duripan. The transportation and deposition of sodium salts with eolian material from the basin rim of Tulare Lake possibly influenced prominent natric horizons.

Calgro soils on the fan remnants are similar to Flamen soils in that the original soil material above the duripan has been stripped away. Younger material has been deposited above the much older duripan. Many areas of Calgro soils formerly were saline-sodic, but much of the acreage of these areas has been reclaimed.

Crosscreek soils are the chemically and mechanically modified remnants of Kai soils. Crosscreek soils are very young soils created from older soils on a late to middle Pleistocene landscape. As described in the section "Altered Soils," the original natric horizon has been destroyed and the duripan has been mechanically ripped to a depth of at least 40 inches. This type of modification is very common in all of the soils on fan remnants.

The lower fan remnants are typified by such soils as Colpien (Calcic Pachic Haploxerolls). Many of these soils are highly altered and reclaimed. In their native state, they were strongly saline-sodic. Soils in native areas on this landform commonly had a weak natric or argillic horizon and some thin layers of weak silica cementation, but these have now been almost completely destroyed. Colpien soils have clay films but do not meet the requirements for an argillic horizon. Mollic epipedons, cambic horizons, and accumulations of secondary carbonates are common on this landform.

The soils on the basin rims and flood plains of Tulare Lake formed in alluvium derived from granitic rocks with minor additions of alluvium derived from sedimentary and metamorphic rocks from both sides of the San Joaquin Valley. Lacustrine sediments also influenced these soils. This landscape dates back to the late Pleistocene. Most of the soils have a high water table or are artificially drained. Stratification is common. Many of the soils that have a high content of clay are classified as Vertisols. They have cracks that form when the soils dry.

Gepford soils (Typic Natraquerts) are typical of the soils on basin rims and flood plains. They may have sandy substratum phases. Most of the soils on this landscape are highly saline-sodic, or they have been reclaimed. The lake bottom, backwater swamps, and lagoons are protected from wave action and allow water to stand for long periods. Under these conditions, the soils tend to be very high in content of silt and clay.

Armona soils (Fluvaquentic Endoaquolls), which have fine-loamy textures, are typical of areas that were adjacent to the more active drainageways.

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Glossary

AASHTO classification. A system that classifies soils specifically for geotechnical engineering purposes related to highway and airfield construction. It is based on particle-size distribution and Atterberg limits.

AASHTO Group Index (GI). An empirical index number used to evaluate clayey and silty clay materials.

ABC soil. A soil having an A, a B, and a C horizon.

AC soil. A soil having only an A and a C horizon. Commonly, such soil formed in recent alluvium or on steep, rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali (sodic) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Alluvial fan. A low, outspread mass of loose material and/or rock material, commonly with gentle slopes, shaped like an open fan or a segment of a cone, deposited by a stream at the place where it issues from a narrow mountain valley or where a tributary stream is near or at its junction with the main stream. It is steepest near the mouth of the valley where its apex points upstream, and it slopes gently and convexly outward with a gradual decrease in gradient.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Alpha,alpha-dipyridyl. A dye that when dissolved in 1N ammonium acetate is used to detect the presence of reduced iron (Fe^{++}) in the soil. A positive reaction indicates a type of redoximorphic feature.

Animal unit month (AUM). The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

Aquic conditions. Current soil wetness characterized by saturation, reduction, and redoximorphic features.

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial clay.

Aridic moisture regime. A moisture regime in which soils are dry for at least half of the year. Soils that have an aridic moisture regime generally occur in areas of arid climates. A few are in semiarid areas and either have physical properties that keep them dry, such as a crusty surface that virtually precludes the infiltration of water, or are on steep slopes where runoff is high. There is little or no leaching in this moisture regime, and soluble salts accumulate in the soils if there is a source.

Aspect. The direction in which a slope faces.

Association, soil. A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity) (AWC). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 2.5
Low	2.5 to 5
Moderate	5 to 7.5
High	7.5 to 10
Very high	more than 10

AWC. See Available water capacity

Back slope. The position that forms the steepest and generally linear, middle portion of a hill slope. In profile, back slopes are commonly bounded by a convex shoulder above and a concave foot slope below.

Base saturation. The degree to which material having cation-exchange properties is saturated with

exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Base slope. A geomorphic component of hills consisting of the concave to linear (perpendicular to the contour) slope that, regardless of the lateral shape, forms an apron or wedge at the bottom of a hillside dominated by colluvium and slope-wash sediments (for example, slope alluvium).

Basin. The nearly level to gently sloping bottom of a wide structural depression between mountain ranges.

