

GENERALIZED SOIL MAP OF CALIFORNIA

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UNIVERSITY OF CALIFORNIA

COLLEGE OF AGRICULTURE

Agricultural Experiment Station and Extension Service

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THE MAP, which presents four major topographic divisions that are separated into 18 mapping categories and an unmapped south-eastern desert region, will be found in the pocket on the inside back cover. Additional copies of this map may be obtained for 25 cents each from:

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GENERALIZED SOIL MAP OF CALIFORNIA

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THE GENERALIZED soil map of California is intended to depict, in a general way, the soil geography of California. The map shows four major topographic divisions that are separated into 18 mapping categories and an unmapped southeastern desert region. Following this description, a table separates each category into one or more Great Soil Groups of the World, then separates the Great Soil Groups into Series-Groups, and the Series-Groups into Soil Series. Dominant soil textures are listed for each series.

There are six categories of valley land, four of which contain alluvial fan and flood plain soils, and two, wind modified soils. The alluvial fan and flood plain soils comprise about 9,700,000 acres of the best agricultural land of the state. There are about 1,200,000 acres of wind modified soils.

Valley basin land contains three of the major categories, one of which includes the organic soils (300,000 acres), another the imperfectly drained basin soils of the great valley trough (2,500,000 acres), and the third the saline and alkaline soils (2,800,000 acres).

The terrace land includes five of the major categories totaling 7,400,000 acres, of which 1,900,000 acres are hardpan soils, and 1,100,000 are claypan soils.

There are four major categories of upland soils, with a total area of about 54,100,000 acres. These include 20,500,000 acres of Podzolic timberland soils; 4,800,000 acres of Prairie, Chernozem, and Rendzina grassland soils; 15,300,000

acres of Noncalcic Brown woodland-grass soils; and 13,500,000 acres of shallow or very shallow soils classed as lithosols.

Each of the 18 major categories, as well as the unmapped desert, is rated on its general land-use suitability for commercial timber, grazing, nonirrigated field and truck crops, and irrigated field and truck crops. The best land use for each category is also listed.

On the map, physiographic features are shown in colors: valley lands are yellow; valley basin lands, green; terrace or bench lands, blue; hilly or steep uplands, red; unmapped desert, uncolored. Secondary soils (those deposited by water or wind) are indicated by symbols A, B, and C; and the residual or primary soils by symbol E. Although the desert is largely unmapped, the probable dominant soil conditions are indicated on the map legend.

In using this generalized map, it must be kept in mind that its scale imposes certain limitations on its use; therefore, the map is not intended for detailed land planning purposes. (Soil surveys suitable for more detailed use have been made for much of California.*) Areas of less than 4,000 acres could not be shown on a map of this scale. In many instances, complex soil conditions are included with adjacent soil groups of somewhat dissimilar nature.

* List of soil surveys in California, 1951, is available from the Department of Soils, University of California, Berkeley.

VALLEY LAND

(Alluvial flood plain or alluvial fan soils;
gently sloping, smooth topography)

This valley-land category, which includes the best all-purpose agricultural soils of the state, contains the gently sloping, well-drained alluvial flood plain or alluvial fan soils. Four groups are shown on the generalized soil map: As (high rainfall), An (medium rainfall), Ang (sandy and gravelly), and Ac (desert).

As Deep alluvial fan and flood plain soils of slightly acid reaction occurring in higher rainfall zone

These soils occupy the valleys in the higher rainfall zone. They are generally dark colored and are high in organic

matter. The Soquel and Ferndale soils in Humboldt, Mendocino, Sonoma, San Mateo, and Santa Cruz counties have produced some of the state's best stands of redwood. Cleared areas of these soils, drained and fertilized, are productive when planted to such crops as bush berries, strawberries, vegetables, and apples. These soils occur under climatic conditions that make them desirable for small home farms.

Soils of this group are classified and tabulated in table 1. A typical landscape on Soquel loam in Santa Cruz County appears in figure 1; and a profile of Soquel loam, in figure 2.

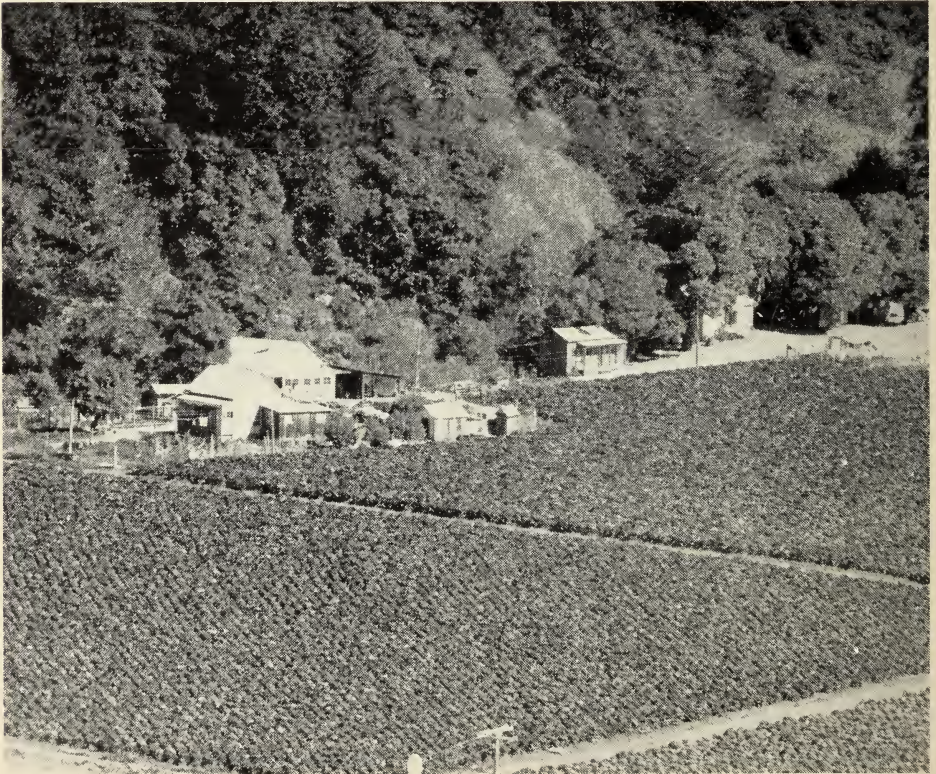


Fig. 1. Bush berries on Soquel loam in Santa Cruz County, a typical landscape of group As. The timbered upland above the valley is classed as group Ea.

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No. As

Soil Type Soquel loam
 Location Santa Cruz County
 Geographical Landscape gently sloping alluvial fan
 Elevation 50-100' Slope $\frac{1}{2}$ - 1% Erosion none
 Groundwater 40-80' Drainage good Alkali none
 Mode of Formation secondary Parent Material sedimentary rock alluvium
 Climate 40-50" rainfall
 Natural Cover timber Present Use orchards, truck crops
 Series - Group 45-Corralitas Soil Region I, II
 Profile Group I Great Soil Group Prairie Alluvial
 Related Soil Series Corralitas

Variations, etc. stratified profile

Profile Sketch	Color	Texture	Structure	Compactness Density	Reaction	Miscellaneous Roots, Concretions Permeability, etc.
	dark brownish gray	loam	soft cloddy	friable	slightly acid	many roots, fairly high organic content, permeable
	dark brownish gray	loam	cloddy when dry	friable	slightly acid	permeable

Natural Land Division alluvial fan; medium textured soils
having deep permeable profiles Al
 Soil Rating (Storle Index) 100 x 100 x 100 x 100 = 100% Grade 1
 Productivity: Irrigated Crops very good Range good
 Nonirrigated Crops good Timber very good
 Adaptation many crops, apples, bush berries, truck crops
 Soil Management protect from overflow

Fig. 2. Soil description and profile of Soquel loam, a typical soil of group As. This form is useful in reporting and showing the characteristics of a soil by horizons.

TABLE 1—As Deep Alluvial Fan and Flood Plain Soils of Slightly Acid Reaction Occurring in Higher Rainfall Zone

Great Soil Group of World		Series-Group		Soil series	Dominant soil textures
Name	Description	Name	Parent material		
Prairie Alluvial	dark colored; slightly acid reaction	15a. Julian	granitic rock alluvium	Farralone Julian Mottsville	loams
		45. Corralitos	sedimentary rock alluvium	Corralitos Soquel	loams
		59. Ferndale	mixed alluvium	Ferndale	loams

An Deep alluvial fan and flood plain soils occurring in intermediate rainfall zone

These soils occupy the valley land in the intermediate rainfall zone (10 to 20 inches annually), and generally are of various shades of brown. They represent the most important agricultural group of soils in California, and are highly valued for such irrigated crops as alfalfa, apricots, carrots, corn, lettuce, peaches, potatoes, sugar beets, and walnuts. Where climatic conditions are suitable they rate high for avocados, citrus fruits, cotton, and grapes. The soils of this group are found where the rainfall is too low for timber production. These soils have a top Storie-Index rating (90 to 100 per cent*).

Large areas occur in the Sacramento, Santa Clara, Salinas, Santa Maria, and Santa Ynez valleys, in the central and northern San Joaquin Valley and in the valleys of southern California.

Soils of this group are classified and tabulated in table 2. A typical soil of this group, Yolo loam, is illustrated in figure 3. Figure 4 is a profile of Yolo loam; figure 5 is of Sorrento soil, also typical of Group An.

* Storie, R. Earl. Revision of the Soil Rating Chart. California Agr. Exp. Sta., 1944. (Litho.)



Fig. 3. Prune orchard on Yolo loam (group An) in Santa Clara Valley.

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No. An

Soil Type Yolo loam
 Location Solano and Yolo counties
 Geographical Landscape gently sloping alluvial fans
 Elevation 50-300' Slope 1/2 to 1% Erosion none
 Groundwater 40-100 Drainage good Alkali none
 Mode of Formation secondary Parent Material sedimentary rock alluvium
 Climate 15-25" rainfall
 Natural Cover oak-grass Present Use many crops
 Series-Group 36-Yolo Soil Region IV, V, VII
 Profile Group I Great Soil Group Noncalcareous Brown Alluvial
 Related Soil Series Zamora, Sorrento

Variations, etc. stratified profile

Profile Sketch	Color	Texture	Structure	Compactness Density	Reaction	Miscellaneous Roots, Concretions Permeability, etc.
	brown	loam	soft clods	friable	neutral	permeable
	light brown	loam	soft clods	friable	neutral	permeable

Natural Land Division alluvial fan with medium textured soils
deep permeable subsoils - R1
 Soil Rating (Storie Index) 100 x 100 x 100 x 100 = 100% Grade 1
 Productivity: Irrigated Crops very good Range good
 Nonirrigated Crops: good Timber no
 Adaptation many irrigated crops; nonirrigated grain
 Soil Management nitrogen

Fig. 4. Soil description and profile of Yolo loam, a typical soil of group An.

