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California Forests: Trends, Problems, and Opportunities

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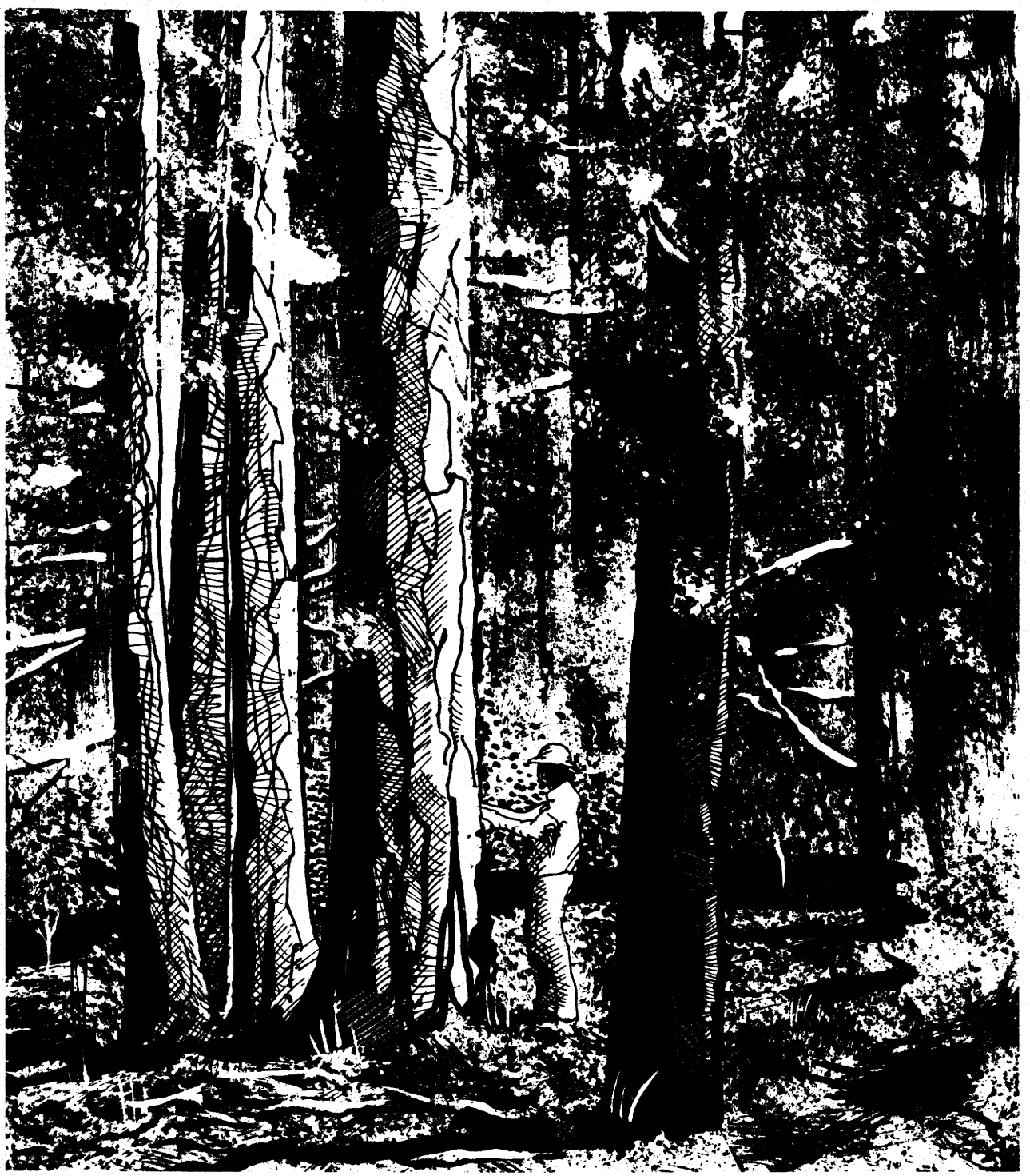

Resources-Oriented Outline of California's History

1542	California discovered by Cabrillo.
1579	Sir Francis Drake landed; he recorded the site as lat. 36° N.
1769-1823	Pueblos, presidios, and missions constructed. The Spanish influence preserved in place names, people and cultures, highway routes, and in the annual grasses and forbs introduced by the Spanish which replaced much of the native vegetation on foothills and in valleys.
1812	Russian colony established at Fort Ross.
1826	Jedediah Smith, Peter Skene Ogden, and other fur-seekers came to California.
1839	John Sutter established his colony, New Helvetia, on the Sacramento River.
1842	First water-powered sawmill constructed – Santa Cruz.
1846-48	Mexican War. California came under U.S. ownership on February 2, 1848.
1848	Gold discovered at Coloma.
1848-52	Gold rush.
	Population in California increased by a factor of 17 – from 15,000 to 250,000.
	Extensive timber cutting and burning in the foothills of the Sierra Nevada.
	Annual sheep and cattle drive from the valleys to mountain summer ranges began.
	Cities of Stockton, Sacramento, and San Francisco were developed.
	California gained Statehood in 1850.
	Crude water development for mining and irrigation and first recorded reservoir construction – Emery Lake, Upper Lake, and White Rock Lake.
1849	California lumber production first reported – 10 mills produced 5 million board feet.
1851-69	Numerous reservoirs built, including French Lake, the first with a capacity of 10,000 acre-feet.
1859	Lumber produced by 279 sawmills totaled 196 million board feet.
1860	Severe drought.
	Irrigation began in valleys; agriculture began to diversify.
	Livestock relocated to foothill and mountain ranges where the increasing numbers of animals began to deplete the grazing resources.
1861	Yosemite Valley and Mariposa Grove of big trees granted to the State of California by Congress.
1869	Railroad connected California with Eastern United States.
	Lumber produced by 251 sawmills totaled 354 million board feet.
1870-1900	In three decades the Nation experienced two major and five minor economic contractions.
	Over 70 reservoirs built in California, 11 with a capacity of 10,000 acre-feet or more.
	Irrigated agriculture expanded.
	Large investments made in southern California citrus industry.
	Real estate boom began in southern California.
	Range wars. Much of the grazing land was badly deteriorated by 1890.
	Sequoia National Park established in 1890, and the 4-square mile area surrounding General Grant tree established as "General Grant National Park."
	Forest Reserves authorized by Creative Act of 1891 and held by Department of the Interior. These reserves included much of the mountain rangelands, thus controlled grazing began.
	Organic Administration Act of 1897 provided that Forest Reserves be managed to protect forests, to yield water, and to furnish timber to U.S. citizens.
1904	Lumber produced by 247 sawmills totaled 1.1 billion board feet. California ranked 13th in U.S. lumber production.
1905	U.S. Forest Service established; Forest Reserves transferred to Department of Agriculture.
1906	San Francisco earthquake and fire.
1913	Los Angeles aqueduct built from Owens Valley, a distance of 238 miles.
1900-29	Over 300 reservoirs built, including 60 with a capacity of 10,000 acre-feet or more.
1920	Population in California approached 4 million.
1923-29	About 170 sawmills produced 2 billion board feet of lumber per year. California ranked sixth in U.S. lumber production.
1924	Clarke-McNary Act provided for cooperative forest management and protection on State and private lands.
1930	Irrigated cropland in California totaled 4 million acres.
1930-40	Great Depression curtailed development.
	Dust bowl immigrants arrived.
	Lumber production dropped to between 700 and 900 million board feet per year from 140-150 mills; yet California became 3d ranking lumber producer in U.S.

California Forests: Trends, Problems, and Opportunities

Reference Abstract

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The most recent information on forest area in California, volume of timber, ownership of forest resources, and rate of use and replenishment is summarized. An analysis of physical opportunities to increase timber production is presented, along with a discussion of problems relating to timber production. Also included are detailed statistical tables; a brief historical sketch of California forestry; a profile of the State's forest industry; a discussion of past, present, and future timber harvest; and a brief summary of nontimber forest resources.

Keywords: Timber resources, resources (forest), forest products industries, statistics (forest), California.

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Research Summary

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California ranks second in the United States in total forest area. Its 40 million acres of forest, including chaparral, oak woodlands, pinyon-juniper, and vast areas of pine, fir, and redwood occupy 40 percent of the State. Included in these forests are the world's most massive tree, the tallest tree, and the oldest known living tree.

Demand for forest resources – both products and amenities – has increased markedly during recent years, yet the area of California forests has decreased and will continue to decrease in the future as forest land is converted to nonforest use.

Timberlands occupy 16.3 million acres, over half of which is National Forest or other public land. Productive forests in parks, Wilderness Areas or deferred areas being studied for inclusion in Park or Wilderness systems amount to 1.6 million acres. National Forest and National Park systems each contain about 750,000 acres of these productive reserved and deferred forests; the balance is in State, county, and municipal parks, and a small amount of private land purchased by The Nature Conservancy. Unproductive forests, those incapable of producing 20 cubic feet of wood per acre per year, occupy 22.2 million acres. About 6.2 million acres are in National Forests or Parks. The remaining 16 million acres include large areas in private ownership and land administered by the State, Bureau of Land Management, military establishments, and other government agencies.