Basin floor. The nearly level, lowermost part of intermontane basins (i.e., bolsons and semibolsons). The floor includes all of the alluvial, eolian, and erosional landforms below the piedmont slope.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bulk density. A measurement of the ovendried weight of the soil material less than 2 mm in size per unit volume of soil. Common measurements are taken at a water tension of $^1/_{10}$ bar, $^1/_3$ bar, or 15 bar. Bulk density influences plant growth and engineering applications. It is used to convert measurements from a weight basis to a volume basis. Within a family particle-size class, bulk density is an indicator of how well plant roots are able to extend into the soil. Bulk density is used to calculate porosity.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Calcic horizon. A mineral soil horizon of secondary carbonate enrichment that is more than 15 cm thick, has a $CaCO_3$ equivalent of more than 150g kg^{-1}, and has at least 50g kg^{-1} more calcium carbonate equivalent than the underlying C horizon.

Calcium carbonate equivalent. The quantity of carbonate (CO_3) in the soil expressed as $CaCO_3$ and as a weight percentage of the fraction less than 2 mm in size.

California bearing ratio (CBR). The load-supporting capacity of a soil as compared to that of standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.

Cambic horizon. A mineral soil horizon that has a texture of loamy very fine sand or finer, has a soil structure rather than rock structure, contains some weatherable minerals, and is characterized by the alteration or removal of mineral material as indicated by mottling or gray colors, stronger chromas, or redder hues than in the underlying horizons, or the removal of carbonates. The cambic horizon is cemented or indurated and has too little evidence of illuviation to meet the requirements of an argillic horizon.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cathodic protection. The control of the electrolytic corrosion of an underground or underwater metallic structure (such as a pipeline) by the application of an electric current in such a way that the structure is made to act as the cathode instead of anode of an electrolytic cell. See Coatings for pipelines.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity (CEC). The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

CEC. See Cation exchange capacity.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

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 depletions. Low-chroma zones having a low content of iron, manganese, and clay because of the chemical reduction of iron and manganese and the removal of iron, manganese, and clay. A type of redoximorphic depletion.

Clayey. A soil texture group consisting of sandy clay, silty clay, and clay.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A dense, compact, slowly permeable subsoil layer that has a much higher content of clay than the overlying material from which it is separated by a sharply defined boundary. A claypan is

usually hard when dry and plastic or sticky when wet.

Coarse textured soil. Sand or loamy sand.

Coatings for pipelines. Pipeline coatings that provide a barrier to the flow of electricity and moisture, thereby preventing the formation of corrosion cells.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material. Material that is 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has more than 60 percent.

COLE (coefficient of linear extensibility). See Linear extensibility.

Colluvium. Unconsolidated, unsorted earth material being transported or deposited on side slopes and/or at the base of slopes by mass movement (e.g., direct gravitational action) and by local unconcentrated runoff.

Compaction. The process by which soil grains are rearranged in a manner that decreases void space and brings the grains into closer contact with one another, thereby increasing the bulk density.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Concretions. Cemented bodies with crude internal symmetry organized around a point, a line, or a plane. They typically take the form of concentric layers visible to the naked eye. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up concretions. If formed in place, concretions of iron oxide or manganese oxide are generally considered a type of redoximorphic concentration.

Consistence, soil. Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the "Soil Survey Manual."

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosion. Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Deep soil. See Depth, soil.

Depth, soil. Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Drainage class (natural). Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—*excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained,* and *very poorly drained.* These classes are defined in the "Soil Survey Manual."

Drainage, surface. Runoff, or surface flow of water, from an area.

Drainageway. A general term for a course or channel along which water moves in draining an area.

Dune. A low mound, ridge, bank or hill of loose, windblown, granular material (generally sand), either bare or covered with vegetation, capable of movement from place to place but always retaining its characteristic shape.

Duripan. A subsurface soil horizon that is cemented by illuvial silica, usually opal or microcrystalline forms of silica, to the degree that less than 50 percent of the volume of air-dry fragments will slake in water or HCl.

EC. See Electrical conductivity

Electrical conductivity (EC). The electrolytic conductivity of an extract from saturated soil paste.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material

through eluviation are eluvial; those that have received material are illuvial.

Endosaturation. A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

Eolian. Pertaining to material transported and deposited by the wind. Includes earth materials, such as dune sands, sand sheets, loess deposits, and clay.

Episaturation. A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

Erosion. The wearing away of the land surface by running water, waves, or moving ice and wind, or by such processes as mass wasting and corrosion (solution and other chemical processes). The term "geologic erosion" refers to natural erosion processes occurring over long (geologic) timespans. "Accelerated erosion" generically refers to erosion that is in excess of what is presumed or estimated to be naturally occurring levels and is a direct result of human activities.

Escarpment. A relatively continuous cliff or relatively steep slope, produced by erosion or faulting, breaking the general continuity of more gently sloping land surfaces. The term is most commonly applied to cliffs produced by differential erosion, and it is commonly used synonymously with "scarp."