TABLE 2—An Deep Alluvial Fan and Flood Plain Soils Occurring in Intermediate Rainfall Zone

Great Soil Group of World		Series-Group		Soil series	Dominant soil textures
Name	Description	Name	Parent material		
Calcic Brown Alluvial	calcareous subsoil; some soils are calcareous throughout profile generally brown soils	15. Hanford	granitic rock alluvium	Grangeville Hesperia Pachappa	sandy loam
		26. Vina	basic igneous alluvium	Buntingville Nord Plainsburg Ryer Stacy	loams
Noncalcic Brown Alluvial	usually of neutral or very slightly acid reaction	36. Yolo	sedimentary rock alluvium	Brentwood Campbell Sorrento	loams
		48. Columbia	mixed alluvium	Colusa Marvin Sycamore	loams
		54. Metz	mixed alluvium	Metz Moreno Sainas San Emigdio	loams
		15. Hanford	granitic rock alluvium	Greenfield Hanford Hilmar Oakdale Oak Glen Ripperdan Visalia	sandy loam

<p>Noncalic Brown Alluvial</p>	<p>usually of neutral or very slightly acid reaction</p>	<p>26. Vina</p>	<p>basic igneous rock alluvium</p>	<p>Athlone Gridley Honcut La Branza Modoc Sutter Surprise Vina Wyman</p>	<p>loams</p>																											
<hr/>						<p>36. Yolo</p>						<p>sedimentary rock alluvium</p>	<p>Carpenteria Cortina Danville Elder Yolo Zamora Zanga</p>	<p>loams</p>	<p>48. Columbia</p>						<p>mixed alluvium</p>	<p>Anderson Ballico Bear Columbia Feather Ramada</p>	<p>loams</p>	<p>48a. Arbuckle</p>						<p>mixed alluvium from gravelly sources</p>	<p>Arbuckle Chamisal Maywood</p>	<p>gravelly sandy loam gravelly loam</p>
<p>36. Yolo</p>						<p>sedimentary rock alluvium</p>	<p>Carpenteria Cortina Danville Elder Yolo Zamora Zanga</p>	<p>loams</p>																								
<p>48. Columbia</p>						<p>mixed alluvium</p>	<p>Anderson Ballico Bear Columbia Feather Ramada</p>	<p>loams</p>																								
<p>48a. Arbuckle</p>						<p>mixed alluvium from gravelly sources</p>	<p>Arbuckle Chamisal Maywood</p>	<p>gravelly sandy loam gravelly loam</p>																								



Fig. 5. Ground prepared for growing truck crops on Sorrento soils, typical of group An.

Ang Deep alluvial fan soils of very sandy or very gravelly texture

The Tujunga soils occupy very recent deposits of sandy, gravelly, or stony material and occur principally in Los Angeles, Riverside, and San Bernardino counties. These "raw" alluvial soils are derived from granitic material. They are

of very low value for agricultural purposes and, because of their extremely coarse texture, have a low Storie-Index rating (10 to 30 per cent). Deep alluvial fan soils of very sandy or very gravelly texture are classified in table 3. A profile of Tujunga gravelly sand is shown in figure 6.

TABLE 3—Ang Deep Alluvial Fan Soils of Very Sandy or Very Gravelly Texture

Great Soil Group of World		Series-Group		Soil series	Dominant soil textures
Name	Description	Name	Parent material		
Noncalic Brown Alluvial	very coarse-textured neutral soils	14. Tujunga	granitic rock alluvium	Tujunga	stony sand; gravelly sand

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No. Ang

Soil Type Tujunga gravelly sand
 Location Southern California
 Geographical Landscape very recently deposited alluvial fans
 Elevation 50-500' Slope 1/2 to 2% Erosion channels
 Groundwater 10-200' Drainage good to excessive Alkali none
 Mode of Formation secondary Parent Material granitic rock alluvium
 Climate 8-20" rainfall
 Natural Cover shrubs Present Use residential
 Series - Group 14 - Tujunga Soil Region VII and IX
 Profile Group I Great Soil Group Noncalic Brown Alluvial
 Related Soil Series Hanford

Variations, etc. gravel content

Profile Sketch	Color	Texture	Structure	Compactness Density	Reaction	Miscellaneous Roots, Concretions Permeability, etc.
	light brownish gray	gravelly sand	single grained	friable	neutral	very permeable, very low moisture holding capacity
	light brownish gray	stratified coarse textured	single grained	friable	neutral	very permeable, very low moisture holding capacity

Natural Land Division very coarse textured recent alluvium A 13

Soil Rating (Storie Index) 100 x 25 x 100 x 90 = 22% Grade 4
 Productivity: Irrigated Crops fair Range low to very low
 Nonirrigated Crops low Timber no
 Adaptation grapes; sand pits
 Soil Management protection from overflow, fertilization; irrigation

Fig. 6. Soil description and profile of Tujunga gravelly sand, a typical soil of group Ang.

TABLE 4—Ac Alluvial Fan and Flood Plain Soils of Desert Region

Great Soil Group of World		Series-Group		Soil series	Dominant soil textures
Name	Description	Name	Parent material		
Red Desert Alluvial	light-colored, calcareous alluvial soils	19. Cajon	granite rock alluvium	Cajon Daggett Indio	sandy loams
Gray Desert Alluvial	light-gray, calcareous alluvial soils	58. Gila	mixed alluvium	Carrizo, Gila Holtville Imperial Meloland	all textures
		41. Panoche	sedimentary rock alluvium	Mochó Panhill Panoche, Topo	loams

Ac Alluvial fan and flood plain soils of desert region

These soils are found in the desert and semi-desert areas of low rainfall (1 to 7 inches annually). They are light colored, low in organic matter, and calcareous. They may be found in the Imperial and Palo Verde valleys, in parts of the Mojave Desert, and in the southwestern portion of the San Joaquin Valley. These areas are too dry to produce crops without irrigation, but when irrigated the soils are highly valued for such field crops as alfalfa, flax, and cotton. These soils generally have a high (70 to 100 per cent) Storie-Index rating (except where they contain alkali). Soils of this group are classified in table 4. Truck crops growing on Holtville silty clay loam in figure 7; and a profile of Gila fine sandy loam appears in figure 8.



Fig. 7. Lettuce on Holtville silty clay loam (group Ac) in the Imperial Valley.

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No. Ac

Soil Type Gila fine sandy loam
 Location Palo Verde valley
 Geographical Landscape very gently sloping valley
 Elevation 0-100' Slope less than 2% Erosion none
 Groundwater 5-100' Drainage usually good Alkali free to slight
 Mode of Formation secondary Parent Material mixed alluvium
 Climate 1-5" annual rainfall
 Natural Cover desert shrubs Present Use field and truck crops
 Series - Group 5B - Gila Soil Region XII
 Profile Group I Great Soil Group Red Desert Alluvial
 Related Soil Series Holtville, Meloland

Variations, etc. stratified

Profile Sketch	Color	Texture	Structure	Compactness Density	Reaction	Miscellaneous Roots, Concretions Permeability, etc.
12"	light brown	fine sandy loam	soft clods	friable	calcareous	permeable
24"	light brown	variable	soft clods	friable	calcareous	permeable
36"						
48"						
60"						

Natural Land Division flood plain land, medium textured soils, deep permeable profiles - R1
 Soil Rating (Storie Index) $100 \times 100 \times 100 \times 95 = 95\%$ Grade 1
 Productivity: Irrigated Crops very good Range very low
 Nonirrigated Crops no Timber no
 Adaptation irrigated alfalfa, cotton, etc
 Soil Management irrigation, nitrogen, phosphorus, green manures

Fig. 8. Soil description and profile of Gila fine sandy loam, a typical soil of group Ac.

VALLEY LAND

(Aeolian or wind modified sandy soils)

The soils in this subcategory are aeolian or wind modified sandy soils. They are included in two groups: Asnw (aeolian; intermediate rainfall) and Acw (aeolian; low rainfall).

Asnw Sandy, wind modified soils of intermediate rainfall zone

The Delhi and Atwater sands are found in Stanislaus, Merced, Madera, and Fresno counties, where the annual rainfall is between 8 and 13 inches. These soils are light brown and about neutral in reaction. Soils of the Marina, Elkhorn, and Tangair series-groups are found closer to the seacoast where the rainfall is higher. They are more acid in reaction, and the profiles are more fully developed than those in the Delhi series-group. With irrigation, the Delhi and Atwater soils produce grapes, sweet potatoes, watermelons, alfalfa, etcetera. The soils of the Marina, Elkhorn, and Tangair groups receive sufficient winter rain to produce certain crops in fair quantity.

All of these soils are subject to wind erosion, have a low water-holding capacity, and are somewhat deficient in plant nutrients. Their rating for natural grazing is fair to poor. The Storie-Index rating is fair (40 to 59 per cent). Soils of this group are classified and tabulated in table 5, and a profile of Delhi sand is shown in figure 9.

Acw Sandy, wind modified soils of low rainfall zone

These soils are found in the desert where the annual rainfall is 0 to 3 inches. They are calcareous, low in organic matter and in nitrogen, and have a low water-holding capacity. Extensive areas are found on the Imperial East Mesa and Imperial West Mesa in Imperial County; in the Coachella Valley, and Palo Verde Mesa in eastern Riverside County. Areas of Superstition, Acolita, Drylyn, and Orita series have been included with

TABLE 5—Asnw Sandy, Wind Modified Soils of Intermediate Rainfall Zone

Great Soil Group of World		Series-Group		Soil series	Dominant soil textures
		Name	Parent material		
Noncalic Brown Sand	light-brown, wind modified, sandy soils; neutral to acid	24. Delhi	granitic sands	Atwater Delhi	sands
		66. Marina	mixed sands	Baywood Marina Oakley	sands
		67. Elkhorn	mixed sands	Elkhorn Westport	sand, loamy sand
		68. Tangair	mixed sands	Garey Tangair	sand, loamy sand

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No. Asnw

Soil Type Delhi sand
 Location Merced county - San Joaquin Valley
 Geographical Landscape undulating, wind modified valley plain
 Elevation 100-400' Slope 2-5% Erosion wind
 Groundwater 10-75' Drainage good Alkali free
 Mode of Formation secondary Parent Material wind modified granitic alluvium
 Climate 8-12" annual rainfall
 Natural Cover shrubs, grass Present Use specialized irrigated crops
 Series - Group 24 - Delhi Soil Region VII, IX
 Profile Group _____ Great Soil Group Noncalcic Brown Sand
 Related Soil Series Atwater

Variations, etc. topography

Profile Sketch	Color	Texture	Structure	Compactness Density	Reaction	Miscellaneous Roots, Concretions Permeability, etc.
	light brown	sand	single grained	friable	neutral	permeable, low water holding capacity
	light grayish brown	sand	single grained	friable	slightly basic	permeable, low water holding capacity

Natural Land Division wind modified sands ; A5-5d

Soil Rating (Storie Index) 100x60 x 95 x 90 = 51% Grade 3
 Productivity: Irrigated Crops fair to good Range low
 Nonirrigated Crops low Timber no
 Adaptation sweet potatoes, melons, grapes, alfalfa, etc, with irrigation
 Soil Management protection from wind drifting, nitrogen

Fig. 9. Soil description and profile of Delhi sand, a typical soil of group Asnw.

these soils on the mesa lands. The soils are subject to wind erosion; and leveling is expensive. They are low in plant nutrients, and must be irrigated in order to produce any crops. Specialized crops, such as dates, grapes, and grapefruit, may be grown where the climate is suit-

able and the land is leveled and irrigated. These soils have a medium-to-low Storie-Index rating (30 to 55 per cent).

