

UNITED STATES DEPARTMENT OF AGRICULTURE

**Soil Survey**  
of  
**The Placerville Area, California**

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and

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United States Department of Agriculture



**Bureau of Chemistry and Soils**

In cooperation with the University of California Agricultural  
Experiment Station

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## SOIL SURVEY

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# SOIL SURVEY OF THE PLACERVILLE AREA, CALIFORNIA

By R. EARL STORIE, University of California, in Charge, and D. F. TRUSSELL, United States Department of Agriculture

## AREA SURVEYED

The Placerville area is in the east-central part of California and comprises the western part of Eldorado County. (Fig. 1.) The western boundary of the area is approximately 25 miles east of Sacramento, the State capital. The boundaries of the area on the south, west, and north coincide with the boundaries of the county, but the eastern boundary is an irregular line. The higher ridges and canyons of the Sierra Nevada lie east of the area surveyed. About one-third of the county is included in the Placerville area which comprises practically all the arable land. The total extent is 580 square miles, or 371,200 acres. A previous soil survey<sup>1</sup> joins the area on the north, and a narrow strip along the western edge is included in an earlier soil survey of the Sacramento area.<sup>2</sup>

The elevation along the western boundary of the area ranges from 400 to 800 feet above sea level, and there is a gradual rise to the eastern boundary, where the elevation ranges from 2,500 to 3,500 feet. The grade of the highway from Clarksville, in the western part of the area, to Camino, in the eastern part, is about 100 feet to the mile. A number of prominent hills are in the area. Pilot Hill has an elevation of 1,900 feet; Pine Hill, 2,056 feet;<sup>3</sup> Thompson Hill, 2,021 feet; Big Sugar Loaf, 1,236 feet; Mount Ararat, 2,043 feet; and Mount Orcum, 2,654 feet.

The term "foothill" is often used to distinguish the lower arable land included in the Placerville area from the higher nonagricultural land of the Sierra Nevada which lies at an elevation ranging from 3,500 to 9,000 feet. The middle and eastern parts of Eldorado County, which are not included in the present survey, extend over the summit of the Sierra Nevada to the California-Nevada boundary line. The level plains of the Sacramento Valley are within a few miles of the western boundary of the area.



FIGURE 1.—Sketch map showing location of the Placerville area, California

<sup>1</sup> COSBY, S. W., WATSON, E. B., and HARPER, W. G. SOIL SURVEY OF THE AUBURN AREA, CALIF. U. S. Dept. Agr., Bur. Chem. and Soils, Rpt. 15, series 1924, 38 p., illus. 1928.

<sup>2</sup> LAPHAM, M. H., ROOT, A. S., and MACKIE, W. W. SOIL SURVEY OF THE SACRAMENTO AREA, CALIF. U. S. Dept. Agr., Bur. Soils, Field Oper. 1904, Rpt. 6: 1049-1087, illus.

<sup>3</sup> GANNETT, H. A DICTIONARY OF ALTITUDES IN THE UNITED STATES. U. S. Geol. Survey Bul. 274, ed. 4, 1072 p. 1906.

The western part of the area is characterized by low rounded hills and numerous rocky ridges. Along the Eldorado-Sacramento County line these hills are practically treeless, but from 3 to 6 miles eastward the land supports a scattered growth of oak and brush at an elevation of approximately 1,000 feet.

The deeply intrenched canyons of the American and Cosumnes Rivers and their forks extend from east to west across the area and along the northern and southern boundaries. The canyon slopes are steep and in many places rough and stony. The only arable land in the eastern part of the area is on the tops of the ridges between the stream canyons. The slopes, above an elevation of 2,000 feet, are covered by a thick growth of merchantable timber consisting of pine, fir, and cedar.

Drainage is carried mainly by a number of streams, both large and small, flowing down the slopes of the Sierras.

Eldorado County was formed in 1850 with Coloma as the county seat. Placerville became the county seat in 1857. Very little is known of the history of the county previous to the discovery of gold. John C. Fremont, topographical engineer, came west through what is now Eldorado County from the vicinity of Lake Tahoe in February, 1844, and is supposed to have seen the Sacramento Valley from the crest of Pilot Hill on the northwestern edge of the county. Marshall, who discovered gold in California, came to the present site of Coloma in August, 1847, to erect a mill for Captain Sutter, who had a fort and trading station at Sacramento, and while he (Marshall) was working on the mill race at Coloma, discovered gold on January 19, 1848. This discovery resulted in a great influx of miners and others to this section and to the whole State, and a large number of mining towns were established between 1848 and 1850. Early mining towns included Uniontown (now Lotus), Georgetown, Michigan Flat, Pilot Hill, Spanish Dry Diggings, Greenwood, Kelsey, Mud Springs (now El Dorado), Gold Hill, Newtown, Pleasant Valley, and the present town of Placerville, which was established in 1848 and known as "Old Dry Diggings." In 1849 the name was changed to Hangtown, and in 1854 it was again changed from Hangtown to Placerville by an act of the State legislature. Latrobe in the southwestern part and Shingle Springs in the west-central part of the county were established as railroad towns when the Southern Pacific Railroad built a branch line from Sacramento to the area in 1864. From Shingle Springs freight was hauled across the mountains by wagon until the railway route via Truckee was completed in 1866.

According to the United States Census reports, the population of Eldorado County gradually decreased from 10,300 in 1870 to 6,426 in 1920, but it increased to 7,492 in 1930.<sup>4</sup> The loss in population was largely brought about by the decline in mining operations. All the population is classed as rural and is largely Anglo-Saxon. The 1870 and 1880 censuses show a large proportion of Chinese, but at the present time there are very few Chinese in the county. Very little farming was done during the early mining period as all able-bodied men worked in the mines, and many of the older farmers were former miners, the younger farmers coming into the area from the

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<sup>4</sup> Soil survey reports are dated as of the year in which the field work was completed. Later census figures are given whenever possible.

Sacramento and San Joaquin Valleys. With the exception of residents of the recreation resorts at Lake Tahoe and on American River and of the scattered lumber camps, the population of the county is chiefly in the area covered by the survey. Placerville is now the largest town and county seat and in 1930 had a population of 1,914. Other towns are Camino, Diamond Spring, Georgetown, El Dorado, and Coloma. Many of the residents of Camino and Diamond Spring are employed at the large mills, where logs are brought from the higher mountain camps to be worked into finished lumber. Many of the smaller settlements are remnants of old mining towns.

The Southern Pacific Railroad operates a branch line from Sacramento through Folsom (Sacramento County), Latrobe, Shingle Springs, El Dorado, Diamond Spring, Placerville, and Camino. A paved highway extends through the area from Clarksville to Camino, affording good transportation to Sacramento or to the east over the summit of the Sierra Nevada. Good mountain roads lead into Placerville and to other points on the highway, affording a means of travel from the outlying districts in the northern and southern parts of the area. The Mother Lode Highway is being completed from a point near Nashville northward through the central part of the county to the Auburn Bridge and will facilitate transportation in this direction. The southeastern part of the area is somewhat isolated from markets by the canyons of Cosumnes River, which are crossed by rough roads, and farms in the northeastern part are from 10 to 25 miles from a shipping point.

Most of the fruit produced in the area is shipped from Placerville. A considerable part of the produce on the Georgetown-Cool divide is shipped from Auburn, Placer County. Beef cattle, dairy products, sheep, and wool are shipped to outside markets from a number of points on the Southern Pacific Railroad.

### CLIMATE

The Placerville area, situated between the Sacramento Valley and the Sierra Nevada, has a wide range of climatic conditions. In the western part, bordering the Sacramento Valley, the summers are hot and dry and the rainfall is low, and in the eastern part, bordering the mountainous district, the climate is cooler and moister.

The foothill region has been termed the "thermal belt" because of its mild winter climate, yet marked differences occur within short distances as the temperature is dependent on elevation and air drainage. In the depressions and small valleys the temperature is lower, as the cool air moves downward, and on the slopes and tops of the ridges it is higher. This is a very important factor in determining the location of orchards.

The eastern part of the area has the shortest growing season and the highest rainfall. Climatic conditions at Placerville, which lies at an elevation of 1,925 feet, are representative of average conditions in the central part of the area. The average frost-free season at Placerville is 190 days, from April 20 to October 27, inclusive. Killing frosts have been known to occur as early as August 18 and as late as June 15. Above an elevation of 3,500 feet frosts are likely to occur any month in the year, and consequently the growing of fruits, vegetables, and general crops is uncertain, but grass for hay

and pasturage can be grown. Occasional snowfalls occur in the extreme eastern and northeastern parts of the area.

Table 1, compiled from records of the United States Weather Bureau station at Placerville, gives data fairly representative of climatic conditions in the main agricultural part of the area.

TABLE 1.—Normal monthly, seasonal, and annual temperature and precipitation at Placerville, Eldorado County, Calif.

[Elevation, 1,925 feet]

Month	Temperature			Precipitation		
	Mean	Absolute maximum	Absolute minimum	Mean	Total amount for the driest year (1898)	Total amount for the wettest year (1884)
	°F.	°F.	°F.	Inches	Inches	Inches
December.....	42.0	76	15	7.00	2.80	22.65
January.....	41.8	80	10	8.43	1.78	6.06
February.....	44.4	75	14	6.53	6.18	11.56
Winter.....	42.7	80	10	21.96	10.76	40.27
March.....	47.2	80	20	7.20	1.28	14.46
April.....	52.1	90	24	3.72	.58	11.82
May.....	56.2	101	29	2.05	2.70	1.60
Spring.....	51.8	101	20	12.97	4.56	27.88
June.....	65.8	104	30	.55	.66	2.51
July.....	72.2	114	40	.02	( <sup>1</sup> )	( <sup>1</sup> )
August.....	69.4	106	39	.02	( <sup>1</sup> )	.03
Summer.....	69.1	114	30	.59	.66	2.54
September.....	64.2	104	30	.77	.11	.85
October.....	55.7	92	26	2.11	1.00	2.47
November.....	47.4	81	18	4.44	2.30	.10
Fall.....	55.8	104	18	7.32	3.41	3.42
Year.....	54.8	114	10	42.84	19.39	74.11

<sup>1</sup> Traces.

## AGRICULTURE

The first white settlers in the Placerville area were miners who paid practically no attention to agriculture. In the vicinity of Union Bar and Coloma potatoes and other vegetables to supply the miners were grown as early as 1849.<sup>5</sup> Garden Valley derived its name from the vegetable growing carried on in the early days. The first barley grown in the county was sown in 1851 in Greenwood Valley, and one farmer, in the vicinity of Pilot Hill, engaged in general farming on a large scale in 1851 and 1852, being the first man in the area to make use of harvesting machinery.

During the years from 1850 to 1875 canals and ditches to supply water for gold mining were extensively developed over the area, and water from these canals was also used to irrigate agricultural land. In 1855, 20 canals were listed, including 475 miles of mains and 325 miles of laterals. The building of the Gold Hill Canal in 1853

<sup>5</sup> SIOLL, P. HISTORICAL SOUVENIR OF ELDORADO COUNTY, CALIFORNIA, WITH ILLUSTRATIONS AND BIOGRAPHICAL SKETCHES OF ITS PROMINENT MEN AND PIONEERS. 272 p., illus. Oakland, Calif. 1883.

marked the beginning of the extensive fruit-growing interests in the Gold Hill-Coloma district, where successful orchards were set out between 1850 and 1860. Sioli states that "the California Fruit Growing Association, located 5 miles south of Placerville, in 1881 had 140 acres of orchard comprising peach, prune, and plum trees."

Table 2, compiled from the United States census reports, shows the number and size of farms and other statistical data in regard to farm land in Eldorado County in census years.

TABLE 2.—Census data relating to farms in Eldorado County, Calif.

Year	Farms	Land area of county	Land in farms	Improved land in farms	Average size of farms	Value of farm property per farm
	Number	Acres	Per cent	Per cent	Acres	Dollars
1880	542	1, 121, 920	11. 8	52. 3	244. 0	2, 885
1890	744	1, 121, 920	10. 6	29. 1	238. 0	4, 125
1900	759	1, 121, 920	18. 7	21. 7	275. 8	3, 554
1910	716	1, 121, 920	18. 8	19. 8	294. 5	5, 273
1920	729	1, 111, 680	21. 6	18. 1	329. 6	11, 013
1925	883	1, 111, 680	25. 8	17. 4	324. 8	10, 636

<sup>1</sup> Includes crop land and plowable pasture.

These figures show that there has been a gradual increase in the number of farms, together with an increase in the average size of farms since 1880. The value of farm property has increased greatly.

Table 3 gives the acreage in selected crops and the number of fruit trees in Eldorado County in census years.