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grain is grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fan piedmont. The most extensive landform on piedmont slopes, formed by a) the lateral, downslope coalescence of mountain-front alluvial fans into one generally smooth slope with or without the transverse undulations of the semiconical alluvial fans and b) accretions of fan aprons.

Fan remnant. A general term for a landform that is the remaining part of an older fan landform, such as an alluvial fan, fan apron, inset fan, or fan skirt. It has been either dissected (an erosional fan remnant) or partially buried (a nonburied fan remnant). An erosional fan remnant must have a relatively flat summit that is a relict fan surface. A nonburied fan remnant is a relict surface in its entirety.

Fan terrace. See Fan remnant.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fill slope. A sloping surface consisting of excavated soil material from a road cut. It commonly is on the downhill side of the road.

Fine textured soil. Sandy clay, silty clay, or clay.

Flood plain. The nearly level plain that borders a stream and is subject to inundation under flood-stage conditions unless protected artificially. It is generally a constructional landform built of sediment deposited during overflow and lateral migration of the streams.

Fluvial. Of or pertaining to rivers; produced by river action.

Foot slope. The position that forms the inner, gently inclined surface at the base of a hill slope. In profile, foot slopes are commonly concave. A foot slope is a transition zone between upslope sites of erosion and transport (shoulders and back slopes) and downslope sites of deposition (toe slopes).

Forb. Any herbaceous plant not a grass or a sedge.

Fragments. Unattached cemented pieces of bedrock, bedrocklike material, durinodes, concretions, and nodules 2 mm or larger in diameter and woody material 20 mm or larger in organic soils.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

Gravel. Rounded or angular rock fragments as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Ground water. Water filling all the unblocked pores of the material below the water table.

Hard bedrock. Bedrock that cannot be excavated, except by blasting, or by the use of special equipment that is not commonly used in construction.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Hill. A generic term for an area of the land surface, rising as much as 300 meters above surrounding lowlands, generally of restricted summit area relative to surrounding surfaces and having a well defined outline; hill slopes generally exceed 15 percent. The distinction between a hill and a mountain is often dependent on local usage.

Hogwallow. See Mound-intermound microrelief.

Holocene. The epoch of the Quaternary Period of geologic time, extending from the end of the Pleistocene Epoch (about 10 to 12 thousand years ago) to the present.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the "Soil Survey Manual." The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

Hummock. A rounded or conical mound or other small elevation.

Hydrologic soil groups. Refers to soils grouped according to their runoff potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties are depth to a seasonal high water table, the infiltration rate and permeability after prolonged wetting, and depth to a very slowly permeable layer. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

Igneous rock. Rock formed by solidification from a molten or partially molten state; major varieties include plutonic and volcanic rocks. Examples: andesite, basalt, or granite.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Intermittent stream. A stream, or reach of a stream,

that does not flow throughout the year (is commonly dry for 3 or more months of the year) and has a channel that is generally below the local water table. It flows only when it receives base flow during wet periods or when it receives ground-water discharge or protracted contributions from melting snow or other erratic surface and shallow subsurface sources.

Iron depletions. Low-chroma zones having a low content of iron and manganese oxide because of chemical reduction and removal, but having a clay content similar to that of the adjacent matrix. A type of redoximorphic depletion.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Level basin (paddy).—Water is applied to a level plain surrounded by levees or dikes.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

K factor. A measurement of potential soil erodibility caused by detachment of soil particles by water.

Lacustrine deposit. Clastic sediments and chemical precipitates deposited in lakes.

Leaching. The removal of soluble material from soil or other material by percolating water.

LEP. See Linear extensibility percent.

Linear extensibility percent (LEP). The linear expression of the volume difference of natural soil fabric at $^1/_3$- bar or $^1/_{10}$-bar water content and oven dryness. The volume change is reported as percent change for the whole soil.

Liquid limit (LL). The moisture content at which the soil passes from a plastic to a liquid state.

LL. See Liquid limit

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loamy. A soil texture group consisting of coarse sandy loam, sandy loam, fine sandy loam, very fine sandy loam, loam, silt loam, silt, clay loam, sandy clay loam, and silty clay loam.

Low strength. The soil is not strong enough to support loads.

Masses. Concentrations of substances in the soil matrix that do not have a clearly defined boundary with the surrounding soil material and cannot be removed as a discrete unit. Common compounds making up masses are calcium carbonate, gypsum or other soluble salts, iron oxide, and manganese oxide. Masses consisting of iron oxide or manganese oxide generally are considered a type of redoximorphic concentration.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline. Examples: schist, gneiss, quartzite, slate, and marble.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately deep soil. See Depth, soil.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Descriptive terms are as follows: abundance—*few, common,* and *many;*

size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent.* The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Mound-intermound microrelief. Circular or oval domes, generally 1 to 3 feet in height and 115 to 100 feet in diameter, with intervening basin-shaped depressions, which often have no external drainage. In various parts of the West, this kind of microrelief is called by many names, mainly "hogwallow" and "Mima mounds."