Soils of the group are classified and tabulated in table 6. Figure 10 shows date palms growing on soils of this group; and figure 11, a profile of Rositas sand.

TABLE 6—Acw Sandy, Wind Modified Soils of Low Rainfall Zone

Great Soil Group of World		Series-Group		Soil series	Dominant soil textures
Name	Description	Name	Parent material		
Red Desert Sand	light reddish-brown; calcareous, wind modified sands	25. Coachella	granitic sands	Coachella	sands
		65. Rositas	mixed sands	Rositas	sands
Gray Desert Sand	light gray, calcareous, wind modified sands	65. Rositas	mixed sands	Preston	sands

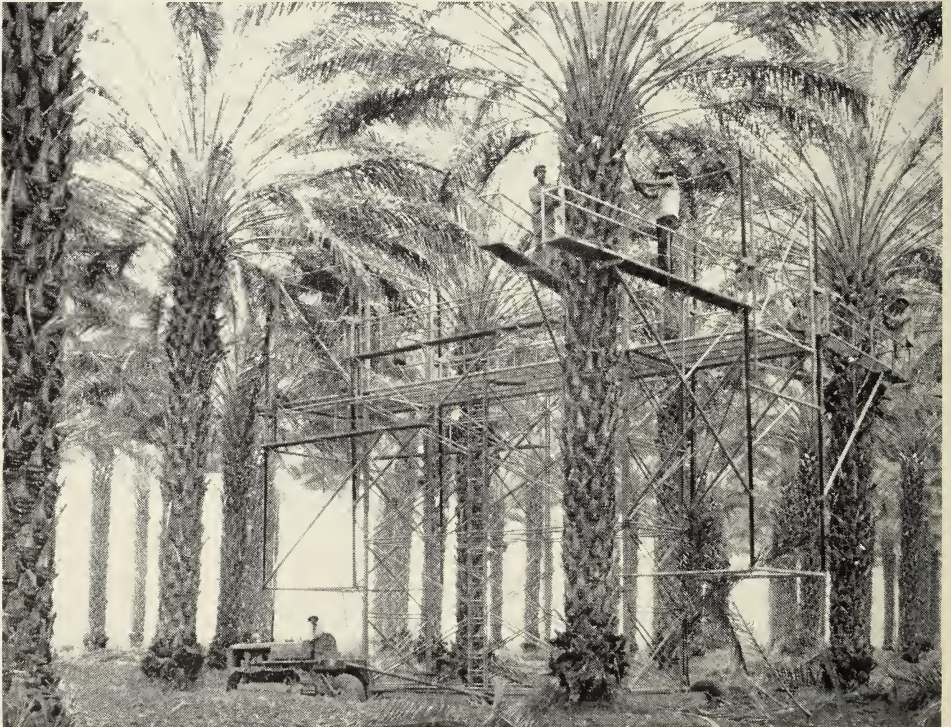


Fig. 10. Deglet Noor date palms growing on soils of group Acw.

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No. Acw

Soil Type Rositas sand
 Location Imperial East Mesa
 Geographical Landscape undulating wind modified valley
 Elevation -50 to 100' Slope 1/2 - 3% Erosion wind
 Groundwater deep Drainage good Alkali none
 Mode of Formation secondary Parent Material sandy mixed alluvium
 Climate 1-3" annual rainfall
 Natural Cover desert shrubs Present Use specialized crops with irrigation
 Series - Group 65 - Rositas Soil Region XII
 Profile Group I Great Soil Group Red Desert Sand
 Related Soil Series Preston, Superstition

Variations, etc. topography

Profile Sketch	Color	Texture	Structure	Compactness Density	Reaction	Miscellaneous Roots, Concretions Permeability, etc.
	light brownish gray	sand	single grained	friable	calcareous	low organic content, low water holding capacity.

Natural Land Division sandy wind modified soils - A5-5d
 Soil Rating (Storie Index) 100 x 60 x 100 x 70 = 42% Grade 3
 Productivity: Irrigated Crops fair Range no
 Nonirrigated Crops no Timber no
 Adaptation specialized irrigated crops
 Soil Management control wind erosion, green manures, frequent irrigations

Fig. 11. Soil description and profile of Rositas sand, a typical soil of group Acw.

VALLEY BASIN LAND (Nearly flat topography)

Lands in this category, which occupy the lowest parts of the valleys, are nearly flat and usually imperfectly or poorly drained. There are three general groups of soils in this category: Ba (highly organic basin soils); Bnc (basin clays); and Bck (alkali basin soils).

Ba Organic soils

These soils are dark colored and high in organic matter (10 to 30 per cent). They have been formed through the decomposition of tules and reeds, and are acid in reaction and low in bases. They are confined to one large area in the Sacramento-San Joaquin Delta region, where the Sacramento and San Joaquin rivers join.

Most of these organic soils have been protected from overflow and reclaimed by an extensive system of levees. They are drained by open canals and pumps.

These soils rate high for such field and vegetable crops as corn, potatoes (figure 12), onions, sugar beets, asparagus, and celery. All cultivated areas are irrigated.

Soils of this group are classified and tabulated in table 7. A profile of Staten Peaty Muck is shown in figure 13.



Fig. 12. The dark-colored, highly organic soils of group Ba are excellent for potato growing.

Great Soil Group of World		Series-Group		Organic Soils	
				Name	Parent material
Name	Description	Name	Parent material	Soil series	Dominant soil texture
Prairie Bog	poorly drained, highly organic soils; acid in reaction	69. Egbert	tules, reeds	Burns Correra Peat Egbert Muck Peat Roberts Muck Ryde Staten Peaty Muck Venice	peat, muck, organic loams

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No. Ba

Soil Type Staten Peaty Muck
 Location Delta area in western San Joaquin County
 Geographical Landscape nearly flat basin
 Elevation -2 to 5' Slope flat Erosion none
 Groundwater 2 to 4' Drainage poor Alkali none
 Mode of Formation primary-organic Parent Material tules, reeds
 Climate 12 - 18" annual rainfall
 Natural Cover tules, reeds Present Use field and truck crops
 Series - Group 69-Egbert Soil Region IX
 Profile Group I Great Soil Group Prairie Bog
 Related Soil Series Correra Peat, Venice

Variations, etc. organic content

Profile Sketch	Color	Texture	Structure	Compactness Density	Reaction	Miscellaneous Roots, Concretions Permeability, etc.
	dark gray	peaty muck	fibrous	friable	moderately acid	40-50% organic permeable
	dark brown	peat	fibrous	friable	slightly acid	about 70% organic permeable
	dark brown	peat	layered	friable	slightly acid	permeable

Natural Land Division basin land, medium textured soils, deep permeable profiles, poor drainage
B1-1p
 Soil Rating (Storie Index) $100 \times 100 \times 100 \times 70 = 70\%$ Grade 2
 Productivity: Irrigated Crops good Range fair to good
 Nonirrigated Crops fair Timber no
 Adaptation field and truck crops
 Soil Management drainage, fertilization

Fig. 13. Soil description and profile of Staten Peaty Muck, a typical soil of group Ba.

Bnc Imperfectly drained basin soils

This group contains natural grassland soils. They are generally dark-colored clays, and have a high water table or are subject to overflow. The largest areas occur in the trough of the Sacramento and San Joaquin valleys. Some of the San Joaquin Valley basin soils contain alkali.

Under dry-farming practice these soils are used for wheat and barley. Native pasture, as well as irrigated permanent pasture, does well. In the Sacramento Valley they are used extensively for rice. They are not adapted to orchard or vineyard use because of position and drainage conditions. Problems limiting their uses are drainage, clay texture, and danger of frost.

Soils of this group are classified and tabulated in table 8. Pasture on Merced

clay is shown in figure 14. A profile of Sacramento clay is shown in figure 15.

Bck Saline and alkali soils

The soils of this group, which are characterized by a moderate-to-high content of soluble salts, are commonly called "alkali soils." Uncultivated areas are used for saltgrass pasture. Areas having slight-to-moderate concentrations of salt, or which have been partially reclaimed, produce such salt-tolerant crops as barley, rice, and flax. Reduction in salt concentration by leaching and by chemical means is very difficult over much of the area because of poor drainage, slowly permeable soil profiles, and high content of sodium.

Large areas of saline and alkali soils occur in the San Joaquin Valley, in Surprise Valley in Modoc County, in Honey Lake Valley in Lassen County, and on



Fig. 14. Pasture on Merced clay, basin clay soil of group Bnc.

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No. Bnc

Soil Type Sacramento clay
 Location trough of Sacramento Valley
 Geographical Landscape nearly flat valley trough
 Elevation 10-100' Slope less 1/2% Erosion none
 Groundwater 3-10' Drainage imperfect to poor Alkali none
 Mode of Formation secondary Parent Material fine textured mixed alluvium
 Climate 15-25" annual rainfall
 Natural Cover grass Present Use field crops
 Series - Group 52. Sacramento Soil Region IV, IX
 Profile Group II Great Soil Group Chernozen Wiesenboden
 Related Soil Series Temple, Merced
geographically associated with Columbia series.
 Variations, etc. drainage, lime content

Profile Sketch	Color	Texture	Structure	Compactness Density	Reaction	Miscellaneous Roots, Concretions Permeability, etc.
	dark gray	clay	cloddy	friable	neutral	permeable
	gray	clay	cloddy	slightly compact	slightly calcareous	permeable

Natural Land Division basin land with fine textured soils, usually moderately dense subsoils B4
 Soil Rating (Storie Index) $70 \times 70 \times 100 \times 90 = 57\%$ Grade 3
 Productivity: Irrigated Crops fair to good Range good
 Nonirrigated Crops fair to good Timber no
 Adaptation grains, sugar beets, rice
 Soil Management protection from overflow, drainage

Fig. 15. Soil description and profile of Sacramento clay, a typical soil of group Bnc.

TABLE 8—Bnc Imperfectly Drained Basin Soils

Great Soil Group of World		Series-Group		Soil series	Dominant soil textures
Name	Description	Name	Parent material		
Wiesenboden (Calcic Brown) (Chernozem) (Prairie)	soils occupying relatively flat areas; generally of dark colors; generally clay textures; nearly all are basic in reaction or have calcareous subsoils	31. Conejo	basic igneous rock alluvium	Burchell Carson Conejo Edenvale Pit	clays
		33. Stockton	basic igneous rock alluvium; underlain by substratum	Anita Landlow Stockton	clays
		37a. Genevra	sedimentary rock alluvium; some mixture	Genevra Meyers	clays
		39. Dublin	sedimentary rock alluvium	Agueda Alamitos Bayshore Castro Clear Lake Cropley Dublin Pacheco Russell Santa Rita Sunnyvale	clays
		43. Willows	sedimentary rock alluvium; some alkali	Capay Grimes	clays
		52. Sacramento	mixed alluvium	Freeport Mormon Sacramento Temple Tulare	clays
		53. Merced	mixed alluvium; dense subsoils	Glenn Kirkwood Merced	clays

the playas of the Mojave Desert Region. A considerable acreage of saline soils is associated with the soils in the Imperial and Palo Verde valleys of Imperial and Riverside counties. The scale of the map does not permit showing all of the areas where this complex is found.

The Storie-Index rating of unreclaimed saline and alkali soils is 2 to 20 per cent.