TABLE 3.—Acreage in selected crops and number of fruit trees in Eldorado County, Calif., in 1879, 1889, 1899, 1909, 1919, and 1924

Crop	1879	1889	1899	1909	1919	1924
	Acres	Acres	Acres	Acres	Acres	Acres
Corn	13	29	31	38	65	42
Oats	57	630	1, 067	543	732	268
Barley	1, 137	2, 682	401	50	275	41
Wheat	1, 360	3, 912	1, 235	193	704	103
Hay	8, 098	12, 501	16, 187	12, 115	9, 717	6, 054
Potatoes		90	71	113	89	47
	Trees	Trees	Trees	Trees	Trees	Trees
Apples		50, 768	36, 944	31, 929	26, 464	31, 744
Apricots		346	1, 905	503	20	
Peaches		93, 005	91, 851	61, 800	51, 011	51, 085
Pears		16, 357	52, 311	49, 672	108, 305	411, 033
Plums and prunes		20, 955	43, 845	32, 764	47, 211	80, 090
Almonds and walnuts			1, 381	1, 318	1, 938	
	Vines	Vines	Vines	Vines	Vines	Vines
Grapes			704, 702	581, 342	182, 067	258, 672

The livestock industry in Eldorado County has been fairly stationary from 1900 to 1925. There has been a gradual increase in the number of sheep, but the number of hogs has decreased, probably because grain growing is decreasing and because the trend is away from general farming and toward fruit growing. The acreage devoted to some deciduous fruits, particularly pears, has increased rapidly. The plantings of peaches are now increasing over the plantings of plums. There has been a slight decrease in the acreage of

apples, which were the principal fruit in the early days, and many old apple trees are scattered over the higher parts of the area.

At the present time pears are the principal deciduous fruit crop and the most important and valuable agricultural product of the county. The California Crop Report of 1925<sup>6</sup> reports 2,300 acres of bearing pear trees and 920 acres of nonbearing trees, a total of 3,220 acres. The leading variety of pears is the Bartlett, which comprises about 80 per cent of the total plantings.<sup>7</sup> The need for cross-pollination of this variety, together with the fact that later-maturing varieties are profitable, has led to an increase in plantings of other varieties during the last few years. Probably 80 per cent of the varieties other than Bartlett are Beure Bosc and 20 per cent are Winter Nelis. Practically all pears produced in the area are shipped fresh to San Francisco and eastern markets. In 1926 the Placerville district shipped 500,651 packages and the Northside district 52,000. The Northside district, including the Pilot Hill, Cool, and Penobscot districts, ship their produce through Auburn, which is located on the main line of the Southern Pacific Railroad in Placer County. Over a period of four years the net return to the grower, per box of 50 pounds gross, has been for Bartlett, \$1.65; Bosc, \$1.85; and Nelis, \$1.50. These prices represent the amount returned to the grower from the packing house after packing, shipping, refrigeration, and commission charges are paid. The Placerville Fruit Growers' Association, a cooperative organization made up of a majority of the fruit growers in the vicinity of Placerville, operate their own packing house. The average yield of pears in Eldorado County is about 4 tons to the acre.

The largest pear-growing district in Eldorado County is within a radius of 8 miles of Placerville and extends east of Placerville on Camino Ridge. Pears are also grown in the Northside district in the vicinities of Georgetown, Penobscot School, Cool, and Pilot Hill. Other scattered plantings occur over the county where water is available for irrigation. Pears are grown on practically all the deeper soils in the area, the deeper soils of the Aiken series being recognized as very desirable, although the danger of frost increases at the higher elevations.

Peaches are grown on approximately 525 acres. The most popular varieties are the Elberta, Hale Early, Orange Cling, Levy, Picquet, and Salwey. There is an increasing tendency to plant the late-maturing varieties in order to avoid competition with the Elberta and other varieties from other districts of California and elsewhere in the United States. Peaches are shipped fresh to the San Francisco and eastern markets. The average return to the grower for cling peaches over a period of four years has been about \$1 per 21½-pound box, from which must be deducted the box and packing charges. In 1919 the total shipments from Placerville amounted to 78,809 packages, and in 1926, to 94,961 packages. The chief peach-growing districts are in the vicinity of Gold Hill, Coloma, Missouri Flat, and El Dorado. Peaches are grown primarily on the lighter-textured soils of the Holland and Diamond Springs series, and particular

<sup>6</sup> KAUFMAN, E. E. CALIFORNIA CROP REPORT FOR 1925. Calif. Dept. Agr. Spec. Pub. 63, 1926.

<sup>7</sup> Much of the data pertaining to general agriculture of the county was supplied by Burle J. Jones, county farm advisor.

attention is paid to obtaining comparatively frost-free locations in setting out an orchard.

Plum trees are grown on approximately 630 acres. The varieties grown are the Grand Duke, Diamond, and President. In 1926 the total shipment of plums from the Placerville district was 73,032 packages and from the Northside district 15,000, making a total of 88,032 packages from the county. Plums are shipped to the eastern markets, and the return to the grower averages about \$1 a 26-pound box, out of which the packing charges must be taken. Plums are not considered so desirable a fruit for this area as pears and peaches. They are grown on the medium-textured soils. The plantings are scattered over the area where water is available for irrigation and where transportation facilities are good.

Apples are grown chiefly in the older orchards. New orchards are being set out, mainly at elevations too high for the commercial production of other deciduous fruits. The apples are handled and shipped largely by the individual growers. They are grown on many different soils, but mostly on the deeper soils.

Cherries are produced commercially in the vicinities of Cool and Penobscot, with a few plantings elsewhere. The principal varieties are Napoleon, Black Tartarian, Bing, and Lambert. In 1926, 120 acres of bearing and 126 acres of nonbearing trees were reported. The acreage is increasing in the districts mentioned. Cherries are produced for the most part without irrigation, and they seem to be less susceptible to gummosis and other diseases so damaging in some areas where the trees are irrigated. The soil in the vicinities of Cool and Penobscot, mapped as Aiken clay loam, is somewhat lighter in texture and more friable than typical and contains a higher content of organic matter. Cherries are also grown on Holland fine sandy loam and Sierra loam in this district. Care is used in selecting the location of the orchards in regard to exposure and air drainage. Total shipments of cherries average about 25,000 packages, containing about 8 pounds each per annum, for which the growers have been receiving about 10 cents a pound net during the last four years.

The production of grapes is not important at the present time. Most of the plantings are scattered over the county, and the crop is grown without irrigation. The Mission variety predominates, with the Zinfandel, Cornichon, Black Hamburg, and other black table varieties grown to some extent. There are at present about 300,000 vines, and much of the produce is sold to buyers outside the county. A moderately good tonnage of fruit containing a very high sugar content is produced. Grapevines are grown on a fairly wide range of soils.

Walnuts are grown on a small scale, the Franquette being the leading variety. The small output is absorbed by the local market. In general walnuts are grown without irrigation on the deeper soils where the rainfall is sufficient. There are small plantings of strawberries, blackberries, raspberries, and Logan blackberries. Conditions are ideal for small fruits, but the distance from markets is a restricting factor. The present output of berries is marketed locally.

Winter cover crops are generally grown in the orchards. Common vetch seems best suited to local conditions, with hairy vetch second, and purple vetch doing well at elevations below 1,500 feet. The cover crop is planted in September or October and usually turned

under in April. Animal manures are used to some extent in orchards and are practically always used for small fruits and truck crops. The use of nitrate of potash is increasing as a means of stimulating growth in trees that are dwarfed or deficient in vigor. It is applied in the spring and is carried to the roots of the trees by the first irrigation water.

The irrigation season begins the latter part of May and continues to October. After irrigation furrows are opened in the spring the general practice is to allow them to remain open throughout the season.

Long pruning or modifications of that type are practiced in most of the orchards. During the last 10 years the Caldwell system of tying down pear trees has been developed. This system consists of very light pruning of the smaller branches until the pear tree is 4 or 5 years old and then pulling down the outer ends of the larger branches and tying them to stakes driven in the ground or to the trunk of the tree. This practice results in a spreading growth of the tree and, it is claimed, has been of value in developing trees having a large bearing area within a reasonable time.

The most conspicuous orchard pests in the area are the codling moth of pears and apples and the blister mite of pears. Other pests of minor importance are red spider, mealy plum louse, root aphid of pears, cankerworm, woolly aphid of apples, black cherry aphid on both cherries and pears, leaf hopper, and bud mites. The principal diseases are pear blight of pears and apples, peach blight, curly leaf of peaches, gummosis of cherries and plums and sometimes of peaches, oak-root fungus, and crown gall.

At the present time only the Fairplay district produces cereal crops harvested for grain, most of which is sold locally. Wheat yields from 8 to 17 sacks<sup>\*</sup> to the acre on Holland loamy sand. One grower reported a yield of 13 sacks to the acre in 1926. In 1925, 103 acres of wheat, 316 acres of barley, and 268 acres of oats were reported threshed for grain. Small grains are cut for hay from about 4,000 acres, and hay is cut from about 1,500 acres of wild grasses and from about 300 acres of alfalfa and clover. The average yield of hay is about 1 ton to the acre per annum. Irrigated mountain meadows are scattered over the eastern part of the area, from some of which the grass is cut for hay, and others are pastured.

Cattle raising ranks second in importance to pear growing. In 1925 there were 12,919 head of cattle in the county, about 2,200 of which were dairy cattle and the remainder beef cattle. Land held in large tracts in the western part of the area is used for grazing during spring and winter, and the cattle are pastured in the mountains during summer and fall. Many of the cattlemen own ranges in the mountains and others lease range land from the Government. The cattle are driven to the mountain pastures in May and June and returned to the foothills in October. Shorthorn and Hereford are the favorite breeds. From 10 to 20 acres of average foothill pasture are required to carry one steer, with additional summer grazing in the high mountains. Most of the dairy herds are widely scattered on comparatively small farms, the average dairy herd including 10

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<sup>\*</sup> The capacity of grain sacks in different markets in California ranges from 100 to 125 pounds, but the general average is about 2 bushels.

or 15 cows. A number of fairly large dairies are in the Latrobe-Clarksville district in the western part of the county. During 1926 about 12,000 gallons of cream were shipped from Placerville to outside creameries.

The number of sheep and goats is gradually increasing, 16,000 sheep and 5,000 goats being reported in the county in 1925. There is an increasing tendency to raise sheep and goats on the smaller farms in order to utilize the poorer soils in the western part of the area and as an aid in clearing land and keeping down brush and sprouts. Most of the goats are Angoras, as there is no demand for goat milk. An Angora goat produces from  $2\frac{1}{2}$  to 4 pounds of mohair which sells from 40 to 60 cents a pound. The kids sell from \$1.50 to \$2 each.

A number of commercial poultry flocks, mainly White Leghorns, are being established in the county. On most farms green feeds and milk are available and other poultry feeds are imported. A number of the flocks have been established in the Kelsey and Cool districts, and the eggs are shipped from Auburn. A few farmers raise turkeys, but turkey raising is a minor branch of the poultry industry.

In the recently developed orchard districts farm buildings are new and modern, but in the outlying livestock-raising districts a large proportion of the buildings are uninhabited and many of them are in need of repair. Throughout the orchard districts the light tractor is in general use, but horses and mules of medium weight and rather poor quality are used on the smaller farms.

Very little outside labor is employed on the farms and ranches, except during fruit-harvest season and sufficient local labor is generally available at this season. Laborers are mostly American born. Day labor is paid from \$2.50 to \$4.

The size of most farms ranges from 200 to 400 acres, a few acres being in pears, peaches, or plums and the rest in grazing land. In the livestock-raising districts the ranches are large, comprising 640 or more acres. The census of 1925 shows that 90 per cent of the farms are operated by owners, 7 per cent by tenants, and 3 per cent by managers.

## SOILS

The Placerville area is situated in the east-central part of California, in the lower mountains and foothills of the Sierra Nevada. There is a gradual rise from the western part of the area, which lies at an elevation of 400 feet, to the eastern boundary lying at an elevation ranging from 2,500 to 3,500 feet. With this rise in elevation, there is a gradual increase in the annual rainfall from approximately 24 inches on the west to 60 inches in the extreme eastern part, and this difference in rainfall has had a marked effect on soil development and weathering.

As this is a foothill and mountainous area, only a few alluvial deposits occur in small bodies on some of the smaller streams. Old alluvial deposits existed in a number of places at one time, but these have been placer mined, so that remnants only of the original material remain, their place being taken by placer diggings and tailings.

The soils in the southwestern part of the area in the lower foothills are in general shallow and stony, bedrock being present in most

places within a depth of 3 feet. Most of the ridges are covered with large rock outcrops and are essentially nonagricultural, but the lower slopes contain small patches of plow land. Bald hills lie along the extreme western edge of the area, and from here the vegetal cover ranges to the scattered oak and brush cover in the vicinity of Shingle Springs. One large area covered by chamiso (*Adenostoma fasciculatum*) extends northwest and southwest of Shingle Springs. Here the soil is stony and shallow and essentially nonagricultural. Other stony bodies extend in a northwest-southeast direction through the area.

The shallow soils of the Aiken series in the lower foothills differ from the deeper soils lying at higher elevations. The shallow soils are lighter red, contain less organic matter, and lack a distinct subsoil, or have a poorly developed subsoil, or B horizon. (Pl. 1, B.) In general this type of land is held in large tracts and utilized for grazing cattle, sheep, and goats (pl. 1, A), but land that is capable of being plowed is utilized for grain or grain hay. Such soil conditions exist in the southwestern part of the area between elevations of 400 and 1,000 feet. The Aiken soils in the eastern part of the area have been developed under an annual rainfall ranging from 40 to 60 inches. They are redder than the soils farther west, are deeper, and, in the virgin state, are covered by a thick growth of pine, fir, and cedar. Under these conditions a definite soil profile has been developed having a surface mulch of organic material and a red subsurface soil, or A<sub>2</sub> horizon. The subsoil shows evidence of considerable weathering, and upper and lower subsoil layers, or B<sub>1</sub> and B<sub>2</sub> horizons, have developed. The subsoil is, typically, considerably heavier in texture than the surface soil. These soils are utilized for fruit and general farm crops, although the frost hazard must be taken into account above an elevation of 3,000 feet. The cost of clearing forested land of this kind amounts to as much as \$100 an acre.