Mountain. A natural elevation of the land surface, rising more than 300 meters above surrounding lowlands, generally of restricted summit area relative to surrounding surfaces and generally having steep sides (a slope of more than 25 percent), with or without a considerable surface of bare rock. A mountain can occur as a single, isolated mass or in a group forming a chain or range. Mountains are formed primarily through tectonic activity and/or volcanic action and secondarily through differential erosion.

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Native soils. Soils that have not been significantly altered by human activities. Typically, these soils have never been farmed or have been farmed at such a low intensity that they are essentially unchanged.

Natric horizon. A special kind of argillic horizon that contains enough exchangeable sodium to have an adverse effect on the physical condition of the subsoil.

Neutral soil. A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

Nodules. Cemented bodies lacking visible internal structure. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up nodules. If formed in place, nodules of iron oxide or manganese oxide are considered types of redoximorphic concentrations.

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

OM. See Organic matter.

Organic matter (OM). Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low	less than 0.5 percent
Low	0.5 to 1.0 percent
Moderately low	1.0 to 2.0 percent
Moderate	2.0 to 4.0 percent
High	4.0 to 8.0 percent
Very high	more than 8.0 percent

Paleosol. A soil that formed on a landscape in the past and has distinctive morphological features resulting from a soil-forming environment that no longer exists at the site. The former pedogenic process was either altered because of external environmental changes or interrupted by burial. A paleosol (or component horizon) may be classed as relict if it has persisted in a land-surface position without major alteration of morphology by processes of the prevailing pedogenic environment. An exhumed paleosol is one that formerly was buried and has been reexposed by erosion of the covering mantle. Most paleosols have been affected by some subsequent modification of diagnostic horizon morphology and profile truncation.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example: *hardpan, fragipan, claypan, plowpan,* and *traffic pan.*

Parent material. The unconsolidated and more or less chemically weathered mineral or organic material in which the solum of a soil forms through pedogenic processes.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Permeability. The quality of the soil that enables water or air to move downward through the profile. The rate at which a saturated soil transmits water is accepted as a measure of this quality. In soil physics, the rate is referred to as "saturated hydraulic conductivity," which is defined in the "Soil Survey Manual." In line with conventional usage in the engineering profession and with traditional usage in published soil surveys, this rate of flow continues to be expressed as "permeability." Terms

describing permeability, measured in inches per hour, are as follows:

Extremely slow	0.0 to 0.01 inch
Very slow	0.01 to 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

PI. See Plasticity index.

Plasticity index (PI). The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Pleistocene. The epoch the Quaternary Period of geologic time, following the Pliocene Epoch and preceding the Holocene (from approximately 2 million to 10 thousand years ago); also the corresponding (time-stratigraphic) "series" of earth materials.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid	less than 3.5
Extremely acid	3.5 to 4.4
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly 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

Reclamation, soil. Improving soil structure, tilth, and crop production by removing excess salts and exchangeable sodium. Removal of the salts and sodium may involve drainage systems, irrigation systems, leaching, soil amendments, the production of specialty crops, and other management practices.

Redoximorphic concentrations. Nodules, concretions, soft masses, pore linings, and other features resulting from the accumulation of iron or manganese oxide. An indication of chemical reduction and oxidation resulting from saturation.

Redoximorphic depletions. Low-chroma zones from which iron and manganese oxide or a combination of iron and manganese oxide and clay has been removed. These zones are indications of the chemical reduction of iron resulting from saturation.

Redoximorphic features. Redoximorphic concentrations, redoximorphic depletions, reduced matrices, a positive reaction to alpha,alpha-dipyridyl, and other features indicating the chemical reduction and oxidation of iron and manganese compounds resulting from saturation.

Reduced matrix. A soil matrix that has low chroma in situ because of chemically reduced iron (Fe^{++}). The chemical reduction results from nearly continuous wetness. The matrix undergoes a change in hue or chroma within 30 minutes after exposure to air as the iron is oxidized (Fe^{+++}). A type of redoximorphic feature.

Relief. The elevations or inequalities of a land surface, considered collectively.

Remnant. A remaining part of some larger landform or of a land surface that has been dissected or partially buried.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Riverwash. In barren alluvial areas, unstabilized sand, silt, clay, or gravel reworked frequently by stream activity.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, gravel, cobbles, stones, and boulders.