Soils of this group are classified in table 9. A landscape showing high salt concentration appears in figure 16; and a profile of Fresno fine sandy loam in figure 17.

TERRACE LAND

(Gently sloping to undulating)

The soils of the terrace land category are found along the edges of the valleys, usually at elevations of 5 to 100 feet above the valley lands. In this generalized classification, Terrace Land includes both low and high terraces. These two types of terraces have been described sepa-

rately in many publications. The soils included in the terrace group consist of older secondary deposits or old valley-filling material that has moderately dense subsoils, those having dense clay subsoils, and those having lime or iron hardpan subsoil layers. There are five



Fig. 16. Landscape of Fresno fine sandy loam (group Bck) south of Kerman, Fresno County, showing high salt concentration.

TABLE 9—Bck Saline and Alkali Soils

Great Soil Group of World		Series-Group		Soil series	Dominant soil textures
Name	Description	Name	Parent material		
Gray Desert Solonchak	saline and alkali soils of Great Basin Region; light color	64. Lahontan	mixed alluvium	Lahontan Rosamond	variable
Red Desert Solonchak	saline and alkali soils of Colorado Desert Region; light color	56. Gila	mixed alluvium	Gila Imperial Meloland Woodrow	variable
Calcic Brown Solonchak	saline and alkali soils of intermediate-to-low rainfall zone	23 Fresno	acid igneous rock alluvium	Bishop Fresno, Lewis Merrill Milham Pond San Marcos Traver Waukena	loams
		35. Canby	basic igneous rock alluvium	Canby Gazelle	clay loams
		44. Lethent	sedimentary rock alluvium	Lethent Levis, Volta	clay loam and clay
		63. Alviso	mixed alluvium	Alviso Hacienda	variable
Chernozem Solonchak	saline and alkali soils of darker color; usually higher rainfall zone	43. Willows	usually sedimentary rock alluvium	Norman Orestimba Oxalis Pescadero Piper, Willows	generally clays
		53a. Solano	usually mixed alluvium	Antone Dunning Lindsay Marcuse Solano	generally clays

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No. Bck

Soil Type Fresno fine sandy loam, strong alkali
 Location San Joaquin Valley
 Geographical Landscape nearly flat valley plain
 Elevation 100-400' Slope 5% Erosion none
 Groundwater 10-30' Drainage imperfect to poor Alkali strong
 Mode of Formation secondary Parent Material granitic rock alluvium
 Climate 6-11" annual rainfall
 Natural Cover alkali weeds Present Use pasture
 Series - Group 23 - Fresno Soil Region IX
 Profile Group V Great Soil Group Calcic Brown Solonchak
 Related Soil Series Waukena, Pond and Traver

Variations, etc. _____

Profile Sketch	Color	Texture	Structure	Compactness Density	Reaction	Miscellaneous Roots, Concretions Permeability, etc.
	gray	fine sandy loam	laminated	slightly compact	calcareous	alkaline
	light gray	fine sandy loam	soft cloddy	slightly compact	calcareous	highly alkaline (black alkali)
	light gray		lime cemented		hardpan	
	light gray	fine sandy loam	soft cloddy	slightly compact	calcareous	thin lenses of hardpan

Natural Land Division basin soils of medium texture having hardpan lenses, strong alkali
B13-2a
 Soil Rating (Storie Index) 40 x 100 x 100 x 10 = 4% Grade 6
 Productivity: Irrigated Crops very low Range low
 Nonirrigated Crops no Timber no
 Adaptation pasture of alkali resistant grasses and shrubs
 Soil Management alkali, poor drainage and hardpan render alkali reclamation difficult and costly.

Fig. 17. Soil description and profile of Fresno fine sandy loam, a typical soil of group Bck.

general groups: Csm (dark-colored, moderately dense subsoil); Cnm (brownish, moderately dense subsoil); Ccy (desert); Cand (dense clay subsoils); and Canh (red-iron hardpan).

Csm Terrace land having dark-colored, slightly to moderately acid soils with moderately dense subsoils

These soils occur where the rainfall is between 15 and 40 inches annually, with cool, wet winters and temperate, dry summers. Narrow strips border the coast from Del Norte County to San Luis Obispo County. Many of these areas are too small to be delineated on the generalized soil map and are included with associated claypan soils (Cand).

This group is classed as Prairie soils because of the grass vegetation, dark color, and other profile characteristics normally associated with Prairie soils. The soils have a high value for natural grazing and for certain vegetables that thrive close to the ocean. Phosphate fertilization is generally needed to maintain good yields. The Storrie-Index rating of these soils is generally 60 to 80 per cent. Soils of this group are classified and tabulated in table 10, and a profile of Rohnerville clay loam is shown in figure 18.

Cnm Terrace land having moderately dense subsoils, usually with brownish soils of neutral reaction

The soils of this group occupy low terrace positions in the intermediate rainfall zone (10 to 20 inches annually). The native cover is grass or woodland grass. The Noncalic Brown soils in this group are brownish and neutral in reaction, whereas the Chernozem, which are included, are dark gray, of clay texture, and have calcareous subsoils.

With irrigation, the soils have a fair-to-good agricultural rating. For grazing, the Noncalic Brown soils are of fair quality, whereas the Chernozem soils are

TABLE 10—Csm Terrace Land Having Dark-colored, Slightly to Moderately Acid Soils with Moderately Dense Subsoils

Great Soil Group of World		Series-Group		Soil series	Dominant soil textures
Name	Description	Name	Parent material		
Prairie	dark-colored, slightly to moderately acid soils; moderately dense subsoils	16a. Chualar	granitic rock alluvium	Chualar	sandy loam
		37. Pleasanton	sedimentary rock alluvium	Gorman Lockwood	loams
		47. Empire	sedimentary rock alluvium	Arguello	loam
		60. Rohnerville	mixed alluvium	Rohnerville	loam, clay loam

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No. Csm

Soil Type Rohnerville clay loam
 Location Sonoma, Mendocino and Humboldt Coast
 Geographical Landscape gently sloping coastal terraces
 Elevation 50-200' Slope 1/2 - 3% Erosion generally none
 Groundwater deep Drainage subsurface slow Alkali none
 Mode of Formation secondary Parent Material mixed sediments
 Climate 30-40" annual rainfall, foggy
 Natural Cover grass Present Use grazing
 Series - Group 60-Rohnerville Soil Region II, I.
 Profile Group III. Great Soil Group Prairie
 Related Soil Series Watsonville (IV).

Variations, etc. depth of dark surface

Profile Sketch	Color	Texture	Structure	Compactness Density	Reaction	Miscellaneous Roots, Concretions Permeability, etc.
12"	dark brownish gray	clay loam	granular	friable	moderately acid	many roots, permeable
24"	yellowish brown	gritty clay loam	cloddy	moderately compact	moderately acid	slowly permeable
36"						
48"						
60"	highly mottled	stratified	massive	moderately compact	moderately acid	yellow and brown mottlings.

Natural Land Division lower terrace land medium textured soils with moderately dense subsoils, low nutrient level. C2-4p
 Soil Rating (Storie Index) 90 x 85 x 100 x 90 = 69% Grade
 Productivity: Irrigated Crops good Range good
 Nonirrigated Crops fair to good Timber questionable
 Adaptation pasture
 Soil Management better grasses, lime, phosphorus

Fig. 18. Soil description and profile of Rohnerville clay loam, a typical soil of group Csm.

TABLE 11—Cnm Terrace Land Having Moderately Dense Subsoils, Usually with Brownish Soils of Neutral Reaction

Great Soil Group of World		Series-Group		Soil series	Dominant soil textures
Name	Description	Name	Parent material		
Noncalcic Brown	brown soils; neutral or slightly acid reaction	16. Ramona	granitic rock alluvium	Camphora Ramona Snelling	gritty loam sandy loam
		28. Bale	basic igneous rock alluvium	Ager Bale Cowell Delaney Rydborg Shasta	loams
		37. Pleasanton	sedimentary rock alluvium	Barron Esparto Harrington Ojai Pleasanton Spore Sunol	loams
		49. Tehama	mixed alluvium	Ballard Ben Lomond Hames Perkins Prado Tehama Tejon	loams
Chernozem	dark-colored soils; calcareous subsoils	27. Porterville	fine textured basic igneous rock alluvium	Ducor Planada Porterville	clay
		32. Hovey	fine textured basic igneous rock alluvium calcareous	Hovey	clay
		40. Montezuma	fine textured sedimentary rock alluvium	Denverton Los Banos Montezuma	clays

good. Irrigated pasture does well on all the soils. Irrigation and nitrogen fertilization are needed to produce good, sustained crop yields. The Storrie-Index rat-

ing of these soils is generally 60 to 80 per cent. Soils of this group are classified and tabulated in table 11, and a profile of Ramona loam is shown in figure 19.

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No. Cnm

Soil Type Ramona loam
Location valley terraces in Southern California
Geographical Landscape alluvial terrace
Elevation 100-400' Slope 1-3% Erosion slight
Groundwater deep Drainage good Alkali none
Mode of Formation secondary Parent Material granitic rock alluvium
Climate 8-20" annual rainfall
Natural Cover shrubs, grass Present Use citrus, field crops
Series - Group 16 - Ramona Soil Region IV and VII
Profile Group III Great Soil Group Noncalic Brown
Related Soil Series Greenfield, Placentia

Variations, etc. density of subsoil

Profile Sketch	Color	Texture	Structure	Compactness Density	Reaction	Miscellaneous Roots, Concretions Permeability, etc.
12"	brown	gritty loam	cloddy	friable when moist	neutral	permeable
24"	brown	loam	cloddy	slightly compact	slightly basic	permeable
36"	light reddish brown	clay loam	fairly hard clods	moderately compact	slightly basic	slowly permeable
48"	brown	gritty loam	medium clods	slightly compact	slightly basic	permeable
60"						

Natural Land Division low terrace medium textured soils having moderately dense subsoils C2

Soil Rating (Storrie Index) $80 \times 100 \times 100 \times 90 = 72\%$ Grade 2

Productivity: Irrigated Crops fair to good Range fair

Nonirrigated Crops fair Timber no

Adaptation citrus and shallow rooted irrigated crops

Soil Management winter cover crops, nitrogen fertilizer

Fig. 19. Soil description and profile of Ramona loam, a typical soil of group Cnm.

Ccy Desert soils

This group includes the desert terrace soils in the low rainfall zone (1 to 6 inches annually). They are light colored, of low organic matter content, and usu-

ally high in lime. Without irrigation they provide only poor grazing from the native grasses. The Storie-Index rating varies with the depth and texture (10 to 60 per cent). Soils of this group are classified

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No. Ccy

Soil Type Tijeras gravelly sandy loam
 Location Mojave and Colorado desert mesas
 Geographical Landscape high terraces
 Elevation 100-1000' Slope 1/2 - 2% Erosion severe on edges of terraces
 Groundwater very deep Drainage good Alkali none
 Mode of Formation secondary Parent Material chiefly granitic rock alluvium
 Climate desert, 1-6" annual rainfall
 Natural Cover desert shrubs Present Use _____
 Series - Group 21 - Tubac Soil Region XII
 Profile Group Vx Great Soil Group Red Desert Calcisol
 Related Soil Series Tubac

Variations, etc. _____

Profile Sketch	Color	Texture	Structure	Compactness Density	Reaction	Miscellaneous Roots, Concretions Permeability, etc.
	desert pavement of light reddish brown	sandy loam	vesicular	polished friable	gravel calcareous	(desert varnish) permeable
	12" pinkish gray	gravelly sandy loam	soft cloddy	moderately compact	calcareous	Many lime nodules
	24" pinkish gray	gravelly	semi-cemented	dense, cemented	calcareous	very gravelly, with lime cemented lenses
36"						
48"						
60"						

Natural Land Division terrace land, gravelly soils with hardpan, severe erosion D28-3b

Soil Rating (Storie Index) 25 x 65 x 100 x 70 = 11% Grade 5

Productivity: Irrigated Crops ? Range very low
 Nonirrigated Crops no Timber no

Adaptation _____

Soil Management _____

Fig. 20. Soil description and profile of Tijeras gravelly sandy loam, typical of group Ccy.