The mother lode, a gold-bearing formation of metamorphosed sedimentary rocks, extends through the area in a northwest-southeast direction. The soil formed over these rocks has been mined over to such an extent that the surface configuration has been altered, leaving gullies and exposed pieces of slate bedrock. This extensive area, composed of Mariposa and Sites soils, extends from Diamond Spring northwest through Placerville, Kelsey, Garden Valley, and Georgetown, and these soils are locally known as "slate soils." They are of loam, silt loam, and clay texture, and the slate substratum occurs at a depth of less than 6 feet below the surface.

The soils of the Placerville area have been classed in three groups as follows: Residual soils, recent-alluvial soils, and miscellaneous materials.

The soils of the first two groups have been classified into series on the basis of similarity in color and in profile (including the same general range in color, consistence, and structure), as well as other physical and chemical properties. The soil type is the unit of the soil series and of mapping, and it includes areas of soil material which are similar in all characteristics including that of texture of the surface soil. Where subordinate variations from typical occur within a soil, they are mapped and recognized as phases of the type.

Owing to the comparatively early date of the preceding soil survey of the Sacramento area<sup>9</sup> and to development in the science of soil mapping and soil classification which has since taken place, a number of apparent discrepancies in soil classification and names appears in the reports of the two surveys. The more important of these are noted in the descriptions of the soil series and types which follow.

With the exception of a few inextensive areas, the soils of the Placerville area are residual in origin. They have been formed by the weathering in place of the various underlying consolidated rocks and, having been subjected to various climatic conditions, differ in profile characteristics. Thus, the soils of the Aiken series occurring in the lower foothills are of comparatively slight depth and have slightly developed profile characteristics, whereas the soils of the Aiken, Sites, Holland, and Sierra series occurring in the upper foothills have well-defined profiles. The surface horizon ( $A_1$ ) is rather high in organic-matter content and is darker than the underlying ( $A_2$ ) horizon which rests on a heavier-textured, more compact subsoil gradually merging into the partly weathered and broken bedrock (the C horizon). The residual soils identified and mapped in this area have been grouped in the Sierra, Holland, Diamond Springs, Aiken, Olympic, Mariposa, and Sites series.

Soils of the Sierra series as recognized at the present time consist typically of pronounced reddish-brown, light-red, or dark brownish-red surface soils overlying more compact and heavier-textured subsoils of similar or redder color. A considerable quantity of quartz grit occurs throughout the soil, giving the soil material of each horizon a gritty feel. Granitic bedrock lies from 2 to 5 feet below the surface. These soils are noncalcareous, of low or medium organic-matter content, and, under virgin conditions, are covered with a growth of trees, brush, and native grasses. The stonier and shallower soils in the western part of the area are covered by a thick growth of chamiso. The Sierra soils occupy rolling or hilly regions, and drainage is well developed. With irrigation, the better soil types are utilized for fruit and general farm crops, but where irrigation water is not available they are utilized for grain and grain hay.

Typically the soils of the Holland series are brown or grayish brown. Under virgin conditions the loose granular surface layer, or  $A_1$  horizon, is grayish brown or light grayish brown. The subsoil is typically somewhat heavier in texture and more compact than the surface soil and ranges in color from reddish brown to red. An appreciable amount of quartz grit is characteristic throughout both the surface soil and subsoil. The underlying parent granitic rock, occurring from 2 to 5 feet below the surface, is weathered to a considerable depth. The Holland soils occupy rolling or gently sloping hills, with a few steep slopes bordering deeply cut stream ways. (Pl. 2, A.) In most areas drainage is good, although poorly drained pockets occur in a few places, especially where there is seepage from irrigation ditches. These soils are noncalcareous and contain a small amount of organic matter. They support a natural growth of oak, pine, and grasses. Where irrigation water is available, these soils, owing to their sandy character, are considered very desirable for peaches and plums, and other fruits do well.

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<sup>9</sup> See footnote 2, p. 1.

Diamond Springs soils range in color from brownish yellow or grayish yellow to reddish yellow. The subsoil is yellowish red and is more compact and heavier in texture than the surface soil. Considerable quartz grit is present throughout the weathered soil. The parent bedrock, which is a quartz porphyry in this area and is shattered and weathered to a considerable depth, is reached within 5 feet of the surface. These soils occur on gentle or fairly steep slopes where drainage is good. They contain a moderate or low content of organic matter, and give a slight acid reaction with soiltex. Pine, live oak, and brush grow on these soils under virgin conditions. Mining operations have disturbed and modified the surface soils to considerable extent. Where irrigation water is available the land is utilized for orchards.

Soils of the Aiken series are dull brownish red or red. In the eastern part of the area, where the rainfall is heavier, a thin surface horizon (A<sub>1</sub>) of organic-matter accumulation and reddish-brown friable granular material is developed under virgin conditions. The subsoil is heavier in texture than the surface soil, is more compact, and shows distinct structural characteristics, especially in areas having the greatest rainfall. Disintegrating bedrock occurs in most places within 6 feet of the surface, although the depth of weathering in soils of this series varies greatly. In the shallow areas the bedrock lies within 3 feet of the surface (pl. 1, B), but it occurs below a depth of 6 feet in the deep phase of Aiken clay loam on Camino Ridge. The Aiken soils occupy rolling or mountainous regions, and drainage is good in most places. These soils contain variable amounts of organic matter, the quantity of which depends on the location of the areas with respect to rainfall and natural vegetation. The type of cover ranges from a growth of scattered oak and brush in the western part of the area to a thick cover of pine, cedar, and fir in the extreme eastern part, where the rainfall is greatest. The soils give a moderate or high acid reaction with soiltex. With irrigation these soils are utilized for fruit and general farm crops, and where irrigation is not available they are utilized for grain, grain hay, and grazing.

In the earlier soil survey of the Sacramento area, which included a strip along the western margin of the present survey, the Aiken soils were included with the Sierra soils. The soils of more pronounced red color and lower quartz content, which are derived from basic igneous rocks, have since been differentiated and recognized as a distinct series of soils under the name of the Aiken series.

Typical surface soils of the Olympic soils are brown. The subsoils are slightly heavier in texture and somewhat more compact than the surface soils. They range in color from light reddish brown to brownish red. Disintegrating parent bedrock occurs at a depth ranging from 1 to 5 feet. As occurring in the Placerville area, these soils are shallower than the soils of other series with which they are associated. Olympic soils occupy rolling or steeply sloping hills, are well drained, and have a medium content of organic matter. They support a wide variety of vegetal cover depending on the location of the soil with regard to rainfall. Virgin areas in the western part of the area have a brush and oak cover, and in the eastern part they

support a mixed growth of forest trees. These soils have a moderately acid reaction when tested with soiltex. They are utilized for grazing and the growing of some grain and grain hay.

Typical soils of the Mariposa series have surface soils ranging in color from brownish yellow to pale reddish yellow and slightly heavier textured more compact subsoils of more pronounced reddish-yellow color. Flat angular fragments of the parent rock occur throughout the profile, and in many places the bedrock outcrops as slabs. As a rule the soils of this series are shallow, the disintegrating slate substratum being reached within 2 feet of the surface. Tree roots work their way into the substratum to a considerable extent as the slabs occur in an upturned vertical position and are shattered to some depth. These soils are related to the Sites soils from which they are distinguished by their yellowish color. They are locally known as "slate soils" and are recognized as inferior to the red soils which have been formed from the disintegration and decomposition of andesite, amphibolite, and diabase rocks. In this area these soils occur in the mother-lode district, and consequently mining operations have resulted in disturbing the soil material and channels have been cut over the surface causing the land to have an eroded appearance in many places. The soils occur on rolling or steep slopes, and drainage is good or excessive. The soils are leached of their lime and have a medium or low content of organic matter. Under virgin conditions in the eastern part of the area they support a growth of yellow pine, but the shallower areas which are subject to lower rainfall are covered by a growth of manzanita, chamiso, and buckbush. The brush cover is typical of the mined-over areas. With irrigation, the deeper soils of this series are utilized for orchards, and, where irrigation is not available, for grain, hay, and pasture.

The surface soils of the Sites soils are reddish brown or brownish red, with a decided pink shade showing under field conditions. In most places the subsoil is redder than the surface soil, heavier in texture, more compact, and contains fragments of shale and slate rock throughout the weathered soil. Disintegrating bedrock, similar to that underlying and giving rise to the Mariposa soils, lies from 2 to 4 feet below the surface. The Sites soils occur on gentle or steep slopes, and drainage ranges from good to excessive. The surface material has been considerably modified and eroded in places by placer mining. The soils are leached of their lime and contain a moderate amount of organic matter. Virgin areas support a growth of trees, brush, and native grasses that are green during the winter and spring but become dry during the summer and fall. With irrigation these soils are utilized for orchard and general farm crops and without irrigation, for grain, hay, and pasture.

In that part of the area included in the early survey of the Sacramento area the soils now recognized as belonging to the Sites series were included with the Sierra soils.

The soils derived from recent stream-laid deposits are rather inextensive in the Placerville area. They consist of soil material which has been deposited or is now being deposited on the narrow flood plains of small streams. Their profile has not been modified to an appreciable extent since deposition by weathering, so that they con-

sist of unmodified soil material, and, although soil material of such character is variable, it has, on account of its small extent, all been included in the Honcut series.

Typical Honcut soils have reddish-brown or brownish-red surface soils, and the subsoils are of similar color but variable in texture. The included soils vary widely. Soils of the Honcut series occupy stream bottoms, and the surface is smooth or slightly gullied in places. Drainage is well developed except in areas which are covered frequently by overflows. The soils are of mixed origin and are noncalcareous. Under cultivation they are utilized in the production of vegetables and general farm crops.

In addition to the soils already described, which have been classified with regard to soil series and type relationships, a number of types of miscellaneous materials have been recognized and mapped. These include placer diggings and tailings, rough mountainous land, and rough stony land. With the exception of a few small areas included with placer diggings and tailings, these materials are mainly nonagricultural.

Table 4 shows the results of mechanical analyses of samples of several soils mapped in the Placerville area.

TABLE 4.—*Mechanical analyses of several soils from the Placerville area, Calif.*<sup>1</sup>

Soil type and sample No.	Depth	Fine gravel	Coarse sand	Medium sand	Fine sand	Very fine sand	Silt	Clay <sup>2</sup>	Colloid <sup>3</sup>
	Inches	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent
<b>Mariposa silt loam:</b>									
577001-----	0 to 1½	3.228	3.372	4.400	8.750	12.506	46.928	18.206	3.45
577002-----	1½ to 10	5.168	4.980	2.222	5.158	11.250	49.852	10.202	4.49
577003-----	10 to 22	5.000	4.030	2.952	4.566	11.348	43.794	15.784	7.52
<b>Aiken clay loam, deep phase:</b>									
577004-----	0 to 2	3.736	5.796	6.882	13.516	19.736	19.984	15.616	15.55
577005-----	2 to 14	3.302	6.584	4.522	12.440	18.825	19.012	16.700	18.92
577006-----	14 to 36	2.138	2.980	3.600	8.312	14.826	22.416	15.004	30.06
577007-----	36 to 72	1.820	3.664	2.120	7.528	13.540	22.596	14.956	33.94
<b>Sierra loam:</b>									
577008-----	0 to 2	10.068	9.112	8.076	12.280	19.756	18.576	14.048	7.98
577009-----	2 to 14	6.576	11.740	6.200	13.000	20.304	17.902	15.570	8.87
577010-----	14 to 28	4.020	6.838	6.344	8.800	18.536	17.896	13.138	23.61
577011-----	28 to 60	3.480	7.690	4.262	7.608	14.752	18.812	12.564	29.81
<b>Diamond Springs loam:</b>									
577013-----	0 to 10	4.600	2.880	3.368	7.844	28.000	37.416	10.528	4.69
577014-----	10 to 20	2.962	3.660	2.236	8.142	28.642	34.396	10.418	9.69
577015-----	20 to 36	3.922	3.332	3.420	8.316	32.302	31.480	7.904	9.35
<b>Holland fine sandy loam:</b>									
577017-----	0 to 3	3.864	7.888	5.628	18.156	30.956	18.446	9.796	4.82
577018-----	3 to 14	4.536	5.050	5.902	16.252	30.362	18.852	12.248	5.98
577019-----	14 to 28	4.732	7.126	5.012	14.900	26.900	18.884	12.464	9.36
577020-----	28 to 50	3.546	6.344	4.568	13.836	23.636	21.952	11.340	14.82

<sup>1</sup> Analyses made in the soil technology laboratory, University of California.

<sup>2</sup> Clay includes materials from 0.005 to 0.001 millimeter in diameter.

<sup>3</sup> Colloid includes materials less than 0.001 millimeter in diameter.

In the following pages of this report the various soils mapped in the Placerville area are described in detail, and their agricultural importance is discussed; their distribution is shown on the accompanying soil map; and their acreage and proportionate extent are given in Table 5.