Rock outcrop. Exposures of bedrock other than lava and rock-lined pits.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs plant growth. A saline soil does not contain excess exchangeable sodium. Salinity is expressed as the electrical conductivity of a saturation extract in millimhos per centimeter (mmhos/cm) or decisiemens per meter at 25 degrees C. Salinity classes are:

0 to 4	nonsaline
4 to 8	slightly saline
8 to 16	moderately saline
More than 16	strongly saline

Saline-sodic soil. A soil containing sufficient exchangeable sodium to interfere with the growth of most crops and containing appreciable quantities of soluble salts. The exchangeable sodium ratio is greater than 0.15, the conductivity of the soil solution, at saturated water content, is more than 4 dS m^{-1} (at 25 degrees C), and the pH is generally 8.5 or less in the saturated soil.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sandy. A soil texture group consisting of sands and loamy sands.

SAR. See Sodium adsorption ratio.

Saturation. Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Sedimentary rock. A consolidated deposit of clastic particles, chemical precipitates, or organic remains accumulated at or near the surface of the earth under "normal" low temperature and pressure conditions. Sedimentary rocks include consolidated equivalents of alluvium, colluvium, drift, and eolian, lacustrine, marine deposits, e.g., sandstone, siltstone, mudstone, claystone, shale, conglomerate, limestone, dolomite, and coal.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shallow soil. See Depth, soil.

Shoulder. The position that forms the uppermost inclined surface near the top of a hill slope. It is a transition from a back slope to a summit. The surface is dominantly convex in profile and erosional in origin.

Side slope. A geomorphic component of hills consisting of a laterally planar area of a hillside. The overland water flow is predominantly parallel.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical

distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey, classes for simple slopes are as follows:

Nearly level	0 to 2 percent
Gently sloping	2 to 5 percent
Moderately sloping	5 to 9 percent
Strongly sloping	9 to 15 percent
Moderately steep	15 to 30 percent
Steep	30 to 50 percent
Very steep	50 percent and higher

Sodic (alkali) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Sodicity. The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of Na^{+} to $Ca^{++} + Mg^{++}$. The degrees of sodicity and their respective ratios are:

Slight	less than 13:1
Moderate	13-30:1
Strong	more than 30:1

Sodium adsorption ratio (SAR). A measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration.

Soft bedrock. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil. A natural, three-dimensional body at the earth's surface. It can support plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil erodibility factors. Factors (Kw) and (Kf) are erodibility factors which quantify the susceptibility of soil to detachment by water. These erodibility factors predict the long-term average soil loss which results from sheet and rill erosion under various alternative combinations of crop systems and conservation techniques. Factor Kw indicates the erodibility of the whole soil, and factor Kf indicates the erodibility only the fine-earth fraction, which is the material less than 20 mm in diameter.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Stratified. Formed, arranged, or deposited in layers. The term refers to geologic deposits. Layers in soils that result from the processes of soil formation are called horizons; those inherited from the parent material are called strata.

Stream terrace. One of a series of platforms in a stream valley, flanking and more or less parallel to the stream channel, originally formed near the level of the stream, and representing the dissected remnants of an abandoned flood plain, streambed, or valley floor produced during a former period of erosion or deposition.

Stringers. Typically meandering, elongated drainageways that tend to be narrow.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular. Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the E horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Summit. The topographically highest position of a hill slope. It has a nearly level (planar or only slightly convex) surface.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

T factor. The soil loss tolerance factor. An estimate of the maximum annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior. Soils are recognized as taxadjuncts only when one or more of their characteristics are slightly outside the range defined for the family of the series for which the soils are named.

Temperature regime, soil. A system that categorizes, for taxonomic purposes, general, long-term soil temperature conditions at the standard depth of 20 inches or at the bedrock surface, whichever is shallower. The various regimes are defined according to the freezing point of water or the high and low extremes for significant biological activity. The regimes, which are fully defined in "Keys to Soil Taxonomy," are outlined as follows:
Pergellic.—Soils that have a mean annual temperature of less than 32 degrees F and that have permafrost.
Cryic.—Soils that have a mean annual temperature between 32 and 47 degrees F and that remain cold in summer.
Frigid.—Soils that have a mean annual temperature similar to that of the soils in the cryic regime but that have an average summer temperature that is at least 9 degrees F warmer.
Mesic.—Soils in which the mean annual temperature is between 47 and 59 degrees F and the difference between summer and winter temperatures is more than 9 degrees.
Thermic.—Soils in which the mean annual temperature is between 59 and 72 degrees F and the difference between mean summer and winter temperatures is more than 9 degrees.
Hyperthermic.—Soils in which the mean annual temperature is more than 72 degrees F and the difference between mean summer and mean winter temperatures is more than 9 degrees.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Terrace (geomorphologic). A steplike surface, bordering a valley floor or shoreline, that represents the former position of a flood plain, lake, or seashore. The term is generally applied to both the relatively flat summit surface (tread), cut or built by stream or wave action, and the steeper descending slope (scarp, riser), graded to a lower base level of erosion. Practically, terraces are considered to be generally flat alluvial areas above the 100-year flood stage.