TABLE 12—Ccy Desert Soils

Great Soil Group of World		Series-Group		Dominant soil textures
Name	Description	Name	Parent material	
Red Desert	light reddish-brown desert soils	20. Mojave	granitic rock alluvium	sandy loam, gritty loam
Red Desert Calcisol	light reddish-brown calcareous soils, having caliche hardpan	21. Tubac	granitic and mixed alluvium	gravelly sandy loam
Gray Desert	light-gray or light brownish-gray calcareous soils	42. Commatti	principally sedimentary rock	variable
		64a. Johnstonville	basic igneous rock alluvium	loams
Gray Desert Calcisol	light-gray or light brownish-gray calcareous soils, having caliche hardpan	57. Sunrise	mixed alluvium	loams

and tabulated in table 12, and a profile of Tijeras gravelly sandy loam is shown in figure 20.

Cand Terrace land having soils with dense clay subsoils

California has a large number of claypan soils. With the exception of the desert region they are widely distributed in the state.

These soils have medium-textured surface soils overlaid with very dense clay subsoils. The change from surface soil to subsoil is generally very abrupt. The brownish neutral soils having calcareous subsoils are classed as Calcic Brown Planosols and normally are found in the 6 to 12 inch rainfall zone; the dark-colored neutral soils having calcareous subsoils are classed as Chernozem Planosols and normally occur in the 12 to 20 inch rainfall zone; the brownish neutral soils having noncalcareous subsoils are classed as Noncalcic Brown Planosols and usually occur in the 12 to 20 inch rainfall zone; the dark-colored acid soils having slightly acid subsoils are classed as Prairie Planosols and normally occur

in the 20 to 40 inch rainfall zone; and the more acid soils occurring in the highest rainfall zone are classed as Podzolic Planosols.

Soils of this group are satisfactory for grasses and shallow-rooted crops. Some areas on sloping topography, especially on the higher bench positions, are badly eroded. A permanent grass cover should be maintained on such areas to prevent erosion. The Storie-Index rating in such soils is about 30 to 55 per cent. Soils of this group are classified and tabulated in table 13. A typical landscape of terrace soil with dense clay subsoil is shown in figure 21; and a profile of McClusky loam in figure 22.

Canh Terrace lands having red-iron hardpan soils

The red-iron hardpan soils, which are often called the "red hogwallow lands" of California, occupy bench lands along the east side of the San Joaquin and Sacramento valleys, and mesa lands in the vicinity of San Diego. The red-iron hardpan soils occur in the 7 to 25 inch rainfall zone.



Fig. 21. Typical landscape of terrace soil having dense clay subsoil (group Cand), Woodland-grass upland soils (group En) on the hills, and recent alluvial soils (group An) in valley.

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No. Cand

Soil Type McClusky loam
 Location Coastal Monterey County
 Geographical Landscape low coastal terraces
 Elevation 50-100' Slope 1/2 - 1% Erosion none to slight
 Groundwater deep Drainage subsurface slow Alkali none
 Mode of Formation secondary Parent Material mixed marine sediments
 Climate 15 - 20" annual rainfall
 Natural Cover grass Present Use pasture, field crops
 Series - Group 61 - McClusky Soil Region II
 Profile Group IV Great Soil Group Prairie Planosol
 Related Soil Series Watsonville

Variations, etc. depth to claypan

Profile Sketch	Color	Texture	Structure	Compactness Density	Reaction	Miscellaneous Roots, Concretions *Permeability, etc.
12"	dark grayish brown	loam	granular	friable	moderately acid	permeable
24"	grayish brown	clay	prismatic	very compact	slightly acid	very slowly permeable.
36"						
48"	yellowish brown	clay	stratified massive	compact	slightly acid	very slowly permeable.
60"						

Natural Land Division lower terrace; medium textured soils with dense clay subsoils
 Soil Rating (Storie Index) 50 x 95 x 100 x 95 = 45% Grade 3
 Productivity: Irrigated Crops fair to good Range fair to good
 Nonirrigated Crops low to fair Timber no
 Adaptation pasture
 Soil Management better grasses, P.

Fig. 22. Soil description and profile of McClusky loam, a typical claypan soil of group Cand.

TABLE 13—Cand Terrace Land Having Soils with Dense Clay Subsoils

Great Soil Group of World		Series-Group		Soil series	Dominant soil textures
Name	Description	Name	Parent material		
Calcic Brown Pianosol	brown soils of neutral or slightly acid reaction, having dense clay subsoils; calcareous in lower subsoil	55. Huerhuero	mixed alluvium	Aliso Huerhuero Stockpen	loams
			basic igneous rock alluvium	Twin Oaks	loams
			granitic rock alluvium	Edison Merriam	loams
Noncalcic Brown Pianosol	brown soils of neutral or slightly acid reaction, having dense clay subsoils	17. Placentia	granitic rock alluvium	Bonsall Placentia	loams
		29. Keefers	basic igneous rock alluvium	Coombs Keefers	loams
		34. Bieber	basic igneous rock alluvium	Agate Antelope Bieber Gould	loams
		38. Antioch	sedimentary rock alluvium	Capay Hillgate Ohmer Positas Saratoga Ulmar Wasioja	loams
		50. Corning	mixed alluvium	Cachuma Cometa Corning Flournoy Hartley Herdlyn Kimball Olcott	loam; gravelly loam
		62. Olivenhain	mixed coastal plain sediments	Las Flores Olivenhain	loams

Chernozem Planosol	dark-brown soils, neutral or slightly acid reaction, having dense clay subsols; lower subsoil calcareous	38. Antioch	sedimentary rock alluvium	Ambrose Antioch	loams
Prairie Planosol	dark-colored soils of moderately acid reaction, having dense clay subsols	38. Antioch 61. McClusky 62. Olivenhain	sedimentary rock alluvium mixed alluvium mixed material	Santa Ynez McClusky Pinto Tierra Watsonville Atascadero Chamise Jalama Sebastopol Wright	loams loams loams
Podzolic Planosol	brown soils of moderately acid reaction, having dense clay subsols; also moderate acid reaction	29. Keefers 38. Antioch	basic igneous rock alluvium sedimentary rock alluvium	Manzanita Holcomb Milpitas Pinole San Ysidro	clay loam loam

These soils are characterized by reddish-colored surface soils with dense clay subsoils that rest on a silica-iron cemented hardpan that is generally more than a foot in thickness and is impermeable to roots and water. A few of the hardpan series have considerable lime in the hardpan.

Dominant soil types of this category include San Joaquin loam and Redding gravelly loam. San Joaquin loam and associated red-iron hardpan soils of the great Central Valley have been utilized with fair results for hay, grain, and pasture under dry-farming practices. Deeper soils of this group in the San Joaquin Valley have been planted to grapes. Large areas of these soils are being uti-

lized for shallow-rooted, permanent irrigated pasture grasses. The soils are not well suited to deep-rooted crops. Redding gravelly loam has a much lower value than San Joaquin loam because of its gravelly or cobbly texture, higher acidity, and shallow depth. All of the soils of this group respond to the application of phosphate and nitrogenous fertilizers. The Storie-Index rating of San Joaquin loam is between 25 and 40 per cent. The Redding gravelly loam generally rates between 10 and 20 per cent. Soils of this group are classified and tabulated in table 14. Hogwallow micro-relief on San Joaquin loam appears in figure 23. A profile of San Joaquin loam is shown in figure 24.



Fig. 23. Hogwallow micro-relief on San Joaquin loam (group Canh).

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No. Canh

Soil Type San Joaquin loam
 Location east side of Sacramento and San Joaquin Valleys
 Geographical Landscape terraces with hogwallow microrelief
 Elevation 50-300' Slope 1/2 - 3% Erosion none
 Groundwater 50-150' Drainage imperfect Alkali none
 Mode of Formation secondary Parent Material granitic rock alluvium
 Climate 5-20" rainfall
 Natural Cover short grass Present Use grain, pasture
 Series - Group 18 - San Joaquin Soil Region IV, IX
 Profile Group V Great Soil Group Noncalcic Brown Ferrasol
 Related Soil Series Madera, YoKohl

Variations, etc. depth to hardpan, thickness of hardpan

Profile Sketch	Color	Texture	Structure	Compactness Density	Reaction	Miscellaneous Roots, Concretions Permeability, etc.
	brownish red	loam	cloddy	friable when moist	slightly acid	redder color when wet. permeable
	brownish red	clay loam	hard clods	slightly compact	slightly acid	permeable
	red	clay	blocky	compact	neutral	very red when moist, very slowly permeable
	brownish red		cemented	hardpan	slightly basic	iron cemented, impermeable to roots and moisture
	brownish red	gritty loam	massive	moderately compact	neutral	permeable

Natural Land Division terrace land; medium textured soils with hardpan
C 13

Soil Rating (Storie Index) 35 x 100 x 100 x 80 = 28% Grade 4

Productivity: Irrigated Crops fair to low Range fair to low

Nonirrigated Crops fair to low Timber no

Adaptation irrigated pasture, grain

Soil Management needs N and P.

Fig. 24. Soil description and profile of San Joaquin loam, typical hardpan soil of group Canh.

TABLE 14—Canh Terrace Lands Having Red-iron Hardpan Soils

Great Soil Group of World		Series-Group		Soil series	Dominant soil textures
Name	Description	Name	Parent material		
Calcic Brown Ferrosol	brown or reddish-brown soils, having calcareous subsoils, with iron-lime hardpan	18. San Joaquin	granitic rock material	Madera Monserate	sandy loam
			basic igneous rock material	Yokohl Ysidora	loams
Noncalcic Brown Ferrosol	reddish soils of acid reaction, having dense red-iron hardpan	30. Seville	fine textured basic igneous material	Lindo Montague Seville	loam to clay
		18. San Joaquin	granitic material	Gloria Rocklin San Joaquin	sandy loam, loam
		51. Redding	mixed cobbly material	Redding	gravelly sandy loam, gravelly loam

UPLAND

(Rolling, hilly-to-steep topography)

More than 54 per cent of the state, exclusive of the unmapped desert, is composed of upland areas that have rolling, hilly-to-mountainous topography. Most of the upland soils are residual, that is, they have been formed in place through the decomposition and disintegration of the underlying parent rock. Nearly all of the timberlands of the state, and most of the foothill and mountain grazing lands fall into these upland groups.