TABLE 5.—*Acreage and proportionate extent of the soils mapped in the Placerville area, Calif.*

Type of soil	Acres	Per cent	Type of soil	Acres	Per cent
Aiken clay loam.....	19,392	17.1	Sites clay loam.....	30,144	8.4
Deep phase.....	6,592		Shallow phase.....	1,280	
Shallow phase.....	37,376		Sites stony loam.....	3,904	
Aiken clay.....	1,728	.5	Mariposa silt loam.....	6,720	4.6
Aiken stony clay loam.....	44,288	11.9	Shallow phase.....	7,744	
Holland loamy sand.....	28,736	7.8	Brown phase.....	2,688	
Holland fine sandy loam.....	4,096	1.1	Olympic loam.....	1,280	.3
Sierra loam.....	4,032	1.1	Honcut loam.....	1,152	.3
Sierra clay loam.....	7,168	1.9	Rough mountainous land.....	107,136	28.9
Sierra stony clay loam.....	8,320	2.2	Placer diggings and tailings.....	6,336	1.7
Diamond Springs loam.....	5,568	1.8	Rough stony land.....	34,368	9.3
Stony phase.....	1,152				
			Total.....	371,200	

**AIKEN CLAY LOAM**

The surface soil of Aiken clay loam to a depth ranging from 8 to 16 inches consists of brownish-red or red friable heavy-textured clay loam having a granular structure. When wet the material is deep red. Under virgin conditions an A<sub>1</sub> horizon, or surface layer, from 1 to 3 inches deep, is developed, consisting of reddish-brown friable clay loam with a fine-granular structure and high in organic matter. The upper subsoil layer, or B<sub>1</sub> horizon, extending to a depth of 24 to 28 inches below the surface, consists of red fairly compact clay having a coarse granular structure. The lower subsoil layer, or B<sub>2</sub> horizon, is red compact clay which breaks up to a nut structure and has a slick glassy appearance when moist owing to the high colloidal content. This horizon extends to a depth ranging from 36 to 60 inches below the surface where it grades into the disintegrating parent rock, or C horizon, which is composed of diabase or amphibolite schist rocks.

Aiken clay loam has developed under moderate or fairly heavy rainfall, and the profile shows well-developed horizons. The soil has been formed in place from the decomposition and disintegration of the underlying rocks. It occurs on gently rolling to steep slopes, and drainage is well developed. It contains a moderate amount of organic matter and has been leached of its lime to such an extent that it gives only moderate acid reaction with soiltex. Small areas mapped with this soil vary from typical areas in being somewhat lighter in texture and in having other minor differences. Cherry orchards in the vicinity of Cool are located on some of these included areas.

Aiken clay loam is not so extensive as its shallow phase. Scattered bodies occur on French Creek in the vicinity of Shingle Springs, near El Dorado, west of Placerville, and northwest and south of Garden Valley. A large area, including about 4 square miles, lies northwest of Georgetown, and a number of bodies are in the Penobscot-Cool district, associated with the shallow phase of Aiken clay loam.

In the virgin state this soil is covered by a growth of oak and brush in the central part of the area surveyed and by a covering of yellow pine and sugar pine in the eastern part. Most of the land, where water is available for irrigation, has been cleared, but

a considerable area still remains in forest and brush, and very little use is made of it. Some wood is sold, and a few head of livestock are carried. South of Shingle Springs the land is utilized in the production of grain, hay, and grapes without irrigation. Where irrigation water is available this is a very desirable soil for pears, peaches, and plums, particularly pears. Walnuts, cherries, apples, and grapes are grown without irrigation where the soil is of sufficient depth and the rainfall sufficient to supply needed moisture.

On account of the fairly steep slopes some difficulty is experienced in the application of irrigation water, and the heavy texture of the soil retards the penetration of water. These conditions can be improved by planting the trees and laying out the irrigation ditches in the orchards to run with the contour of the slopes.

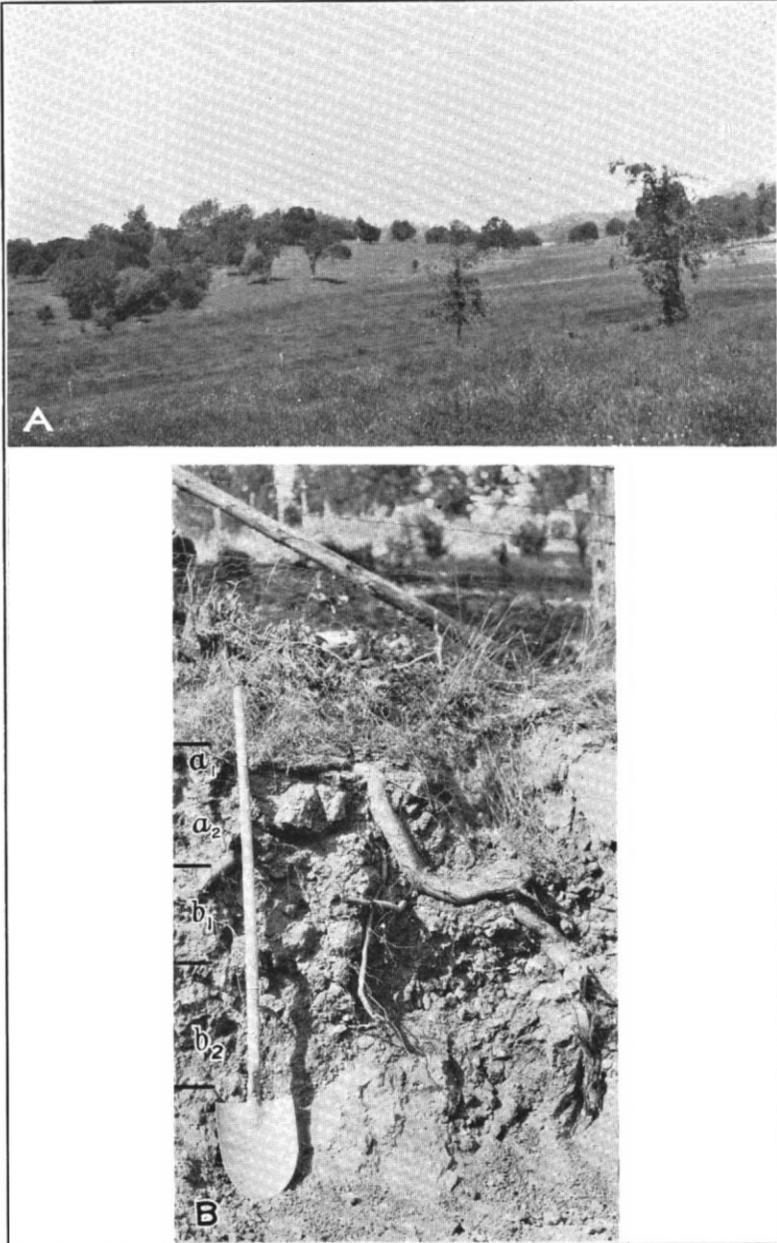
*Aiken clay loam, deep phase.*—The soil of the deep phase is similar in color to typical Aiken clay loam. Under virgin conditions it has a surface horizon from 1 to 4 inches deep consisting of reddish-brown clay loam which contains a large amount of organic matter and a large number of iron pellets. When plowed the high content of iron pellets masks the heavy texture of the fine material. The B<sub>1</sub> and B<sub>2</sub> subsoil horizons consist of compact clay with greatly weathered fragmental andesitic stones in the lower layer. The underlying C horizon of parent material, which consists of andesite rock, ordinarily does not occur within 6 feet of the surface. The surface soil, although of heavy texture, works up into an excellent mulch with a fluffy or ashy appearance, and it is locally known as "volcanic ash" soil.

The main body of this deep soil occurs on the top of a ridge, locally known as Fruit Ridge, on which Camino is located. An area of about half a square mile in extent is just north of Georgetown, and a number of small areas, ranging from very small to moderately extensive, occur in the vicinity of Placerville and between Placerville and Pleasant Valley.

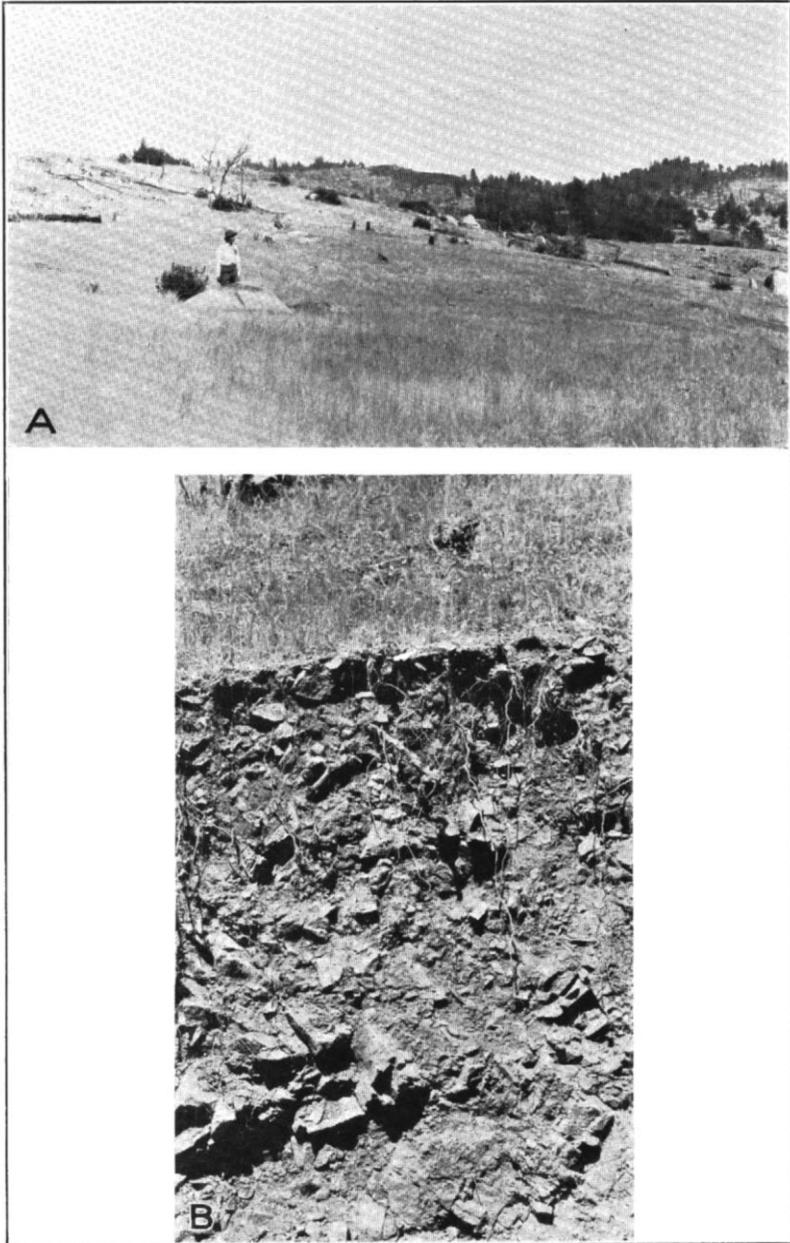
This soil occurs on the crests of ridges of volcanic tuffs and breccias, where the surface is gently sloping or rolling. The surface is favorable to irrigation, and both surface drainage and subdrainage are well developed. The soil has been leached of lime and gives a medium or strongly acid reaction with soiltex. In the Placerville area it has developed under an annual rainfall ranging from 50 to 60 inches. The land supports a natural growth of yellow pine and sugar pine of commercial value, black oak, live oak, and a luxuriant growth of ferns.

Aiken clay loam, deep phase, is one of the most important agricultural soils of the area surveyed. A large proportion of the pears grown in the area are produced on a ridge occupied by this soil east of Placerville. In addition to pears, some apples, plums, and peaches are grown. With increase in elevation on this ridge the danger of frost increases, and this is the limiting factor in pear production. Bearing pear orchards on this soil yield from 4 to 7 tons to the acre in good years.

Practice has shown that cover crops and manures improve this soil, and manures are practically always used for small fruit and truck crops. Nitrate of potash is used for stimulating the growth of dwarfed trees, and the application of phosphoric acid greatly increases the growth of cover crops.



A, Aiken clay loam, shallow phase, in Pilot Hill district, showing natural vegetation of grasses and scattered live oaks and white oaks; B, profile of Aiken clay loam, shallow phase, which has developed on diabase bedrock and as shown has weathered to a depth of about 3 feet



A, Characteristic topography and outcropping bedrock in granitic areas giving rise to soils of the Sierra and Holland series; B, profile of Aiken stony clay loam showing large proportion of stone fragments in soil which has developed by weathering of diabase bedrock

*Aiken clay loam, shallow phase.*—Aiken clay loam, shallow phase, consists of a layer of brownish-red or pronounced reddish-brown light-textured clay loam from 8 to 12 inches thick. The subsoil is light-red or red fairly compact clay loam which contains a large number of schist rock fragments. In many places a distinct subsoil is lacking, the surface soil grading off into the partly weathered bedrock which lies from 6 to about 30 inches below the surface. (Pl. 1, B.) Drainage is well developed, and the soil has a low content of organic matter.

The shallow phase of Aiken clay loam has developed under less rainfall than typical Aiken clay loam, with the result that weathering and oxidation are less advanced, the profile is not so mature, the soil color not so red, and the depth to the parent rock not so great. The topography is similar to that of typical Aiken clay loam. The grass, which covers the ground in winter, dries up after a few hot summer days. The land is covered, in part, by a natural growth of scattered oak, manzanita, and digger pine.