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."

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Vernal pool. Shallow surficial depressions that are temporarily filled with water during winter and spring rains and desiccate during the dry summer months. They occur as small, poorly drained depressions perched above an impermeable or very slowly permeable soil horizon or bedrock.

Very deep soil. See Depth, soil.

Very shallow soil. See Depth, soil.

Water table. The upper surface of ground water or that level below which the soil is saturated by water. Also the top of an aquifer.

WEG. See Wind erodibility group.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Wind erodibility group (WEG). A group of soils that have similar properties affecting their resistance to soil blowing in cultivated areas.

Xeric moisture regime. The typical moisture regime in areas of Mediterranean climates, where winters are moist and cool and summers are warm and dry. The moisture, which falls during the winter, when potential evapotranspiration is at a minimum, is particularly effective for leaching. The mean annual soil temperature is lower than 22 degrees C, and the mean summer and mean winter soil temperatures differ by 6 degrees C.

Appendices

Appendix A is an excerpt from California supplement CA-4 to the National Conservation Planning Manual, dated February 1981, United States Department of Agriculture, Soil Conservation Service.

Appendix B is an edited version of the guides for assigning soils to land capability classes, subclasses, and units. The original documentation is a California guide dated April 2000.

Appendix A.—Prime Farmlands—California

Prime farmland is land best suited for producing food, forage, fiber, and oilseed crops and also available for these uses (the land could be cropland, pastureland, rangeland, forest land, or other land but not urban builtup land or water). It has the soil quality, growing season, and moisture supply needed to produce sustained high yields of crops economically when treated and managed, including water management, according to modern farming methods.

Prime farmland meets all of the following criteria:

1. The soils have:
   a. Aquic, udic, ustic, or xeric moisture regimes and an available water capacity of at least 4 inches (10 cm) per 40 to 60 inches (1 to 1.52 meters) of soil to produce the commonly grown cultivated crops (cultivated crops include, but are not limited to, grain, forage, fiber, oilseed, sugarbeets, vegetables, orchard, vineyard, and bush fruit crops) adapted to the region in 7 or more years out of 10; or
   b. Xeric, ustic, aridic, or torric moisture regimes in which the available water capacity is at least 4 inches (10 cm) per 40 to 60 inches (1 to 1.52 meters) of soil and the area has a developed irrigation water supply that is dependable (a dependable water supply is one in which enough water is available for irrigation in 8 out of 10 years for the crops commonly grown) and of adequate quality; and,
2. The soils have a temperature regime that is frigid, mesic, thermic, or hyperthermic (pergelic and cryic regimes are excluded). These are soils that, at a depth of 20 inches (50 cm), have a mean annual temperature higher than 32 degrees F (0 degrees C). In addition, the mean summer temperature at this depth in soils with an O horizon is higher than 47 degrees F (8 degrees C); in soils that have no O horizon, the mean summer temperature is higher than 59 degrees F (15 degrees C); and,
3. The soils have a pH between 4.5 and 8.4 in all horizons within a depth of 40 inches (1 meter); and,
4. The soils either have no water table or have a water table that is maintained at a sufficient depth during the cropping season to allow cultivated crops common to the area to be grown; and,
5. The soils can be managed so that, in all horizons within a depth of 40 inches (1 meter), during part of each year the conductivity of the saturation extract is less than 4 mmhos/cm and the exchangeable sodium percentage (ESP) is less than 15; and,
6. The soils are not flooded frequently during the growing season (less often than once in 2 years); and,
7. The product of K (erodibility factor) x percent slope is less than 2.0; and,
8. The soils have a permeability rate of at least 0.06 inch (0.15 cm) per hour in the upper 20 inches (50 cm) and the mean annual soil temperature at a depth of 20 inches (50 cm) is less than 59 degrees F (15 degrees C); the permeability rate is not a limiting factor if the mean annual soil temperature is 59 degrees F (15 degrees C) or higher; and,
9. Less than 10 percent of the surface layer [upper 6 inches (15 cm)] in these soils consists of rock fragments coarser than 3 inches (7.6 cm); and,
10. The soils have a minimum rooting depth of 40 inches (1 meter).

The national Land Inventory Monitoring (LIM) definitions have been slightly modified for California standards: criterion 1 is a California definition, not a national one. Part A which reads "AWC of at least 4 inches (10 cm), per 40 to 60 inches (1 to 1.52 meters) of soil" is a California definition.