More than three-fifths of the softwood sawtimber volume is on public lands. Since 1953, softwood volume has declined 30 percent, mostly because of logging. Volumes of redwood and Douglas-fir declined the greatest amount. Sawtimber volume on private lands declined 44 percent compared with 12 percent on National Forest lands.

California contains some of the most productive forest land in the world. The State has only 3 percent of the Nation's timberland, yet 13 percent of the area is capable of growing 120 or more cubic feet per acre per year. Despite the high, innate productivity of California forests, current yields are less than half the land's potential. At least 5 million acres are nonstocked, inadequately stocked, or are occupied by commercially undesirable trees. If the 1.2 million acres classified as productive land were converted to conifer stands now, in 70 years there would be a prospective increase in mean annual yield of 700 million board feet. This amount represents 15 percent of the recent total annual timber harvest in California.

Forest losses to insects, disease, fire, weather, and other damaging agents continue to plague forest managers. If intensive forestry investments are to pay off, integrated pest management, continuing research, and better fire control measures are needed.

The intensity of forest management has increased dramatically in recent years. For example, timber companies were planting and seeding about 7,000 acres per year in the early 1960's. They planted and seeded 24,000 acres in 1976 and 37,000 acres in 1977. These investments will increase future yields of timber, but the benefits will not be realized until well after the year 2000. Before then, timber shortages are likely, especially in the northern part of the State. Supply problems are already evident, indicated by the steady decline in private timber harvest in the face of rising real prices of forest products.

For all ownerships the total timber harvest in California in recent years has been 4.3-4.9 billion board feet, compared with a high of about 6 billion board feet in the early 1950's. Timber harvest in the National Forests increased for many years while timber harvest in private ownership declined. Recently harvests in National Forests have more or less stabilized.

Forest industries employ from 85,000 to 90,000 persons in California, about 55,000 of whom are dependent on California-grown timber for jobs. Although these forest industries account for a small part of total employment, they are extremely important to many communities, especially in the northern part of the State and in the Sierra Nevada Mountains. Forest industry employment has declined in several counties, and can be expected to decline even more in some areas as timber becomes scarce and as forest lands are converted or dedicated to nontimber use.

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Introduction

California is the third largest State in the United States, with 156,328 square miles of land. It ranks first in population with 21.5 million people, and first in the value of its agricultural produce, retail trade, and aerospace industry. The population and economy of California continue to expand as indicated by the 220,000 new houses authorized in 1976, 17 percent of the Nation's total (U.S. Department of Commerce 1977; State of California, Documents Section 1973-76).

In sharp contrast to California's teeming cities and economy are its vast wildlands – forests, brushlands, grasslands, deserts, marshes, and rocky barrens – covering about 132,000 square miles, or 85 percent of the total land area. Nearly 63,000 square miles are forest, 40 percent of the State. Alaska is the only State with a greater area of forest.

California forests include the world's oldest known tree (bristlecone pine),[1] the world's most massive tree (giant sequoia), the world's tallest tree (coast redwood), the world's tallest pine (sugar pine), and the world's heaviest pine cone (Coulter pine) (Harlow and Harrar 1958). Some of the most productive forest land in the world is found in the coastal redwood belt of California, where the greatest accumulations of biomass ever reported have been measured (Franklin and Dyrness 1973).

More important to forest resource managers is the extreme variability in the productivity and composition of California forests. Within San Bernardino County, for example, are forests as diverse as those found over large areas of the United States. Among the native trees in the county are palm, acacia, mesquite, oaks, laurel, ash, sycamore, walnut, aspen, maple, juniper, ponderosa pine, lodgepole pine, cedar, and white fir.

Failure to recognize diversity has led to problems. In northern California, for example, blanket treatment of extensive areas containing various conditions – level land; steep, erodable land; harsh, rocky soils; and hot south-facing slopes – has sometimes resulted in inadequately stocked land, invasion by undesirable trees, adverse effect on several resources, and deterioration of forest productivity. On the positive side, the diversity of California forests offers a wide range of opportunities for supplying various human needs.

Forest products from California are used throughout the Nation and the world. California forests contribute modestly to the State's economy and substantially to the economy of several counties (State of California, Employment Development Department 1960-75).

As populations grow and national and world demand for all resources increases, forests will be expected to furnish a greater supply of commodities and amenities. Planning will be necessary if demands are to be met, and planning requires information. In recognition of this, the California State Legislature enacted the Forest Resources Assessment and Policy Act of 1977, Assembly Bill No. 452, signed by the Governor on September 30, 1977 (State of California 1977). The Legislature found and declared, in part: "Better use of forest resources can result where there is good information as to anticipated needs and constraints and the potentials for meeting such needs. . . ."

The information in this report was gathered by the Renewable Resources Evaluation Research Unit at the Pacific Northwest Forest and Range Experiment Station (figs. 1 and 2). Renewable Resources Evaluation (formerly called Forest Survey) is a nationwide project, authorized by the McSweeney-McNary Forest Research Act of 1928 and subsequent amendments, and the Renewable Resources Planning Act of 1974. Included in this report are recent estimates of forest area and timber volume, growth, and mortality in California. It is presented for the use of policymakers, legislators, and others who need to make decisions now, as California's new forest law is being implemented. This report should also be useful to public and private forest managers, timber users, educators, and others concerned with forest resources.

Some of the information in this report has been published in regional timber resource reports (Bolsinger 1976 and 1978a; Oswald 1968, 1972, and 1979; Oswald and Walton 1966; Wall 1978). New information includes: recent inventory data for several National Forests; revised data to account for ownership changes, and the creation and expansion of parks and other reservations; updated statistics for the north coast resource area (see fig. 3); an analysis of silvicultural opportunities to increase timber production; and data from various sources on forest industry consumption, employment, forestation, and other forest-related activities.

[1] See appendix, page 136, for scientific names of plants.

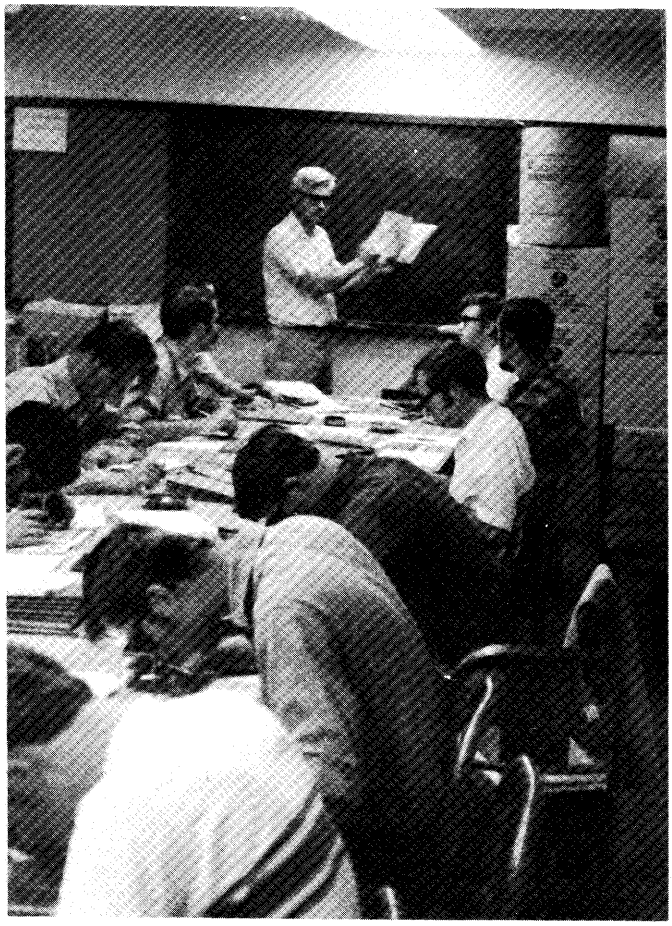
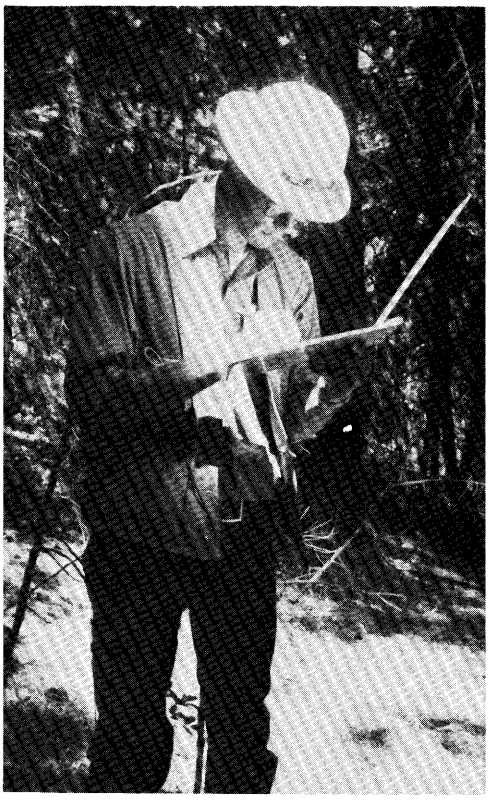
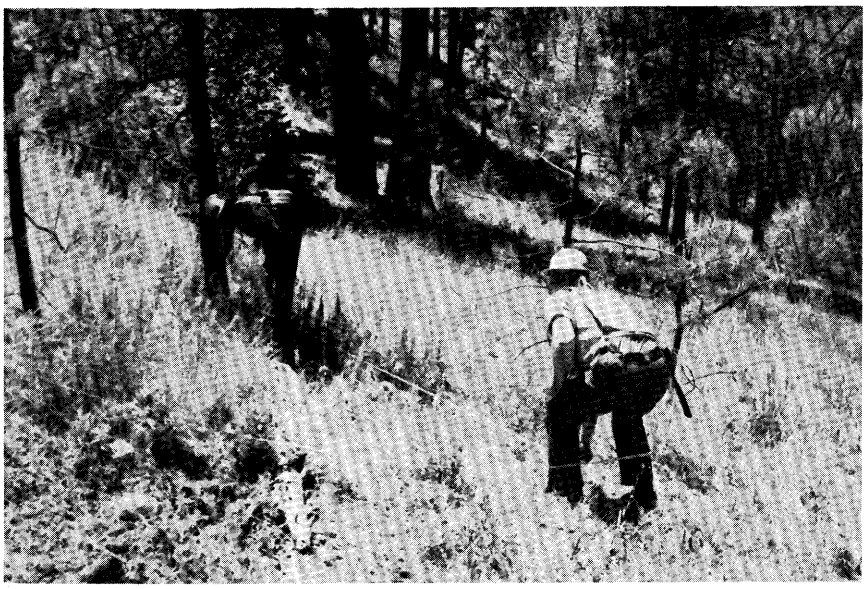