Four groups are shown on the generalized soil map of the state: Ea (deep, acid timber soils); Esc (medium deep, grassland soils); En (medium to fairly shallow woodland-grass soils); and Ex (very shallow chaparral soils). In addition, probably 30 to 40 per cent of the unmapped desert is composed of very shallow residual soils that support unusually scant desert vegetation.

Ea Rolling, hilly-to-steep upland having acid residual soils of good depth to bedrock; high rainfall; timberland soil.

All of these Podzolic soils occur in the high rainfall zone (35 to 80 inches annually) of the Sierra Nevada Mountains and the northwest Coast Range. They are the important timbered lands of the state, and comprise 20.5 per cent of its area.

These soils are characterized by a moderate to strongly acid reaction, especially in the subsoils and depths of three to six feet to bedrock. Generally, the upper portion of the parent rock has been softened by weathering action. Land in this category is used principally for commercial timber (Douglas fir, pine, fir, and redwood), and for recreational purposes. Areas on the lower fringe of the



Fig. 25. Pine timber in the Sierra Nevada Mountains on soils of group Ea.

TABLE 15—Ea Rolling, Hilly-to-Steep Upland Having Acid Residual Soils of Good Depth to Bedrock; High Rainfall; Timberland Soils

Great Soil Group of World		Series-Group		Soil series	Dominant soil textures
Name	Description	Name	Parent material		
Red Podzolic	reddish soils of acid reaction	1. Holland	granitic rocks	Sierra	sandy loam, fine sandy loam
		3. Aiken	basic igneous rocks	Aiken Olympic	clay loam, clay
		6. Hugo	metamorphosed sedimentary rocks	Sites	loam, clay loam
Gray-brown Podzolic	brown soils of acid reaction	1. Holland	granitic rocks	Cuyamaca Diamond Springs Felton Holland Siskiyou	sandy loam
		3. Aiken	basic igneous rocks	Butte	loam, clay loam
		6. Hugo	consolidated sedimentary rocks	Hugo Josephine Mariposa Melbourne	loams
Podzol	thick, light-gray, podzolized A ₁ horizon	10. Goldridge	soft sedimentary rocks	Arnold Empire Goldridge Mendocino	loams
		10. Goldridge	soft sedimentary rocks	Caspar	loam

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No. Ea

Soil Type Holland sandy loam, steep
 Location western slopes of Sierra Nevada
 Geographical Landscape steep upland
 Elevation 2000-7000' Slope 20-60% Erosion severe on denuded areas
 Groundwater deep Drainage good to excessive Alkali none
 Mode of Formation primary Parent Material granitic rock
 Climate high rainfall
 Natural Cover timber Present Use timber
 Series - Group I, Holland Soil Region III
 Profile Group VII Great Soil Group Gray Brown Podzolic
 Related Soil Series Sierra, Siskiyou

Variations, etc. depth to bedrock, slope

Profile Sketch	Color	Texture	Structure	Compactness Density	Reaction	Miscellaneous Roots, Concretions Permeability, etc.
12"	light grayish brown	sandy loam	coarse granular	friable	moderately acid pH 6.0	permeable
24"	brown	gritty loam	medium cloddy	slightly compact	moderately acid pH 5.5	permeable
36"						
48"						granitic bedrock.
60"						

Natural Land Division steep upland; medium textured moderately deep soils E9
 Soil Rating (Storie Index) 70 x 95 x 30 x 80 = 18% Grade 5
 Productivity: Irrigated Crops too steep Range low
 Nonirrigated Crops too steep Timber good
 Adaptation commercial timber, recreation
 Soil Management care in logging to control erosion

Fig. 26. Soil description and profile of Holland sandy loam, typical high rainfall timberland soil of group Ea.

upland timber region have been cleared and used for pasture and occasionally for orchard fruits. Cultivated areas usually are erosive. These soils are not well suited to grazing.

There is a wide range in the Storie-Index rating because of variability in slope, erosion, and depth. Smoother lands generally rate 40 to 60 per cent, while the steeper lands rate as low as 5 to 15 per cent. Soils of this group are classified and tabulated in table 15. Figure 25 shows pine timber on this soil group. Figure 26 is a profile of Holland sandy loam.

Esc Rolling, hilly-to-steep upland having residual soils of moderate depth to bedrock; medium rainfall; grassland soils.

These natural grassland soils occur where the annual rainfall is intermediate to moderately high. The soils are gen-

erally dark colored, fairly high in organic matter, and usually of medium-to-fine texture. The Chernozem soils have neutral surface and calcareous subsoils. The Prairie soils are slightly acid in reaction, whereas the Rendzina soils are calcareous throughout the profile.

These soils are found along the coast in Sonoma, Marin, San Mateo (figure 27), and Santa Barbara counties. Much of the hill land in Alameda and Contra Costa counties also is in this category.

Soils of this group constitute some of the best natural grazing lands of the state, and should be used for that purpose rather than cultivated. These lands are generally not adapted to commercial timber production. The Storie-Index rating of the smoother areas is 40 to 60 per cent, while steep areas generally rate 10 to 20 per cent. Soils of this group are classified and tabulated in table 16, and a profile of Cayucos clay is shown in figure 28.



Fig. 27. Landscape of Cayucos clay (group Esc), good grazing-land soil of San Mateo County.

FIELD SHEET FOR RECORDING SOIL CHARACTERISTICS
University of California - Division of Soils

No. Esc

Soil Type Cayucos clay, rolling to hilly
 Location central and northern Coast Range
 Geographical Landscape rolling to hilly upland
 Elevation 100-1000' Slope 3-15% Erosion none to slight
 Groundwater deep Drainage good Alkali none
 Mode of Formation primary Parent Material sedimentary rock
 Climate 20-30" annual rainfall
 Natural Cover grass Present Use chiefly pasture
 Series - Group 7-Cayucos Soil Region II
 Profile Group VIII Great Soil Group Prairie
 Related Soil Series hos Osos, Colma

Variations, etc. depth to bedrock, slope

Profile Sketch	Color	Texture	Structure	Compactness Density	Reaction	Miscellaneous Roots, Concretions Permeability, etc.
	dark gray	clay	hard granular	moderately friable	slightly acid	many grass roots permeable
	dark gray	clay	clods	slightly compact	slightly acid	permeable

Natural Land Division rolling hilly upland; fine textured soils of moderate depth to bedrock E2
 Soil Rating (Storie Index) 70 x 70 x 90 x 100 = 44% Grade 3
 Productivity: Irrigated Crops good to fair Range good
 Nonirrigated Crops good to fair Timber no
 Adaptation grazing
 Soil Management better grasses.

Fig. 28. Soil description and profile of Cayucos clay, typical upland grass soil of group Esc.

TABLE 16—Esc Rolling, Hilly-to-Steep Upland Having Residual Soils of Medium Depth to Bedrock; Medium Rainfall; Grassland Soils

Great Soil Group of World		Series-Group		Soil series	Dominant soil textures
Name	Description	Name	Parent material		
Chernozem	dark-colored neutral soils, having calcareous subsoils	9. Altamont	sedimentary rocks	Altamont Berryessa Diablo Raynor Rumsey	clay loam, clay
Prairie	dark-colored slightly acid soils	1a. Sheridan	granitic rocks	McCoy Sheridan	sandy loam
		4a. Sweeney	basic igneous rocks	Sweeney	clay loam
		7. Cayucos	consolidated sedimentary rocks	Cayucos Dorado Kneeland Laughlin Los Osos Santa Lucia	loam, clay loam, clay
Rendzina	highly calcareous soils, usually of dark color	12. Ayar	marly material	Ayar Linne Shedd Zaca	clay

En Rolling, hilly-to-steep upland having residual soils of medium to fairly shallow depth to bedrock; intermediate-to-low rainfall

Soils of this group occur in the medium-to-low rainfall zone where woodland grass, shrub grass, or short grass are the characteristic vegetation. The soils are usually brown, light brown, or light grayish brown, and fairly low in organic matter. Some of these soils are about neutral in reaction throughout their profile (Vista sandy loam); some have calcareous subsoils; and some are calcareous throughout the profile. Those having neutral profiles are classed as Noncalcic Brown soils, those having neutral surface soils and calcareous subsoils are classed as Calcic Brown soils, and those that are calcareous throughout as Rendzina.

This is an extensive group in California comprising 15,300,000 acres. Lassen soils are located in Modoc, Siskiyou, Lassen, and Shasta counties; Vista soils in southern California and in the lower

foothills of the Sierra Nevada Mountains along the east side of the San Joaquin Valley; and Vallecitos and related soils in the foothills west of Sacramento Valley and in San Benito, Santa Clara, Monterey, and San Luis Obispo counties. In the central and southern Coast Range Mountains and foothills many small areas of Esc are included with En.

This group of soils is used principally for grazing, for which it is fairly well suited. Small nonstony areas on the smoother slopes are often tilled but are subject to considerable erosion. This type of land is not adapted to commercial timber production. The Storrie-Index rating on the smoother lands is 20 to 60 per cent, and on the steep stony lands is 5 to 15 per cent.

Soils of this group are classified and tabulated in table 17. A landscape, typical of rolling foothills in lower Madera and Tulare counties appear in figure 29. A profile of Vista sandy loam is shown in figure 30.



Fig. 29. Landscape of Vista sandy loam (group En), typical of rolling foothills in lower Madera and Tulare counties.

TABLE 17—En Rolling, Hilly-to-Steep Upland Having Residual Soils of Medium to Fairly Shallow Depth to Bedrock; Intermediate to Low Rainfall

Great Soil Group of World		Series-Group		Soil series	Dominant soil textures
Name	Description	Name	Parent material		
Calcic Brown	brown soils having calcareous subsoils	5. Lassen	basic igneous rocks	Lassen	stony clay
Noncalcic Brown	brownish soils of neutral to slightly acid reaction	2. Vista	granitic rocks	Fallbrook Vista	sandy loam
		4. Auburn	basic igneous rocks	Auburn Escondido Gleason Konokti Las Posas Los Trancos Pentz Sobranite Underwood Whitney	loams
		8. Vallecitos	sedimentary rocks	Amador Carrisalitos Contra Costa Forgeus Gaviota Soper Vallecitos Yucaipa	loams
Rendzina	light-colored calcareous soils	9a. Caliente	calcareous sedimentary rocks	Calera Caliente	clay loam
		13. Kettleman	calcareous soft sedimentary material	Kern Kettleman Nacimiento	clay loam, clay

FIELD SHEET FOR RECORDING SOIL CHARACTERISTICS
University of California - Division of Soils

No. En

Soil Type Vista sandy loam, rolling to hilly
 Location foothills of Southern California
 Geographical Landscape rolling to hilly upland
 Elevation 300-2000' Slope 9-20% Erosion slight
 Groundwater deep Drainage good Alkali none
 Mode of Formation primary Parent Material granitic rocks
 Climate 9-17" annual rainfall
 Natural Cover oak-grass Present Use grazing, fruit
 Series - Group 2-Vista Soil Region VII and VIII
 Profile Group VII Great Soil Group Noncalic Brown
 Related Soil Series Fallbrook

Variations, etc. depth to bedrock, slope

Profile Sketch	Color	Texture	Structure	Compactness Density	Reaction	Miscellaneous Roots, Concretions Permeability, etc.
	brown	sandy loam	coarse granular	friable	neutral	permeable
	light brown	sandy loam	cloddy	very slightly compact	neutral	permeable

Natural Land Division rolling upland; medium textured soils of fairly good depth to bedrock E1
 Soil Rating (Storie Index) $60 \times 75 \times 85 \times 100 = 48\%$ Grade 3
 Productivity: Irrigated Crops fair to good Range fair
 Nonirrigated Crops fair to low Timber no
 Adaptation grazing, fruit where irrigation water is available
 Soil Management erosion control, N fertilization, winter cover crops

Fig. 30. Soil description and profile of Vista sandy loam, typical woodland-grass, upland soil of group En.