Appendix B.—Guide for Placing Soils in Capability Classes

Criteria	Capability class							
	1	2	3	4	5	6 [12]	7 [13]	8 [14]
Effective soil depth (in) [1]	≥40	≥40	≥20	≥10	≥20	≥10	Any	Any
ETp 32 degrees F	≥20	≥14	≥10	≥6	≥6	≥4	---	Any
4ETa	≥20	≥16	≥12	≥8	≥8	≥6	≥2	Any
Surface texture (irrigated)	SL-CL	LS-C, may be GR	Any, may be GR, CB	Any, may be GRV, CBV, ST [10]	Any, may be GRX, CBX, STV	Any, may be GRX, CBX, STV	Any	Any
Surface texture (nonirrigated)	SL-CL	SL-C, may be GR	SL-C, may be, GR, CB	LS-C, GRV, CBV, ST [10]	Any, may be GRX, CBX, STV	Any, may be GRX, CBX, STV	Any	Any
Permeability (in/hr) [2]	0.2-6.0	0.06-20	<0.06-20	Any	Any	Any	Any	Any
Depth to water table (in) [3]	Well or mod. well >60	Somewhat poorly through somewhat excessively >36	Poorly through excessively >20	Poorly through excessively >20	Any	Any	Any	Any
Available water capacity (in) [4]	≥7.5 avg. AWC ≥0.13 in/in	≥5.0 avg. AWC ≥0.08 in/in	≥3.5 avg. AWC ≥0.06 in/in	≥2.5 avg. AWC ≥0.04 in/in	≥3.0 avg. AWC	≥2.0 avg. AWC	≥1.0 avg. AWC	Any
Slope (%): [5, 6, 7]								
Group A	<2	<5	<8	<15	<2	<25	<50	Any
Group B	<2	<8	<15	<25	<2	<50	<75	Any
Erosion hazard	None or slight	None through moderate	None through high	Any	None or slight	Any	Any	Any
Flooding	None or rare	None through occasional	None through occasional	None through frequent [11]	Any	Any	Any	Any
Salinity/EC x 10 at 25 degrees C (mmhos/cm) [8]	<4	<8	<16	<16	<8	Dryland, <16 Irrigated, any	Any	Any
Alkali ESP [8]	None	<25	<50	<50	<25	Dryland, <25 Irrigated, <50	Any	Any

Guide for Placing Soils in Capability Classes—Continued

Criteria	Capability class							
	1	2	3	4	5	6 [12]	7 [13]	8 [14]
Toxic substances [9]	None	None or slight	None through moderate	None through moderate	None or slight	Dryland, slight Irrigated, slight through moderate	Any	Any
Frost-free season (32 degrees F)	≥140 days	≥100 days	≥80 days	≥50 days	Any	Any	Any	Any

[1] Claypans with permeability of less than 0.06 inch/hour will be treated as limiting the effective depth.
[2] Permeability of the least permeable subsurface horizon.
[3] Depth to the water table during the growing season.
[4] Available moisture between field capacity and wilting point.
[5] Use erosion hazard to help determine upper slope percent.
[6] In existing map units, 9 percent and 30 percent can be substituted for 8 percent and 25 percent.
[7] Group A includes soils with K factors of 0.37 or more and soils that are subject to rill and gully erosion, such as soils that formed in granitic material and soils that have a claypan. Other soils are in group B.
[8] For salts and alkali to be a major limitation, there should be other soil limitations, such as slow permeability or a high water table.
[9] Such as boron and magnesium, which are leached with difficulty.
[10] Rock fragments interfere with tillage but do not prevent cropping.
[11] Frequent flooding that does not prevent normal cropping.
[12] Range and woodland mechanical practices can be applied to class 6 land.
[13] Range and woodland mechanical practices are impractical on class 7 land.
[14] Class 8 lands have limitations that preclude their use for commercial plant production and restrict their use to recreation, water supply, or esthetic purposes.

Guide for Placing Soils in Capability Subclasses in California—A

(Where wind velocities are low and/or soils are irrigated. Only the soils in capability classes 2 through 8 are assigned to a subclass.)

Soil properties	Subclass by slope range[1]			
	0-2%	2-9%	9-15%	15+%
1. Moderately slowly, moderately, moderately rapidly, rapidly, and very rapidly permeable, moderately well drained, well drained, somewhat excessively drained, and excessively drained soils more than 20 inches deep that have the following textures:				
a. Fine and very fine	s	e	e	e
b. Moderately fine	s[2, 3]	e	e	e
c. Medium	s[2, 3]	e	e	e
d. Moderately coarse, with or without a textural B	s[2, 3]	e	e	e
e. Coarse and very coarse, with a textural B	s	e	e	e
f. Coarse and very coarse, with little or no textural B	s	s	s	e
2. Slowly and very slowly permeable soils that are more than 20 inches deep:[4]				
a. Well drained and moderately well drained	s	e	e	e
b. Somewhat poorly drained	w	e	e	e
3. Wet, poorly drained and very poorly drained soils:				
a. Moderately coarse to fine textured (includes claypans and fragipans)	w	w	w	e
b. Coarse textured with little or no textural B[5]	w	w	w	e
c. Deep organic soils[5]	w	w	w	e
4. Excessively drained, somewhat excessively drained, and moderately well drained, shallow and very shallow soils:				
a. 10 to 20 inches deep to bedrock	s	e	e	e
b. 0 to 10 inches deep to bedrock	s	s	s	s[6]