Figure 1. – Training forest resource inventory crews at Weaverville, California.

Detailed data are shown by ownership, and by geographic area. Area of timberland,[2] timber volume, and growth are shown by National Forest (fig. 4), and by resource area for lands outside National Forests. Area and volume for lands outside National Forests are also shown by county (see tables in the appendix).

[2] The term "timberland" is synonymous with "commercial forest land" in previous Forest Service reports on the timber resource. See definition, page 131.





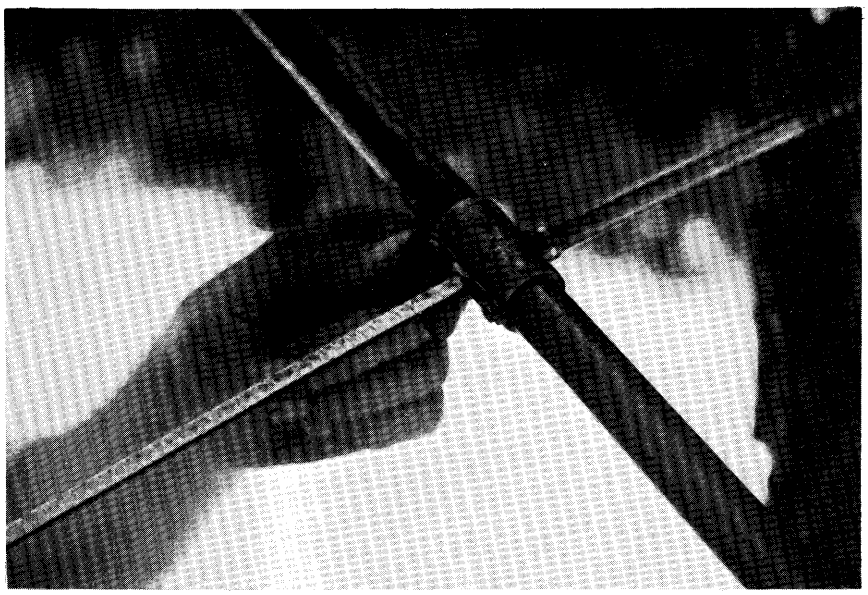


Figure 2. — Forest Service field crews established about 5,400 permanent plots and gathered information on over 225,000 trees in California forests.

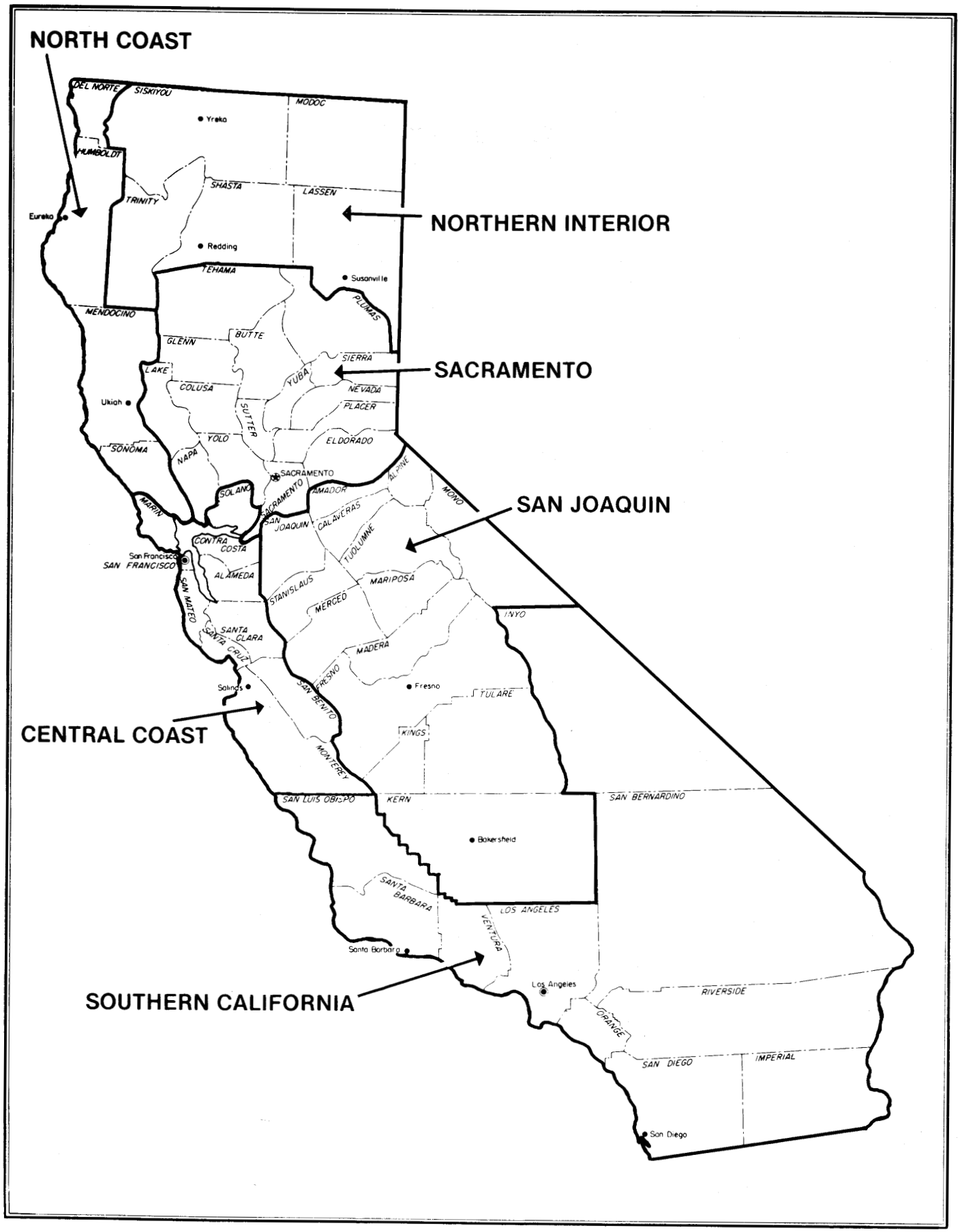


Figure 3. – Resource areas in California.