Aiken clay loam, shallow phase, is extensive in the western part of the area. Large bodies, interspersed with other soil types, are in the vicinities of Latrobe, Clarksville, Salmon Falls, Spring Valley School, Garden Valley, along the Sacramento County line, and near Pilot Hill.

With the exception of a number of orchards near Pilot Hill and Cool, most of this land is utilized for grazing. (Pl. 1, A.) A large part of it has been cleared and farmed to grain or hay some time in the past. Considerable difficulty is experienced in plowing owing to the stoniness of the soil a few inches below the surface. Deciduous fruit trees appear to do fairly well under irrigation. The top of the schist bedrock substratum is shattered to such an extent, and can be further shattered by explosives when setting out trees, that tree roots can work their way into the crevices to some extent and develop a fairly large root area. A fairly good tonnage of grapes of the Zinfandel, Mission, Cornichon, and Black Hamburg varieties, with a very high sugar content, has been obtained on this soil.

The organic-matter content of the soil can be materially increased by growing and turning under cover crops or by the application of barnyard manure.

#### AIKEN CLAY

As mapped in the Placerville area, the surface soil of Aiken clay consists of a 10 to 16 inch layer of red clay which rests on a red compact clay subsoil. No appreciable amount of stone occurs in the soil to a depth of 6 feet. The surface soil is very sticky when wet, and the subsoil shows a high colloidal content and breaks up into cubes from one-half to 1 inch in diameter.

Aiken clay, as occurring in this area, is much redder than the other Aiken soils. It has been developed under an annual rainfall ranging from 50 to 60 inches and has been subjected to erosion, particularly in the cleared areas. The soil is well leached and non-calcareous. Surface drainage is well developed, but subdrainage is somewhat restricted owing to the heavy character of the subsoil.

Aiken clay occupies the rolling hills and ridges of the upper foothill district. One area, somewhat more than 1 square mile in extent,

lies a mile northwest of Camino, another area of approximately the same size is 2 miles east of Garden Valley, and a small area lies about 2 miles west of Newtown.

Virgin areas are covered by a thick growth of pine and cedar. Most of the land is forested or only partly cleared at the present time. Some hay is produced on the cleared areas.

On account of its location, the thick forest cover, and the heavy character of the soil very little attempt has been made to utilize this land.

Table 6 gives the results of mechanical analyses of samples of the surface soil and subsoil of Aiken clay.

TABLE 6.—*Mechanical analyses of Aiken clay*

No.	Description	Fine gravel	Coarse sand	Medium sand	Fine sand	Very fine sand	Silt	Clay
		<i>Per cent</i>						
577022	Surface soil, 0 to 12 inches.....	2.5	2.2	2.6	7.0	19.3	32.3	33.7
577023	Subsoil, 12 to 24 inches.....	.4	.9	.7	2.4	10.7	29.3	55.2
577024	Subsoil, 24 to 72 inches.....	.8	.2	.8	.6	11.2	32.3	54.5

#### AIKEN STONY CLAY LOAM

The surface soil of Aiken stony clay loam to a depth ranging from 8 to 14 inches consists of brownish-red or light-red stony clay loam which is variable in content of stone. Large stones, bowlders, and rocks, most of them more than 12 inches in diameter, are scattered over the surface and through the soil. In the western part of the area there is very slight subsoil development, but in the areas south of El Dorado the subsoil consists of light-red or yellowish-red compact clay loam or clay, containing such a large number of angular stones that it is difficult to dig or bore into the soil to a great depth. (Pl. 2, B.) The depth to bedrock differs in different parts of the area, but in most places it is between 18 and 40 inches. The parent rock material in this area is diabase or amphibolite.

A number of small areas mapped as Aiken stony clay loam, lying 2 miles northeast and directly south of Placerville, differ somewhat from the soil as occurring in other parts of the survey. They occur on the andesite ridges and contain loose stones which are much smaller than typical. They are associated with Aiken clay loam, deep phase, and differ from that soil in that they contain stones and the weathered soil material is much shallower. These areas have been cleared of the loose surface stones, and the better areas are planted with orchards.

This soil is extensive in the area surveyed, the principal bodies lying south of El Dorado and in the western and central-southern parts of the area, from Cosumnes River north to Pilot Hill and Cool. A large number of scattered areas occur at an elevation of less than 1,500 feet.

Aiken stony clay loam occupies rocky ridges and steep or hilly slopes. Drainage is well developed, and the soil is leached of its lime and has a low content of organic matter.

East of Clarksville and Latrobe the soil supports a cover of live oak and buckbush, but west of these places there is no cover of trees

or brush and the natural vegetation consists only of grasses during the winter and spring. Practically none of the land has been cultivated, but it is used solely for grazing, although small patches, a few acres in extent, occur in places which could be cultivated. Good wild-oat pasture grows on this soil southwest of El Dorado, but the grass growing on the hills west of Latrobe is very sparse and dries up during the summer. The ranches on this soil are large, probably averaging more than 640 acres. Cattle, sheep, and goats are raised, and dairying is carried on to some extent in the vicinity of Clarks-ville and Latrobe. The cattle are pastured in the foothills during the winter and spring and taken to the ranges in the high mountains for the summer and fall. From 10 to 20 acres are required to carry a steer on this land.

#### HOLLAND LOAMY SAND

The surface soil of Holland loamy sand to a depth of 12 inches is grayish-brown or light grayish-brown granular loamy sand, which is loose when moist but fairly hard when dry. A surface layer, from 1 to 2 inches thick, which is darker than the rest of the layer, owing to the higher content of organic matter, and which is very loose, is developed under virgin conditions. The subsoil consists of pale reddish-brown or yellowish-brown compact gritty material of sandy loam or heavier texture. A difference exists between the upper and lower subsoil layers at a depth approximately between 24 and 28 inches, the upper layer being less compact, lighter textured, and not so red as the lower one. A considerable number of coarse granite particles occur throughout the weathered soil making the soil materials in the different layers appear coarser in texture than they really are. Granitic bedrock occurs at a depth ranging from 36 to 60 inches below the surface.

One included body of this soil, in the vicinity of Oak Hill School, has a surface soil which is somewhat grayer and coarser textured than typical. Areas occurring south of Pleasant Valley have large boulders, from 2 to 5 feet in diameter, distributed over the surface. (Pl. 2, A.) Such bodies are indicated on the map by rock-outcrop symbols. The soil between the boulders is typical in profile characteristics. Another similar area occurs one-half mile southeast of Lotus. In the earlier survey of the Sacramento area this soil was included with the related Sierra sandy loam.

Holland loamy sand occurs on low rounded hills having a dome-like appearance. Surface drainage and subdrainage are good, although poorly drained spots occur in swales subject to seepage from adjacent slopes. The soil is leached of lime and gives a moderate to high acid reaction with soiltex. The organic-matter content is low or medium.

Fairly large bodies of Holland loamy sand occur mainly in the middle-eastern and southeastern parts of the area in the Cosumnes River drainage basin; south of Pleasant Valley extending to the Amador County line; on either side of the South Fork American River near Coloma and Lotus; and between North Fork and South Fork American River near Negro Hill School. Originally this soil in the southeastern part of the area was covered by a growth of conifers and oak and by a growth of digger pine and scattered

oak in the Negro Hill district, but a large proportion of the land has been cleared and farmed. At one time considerable grain with yields ranging from 8 to 17 sacks to the acre, was grown on this soil in the vicinity of Fair Play. The limiting factors in agricultural development in the Fair Play district are distance from markets, lack of transportation facilities, and lack of water for irrigation. There are a few plantings of walnuts and grapes in this district, but most of the soil is used for grazing. Pears, peaches, plums, and grapes are grown, and a number of meadows occur on this soil in the vicinity of Coloma and Lotus where water is available for irrigation.

Where water is available for irrigation and where the frost hazard is low, this type of soil is very desirable for many orchard and field crops. It can be improved by building up the organic-matter content and by growing winter cover crops to be plowed under in the spring.

Table 7 gives the results of mechanical analyses of samples of the surface soil, subsurface soil, and subsoil of Holland loamy sand.

TABLE 7.—*Mechanical analyses of Holland loamy sand*

No.	Description	Fine gravel	Coarse sand	Medium sand	Fine sand	Very fine sand	Silt	Clay
		<i>Per cent</i>						
577028	Surface soil, 0 to 2½ inches....	16.7	18.9	13.8	17.7	15.9	7.5	9.3
577029	Subsurface soil, 2½ to 12 inches..	21.4	22.0	9.0	16.2	14.9	4.7	11.1
577030	Subsoil, 12 to 28 inches.....	13.9	15.2	12.3	19.6	15.6	11.4	11.7

#### HOLLAND FINE SANDY LOAM

The surface soil of Holland fine sandy loam to a depth of 12 or 14 inches consists of brown fine sandy loam which is loose when moist but hard and baked when dry. A surface mulch, from 1 to 3 inches thick, consisting of grayish-brown loose granular loam, occurs under virgin conditions. The upper subsoil layer is reddish-brown compact fine sandy loam or loam having a nut structure. The lower subsoil layer is dark brownish-red very compact gritty material of heavier texture, which breaks up into medium-sized clods, becoming very hard when dry. Quartz and mica particles occur throughout the soil, and disintegrating parent bedrock of quartz, porphyry, or granodiorite is present from 3 to 5 feet below the surface.

Areas of this soil occurring in the vicinity of Gold Hill are typical of Holland fine sandy loam in profile characteristics, but large stones and boulders are scattered over the surface. These are indicated on the map by rock-outcrop symbols. Such areas occupy the edges of fairly steep slopes, and in general are not adapted to farm or orchard crops owing to the prevalence of stones, although some small patches of good land can be cultivated.

Many areas of Holland fine sandy loam occur on smooth slopes which can be easily cultivated and irrigated. Both surface drainage and subdrainage are good. This soil was mined over in places during the mining period, and it includes narrow strips of placer diggings and tailings that are too small to differentiate on the map. In other places on this soil fine-textured mine waste, known as slickens, has filled up the depressions and formed a yellowish-brown

silt loam surface soil. Holland fine sandy loam is leached of lime and contains a low or medium content of organic matter.

The largest body of this soil is in the vicinity of Gold Hill where it is under cultivation with irrigation and planted to peaches, pears, and plums. There is comparatively little danger from frost in this locality. In the virgin state the soil here was covered by a growth of oak, brush, and a few pines. Most of the land is cleared and under cultivation at the present time. A smaller body is about 2 miles south of Negro Hill School, and a few small bodies occur throughout the area.

With irrigation and a favorable location, this is a valuable orchard soil. The organic-matter content can be built up by growing and turning under winter cover crops.

#### SIERRA LOAM

The surface soil of Sierra loam consists of reddish-brown friable loam from 8 to 14 inches thick. Under virgin conditions it has a 2-inch surface layer, or A<sub>1</sub> horizon, which has a high content of organic matter, light reddish-brown color, fine granular structure, and light loam texture. When the land is cultivated this layer disappears. The surface soil contains considerable sandy and gritty material which helps to promote a granular structure, although when dry the material is very compact. The subsoil is red or deep-red compact clay which overlies granite bedrock at a depth ranging from 30 to 60 inches. The upper subsoil layer has a nut structure and is somewhat less compact than the lower subsoil layer which has a definite jointed structure and a more intense red color. When the subsoil material is smoothed out it presents a shiny or glazed surface owing to the presence of a large amount of colloidal material. This soil contains no free lime and gives a medium acid reaction.

Nearly every occurrence of Sierra loam is in association with Holland loamy sand and Holland fine sandy loam. In the early survey of the Sacramento area it was included with Sierra clay loam. In many places the transition in color from the brown Holland soils to the red or reddish-brown Sierra soils is very gradual, so that it is difficult to draw a definite boundary between soils of the two series. In some places small bodies of brown Holland soil, too small to differentiate on the map, are included with Sierra loam.

Also included with mapped areas of this soil are small areas that are not typical to the extent that they are covered with bowlders from 2 to 7 feet in diameter. These are indicated on the map by rock-outcrop symbols. The soil profile of such areas is identical with that of the typical soil, and they have the same general topographic and drainage conditions. The largest body of this kind occurs about 1½ miles southeast of Aukum along South Fork Cosumnes River. Another body lies 2 miles northeast of Smithflat, and the only other body of any extent is north of Mormon Island in the western part of the area. Where the land is cleared of bowlders it is utilized in the same way as the typical soil.

Sierra loam occupies gently rolling slopes or fairly steep well-rounded hills, and practically none of it occurs as low-lying ground or depressions. Consequently it is well drained.

The size of the individual areas of Sierra loam is comparatively small, few exceeding more than a square mile in extent, but they

occur in a number of places in the western, northwestern, and eastern parts of the area. One of the largest areas is 1 mile northwest of Blair School in the middle-eastern part of the area; other comparatively large areas occur near Mount Orcum, between Spanish Creek and South Fork Cosumnes River; and smaller bodies are in the vicinity of Fair Play, along North Fork Cosumnes River near Summit and River Schools, in the Gold Hill district, and north and northeast of Mormon Island.

Under virgin conditions this soil in the northern and eastern parts of the area supports a growth of yellow pine, some of which is of commercial value, and in the northwestern part, a scattered growth of oak and digger pine. The land is utilized mainly in the production of pears where irrigation is available and for grain, hay, and pasture without irrigation. From 15 to 25 sacks of wheat to the acre have been produced on soil of this kind.