Ex Residual soils of very shallow depth to bedrock

The soils in this category are shallow and are found in scattered areas in the Coast Range Mountains and in the Sierra Nevada Mountains. They are normally covered with brush. The dominant soils of the group are Maymen stony loam, a Podzolic Lithosol, derived from sedimentary rock; Tuscan stony clay loam, a Noncalic Brown Lithosol, derived from basic igneous rock; and Henneke stony clay loam, a Calicic Brown Lithosol derived from Serpentine rock. These soils are not adapted to timber nor to agricultural purposes because of their very shallow depth, steep slopes, and stony textures. They are rated as very low for grazing purposes. The Storie-Index rating of these soils is 2 to 8 per cent.

Soils of this group are classified and tabulated in table 18. A profile of Maymen stony loam is shown in figure 31; and steep, brush-covered lands, in figure 33.

UNMAPPED DESERT SOILS

Soils of this category are found in the very low rainfall zone (1 to 3 inches annually) of the Mojave and Colorado deserts. The characteristic vegetation is creosote bush.

Alluvial soils in the region are classed as: Ac (alluvial fan and flood plain soils of desert region); Acw (wind modified soils); Ccy (terrace and old alluvial plain soils); and Ex (upland residual soils classed as Desert Lithosols). The soils are of light color, low organic content, and high lime content. There is no agriculture without irrigation in this region. Probable soils of this group are classified and tabulated in table 19.

TABLE 18—Ex Residual Soils of Very Shallow Depth to Bedrock

Great Soil Group of World		Series-Group		Soil series	Dominant soil textures
Name	Description	Name	Parent material		
Calicic Brown Lithosol	very shallow, brownish soils of basic reaction, having calcareous subsoils	5a. Montara	serpentine	Henneke	stony clay loam
Noncalicic Brown Lithosol	very shallow, brownish soils of neutral reaction	4. Auburn	basic igneous rocks	Tuscan Scabland	stony clay loam
Chernozem Lithosol	shallow darker-colored soils; calcareous subsoils	9. Altamont	sedimentary rocks	Sespe	stony loam
Podzolic Lithosol	very shallow, acid soils	6. Hugo	sedimentary rocks	Los Gatos Maymen	stony loam

FIELD SHEET FOR RECORDING SOIL CHARACTERISTICS
University of California - Division of Soils

No. Ex

Soil Type Maymen shaly loam
 Location northwestern coast mountains
 Geographical Landscape steeply sloping upland
 Elevation 500-6000' Slope 40-100% Erosion moderate to severe
 Groundwater ? Drainage excessive runoff Alkali none
 Mode of Formation primary Parent Material sedimentary rock
 Climate usually 40-60" rainfall
 Natural Cover chamise Present Use wildlife, watershed
 Series - Group 6 - Hugo Soil Region I
 Profile Group VIII Great Soil Group Podzolic lithosol
 Related Soil Series Hugo, Las Gatos

Variations, etc. depth, erosion

Profile Sketch	Color	Texture	Structure	Compactness Density	Reaction	Miscellaneous Roots, Concretions Permeability, etc.
	light brown	shaly loam	soft cloddy	friable	acid pH 5.5	very shallow soil depth
	light brown		shale	bedrock		pH. 5.5

Natural Land Division upland; stony soils of very shallow depth, steep E 16
 Soil Rating (Starke Index) 20 x 70 x 30 x 80 = 3% Grade 6
 Productivity: Irrigated Crops none Range very low
 Nonirrigated Crops none Timber no
 Adaptation watershed
 Soil Management _____

Fig. 31. Soil description and profile of Maymen stony loam, typical brushland soil of group Ex.

TABLE 19—D Unmapped Desert Soils, Consisting of Ac, Acw, Ccy, and Ex

Great Soil Group of World		Series-Group		Soil series	Dominant soil textures
Name	Description	Name	Parent material		
Ac: Red Desert Alluvial	light-colored calcareous alluvial soils	19. Cajon	granitic rock alluvium	Cajon Daggett Indio	sandy loam
Gray Desert Alluvial		58. Gila	mixed alluvium	Carrizo Gila Holtville Imperial Meloland	all textures
Acw: Red Desert Sands	light-colored calcareous sandy, wind modified soils	25. Coachella	granitic wind modified sands	Coachella	sands
Gray Desert Sands		65. Rositas	mixed wind modified sands	Preston Rositas	sands
Ccy: Red Desert	light reddish-brown desert soils	20. Mojave	granitic rock alluvium	Delano Laveen Mojave	sandy loam, gritty loam

Red Desert Calcisol	light reddish-brown calcareous soils, having caliche hardpan	21. Tubac	granitic rock alluvium and mixed rock alluvium	Mono Tijeras Tubac	stony sandy loam
Cey: Gray Desert	light-gray or light brownish-gray calcareous soils	42. Comhatti	principally sedimentary rock alluvium	Bellegrave Comhatti Cuyama Lost Hills	variable
		64a. Johnstonville	basic igneous alluvium	Johnstonville Lymndyl Standish	loams
Cey: Gray Desert Calcisol	light-gray or light brownish-gray calcareous, having caliche hardpan soils	57. Sunrise	mixed alluvium	Bellavista Churchill Domino Sunrise	loams
Ex: Desert Lithosols	light-colored calcareous stony, very shallow upland soils		generally unclassified		stony

TABLE 20—Land Use Suitability

Symbol (acreage)	Description	Land use suitability*				Best use
		Timber†	Grazing‡	Nonirrigated field and truck crops	Irrigated field and truck crops	
As (400,000) 0.4%	deep alluvial fan and flood plain soils of higher rainfall zone	I	II, III	II, I	II, I	crops; timber
An (5,500,000) 5.5%	deep alluvial fan and flood plain soils of intermediate rainfall zone	VI	III, II, I	III, II	I	irrigated crops; orchard and vines where climate is suitable
Ang (200,000) 0.2%	very sandy, or very gravelly alluvial fan soils	VI	V	IV	III, IV	grapes
Ac (3,600,000) 3.6%	deep alluvial fan and flood plain soils of low rainfall zone	VI	V	VI	I, II	irrigated crops
Asnw (500,000) 0.5%	sandy, wind modified soils of intermediate rainfall zone	VI	IV	III, IV	III, II	specialized crops, for instance, grapes, melons
Acw (700,000) 0.7%	sandy, wind modified soils of very low rainfall zone	VI	V	VI	III	specialized crops with irrigation
Ba (300,000) 0.3%	organic soils, for instance, peat, muck	VI	I, II	II§	I§	asparagus, potatoes, etcetera
Bnc (2,500,000) 2.5%	imperfectly drained basin soils	VI	I, II	II§, III	II§	cereals, rice
Bck (2,800,000) 2.8%	saline and alkali soils	VI	III, IV	V, VI	V	pasture

Csm (100,000) 0.1%	dark-colored, slightly to moderately acid terrace soils; moderately dense subsoils	IV, V, VI	II, III	II, III	II	pasture
Cnm (2,500,000) 2.5%	terrace soils having moderately dense subsoils, intermediate rainfall zone	VI	III	III	II, III	pasture; irrigated crops; non-irrigated crops
Ccy (1,800,000) 1.8%	desert soils	VI	IV, V	VI	III	irrigated crops where water is available
Cand (1,100,000) 1.1%	terrace soils having dense clay subsoils	VI	II, III	III, IV	III, IV	pasture; shallow-rooted irrigated crops; nonirrigated crops
Canh (1,900,000) 1.9%	bench lands having red-iron hardpan soils	VI	III	IV, V	III, IV	pasture; shallow-rooted irrigated crops; grain
Ea (20,500,000) 20.5%	upland; acid residual soils	II, III, I	IV, V	IV, V	III, IV	commercial timber; recreation; limited areas for deciduous fruits
Esc (4,800,000) 4.8%	upland; grassland soils	VI	I, II	II, III, IV	II, III	pasture; grains
En (15,300,000) 15.3%	upland; woodland grass; shrub-grass soils	VI	III	III, IV, V	III, IV	pasture; smoother lands tilled; limited areas for irrigated orchards
Ex (13,500,000) 13.5%	upland; very stony, shallow soils	VI	V, VI	VI	VI	watershed
D (22,000,000) 22.0%	unmapped desert	VI	V, VI	VI	variable	depends on water availability

* Land use suitability classes:

- I—Very good
II—Good
III—Fair
IV—Low
V—Very low
VI—Not suitable

First suitability class listed in column indicates one of most common occurrence.

† Commercial timber, such as fir, pine.

‡ Natural grazing.

§ Drained.

ACKNOWLEDGMENTS

In preparing this map, information on the valley lands was obtained from detailed soil-survey reports, and valuable information on the broad upland areas was obtained from the State Vegetation Survey and the State Forest Survey. The upland soils groups have been found to follow closely vegetative type boundaries.

Co-operative Extension work in Agriculture and Home Economics, College of Agriculture, University of California, and United States Department of Agriculture co-operating. Distributed in furtherance of the Acts of Congress of May 8, and June 30, 1914. J. Earl Coke, Director, California Agricultural Extension Service.

L E G E N D

VALLEY LAND

Gently sloping, smooth topography.

- As** Deep alluvial fan and flood plain soils, slightly acid reaction. Prairie Alluvial soils, e.g., Ferndale loam. Higher rainfall. (400,000 acres)
- An** Deep alluvial fan and flood plain soils, usually neutral reaction. Noncalicic Brown Alluvial soils, Calcic Brown Alluvial Soils, e.g., Yolo loam. Intermediate rainfall. (5,500,000 acres)
- Ang** Deep alluvial fan soils, very sandy or very gravelly, usually neutral reaction. Noncalicic Brown Alluvial Soils, e.g., Tujunga gravelly sand. (200,000 acres)
- Ac** Deep alluvial fan and flood plain soils, calcareous. Red Desert Alluvial Soils, Gray Desert Alluvial Soils, e.g., Gila loam. Low rainfall. (3,600,000 acres)

Undulating, wind modified topography.

- Asnw** Sandy wind modified soils, neutral to slightly acid reaction. Noncalicic Brown Sands, e.g., Oakley sand. Intermediate rainfall. (500,000 acres)
- Acw** Sandy wind modified soils, calcareous. Red Desert Sands, Gray Desert Sands, e.g., Rositas sand. Low rainfall. (700,000 acres)

VALLEY BASIN LAND

Nearly flat topography.

- Ba** Organic soils, generally acid reaction. Poorly drained. Prairie Bog Soils, e.g., Peat Muck. (300,000 acres)
- Bnc** Imperfectly drained soils, reaction from neutral to calcareous. Chernozem Wiesenboden and Prairie Wiesenboden soils, e.g., Sacramento clay. (2,500,000 acres)

- g** Saline and alkali soils. Solonchak and Solonetz soils, e.g., Lahontan loam. (2,800,000 acres)

UNMAPPED DESERT

Ac, Acw, Ccy, Ex.