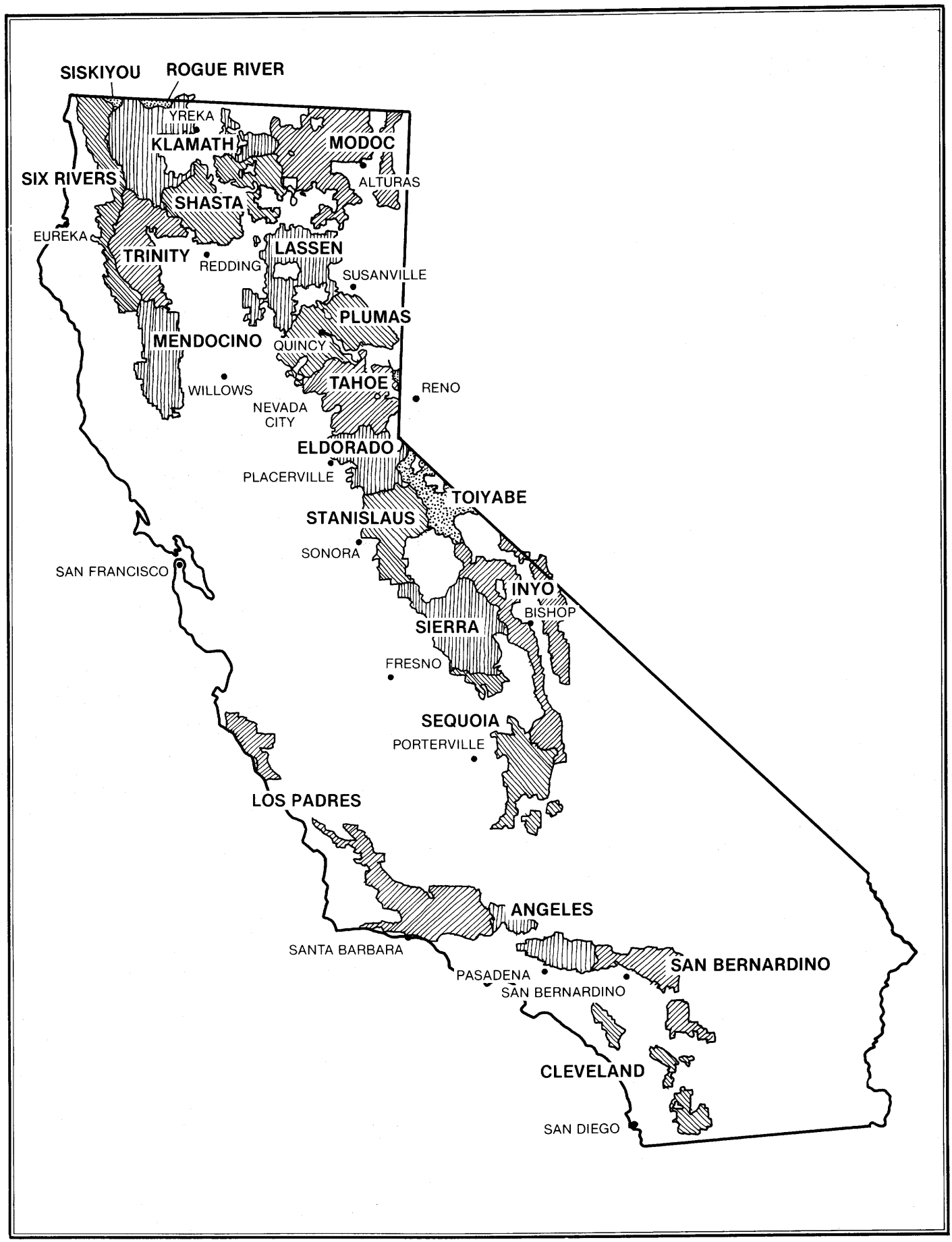


Figure 4. — National Forests in California.

Renewable, Forest-Related Resources of California in Brief

Water

"Water development has done more to enhance the economy . . . of California than any of man's activities."[3] In 1970, the fresh water consumption in California amounted to 25 percent of the Nation's total (U.S. Department of Commerce 1977). About 85 percent of all developed water used in 1974 was for agriculture. California agriculture ranks 1st in the Nation in value of products sold, though acreage in farms ranks only 11th (U.S. Department of Commerce 1972-77). Over two-thirds of all California cropland and 90 percent of harvested cropland is irrigated (State of California, Department of Water Resources 1974).

About 85 percent of the water currently used in California originates in the forests and rangelands of the State. Of the total runoff, 70 percent comes from timberland in areas remote from the place of use (fig. 5).

All land management activities have some effect on water quality and quantity (State of California Legislature, Assembly Committee on California Natural Resources, Planning and Public Works 1967). Though water quality is critical in some areas, such as the anadromous fish streams of the north coast (Citizens Advisory Committee on Salmon and Steelhead Trout 1975), the most crucial problem in the future will be the availability of water, which may be the limiting factor affecting the State's growth and may dictate the direction of other resource uses. Projections show demand in 2020 to exceed supplies from known and prospective sources (State of California, Department of Water Resources 1974).

Additional water supplies will be difficult to obtain because of the scarcity of sites, prior appropriation of water, and conflict with various other resource uses (Coppock 1974). Studies are underway or are planned to determine how to improve quantity and timing of water yields through vegetation management while also enhancing other resource values.

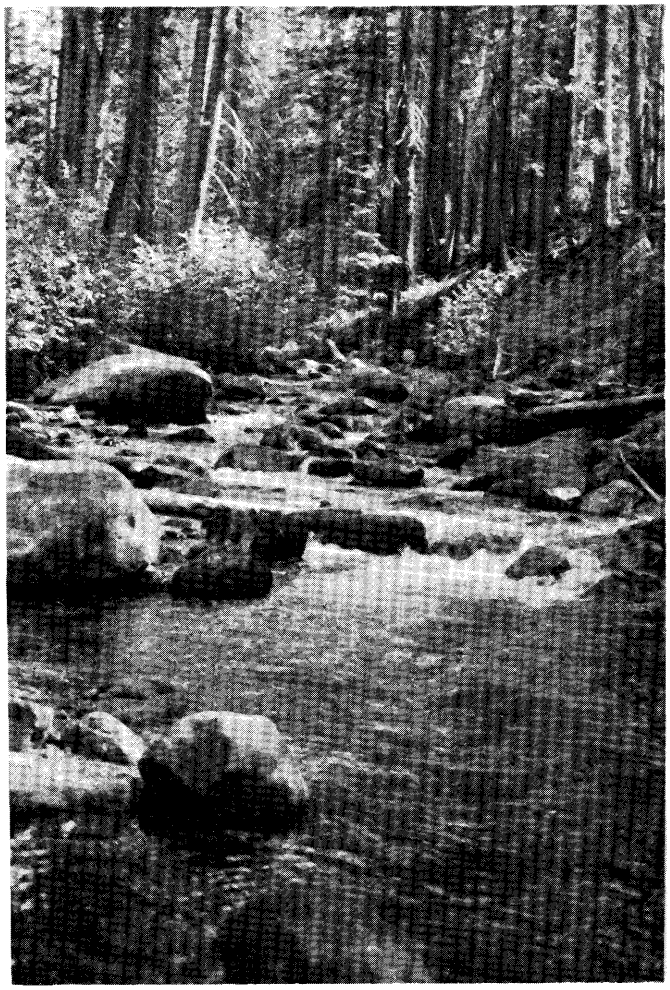


Figure 5. – Most of California's water originates in the forested mountains. Upper Yuba River, Sierra County.

Outdoor Recreation

In 1970, about 19 percent of the Nation's outdoor recreation took place in California.[4] National Forests in California represent 9 percent of the total area in the United States in National Forests, yet in 1972 they bore 25 percent of the total visitor use. Recreational pursuits include camping (27 percent), recreational vehicle use (23 percent), hunting and fishing (16 percent), picnicking (4 percent), winter sports (4 percent), recreational residence use (4 percent), and others.

[3] John R. Teerink, in foreword to the California Water Plan (State of California, Department of Water Resources 1974).

[4] U.S. Department of Commerce 1972-77, and unpublished data from California Department of Parks and Recreation.

Use of off-road vehicles (ORV) has increased dramatically since the mid-1950's. In 1973, ORV visitor-days on lands administered by the Bureau of Land Management approached 12 million (U.S. Department of the Interior, Bureau of Land Management 1974). An estimated 1.5 million motorcycles, dune buggies, snowmobiles, and four-wheel drive vehicles were in use in California in 1973 (State of California, Department of Parks and Recreation 1975).

The National Parks and Monuments in California attract many people. Although these parks represent about 16 percent of the total in the Nation in terms of area, they carry over 20 percent of the use (U.S. Department of Commerce 1972-77).

Demand for outdoor recreation in California has been projected to increase from 2.9 billion participation-days in 1970 to 5 billion in 1990 (fig. 6) (State of California, Department of Parks and Recreation 1974).

Fish and Wildlife

California's diverse climate, vegetation, and topography support a variety of fish and wildlife, including species found nowhere else (State of California, Department of Fish and Game 1966).

The total revenue from the fishing and hunting licenses sold in California in 1975 was $22.4 million, 8 percent of the total in the Nation (U.S. Department of Commerce 1972-77). California issued 2.3 million fishing licenses (fig. 7), over twice the number issued by all other States except Michigan, Minnesota, Texas, and Wisconsin.

Nonconsumptive uses of California's fish and wildlife, such as bird-watching and photography, are extensive and are increasing.

The most pressing problems regarding fish and wildlife in California are related to habitat. The riparian habitat type, the most important in terms of numbers of species that depend on it, is the most threatened. Already reduced greatly from its original acreage, it faces further reduction of 15 percent in the next 10 years, primarily by water development. Other critical habitats include certain wintering areas, wetlands, and special areas supporting rare and endangered species (State of California, Department of Fish and Game 1974). Other problems include streamflow levels too low to support fish, water quality degradation, and poor public access to fishing and hunting areas.

A

B

Figure 6. — What effect will the projected increase in outdoor recreation have on timber and other forest resources? A, John Muir Wilderness; B, Sand Flat Campground, Eldorado National Forest.