Some attempts have been made to grow orchard crops on this soil without irrigation but with little success. This soil, being somewhat heavier in texture, is more retentive of moisture than the Holland soils, and fruit trees do better without irrigation on the Sierra soils than on the Holland soils.

#### SIERRA CLAY LOAM

The surface soil of Sierra clay loam consists of about 8 inches of dark-red or brownish-red somewhat compact clay loam containing a conspicuous amount of coarse sandy or gritty material. When wet the soil is very sticky and the red color is intensified. When dry it breaks up to a nutlike structure. Extending to a depth of about 15 inches the subsoil is red, compact, of heavier texture, and breaks up to a cloddy structure. This layer is underlain by deep-red very compact gritty heavy clay loam or clay with a jointed structure, which at a depth of about 30 inches grades into partly decomposed bedrock—gabbro-diorite. The soil contains no free lime, and both surface soil and subsoil are medium or strongly acid by soiltext test. Areas of Sierra clay loam vary but little from typical, but in some places the soil grades into Sierra stony clay loam.

Sierra clay loam occupies fairly level valleys and gently rolling slopes, having a smooth uniform surface with very few stones. Drainage ranges from fair to good, although there are some small depressions in which drainage is restricted, and in these the soil is darker heavy clay loam or clay.

This is a fairly extensive soil but occurs mainly in one general vicinity, beginning about 2½ miles southwest of Shingle Springs and extending in broken irregular strips northwesterly through Green Valley, Rescue, and Deer Valley to Webber Creek, a distance of about 8 miles. The total width of the strips is about 4½ miles. These areas are not continuous but are interspersed with large bodies of Sierra stony clay loam.

The natural vegetal cover of the soil consists of scattered white oak and live oak, which present an open parklike appearance. Chamiso (*Adenostoma fasciculatum*), known locally as "grease-brush," grows in some places, but in most places it has been cleared off as nearly all the land has at some time or other been under cultivation. At present the land is utilized almost exclusively for

hay and pasture. A few fruit trees are planted around the farm buildings, but no attempt is made to grow orchard trees commercially. None of the soil is under irrigation, though most of it is favorable for irrigation if water were available. Hay, sheep, and Angora goats are the principal sources of income on this soil.

Under irrigation this would be a very productive soil, although some difficulty would be experienced in obtaining sufficient penetration of water, owing to the heavy compact character of the subsoil.

Table 8 gives the results of mechanical analyses of samples of the surface soil and subsoil of Sierra clay loam.

TABLE 8.—*Mechanical analyses of Sierra clay loam*

No.	Description	Fine gravel	Coarse sand	Medium sand	Fine sand	Very fine sand	Silt	Clay
		<i>Per cent</i>						
577073	Surface soil, 0 to 8 inches.....	4.9	8.2	5.3	13.1	21.9	21.1	25.8
577074	Subsoil, 8 to 15 inches.....	4.2	5.3	7.2	15.2	20.4	17.9	29.6
577075	Subsoil, 15 to 23 inches.....	3.4	4.5	6.1	16.2	19.0	15.0	35.8

#### SIERRA STONY CLAY LOAM

Sierra stony clay loam borders Sierra clay loam but occurs on the higher slopes and hills. The surface soil in a dry condition consists of 6 or 8 inches of dark-red fairly compact material which breaks up to a nut structure. It is of gritty or sandy texture but contains much colloidal material and when moist is bright red and very sticky. The subsoil consists of red compact heavier-textured material containing considerable quartz grit and showing definite jointed or columnar structural characteristics. This horizon extends to a depth ranging from 18 to 30 inches from the surface, where it grades into the underlying C horizon composed of disintegrating gabbrodiorite bedrock. A large number of loose stones, ranging in size from 4 to 9 inches in diameter, occur over the surface. Surface drainage is good, but subdrainage is restricted, owing to the heavy compact character of the subsoil.

This soil is extensive in the central part of the area where it occurs in hilly or gently sloping areas. It extends across the State highway about a mile west of Shingle Springs and terminates about 2 miles north of Pine Hill.

The land is covered by a thick growth of chamiso, buckbush, and manzanita, and it has very little agricultural value even for grazing. Probably less than 1 per cent of it has ever been cleared.

#### DIAMOND SPRINGS LOAM

The surface soil of Diamond Springs loam consists of grayish-yellow friable loam extending to a depth ranging from 8 to 15 inches. Considerable variation exists in the color of the surface soil, yellow predominating, although in some areas in the vicinity of El Dorado considerable gray is present. The subsoil is reddish-yellow or yellowish-red fairly compact clay loam. A noticeable quantity of sharp, angular quartz particles occur throughout the weathered soil, and disintegrating quartz-prophyry bedrock lies from 20 to 48 inches

below the surface. This type of soil has a tendency to bake very hard on drying, and this retards the absorption of moisture in the summer. The soil has been developed under a fairly heavy annual rainfall. It gives a moderate acid reaction with soiltex.

The largest area of this soil, approximately 4 square miles in extent, is about 2 miles southwest of Placerville, and small bodies are scattered over the area surveyed.

Under virgin conditions the soil is covered by a growth of pine, live oak, and brush. As a considerable part of the land has been mined over, much of the timber has been removed and the brush cover predominates at the present time. The surface is gently rolling or fairly steep but not so rough as to prevent irrigation of most of the land. Both surface drainage and subdrainage are well developed. The soil contains a moderate or low content of organic matter.

Where irrigation water is available this soil is utilized for pears, peaches, and plums, and a number of young orchards have recently been set out and appear to be doing well. General field crops and vegetables should be fertilized in order to produce well. Land not irrigated is mainly utilized for grazing.

The surface soil of Diamond Springs loam seems to be deficient in plant food and low in organic matter. In many places this is the result of the surface soil having been washed away or eroded, exposing the subsoil. The application of barnyard manure and the growing and turning under of cover crops will increase the organic-matter content and make this soil more fertile and easier to handle. The judicious application of commercial fertilizers is recommended for many fields.

*Diamond Springs loam, stony phase.*—The surface soil of Diamond Springs loam, stony phase, consists of an 8 to 16 inch layer of brownish-yellow or yellowish-brown granular heavy-textured friable loam which is deep brown when wet. Loose stones, from 2 to 12 inches in diameter, occur throughout the soil mass. The upper subsoil layer is reddish-yellow or yellowish-red compact clay loam of slightly higher clay content than the surface soil. It is vesicular in structure, hard when dry, and contains considerable quartz grit. The lower subsoil layer is somewhat redder than the upper subsoil layer. Bedrock occurs at a depth ranging from 24 to 40 inches below the surface.

The surface relief is very irregular, the soil occupying rocky slopes bordering stream ways. This is not a very extensive soil in the area. A number of small bodies occur on Ringold and Webber Creeks southwest and southeast of Placerville. Drainage is well developed, in many places excessive, resulting in much erosion. The soil is leached of lime and contains a low amount of organic matter.

The natural vegetation consists largely of live oak and various kinds of brush. Very little of this land is under cultivation on account of its stone content and irregular surface. It is largely utilized for grazing. A few small orchards are maintained where water is available for irrigation.

Table 9 gives the results of mechanical analyses of samples of the surface soil and subsoil of Diamond Springs loam.

TABLE 9.—*Mechanical analyses of Diamond Springs loam*

No.	Description	Fine gravel	Coarse sand	Medium sand	Fine sand	Very fine sand	Silt	Clay
		<i>Per cent</i>						
577013	Surface soil, 0 to 10 inches.....	4.6	2.9	3.3	7.9	28.0	37.4	15.2
577014	Surface soil, 10 to 20 inches.....	3.0	3.6	2.2	8.1	28.6	34.4	20.1
577015	Subsoil, 20 to 36 inches.....	3.9	3.3	3.4	8.3	32.3	31.5	17.2

## SITES CLAY LOAM

The surface soil of Sites clay loam to a depth ranging from 8 to 14 inches consists of pronounced reddish-brown or brownish-red friable clay loam that has a decided pink cast when dry and is red when wet. The subsoil ranges in color from light red to yellowish red, is heavier textured and more compact than the surface soil, and contains broken fragments of slate or shale rock. The underlying C horizon of parent rock, which is composed of shale or slate rock, in most places occurs at a depth ranging from 24 to 40 inches. This material is shattered and weathered to such a degree that it can be dug out with little difficulty to a depth of 18 inches. In virgin areas, a 1 to 2 inch surface layer consists of light reddish-brown granular loam high in organic matter. Sites clay loam is locally known as red slate soil.

Sites clay loam has been formed in place from the decomposition and disintegration of the underlying rocks which are largely slates and shales. It has weathered under an annual rainfall ranging from 35 to 50 inches. The surface color of this soil is redder and the weathered soil material is deeper at the higher elevations. The soil occurs on smooth or fairly steep slopes, and most of the land can be irrigated. Small areas, which have been disturbed by placer diggings, occupy swales throughout the soil, and these have been differentiated on the map where of sufficient size, but a large number were too small to be shown separately and were included with Sites clay loam. The soil has been well leached of its lime, and drainage is well developed. The content of organic matter is low or moderate.

Sites clay loam is extensive in the Placerville area. A large area extends from Kelsey north to Georgetown. Other bodies are between Ringold School and Pleasant Valley, in the vicinities of Greenwood and Kingsville, and just northeast of the city limits of Placerville. Smaller bodies are scattered over the eastern part of the area.

Sites clay loam has a natural cover of pine, fir, cedar, and oak forest, with considerable manzanita, buckbush, and small oaks at the lower elevations. Most of the soil supports a good growth of native grasses during the winter and spring. Probably less than 25 per cent of the land has been cleared and farmed. A number of scattered pear orchards occur on this soil where water is available for irrigation. The frost hazard and lack of transportation facilities prevents to a great extent the planting of pears in the Kelsey, Garden Valley, and Georgetown districts, but a number of farms with diversified crops are in these districts, most of which have small orchards, a few cattle, goats, and chickens, an irrigated vegetable garden, and meadows. Considerable wood is cut and sold.

This soil is largely used for grain, hay, and pasture. Pears do well under irrigation in favorable locations and there probably will

be considerable expansion in pear culture in the future. A number of small vineyards are doing well at the lower elevations.

Water, for irrigation, in the Kelsey district is obtained from the Georgetown-Cool ditch and costs 25 cents per miner's inch for a 24-hour period.

Sites clay loam can be improved by the incorporation of organic matter through growing and plowing under winter cover crops, of which common vetch seems best suited to local conditions.

*Sites clay loam, shallow phase.*—The shallow phase of Sites clay loam is differentiated from typical Sites clay loam on the basis of its slight depth, the phase in few places being deeper than 18 inches and grading directly into the slate or shale bedrock, no definite subsoil being present. In most places considerable shattered slaty rock fragments occur through the shallow soil mass, and bedrock appears on the surface in many places.

Drainage is excessive on this soil, and there is a tendency toward erosion.

One body, a mile north of Kingsville, occurs on rounded hills that are covered with manzanita, buckbush, poison oak, and other low bushes, and three small bodies are southwest of Oak Hill School.

The shallow phase of Sites clay loam is barely within the class of agricultural soils. Small patches of grain have been grown on the margins of areas of this soil where it borders deeper soils, and grapes have been grown in small selected spots, but as a whole it has little value for agriculture except for grazing.

Table 10 shows the results of mechanical analyses of samples of the surface soil, subsurface soil, and subsoil of typical Sites clay loam.

TABLE 10.—*Mechanical analyses of Sites clay loam*

No.	Description	Fine gravel	Coarse sand	Medium sand	Fine sand	Very fine sand	Silt	Clay
		<i>Per cent</i>						
577057	Surface soil, 0 to 1½ inches.....	7.3	8.7	3.8	7.3	13.3	31.5	27.4
577058	Subsurface soil, 1½ to 12 inches..	5.7	4.9	4.7	7.9	14.0	32.4	30.1
577059	Subsoil, 12 to 20 inches.....	4.7	6.4	2.9	6.3	13.5	29.4	36.5
577060	Subsoil, 20 to 30 inches.....	3.5	4.3	3.7	6.1	13.0	27.2	41.4

#### SITES STONY LOAM

The surface soil of typical Sites stony loam consists of loose stony loam from 8 to 12 inches in thickness ranging in color from pronounced reddish brown to brownish red. The subsoil is brownish-red or red compact clay loam that has a high content of slate and shale fragments. This layer grades into the upturned slate bedrock at a depth ranging from 14 to 28 inches. The soil material is variable in depth, the slate substratum extending to the surface of the soil mass in places and protruding above the surface as outcrops in some localities, as south of Kingsville.

This is not a very extensive soil in the area surveyed. Three small bodies lie between Placerville and Smithflat, one small area north of Placerville, and one southeast of Smithflat. The most extensive area is a long narrow strip about half a mile wide, which extends south from Kingsville to within 2 miles of Cosumnes River.

Sites stony loam is residual in origin, having developed from the decomposition and disintegration of shale and slate rocks, and in this area it has been formed under an annual rainfall ranging from 25 to 45 inches. The surface relief is rolling and in places steep. Drainage ranges from well developed to excessive, and the soil has been leached of lime. The organic-matter content is low.