- D** Unmapped Desert Soils. Light colored, calcareous. Very low rainfall. (22,000,000 acres)

TERRACE LAND

Gently sloping to undulating topography.

- Csm** Dark colored slightly acid soils having moderately dense subsoils. Prairie Soils, e.g., Rohnerville clay loam. Medium high rainfall. (100,000 acres)
- Cnm** Brownish soils, neutral reaction, moderately dense subsoils. Chiefly Noncalicic Brown Soils, e.g., Ramona loam. Intermediate rainfall. (2,500,000 acres)
- Ccy** Desert soils, calcareous, often having caliche hardpan. Gray Desert Soils, Red Desert Soils, Gray Desert Calcisol Soils, Red Desert Calcisol Soils, e.g., Mohave sandy loam, Sunrise loam. Low rainfall. (1,800,000 acres)
- Cand** Soils having dense clay subsoils. Planosol soils. Noncalicic Brown Planosols, Chernozem Planosols, Prairie Planosols, e.g., Placencia loam. McClusky loam. Generally intermediate rainfall. (1,100,000 acres)
- Canh** Iron hardpan soils. Neutral to acid soils. Noncalicic Brown Ferrosol soils, Calcic Brown Ferrosol, e.g., San Joaquin loam. Generally intermediate rainfall. (1,900,000 acres)

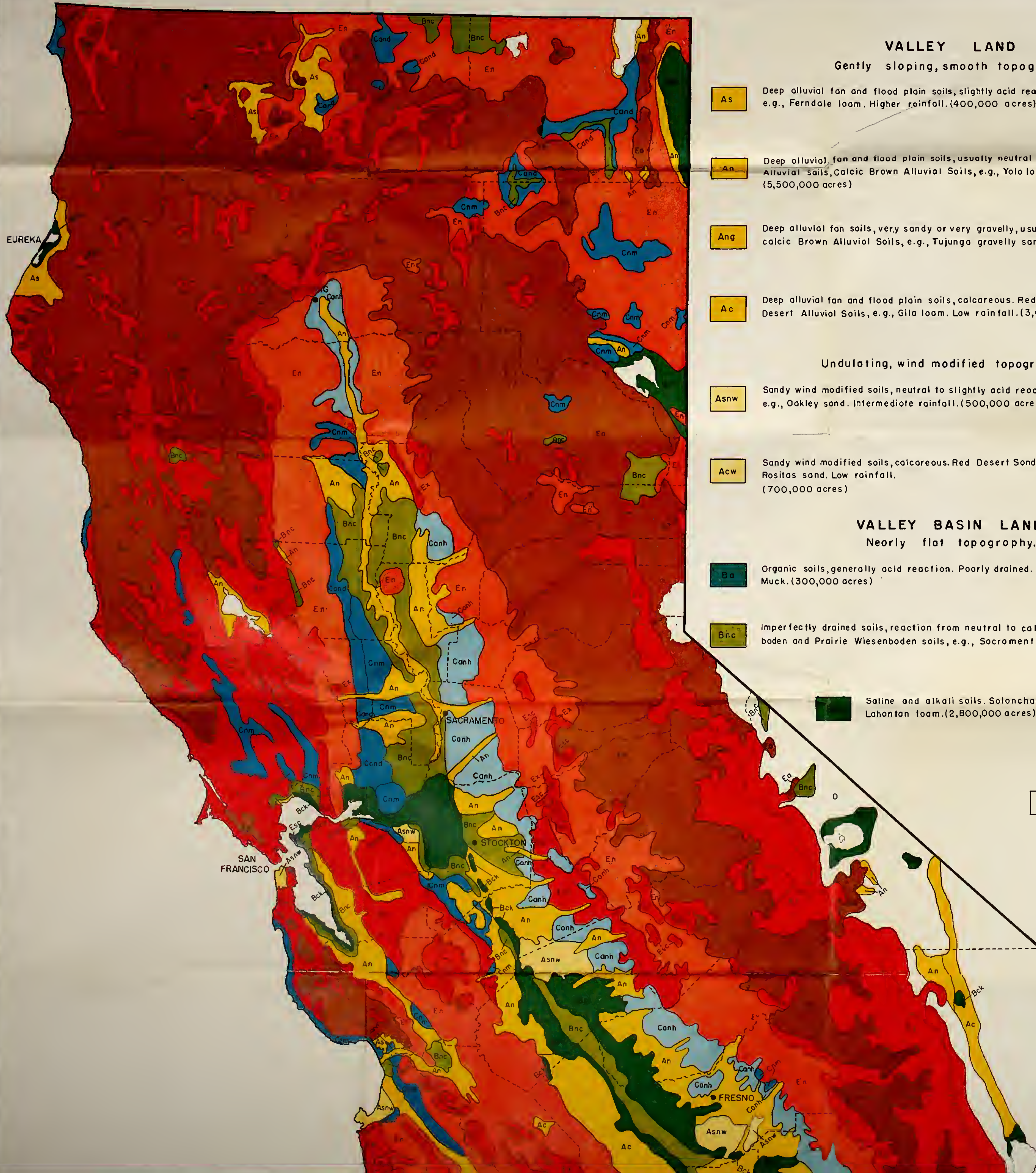
UPLAND

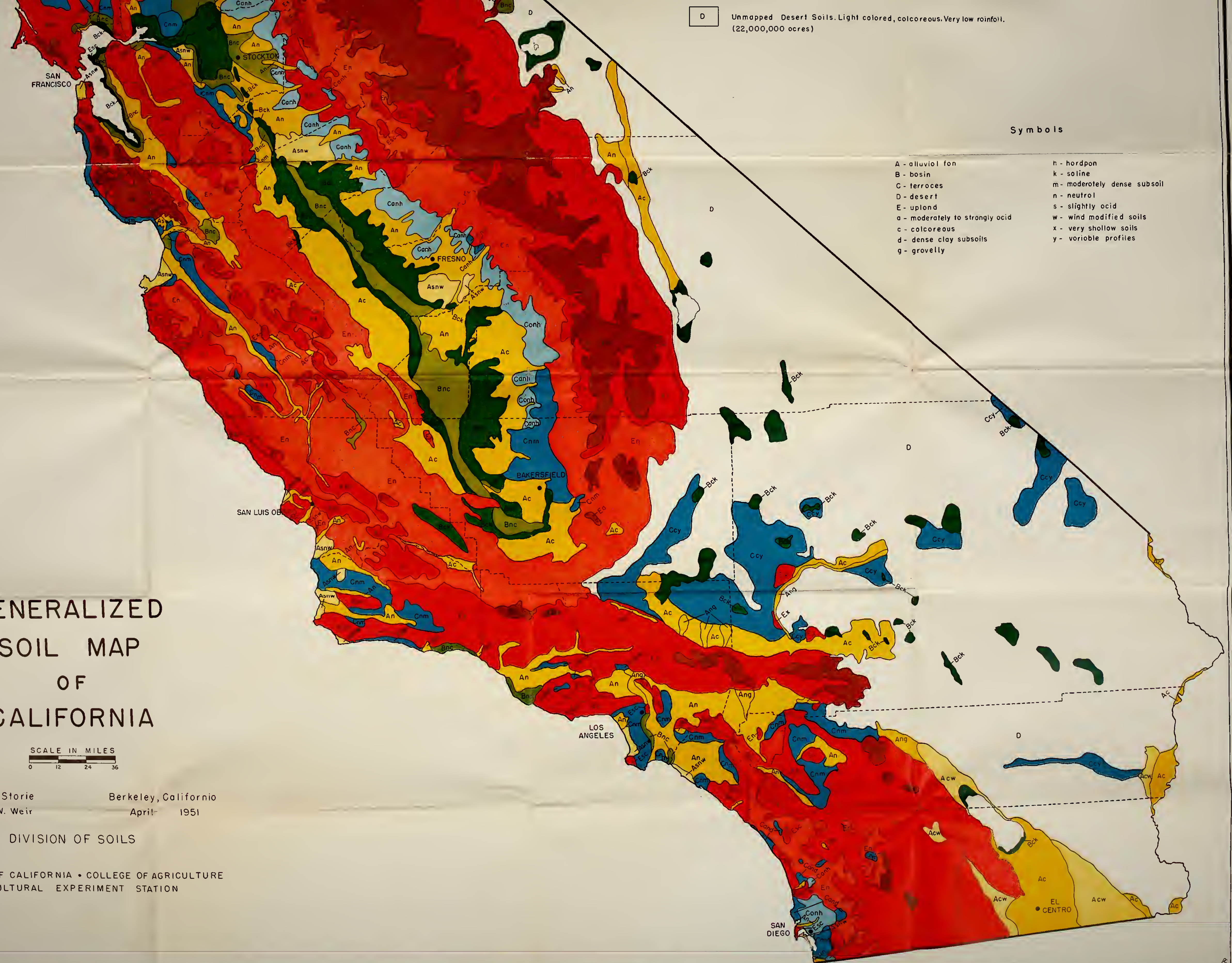
Rolling, hilly to steep topography.

- Ea** Residual soils of good depth to bedrock. Acid reaction. Gray Brown Podzolic Soils. Red Podzolic Soils, e.g., Holland sandy loam, Aiken clay loam. Timbered areas. High rainfall. (20,500,000 acres)
- Es** Residual soils of moderate depth to bedrock. Variable reaction. Dark colored Grassland soils. Prairie, Chernozem and Rendzina soils, e.g., Cayucos clay, Diablo clay, Zaca clay. Generally 15 - 40 inches rainfall. (4,800,000 acres)
- En** Residual soils of medium to fairly shallow depth, to bedrock, often stony. Brownish soils of neutral or basic reaction. Noncalicic Brown soils, Calcic Brown soils, e.g., Vista sandy loam, Vallecitos stony loam. Grass, woodland-grass, Shrub-grass vegetation. Generally 10-20 inches rainfall. (15,300,000 acres)
- Ex** Residual soils of very shallow depth, to bedrock, usually stony, variable in color and reaction. Lithosol soils, e.g., Maymen stony loam. Usually brush cover. (13,500,000 acres)

Symbols

- | | |
|---------------------------------|------------------------------|
| A - alluvial fan | h - hardpan |
| B - basin | k - saline |
| C - terraces | m - moderately dense subsoil |
| D - desert | n - neutral |
| E - upland | s - slightly acid |
| o - moderately to strongly acid | w - wind modified soils |
| c - calcareous | x - very shallow soils |
| d - dense clay subsoils | y - variable profiles |
| g - gravelly | |



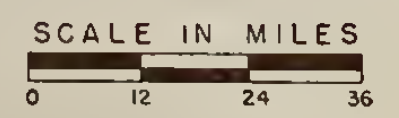


D Unmapped Desert Soils. Light colored, colcoreous. Very low rainfall. (22,000,000 acres)

Symbols

- | | |
|---------------------------------|------------------------------|
| A - alluvial fan | n - hardpan |
| B - basin | k - saline |
| C - terraces | m - moderately dense subsoil |
| D - desert | n - neutral |
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| g - gravelly | |

GENERALIZED SOIL MAP OF CALIFORNIA



By R. Earl Storie Berkeley, California
Walter W. Weir April 1951

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