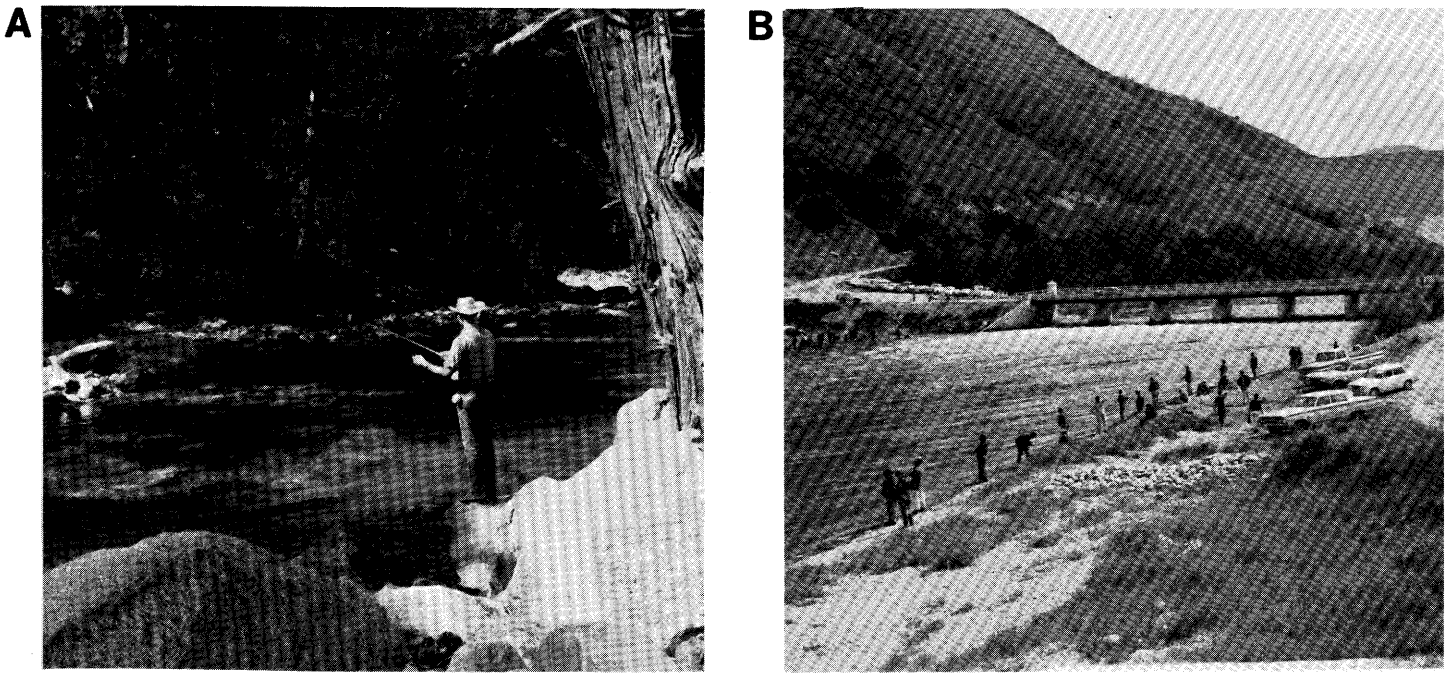


Figure 7. – Most California fishermen pursue their sport in crowds: A, Upper Kings River; B, Lower Kings River.

Range

Demand for livestock grazing on rangelands of the United States is projected to increase considerably by 2020 (USDA Forest Service 1975b). The growing demand for food worldwide has been diverting grain away from livestock feeding yards and also has caused the conversion of some of the better rangelands to crop lands. In some areas housing development has also usurped rangeland grazing. A smaller area of range will be expected to support more animals in the future.

In 1977, California farms and ranches supported 4.8 million cattle and 1 million sheep, placing the State seventh in the United States in cattle production and third in sheep production (U.S. Department of Commerce 1972-77). About 83 percent of all cattle in the State are beef stock and 65 percent of these graze largely on nonirrigated range. The total forest-range area in California is 66.7 million acres (USDA Forest Service 1972). Some of the better grazing lands in the San Joaquin and Sacramento Valleys and benches are being converted to cropland, but an extensive area of chaparral is amenable to development for grazing use (State of California, Division of Forestry 1961-74).

An assessment of rangelands under the jurisdiction of the Bureau of Land Management (BLM) in the West showed that the 10 million acres in the California region (which includes a small piece of Nevada) are in somewhat poorer condition than the average for the West (U.S. Department of the Interior, Bureau of Land Management 1975).

A goal of the BLM is to reverse the trend of deteriorating range conditions through a comprehensive program of management. The proposed program could increase the productivity of the California region from the existing 463,000 animal unit months[5] to 691,000.

National Forests are important locally in supplying grazing area to ranchers (fig. 8). Currently the Forest Service is involved in land use planning which incorporates livestock grazing as one of many uses of land.

The situation on private lands, which comprise 65 percent of the natural range in California, is not so well known, and the future there is less predictable (Reed 1974).

[5] An animal unit month is the amount of feed necessary to maintain 1 mature cow or 5 sheep for 30 days.

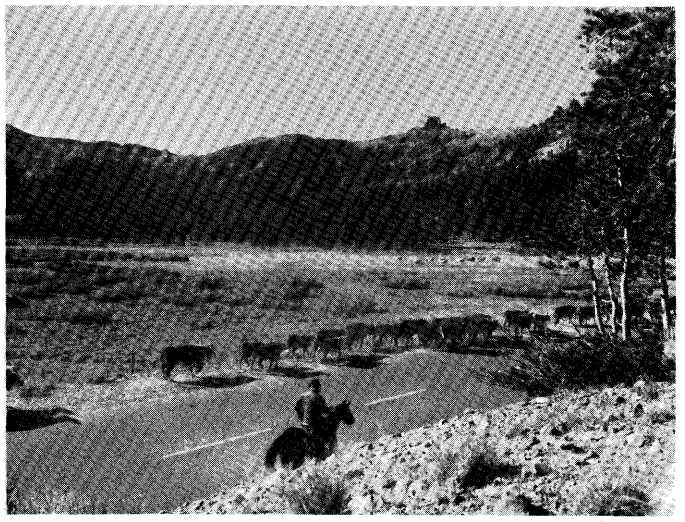


Figure 8. – Cattle drive at Kirkwood Meadows, Eldorado National Forest. Forests in California are important as summer livestock range.

Figure 9. – Current timber yields in California forests are about half of the land's potential, because of the condition of many stands.

Timber

In the face of rising demand for forest products (USDA Forest Service 1975a), California's output has declined and is expected to decline over the next 20 years. Much of the accessible old-growth timber on private lands has been harvested. Though reforestation has generally kept pace with logging in recent years, extensive areas that were logged in the past, or burned, are inadequately stocked with desirable trees. A large proportion of the adequately stocked young stands will not be of harvestable size for 10-40 years. Over 200,000 acres of this young-growth timber in private ownership are being developed for nontimber uses. Much of the timber volume and growth on these lands will not be available for industrial use.

Most of the remaining old-growth timber is in National Forests. Less volume is available for harvesting than forest industries would like. These public lands are managed for many purposes and therefore yield less timber than would be available if timber production were the only objective. National Forests contain over 60 percent of the softwood volume, but large areas in the mountains are on harsh sites that are judged unable to produce continuous timber crops. Forest Service policy is to log only where timber yields can be sustained. Land use planning, litigation, and limited funds have caused short-term delays in preparing timber sales on National Forests; these delays compound the timber supply problem.

Current yields on all ownerships are only half of the land's potential (fig. 9) because of the condition of many stands. These areas amount to over 5 million acres. They hold the potential for increasing the State's timber yields. To capitalize on these opportunities investments in forestry practices are needed. Research is also needed to cope with the many problems that come between the manager and his goal of capturing the land's potential.

Recent legislation related to forestry practices on private lands (State of California 1974, 1976, 1977), and intensified efforts in timber management by public agencies and private timber companies are reasons to expect some improvement in the outlook for California's timber supply.

Much of the material in this report deals with timber resource problems and opportunities for increasing future timber supplies from California timberland.

Forest Area

Ownership

Total land area in California is about 100 million acres, of which 40 million acres are forest (see table 1). Productive forest land capable of growing 20 cubic feet of industrial wood per acre per year (see definitions, page 131) amounts to 17.9 million acres. About 8 percent of the productive forest land is in parks, Wilderness Areas, and other reserves; 1 percent is National Forest land being studied for possible Wilderness classification, and 91 percent is classified as timberland. About 1 million acres of the timberland are in roadless areas of the National Forests being studied by the USDA Forest Service under the second Roadless Area Review and Evaluation program (RARE II). This is 17 percent of the 6.2 million acres, including nonforest and unproductive forest land, designated for study. About 770,000 acres, or 12 percent of the total, have been recommended for Wilderness classification as of January 1979, including 226,000 acres of productive forest.

Timberland ownership is shown below:

Ownership[6]	Thousand acres	Percent
Public:		
National Forest	8,168	50.1
Bureau of Land Management	239	1.4
Other Federal	40	0.2
State	79	.5
County and municipal	27	.2
Indian	114	.7
Total public	8,667	53.1
Private:		
Forest industry	2,688	16.5
Other private timber growers	1,348	8.3
Farmer	1,646	10.1
Miscellaneous private	1,950	12.0
Total private	7,632	46.9
All ownerships	16,299	100.0

[6] See definitions, page 133.