Under virgin conditions Sites stony loam is covered by a growth of pine, live oak, various species of shrubs (including manzanita, buckbush, and poison oak), and native grasses. In the body south of Kingsville the natural vegetation consists largely of scattered live oak and buckbush. Where water is available for irrigation a large part of the soil has been cleared and is planted to a variety of tree fruits and grapes, but it is not suited to field crops owing to the content of stones. Where irrigation water is not available the land is used largely for grazing.

#### MARIPOSA SILT LOAM

The surface soil of typical Mariposa silt loam consists of a 6 to 12 inch layer of brownish-yellow silt loam. In the Placerville area there is considerable range in the color of the surface soil, from yellowish brown, reddish yellow, and grayish yellow to yellowish red. The surface soil is underlain by slightly compacted silty clay loam, ranging in color from yellowish red to reddish yellow, which lies just above the slate bedrock. Under virgin conditions a surface mulch, or A<sub>1</sub> horizon, occurs, consisting of 1 or 2 inches of grayish-yellow silt loam or loam of high silt content, that has a floury structure and a high content of organic matter. This soil has been disturbed and modified to considerable extent by mining operations. The bedrock substratum of upturned or steeply tilted slate lies at a depth ranging from 12 to 30 inches from the surface, and considerable fragmental slate rock occurs throughout the soil mass.

One body of this soil in the vicinity of Cold Springs School differs from typical in being much deeper and in lacking the slate fragments in the surface soil. The soil here is somewhat better than typical Mariposa silt loam. It is utilized for orchards with irrigation and for grain without irrigation. Mariposa silt loam in the vicinity of Ringold School east of Diamond Spring is slightly redder than typical and partakes somewhat of the characteristics of Sites clay loam which borders it.

Mariposa silt loam is weathered in place from the decomposition and disintegration of the underlying Mariposa slate bedrock and is locally known as the Mariposa slate soil because of its derivation. It occurs on rolling or fairly steep slopes, and drainage is well developed, in some places excessive. The surface material has been disturbed to some extent by placer mining. The soil is leached of lime and has a medium or low content of organic matter.

This is not a very extensive soil in the area surveyed. Areas of 1 square mile in extent lie near Georgetown, Greenwood, Diamond Spring, Placerville, Ringold School, and Cold Springs School, and smaller bodies are south of Placerville and in the vicinity of Spanish Dry Diggings.

This soil supports a natural growth of yellow pine and digger pine, with a thick cover of underbrush and native grasses. Digger pines grow on spots that have been worked over by miners. Because of its favorable location in reference to transportation and irrigation facilities much of the Mariposa silt loam is utilized at present for pear orchards, especially near Placerville and Diamond Spring, although pear trees do not attain the size they do on areas of the deeper Aiken soils. The soil is used to less extent, under irrigation, for other deciduous fruits. Where irrigation is not possible Mariposa silt loam is used for grain, grain hay, and pasture.

Mariposa silt loam can be greatly improved by the growing and turning under of cover crops and the application of barnyard manure in order to build up the organic-matter content. The judicious application of commercial fertilizers and lime is probably justified as the soil is well leached of lime and plant food.

*Mariposa silt loam, shallow phase.*—The surface soil and subsoil of the shallow phase of Mariposa silt loam have the same general characteristics as typical Mariposa silt loam, except in depth of the soil material and the amount of slate and shale fragments and outcrops on the surface. The subsoil is practically lacking in places, the bedrock coming very close to the surface, and in other spots the surface layer is a mass of broken shale fragments resting on the shale bedrock. In general soil of this phase is extremely shallow, the soil material in few places extending deeper than 12 inches. A considerable part of this shallow soil has been worked over by placer miners, and very little soil material remains, the fine surface material having been washed away. Small bodies from 1 to 5 acres in extent, which are deeper and better, have been included in the phase as mapped. Had these been larger they would have been differentiated on the map as typical Mariposa silt loam. In the vicinity of Kelsey the soil is grayer than typical.

In general the relief is rougher than that of typical Mariposa silt loam and the surface is more eroded.

The shallow phase of Mariposa silt loam is more extensive than the typical soil, there being 12.1 square miles mapped in the area. Conspicuous bodies are 1 mile north of Garden Valley, south and east of Diamond Spring, one-half mile east of Kelsey, 1 mile north of Kelsey School, 1 mile north of Georgetown, 6 miles southeast of El Dorado, and in the vicinity of Placerville.

The natural vegetation on this soil is largely manzanita and buckbush, with a few pines on the deeper spots. Probably less than 5 per cent of the land has been cleared and farmed, and some of the cleared areas are practically nonagricultural. A few grapes and some grain have been grown without irrigation, but results have been poor. Much of the soil does not even support a growth of grass and has no value as grazing land. Selected shallow-rooted crops could probably be grown on the shallow phase of Mariposa silt loam where careful irrigation is practiced.

*Mariposa silt loam, brown phase.*—The brown phase differs from typical Mariposa silt loam mainly in the color and depth of the surface soil which, to a depth ranging from 3 to 15 inches, consists of brown or yellowish-brown friable loam containing fragments of slate. A distinct subsoil is lacking in most places, the surface soil resting directly on the disintegrating slate bedrock.

One body of this brown soil in which the slate protrudes from the surface in a large number of outcrops, is mapped 3 miles west of Latrobe. The soil material between the stones is very shallow and supports a scant growth of grass during the winter and spring. The land is of no value except for pasture.

This phase of Mariposa silt loam occurs near Nashville along North Fork Cosumnes River and west of Latrobe in the Bald Hills district. The soil is not extensive. It occurs in gently rolling areas, with drainage well developed. The vegetal cover consists of scattered live oaks in the Nashville district and a scant growth of grass on the areas west of Latrobe. The soil has a low content of organic matter and gives a moderate acid reaction with soiltex.

The brown phase of Mariposa silt loam is used for grazing, but the grass cover dries early in the summer after a few warm days, so that its value for grazing is not great.

Table 11 gives the results of mechanical analyses of samples of the surface soil and subsoil of typical Mariposa silt loam.

TABLE 11.—*Mechanical analyses of Mariposa silt loam*

No.	Description	Fine gravel	Coarse sand	Medium sand	Fine sand	Very fine sand	Silt	Clay
		<i>Per cent</i>						
577001	Surface soil, 0 to 1½ inches.....	3.2	3.4	4.4	8.7	12.5	46.9	21.7
577002	Subsurface soil, 1½ to 10 inches.....	5.2	5.0	2.2	5.2	11.2	49.8	20.7
577003	Subsoil, 10 to 22 inches.....	5.0	4.0	2.9	4.6	11.4	48.8	23.3

#### OLYMPIC LOAM

As mapped in this area, the surface soil of Olympic loam consists of an 8 to 12 inch layer of light-brown or brown friable loam of light fine sandy texture and granular structure. Under virgin conditions a shallow surface layer, or A<sub>1</sub> horizon, containing an accumulation of organic matter, is developed. The subsoil consists of reddish-brown or yellowish-brown loam or clay loam, somewhat compacted and breaking up into nut or cloddy structure. It extends to a depth ranging from 20 to 48 inches where it grades into the parent bedrock.

Considerable variation exists in mapped areas of this soil in the Placerville area, a number of variable brown soils of minor extent being included. In the vicinity of Union School is an included small body with a brown loam surface soil, from 3 to 12 inches deep, which is very stony in places and is underlain by lava bedrock. Two small included bodies lying 1 mile northeast of Pleasant Valley are of clay loam texture but are typical in other respects.

This soil is inextensive in the area surveyed, only 2 square miles being mapped. The largest area lies 2½ miles west of Salmon Falls, and a smaller area is 2 miles north of Lotus.

Land of this kind is gently rolling or hilly, and drainage is well developed. The soil contains a moderate amount of organic matter.

The bodies of this soil in the western part of the area support a natural growth of oak and brush, and those at higher elevations are covered by a mixed forest growth. Most of the land has been cleared and is used for grain, grain hay, and pasture. At present water is not available for irrigation, so that few orchards or crops requiring

intensive cultivation have been tried; but the soil takes water readily and, where of favorable depth and relief, is well suited to irrigation. Hay is the principal crop and yields about 1 ton to the acre.

#### HONCUT LOAM

The alluvial soils of the area are not extensive. They are highly variable in color and character and represent a number of distinct soils, all of which have been included with Honcut loam because of the small extent of the individual soil types.

Typically the surface soil of Honcut loam consists of dark reddish-brown friable loam from 8 to 12 inches thick. The subsoil consists of stratified sediments varying in color and texture and containing a large number of rounded stones at a depth ranging from 4 to 6 feet below the surface. These characteristics apply to the soil as mapped on Deer Creek, Carson Creek, and Big Canyon Creek, in the southwestern part of the area. The relief is flat, but the land is gullied in places. Most areas of this soil are well drained, although water has a tendency to stand on the surface for a short period after a storm. The land is well suited to irrigation because of the flat surface and the porosity of the soil. The soil contains a moderate amount of organic matter and gives an acid reaction.

An area mapped with this soil, lying 2 miles west of Pleasant Valley, has a dark grayish-brown gravelly loam surface soil, and a similar, very gravelly subsoil. Here the material has been recently washed in from slopes occupied by basic igneous rocks. It occurs in a small valley and is being utilized for truck crops. It has a fairly high content of organic matter, is well suited for irrigation, and is considered valuable for garden crops.

Small bodies of hydraulic slickens scattered over the area in small ravines and valleys, too small to be differentiated on the map, have been included with Honcut loam in mapping. In such areas the soil material consists of yellowish-brown friable silt loam to a depth of 6 or more feet. These materials, consisting of fine-textured debris or waste material from hydraulic-mining operations, were deposited within a short period of time and have not weathered since deposition. They have a low content of organic matter but are considered very valuable soils when the organic content is built up by manures and cover crops and when irrigated.

Virgin areas of Honcut loam support a good growth of grasses and willow trees, but practically all the land is under cultivation. Sufficient water seepage takes place to produce and mature a wide range of crops without irrigation in a number of places, although irrigation is necessary in most places owing to the porosity of the soil. With irrigation this soil is suited to a wide range of orchard, general farm, and garden crops.

#### ROUGH MOUNTAINOUS LAND

Rough mountainous land consists of areas of undifferentiated soil materials occupying canyon slopes, rough ridges, and steep mountainous areas in the eastern part of the area surveyed. Locally it includes small bodies of arable land, which may ultimately be cleared and farmed, but which, owing to small extent, irregular outline, and

comparative inaccessibility, do not warrant the expense of differentiation on the map.

The fine soil materials represent undifferentiated soils of the various soil series derived from weathering of the underlying rocks. These are usually shallow, stony, in many places broken by rock outcrop, and too steep and rough to be suited to agriculture under present economic conditions.

In the eastern part of the area rough mountainous land is well suited to forestry, as it supports a good cover of commercial pine, cedar, and fir timber. In the western part it has an oak and grass cover and is utilized for pasture.

Almost a third of the surveyed area is included in this kind of land.

#### PLACER DIGGINGS AND TAILINGS

This class of miscellaneous material consists typically of upturned and much disturbed soil materials and piles of cobbles left as a result of placer and hydraulic mining operations. It occupies scarred, eroded, and hummocky areas and is nonagricultural. Areas of river wash, consisting of sandy and gravelly materials overflowed at times of high water along the channels of American River, have also been included in this type of material.

Placer diggings and tailings occur in numerous small, widely scattered areas, chiefly in the vicinities of the old mining settlements of Diamond Spring, Placerville, Smithflat, Newtown, Pleasant Valley, Fair Play, Greenwood, Pilot Hill, and Gold Hill.

One area of this material one-half mile north of Camino and another at Coloma, in which some soil material has been mixed with the mass of cobbles and stones, have been leveled and farmed to some extent. Had these areas been larger they would have been separated and mapped as made land. With the exception of these small areas, the land is of practically no agricultural importance.

As mapped in this survey placer diggings and tailings also include small areas of undisturbed river-laid gravelly materials that would have been mapped and correlated as gravelly soils of the Corning series (which have been mapped extensively in previous surveys) had they been more extensive. Before mining commenced in the Placerville area there was probably a large amount of this gravelly soil which has since been worked over leaving areas of placer diggings and tailings in its place. The surface soil of the gravelly areas consists of an 8 to 14 inch layer of reddish-brown loam containing a large number of cobbles. The subsoil to a depth ranging from 30 to 48 inches consists of red or yellowish-red compact clay containing embedded cobbles. Below this is a mass of weathered cobbles with little fine interstitial material.

North of the Mormon Island bridge is a small body of this included material that has a hardpan of cemented cobbles at a depth ranging from 24 to 48 inches from the surface. Another body of this soil, lying  $1\frac{1}{2}$  miles northeast of Mormon Island, is underlain at a depth ranging from 24 to 36 inches by schist bedrock.

In addition to the areas mentioned there are a few very small widely scattered areas in other localities.

The gravelly areas consist of old weathered alluvial deposits that occupy gently rolling remnants of old stream terraces. The soil

has been leached of its lime and has a low organic-matter content. Surface drainage is well developed, but subdrainage is somewhat restricted in places, owing to the heavy character of the subsoil.

The deeper areas of this included soil can be used for orchard crops where irrigation is available. One pear orchard is located on it near Newtown, where the rainfall is heavy. Without irrigation the land is used for pasture, and grapes are grown on some of the deeper spots.