Guide for Placing Soils in Capability Subclasses in California—A (Continued)

Soil properties	Subclass by slope range[1]			
	0-2%	2-9%	9-15%	15+%
5. Excessively drained, somewhat excessively drained, well drained, and moderately well drained, saline and sodic soils (moderate to severe salinity and sodicity)	s	e	e	e
6. Soils that have a very cobbly, extremely cobbly, very gravelly, extremely gravelly, very stony, or extremely stony surface layer	s	s	s	s[7]
7. Soils that are subject to damaging overflow	w	w	w	e

[1] For soils in capability classes 2 through 8. Class 1 land is excluded.
[2] Where these soils are more than 40 inches deep, they are generally in class 1.
[3] Use "C" only for dryland if soil is class 1 irrigated.
[4] Permeability of the B horizon or control section.
[5] Including somewhat poorly drained soils.
[6] Subclass "e" if slope is more than 50 percent.
[7] Subclass "e" if slope is more than 30 percent.

Guide for Placing Soils in Capability Subclasses in California—B

(Where wind velocities are high and the soils are not irrigated. Only soils in capability classes 2 through 8 are assigned to a subclass.)

Soil properties	Subclass by slope range[1]			
	0-2%	2-9%	9-15%	15+%
1. Moderately slowly, moderately, moderately rapidly, rapidly, and very rapidly permeable, moderately well drained, well drained, somewhat excessively drained, and excessively drained soils more than 20 inches deep that have the following textures:				
a. Fine and very fine	s	e	e	e
b. Moderately fine	e	e	e	e
c. Medium	e	e	e	e
d. Moderately coarse, with or without a textural B	e	e	e	e
e. Coarse and very coarse, with a textural B	e	e	e	e
f. Coarse and very coarse, with little or no textural B	e	e	e	e
2. Slowly and very slowly permeable soils that are more than 20 inches deep:[2]				
a. Well drained and moderately well drained	s	e	e	e
b. Somewhat poorly drained	w	e	e	e
3. Wet, poorly drained and very poorly drained soils:				
a. Moderately coarse to fine textured (includes claypans and fragipans)	w	w	w	e
b. Coarse textured with little or no textural B[3]	w	w	w	e
c. Deep organic soils[3]	w	w	w	e
4. Excessively drained, somewhat excessively drained, and moderately well drained, shallow and very shallow soils:				
a. 10 to 20 inches deep to bedrock	s	s	e	e
b. 0 to 10 inches deep to bedrock	s	s	s	s[4]

Guide for Placing Soils in Capability Subclasses in California—B (Continued)

Soil properties	Subclass by slope range[1]			
	0-2%	2-9%	9-15%	15+%
5. Excessively drained, somewhat excessively drained, well drained, and moderately well drained, saline and sodic soils (moderate to severe salinity and sodicity)	s	e	e	e
6. Soils that have a very cobbly, extremely cobbly, very gravelly, extremely gravelly, very stony, or extremely stony surface layer	s	s	s	s[5]
7. Soils that are subject to damaging overflow	w	w	w	e

[1] For soils in capability classes 2 through 8. Class 1 land is excluded.
[2] Permeability of the B horizon or control section.
[3] Including somewhat poorly drained soils.
[4] Subclass "e" if slope is more than 50 percent.
[5] Subclass "e" if slope is more than 30 percent.

Guide for Placing Soils in Capability Units

Capability unit	Principal soil property or limitation
1	Potential or actual wind or water erosion hazard.
2	Drainage or overflow hazard (somewhat or poorly drained, flooded, or ponded).
3	Slowly or very slowly permeable subsoils or substrata.
4	Coarse or gravelly textures.
5	Fine or very fine textures.
6	Salinity or alkali sufficient to constitue a continuing limitation or hazard.
7	Stones, cobbles, or rocks sufficient to interfere with tillage.
8	Hardpan or hard, unweathered bedrock within the root zone.
9	Low inherent fertility associated with strong acidity, a low calcium-magnesium ratio, or excess calcium, boron, or molydenum.
10	High organic matter content—peats and mucks.
11	Coarse-sandy or very gravelly substrata limiting to root penetration and moisture retention.

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