Productive-reserved and deferred[7] forest ownership is shown in the following tabulation:

Ownership	Thousand acres	Percent
National Forest:		
Reserved	479	29.1
Deferred	268	16.3
National Parks	747	45.4
State parks	125	7.6
County and municipal[8]	23	1.4
Private[9]	3	0.2
Total	1,645	100.0

Unproductive forest area by ownership group inside and outside reservations is shown below:

Ownership	Thousand acres	Percent
National Forest:		
Wilderness and other reservations	742	3.3
Outside reservations	4,824	21.7
National and State parks and other reservations	659	3.0
Private and other public outside reservations	15,991	72.0
Total	22,216	100.0

[7] Productive-reserved forest land is withdrawn from timber utilization through statute, ordinance, or administrative order. Productive-deferred forest land is designated for reserved status but has not yet been dedicated.

[8] Includes parks and certain watersheds where timber cutting is prohibited.

[9] The Nature Conservancy lands at the time ownership was determined.

Table 1--Land area by use or major vegetation type, California, 1975

Land use or vegetation type[1/]	Thousand acres	Percent
Forest:		
Productive forest	17,944	17.9
Unproductive forest	22,216	22.2
Total forest	40,160	40.1
Non-forest:		
Coastal sagebrush	2,300	2.3
Inland sagebrush	3,800	3.8
Desert	23,900	23.9
Grassland	12,000	12.0
Riparian, marsh, tidelands	700	0.7
Barren	1,800	1.8
Agriculture	11,000	11.0
Urban, industrial, roads, and other	4,390	4.4
Total non-forest	59,890	59.9
All types	[2/]100,050	100.0

[1/] Sources:

a. Aerial photo and ground classification data collected by the Pacific Northwest Forest and Range Experiment Station at Portland, and the Intermountain, Pacific Southwest, and Pacific Northwest Regions of the U.S. Forest Service, 1966-75, on file in the various offices.

b. Wieslander and Jensen (1946), and their basic data.

c. U.S. Forest Service, Pacific Southwest Region, Area Guides (1975b, 1976a, 1976b).

d. State of California Department of Fish and Game (1966)(includes wildlife habitat data and projections).

e. State of California, Division of Forestry (1961-74).

f. Cross-checking was done for different portions of the State using information from Bureau of Land Management, National Park Service, Bureau of Indian Affairs, Soil Conservation Service, Southern California Association of Governments, and other organizations.

[2/] Source: United States Bureau of the Census. 1971. Land and water areas of the United States. Revised to account for new water areas reported by the California Department of Water Resources.

Trends in Forest Area

Forest area statistics were published for 1953 in Forest Statistics for California (USDA Forest Service 1954). The inventory procedures used for the current inventory differ from those used in 1953, but a comparison of the estimates gives a fair picture of land class changes:

Land class	1953	1975	Difference	
	Thousand acres			Percent
Timberland	17,317	16,299	−1,018	−5.9
Productive reserved	1,202	1,377	+175	+14.6
Deferred	—	268	+268	—
Unproductive	24,022	22,216	−1,806	+7.5
Total	42,541	40,160	−2,381	+5.6

The differences in timberland area by ownership class between the 1953 and current inventories are shown below:

Ownership Class	1953	1975	Difference	
	Thousand acres			Percent
Public:				
National Forest	8,573	8,168	−405	−4.7
Bureau of Land Management	324	329	−85	−26.2
Other Federal	40	40	0	0
Indian	133	114	−19	−14.3
State	186	79	−107	−57.5
County and municipal	8	27	+19	+237.5
Total public	9,264	8,667	−597	−6.4
Private:				
Farmer	1,586	1,646	+60	+3.8
Industrial and other	6,467	5,986	−481	−7.4
Total private	8,053	7,632	+421	−5.2
All ownerships	17,317	16,299	−1,018	−5.9

Much of the decrease in timberland area was caused by land clearing, refinement in site classification, and Park and Wilderness expansion as shown in the tabulation on page 13. Considerable shifting in ownership has occurred, complicating the picture. The Bureau of Land Management sold many parcels of public domain land until the mid-1960's. The State of California sold many parcels of State Land Board lands. Forest industries have steadily acquired land from various ownerships. The miscellaneous private ownership has decreased through sales, development, and subdivisions.

Figure 10 shows the trends in forest area from 1953 to 1975. The greatest change was in unproductive forest, which declined by 7½ percent. Reported clearings of chaparral and oak (fig. 11) for grazing amounted to about 1.7 million acres (State of California, Division of Forestry 1961-74), accounting for most of the change. Sample-derived estimates indicate that timberland declined about 6 percent. Documented refinement in site classification accounted for 80 percent of the net difference. In National Forests, closer inspection of forest lands (fig. 12) and experience in managing problem sites provided a basis for reducing the area classified as timberland. On lands outside National Forests, an improved method of estimating forest productivity (MacLean and Bolsinger 1973b) was used in estimating timberland area (figs. 13 and 14). Physical conversions for reservoirs, roads, residential areas, agriculture, and other nonforest use

amounted to an estimated 202,000 acres. These changes in forest area are summarized in the following tabulation:

Cause of change	Area changed from 1953 to 1975 [10] (Thousand acres)	Percent of 1953 acres
	Timberland	
Conversion – reservoirs, roads, powerlines, residential, grazing, etc.[11]	–202	–1.2
Refinement in site classification	–812	–4.7
Park and Wilderness expansion	–175	–1.0
Deferred areas	–268	–1.5
Other[12]	+439	+2.5
Net change	–1,018	–5.9
	Unproductive forest	
Grazing clearings	–1,704	–7.1
Reservoirs, roads, and all other sources[12]	–102	–0.4
Net change	–1,806	–7.5

[10] Sources of information include records of reservoir (State of California, Department of Water Resources 1972) and road construction, forest conversion affidavits, records of park dedications, National Forest land records, forest inventory field records, aerial photographs, soil vegetation maps (Colwell 1974), and brushland reclamation records (State of California, Division of Forestry 1961-74).

[11] The total area of timberland conversion documented by the California Department of Forestry from 1953 to 1975 is 814,089 acres (Arvola 1976). Much of this area was either not completely converted to nonforest according to U.S. Forest Service definitions or was reverted to forest after conversion.

[12] Other causes of change may include sampling error, differences in definitions, differences in personal judgment, and undetected real changes.

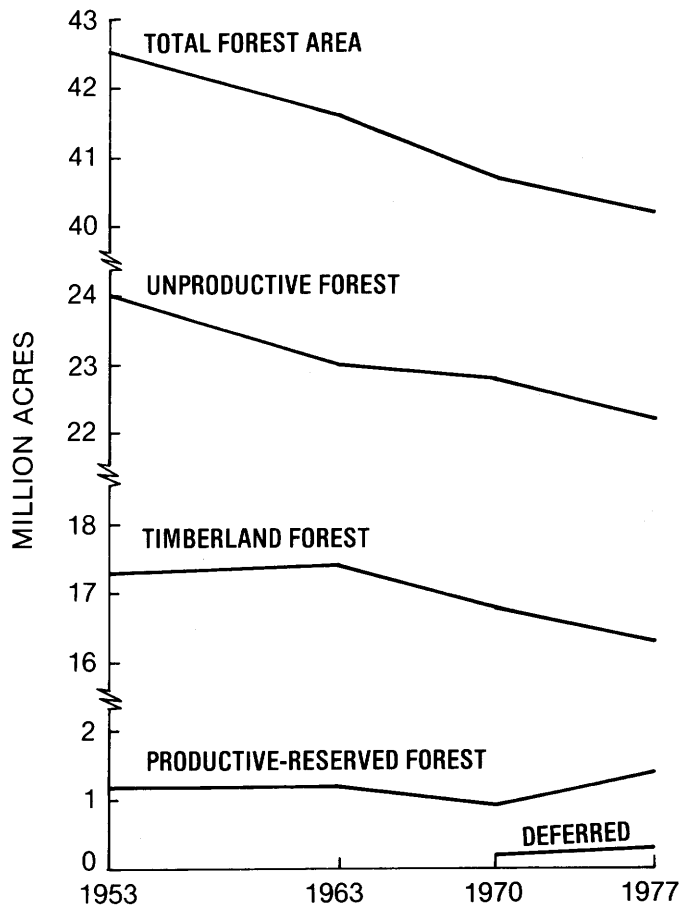


Figure 10. – Trends in forest area in California, 1953-77. (Deferred acreage does not include RARE II study areas.) Sources: (1) USDA Forest Service (1954). (2) Oswald and Hornibrook (1966). (3) Determined by adjusting the 1953 area by the reported clearings for grazing (State of California, Division of Forestry 1961-74). (4) USDA Forest Service (1973a). (5) This figure was determined from new inventory data for all lands except those outside National Forests in southern California. Records of range clearings, reservoirs, etc. were used along with the acreage estimate of California Department of Fish and Game Habitat to approximate unproductive forest area outside National Forests in southern California.