#### ROUGH STONY LAND

Rough stony land includes steep slopes along river canyons, tops of rocky ridges, and areas of stony shallow soils that are nonagricultural owing to the presence of large amounts of surface stone and rock fragments as well as to unfavorable relief. Large areas of such land are in the central and western parts of the area and are covered by serpentine and gabbro-diorite rocks. This rough land supports a cover of digger pine and brush. Scant grazing is afforded in some of the higher bodies, although, as a whole, the land has little grazing value.

#### IRRIGATION

Soon after the discovery of gold the miners began to construct ditches and develop water for mining purposes. In 1855 there were 20 principal canals consisting of 475 miles of mains and 325 miles of laterals.<sup>10</sup> Even at this early date the owners of the ditches recognized the agricultural use of water in the foothills by establishing a separate water rate for irrigation purposes. The Webber Ditch, the Gold Hill Canal, the South Fork Canal, and the Iowa Ditch were among the ones constructed between 1851 and 1855. In 1873 the Eldorado Water & Deep Gravel Mining Co. acquired the canals and constructed a main trunk canal, obtaining water from Echo Lake and Silver Lake, so that hydraulic mining could be carried on on a large scale in the vicinity of Placerville. From 1876 to 1886 came the maximum expansion and development of hydraulic-mining operations in this area. This industry was brought to an end in 1886 by prohibitive legislative action.

The properties and rights of the Eldorado Water & Deep Gravel Mining Co. were acquired by the Western States Gas & Electric Co. in 1916. The Eldorado Water Co., operating as a public-service corporation, with the majority of the stock owned by the water users of the Camino-Placerville district, in 1919 purchased from the Western States Co. the distribution system and 1,600 miner's inches of water below the 14 milestone. The Eldorado irrigation district was organized in 1926 and has taken over the Eldorado Water Co. holdings. The Eldorado irrigation district distributed water to lands extending west from the 14 milestone on Camino Ridge between South Fork American River and Webber Creek, and to the Camino, Placerville, Coon Hollow, Missouri Flat, and Gold Hill districts.

The Eldorado Water Co. irrigated about 6,000 acres in 1926 with 1,600 miner's inches of water. The gross duty measured at the farmer's gate amounts to about 1 miner's inch to 4½ acres. The water is sold at the rate of \$34 a miner's inch for a 120-day season.

<sup>10</sup> See footnote 5, p. 4.

This represents a cost of about \$7.75 an acre per annum for irrigation of deciduous fruits in this district.

The Eldorado irrigation district proposes to develop additional water by constructing a reservoir at Sly Park which will hold 11,000 acre-feet of water, and it has secured water rights on Camp, Hazel, and Sly Park Creeks for this purpose. It proposes to develop water for an additional 14,000 acres of land in the district.

A number of farms in the vicinity of Coloma and Lotus obtain water from a farmers' cooperative ditch which takes water from South Fork American River near Chili Bar. A continuous flow is given each farmer, the cost being prorated among the owners of the ditch. Another farmers' ditch, privately owned, supplies water for land in the vicinity of Negro Hill School, between North Fork and South Fork American River. A small acreage of orchard land is irrigated from the Natomas Ditch in the extreme western part of Eldorado County, along South Fork American River, and a small acreage of land is irrigated on the ridge east of Diamond Spring from the Diamond Ridge Ditch which diverts water from North Fork Cosumnes River east of Pleasant Valley. In dry years this ditch has been known to be without water after July 15 owing to the scant flow of the river.

The Pilot Creek Ditch was constructed in 1852 and 1853 for mining operations on the divide between Middle Fork and South Fork American River. In 1872 this property was sold to the California Water Co. which made extensions, securing more water from Loon Lake. Subsidiary ditches were constructed all over the divide where there was a demand for water for mining purposes. At the present time this ditch is controlled by the Truckee River Power Co., water being sold on a quantity basis. A main ditch extends down the divide from Georgetown to Penobscot, Cool, and Pilot Hill. A lateral leads south to Kelsey and Garden Valley and another north to Spanish Dry Diggings. Water is sold at the rate of 25 cents a miner's inch for 24 hours, which amounts to about \$5 an acre for the annual water cost for deciduous fruits in this district. With the exception of the larger orchards near Cool, most of the irrigated tracts are small and scattered. There are a number of irrigated meadows.

Irrigation is practiced in the growing of most of the deciduous fruits in this area in order to obtain a profitable yield and maintain the condition of the trees. The irrigation season begins about the middle of May and continues to the first of October. For orchards, about 1 miner's inch of water is required for each 4 or 5 acres. The duty of water on orchards is from 1 to 1.5 acre-feet to the acre. With the exception of a few meadows and small patches of truck crops, orchards receive most of the water.

The furrow system is used in irrigating orchards and the "wild flooding" system for meadows. Furrows are usually opened up before the first irrigation and allowed to remain open without cultivation until fall. Two furrows are usually used to a tree row. Some difficulty is had in obtaining absorption of water on the steeper slopes owing to the too rapid flow of water through the furrows. New orchards set out on steep slopes should be planted so as to take advantage of the contour of the slope.

## SUMMARY

The Placerville area is in the western part of Eldorado County. Its western boundary is about 25 miles east of Sacramento, the capital of the State. The surveyed area covers 580 square miles.

The western part of the area comprises the lower, sparsely forested or treeless foothills of the Sierra Nevada; and the eastern part, the lower mountains of the Sierra Nevada, which are forested. The area ranges in elevation from 400 feet above sea level along the western border to 3,500 feet in the eastern part. The range in relief is from gently rolling to mountainous. Drainage is well developed, the area being drained by American and Cosumnes Rivers, which flow into the Great Valley.

Following the discovery of gold on American River in 1848, there was an influx of miners into the area. In 1870 there was a population of 10,300 in the county, but in 1930 the population was only 7,492. The people are predominantly of Anglo-Saxon descent.

Placerville, with a population of 1,914 in 1930, is the county seat and largest town in the area. It is an important shipping point for deciduous fruits, especially pears. Camino and Diamond Spring are important towns connected with the lumbering industry.

A branch line of the Southern Pacific Railroad extends through the area to Placerville and Camino, and a paved highway crosses the area. Outlying districts are served by mountain roads. Agricultural products are marketed in San Francisco and eastern cities.

The climate ranges from semiarid to humid, with an average annual rainfall ranging from 25 to 60 inches in different parts of the area. The summers are hot and dry, with practically no rain. Most of the rain falls between October and May. Maximum temperatures ranging from 100° to 110° F. are recorded from May to September, inclusive. Temperatures of 32° F. or less are likely to occur at Placerville from September to May. The average number of days between the dates of the latest and earliest frosts at Placerville is 190.

Grain, hay, grapes, and several general field crops are matured without irrigation. Pears, peaches, and plums require irrigation. Apples, walnuts, and cherries are grown to some extent without irrigation.

The first settlement in the area was in 1848. The practice of agriculture began between 1850 and 1860, when water was obtained from the mining ditches for the irrigation of land. There has been a gradual trend from grain and general farming to specialized types of agriculture. Pear growing and livestock raising are the two main agricultural industries of the county. Peaches and plums are important deciduous fruits.

Farm buildings are new and modern in the orchard districts, but elsewhere they are somewhat run down. Land values vary according to location, improvements, and utilization.

Nearly all the soils of the area are residual in origin. They are a product of the decomposition and disintegration of the underlying consolidated rocks. In the western part, where the rainfall is low, the soils are shallow and have less mature profiles than the soils that have developed under the humid conditions of the higher foothills. Seven series of residual soils, including 13 soil types and 6 phases,

occur in the area. These are the Sierra, Holland, Diamond Springs, Aiken, Olympic, Mariposa, and Sites. Only one alluvial soil, Honcut loam, which is inextensive, is mapped. Three types of miscellaneous materials occur in the area, placer diggings and tailings, rough mountainous land, and rough stony land. These are mainly nonagricultural, but placer diggings and tailings include some small areas of old undisturbed river-terrace materials or old valley-filling deposits which have some agricultural value.

The irrigation system in this area is developed from the systems of ditches built for mining purposes. Irrigation is necessary for the production of most fruits in the foothills. The furrow system is used, and irrigation is practiced between May and October. The gross duty is about 1 miner's inch to  $4\frac{1}{2}$  acres. The cost of water for orchards on the various ditches is between \$5 and \$8 an acre per annum.

[PUBLIC RESOLUTION—No. 9]

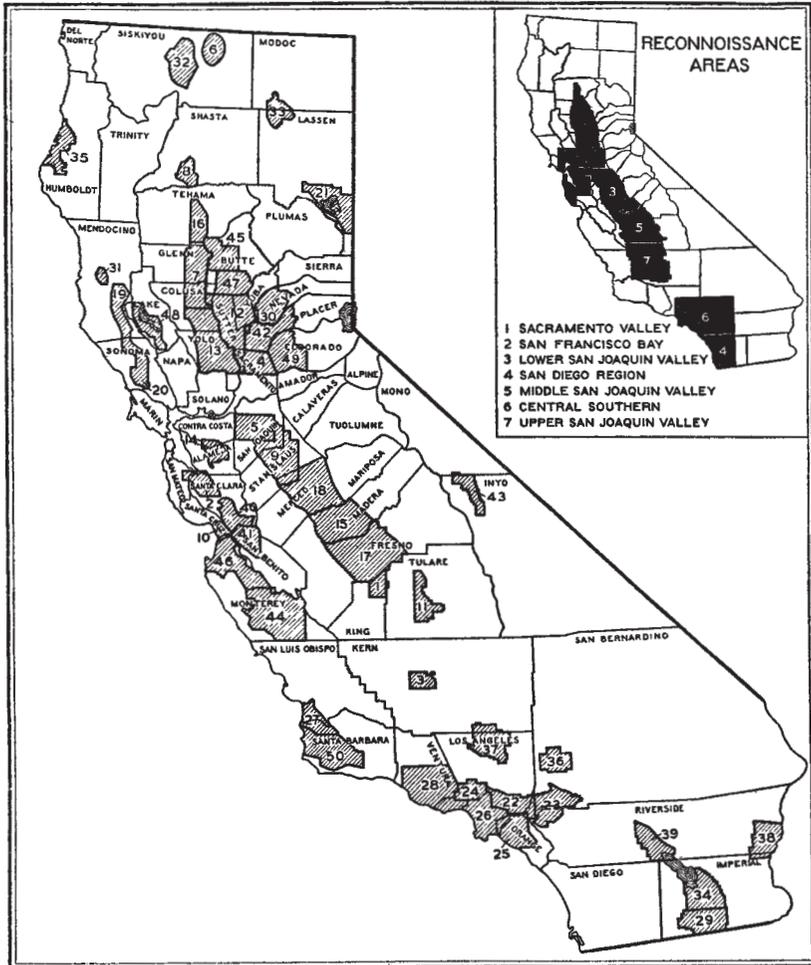
JOINT RESOLUTION Amending public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, "providing for the printing annually of the report on field operations of the Division of Soils, Department of Agriculture."

*Resolved by the Senate and House of Representatives of the United States of America in Congress assembled,* That public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, be amended by striking out all after the resolving clause and inserting in lieu thereof the following:

That there shall be printed ten thousand five hundred copies of the report on field operations of the Division of Soils, Department of Agriculture, of which one thousand five hundred copies shall be for the use of the Senate, three thousand copies for the use of the House of Representatives, and six thousand copies for the use of the Department of Agriculture: *Provided,* That in addition to the number of copies above provided for there shall be printed, as soon as the manuscript can be prepared, with the necessary maps and illustrations to accompany it, a report on each area surveyed, in the form of advance sheets, bound in paper covers, of which five hundred copies shall be for the use of each Senator from the State, two thousand copies for the use of each Representative for the congressional district or districts in which the survey is made, and one thousand copies for the use of the Department of Agriculture.

Approved March 14, 1904.

[On July 1, 1901, the Division of Soils was reorganized as the Bureau of Soils, and on July 1, 1927, the Bureau of Soils became a unit of the Bureau of Chemistry and Soils.]



Areas surveyed in California, shown by shading

- |                     |                   |                       |                  |
|---------------------|-------------------|-----------------------|------------------|
| 1. Hanford.         | 14. Livermore.    | 27. Santa Maria.      | 40. Gilroy.      |
| 2. San Jose.        | 15. Madera.       | 28. Ventura.          | 41. Hollister.   |
| 3. Bakersfield.     | 16. Red Bluff.    | 29. El Centro.        | 42. Auburn.      |
| 4. Sacramento.      | 17. Fresno.       | 30. Grass Valley.     | 43. Bishop.      |
| 5. Stockton.        | 18. Merced.       | 31. Willits.          | 44. King City.   |
| 6. Butte Valley.    | 19. Ukiah.        | 32. Shasta Valley.    | 45. Chico.       |
| 7. Colusa.          | 20. Healdsburg.   | 33. Big Valley.       | 46. Salinas.     |
| 8. Redding.         | 21. Honey Lake.   | 34. Brawley.          | 47. Oroville.    |
| 9. Modesto-Turlock. | 22. Pasadena.     | 35. Eureka.           | 48. Clear Lake.  |
| 10. Pajaro Valley.  | 23. Riverside.    | 36. Victorville.      | 49. Placerville. |
| 11. Portersville.   | 24. San Fernando. | 37. Lancaster.        | 50. Santa Ynez.  |
| 12. Marysville.     | 25. Anaheim.      | 38. Palo Verde.       |                  |
| 13. Woodland.       | 26. Los Angeles.  | 39. Coachella Valley. |                  |



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