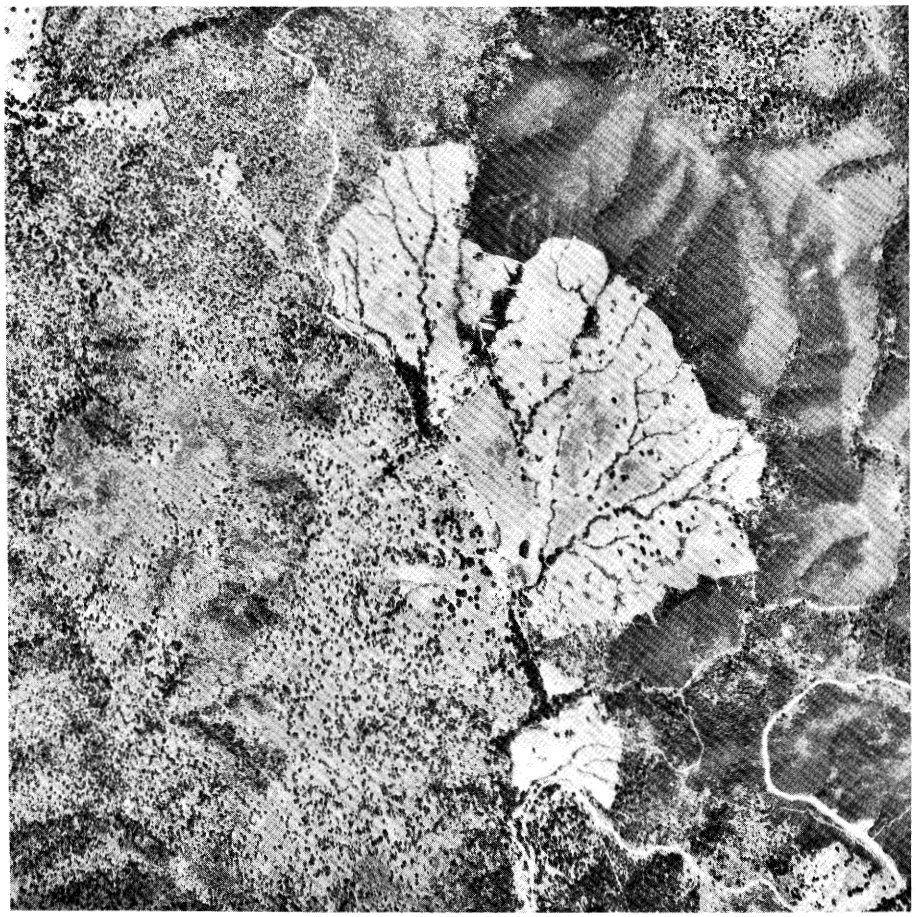


Figure 11. – Clearings in chaparral and oak woodland types between 1953 and 1975 amounted to about 1.7 million acres. Shown is an aerial view of a chaparral and oak clearing in Mariposa County.

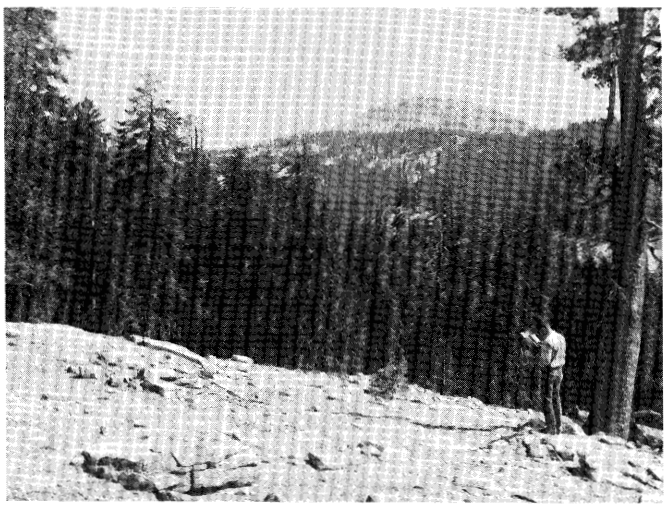


Figure 12. – Previous forest inventories, based on type maps, often included small areas of unproductive land as part of the timberland. Recent inventories have removed many of these areas.

Figure 13. – Jeffrey pine stand on soil derived from serpentine rock, Trinity County. Serpentine soils are naturally low in productivity. In earlier surveys, some areas like this were classified as poorly stocked. In fact, stocking is close to the site's capacity. The dense timber in the background is on soil derived from schistose rock.

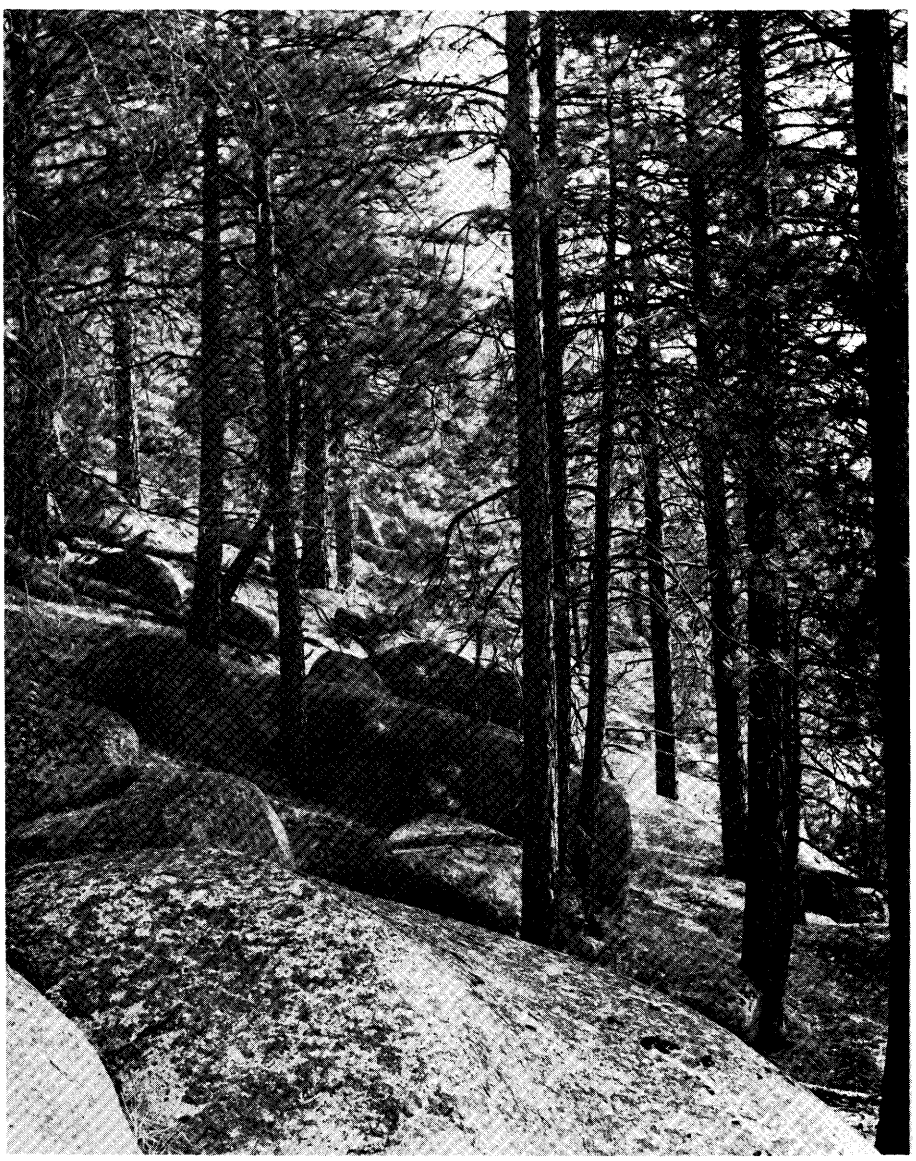


Figure 14. – Rocky lands such as this in Plumas County can support only a fraction of full tree stocking, and they are difficult to log and reforest. In earlier surveys based on type maps, areas like this were often included as timberland. In the recent survey they were classified as unproductive forest.

Forest Types

Forest Types on Timberland

All forest land has been classified into single-species forest types (fig. 15) based on plurality of current tree stocking. Table 2 shows area of timberland by these forest types. The forest type currently present on a given site is not always the most desirable type in terms of timber production. For example, hardwoods occupy some sites that could be growing more valuable conifers (see discussion on silvicultural opportunities, page 39). In much of California's interior, forests are not managed as single-species types.[13] A stand having a mixture of Douglas-fir, ponderosa pine, white fir, and incense-cedar, for example, will be managed as a "mixed conifer" stand (fig. 16) regardless of which species has the plurality of stocking. Coastal redwood is a special case. There is widespread interest in this unique species, not only in the volume and area of redwood type by standard definition, but also in the total area in which the species occurs, regardless of type. In recognition of these situations, the inventory data for lands outside National Forests were recast into special "timber management types" that are more in line with California forest management practices and current interests (table 3).

[13] See USDA Forest Service (1973b, p. 23-33), for a detailed description of California's major forest types and management considerations.

Table 2--Area of timberland by forest-type group and ownership, California, 1975
(In thousand acres)

Forest type group[1]	National Forest	Other public	Forest industry	Other private timber growers	Farmer and miscellaneous private	All ownerships
Douglas-fir	1,542	90	[2]400	198	501	2,731
Ponderosa and Jeffrey pines[3]	3,098	46	368	232	587	4,331
Lodgepole pine	189	--	10	33	29	261
True firs[4]	2,575	29	524	386	237	3,751
Incense-cedar	[5]	[6]28	199	266	158	651
Redwood	[7]21	[8]20	[9]308	[9]10	[9]291	650
Hardwoods	426	222	588	151	1,452	2,839
Nonstocked	317	34	111	72	224	758
North coast areas logged since inventory	--	30	180	--	117	327
All groups	8,168	499	2,688	1,348	3,596	16,299

[1] Based on plurality of stocking.
[2] Includes small amounts of western hemlock and Sitka spruce in Del Norte and Humboldt Counties.
[3] Includes sugar, Coulter, knobcone, Monterey, and Bishop pines; and incense-cedar in National Forests.
[4] Includes white, grand, California and Shasta red firs, western white pine, and mountain hemlock stands intermingled with true fir stands in high mountain forests.
[5] Combined with ponderosa and Jeffrey pines.
[6] Includes small amounts of western red and Port-Orford-cedars in Del Norte and Humboldt Counties.
[7] Includes 16,000 acres of coastal redwood in coastal areas and 5,000 acres of giant sequoia in the Sierra Nevada Mountains.
[8] Includes 18,000 acres of coastal redwood and 2,000 acres of giant sequoia.
[9] Coastal redwood.

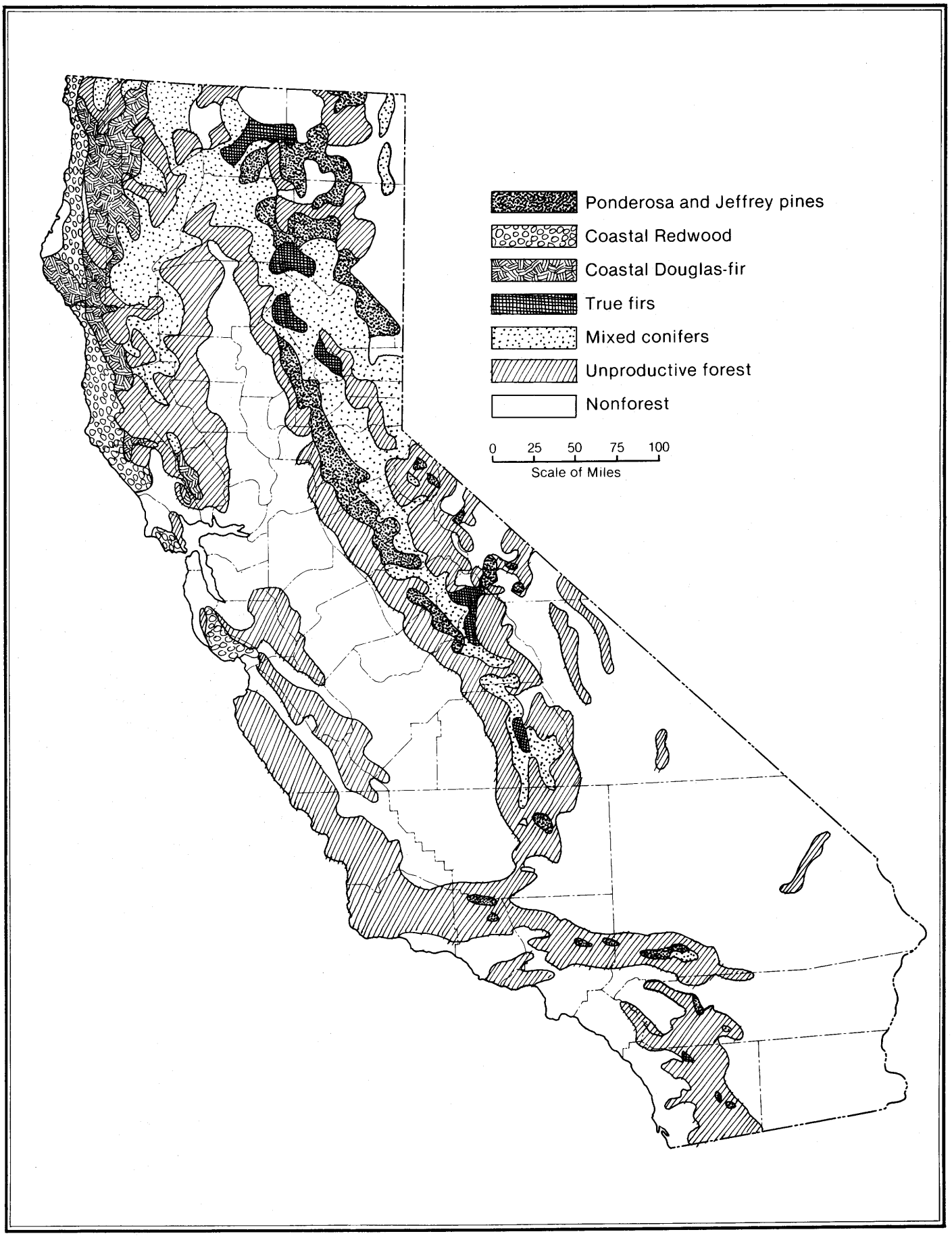


Figure 15. – Forest types and associations in California.

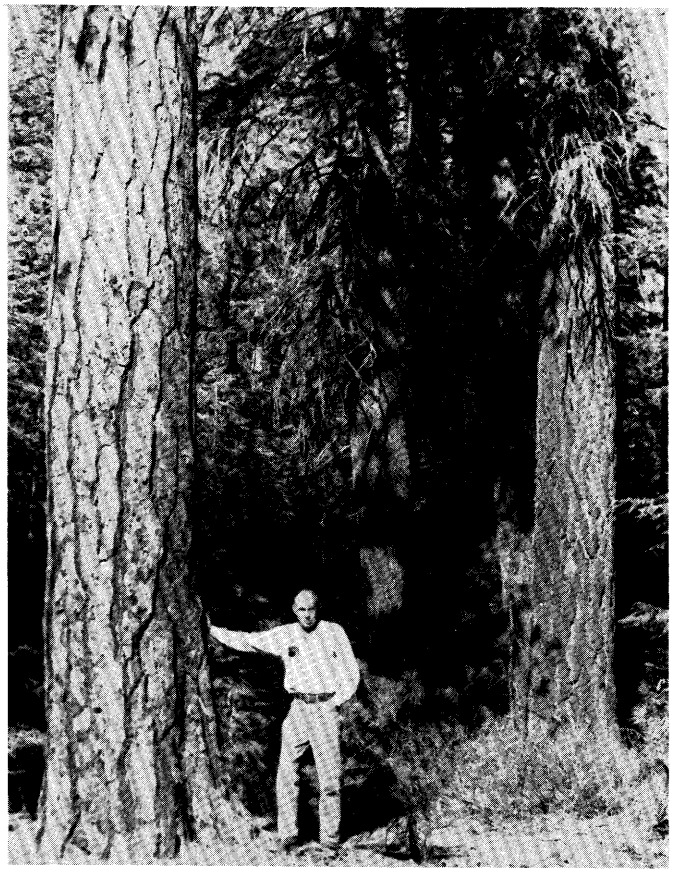


Figure 16. – Three to six tree species can be found in this stand in Plumas County belonging to a timber company. The company's management activities are perpetuating these species.

Table 3--Area of timberland outside National Forests by timber management type, California, 1975

Timber management types	Thousand acres	Percent
Coastal redwood[1/]	1,482	18.2
Coastal Douglas-fir[2/]	1,698	20.9
Ponderosa and Jeffrey pines[3/]	982	12.1
Mixed conifer--Douglas-fir and/or sugar pine present[4/]	2,350	28.9
Mixed conifer--Douglas-fir and/or sugar pine absent[5/]	825	10.1
True firs[6/]	548	6.7
Other conifers	193	2.4
Hardwoods on hardwood sites[7/]	53	0.7
All types	8,131	100.0

1/ All timberland areas having at least one redwood tree per acre, or one redwood stump in recently logged areas.

2/ Includes hardwood stands and nonstocked areas in north coast and central coast counties, and in Napa County, if Douglas-fir trees or stumps are present, unless redwood is present.

3/ Stands that are 80 percent or more stocked with ponderosa or Jeffrey pine.

4/ Stands in which a single species makes up less than 80 percent of the stocking. Douglas-fir and/or sugar pine are always present. Usually present are ponderosa or Jeffrey pine, white fir, and incense-cedar.

5/ Same as footnote 3 except Douglas-fir and sugar pine are absent. This type typically occurs on the east slopes of the Sierra Nevada and Cascade Ranges. Usually consists of ponderosa and/or Jeffrey pine and white fir. Incense-cedar is present in many areas.

6/ Stands that are 80 percent or more white fir and/or California or Shasta red fir.

7/ Includes north coast upland hardwood stands with no evidence of past conifer stocking; riparian hardwood stands such as cottonwood, alder, and ash; and eucalyptus (exclusive of southern California eucalyptus stands).

A Closer Look at Coastal Redwood

The 1975 estimate of coastal redwood forest type[14] on timberland is 643,000 acres, 60 percent less than the 1,588,000 acres reported in 1953 (USDA Forest Service 1954). Although logging, fires, and land clearing for nonforest purposes have reduced the area of coastal redwood type, the actual change is much less than the 1953 and 1975 estimates indicate. Part of the difference is in definition. In 1953, stands in which 20 percent of the sawtimber volume was redwood were classified as redwood type. In 1975, only stands in which the plurality of stocking of all trees was redwood were classified as redwood type.[15]

[14] This discussion concerns coastal (coast) redwood, *Sequoia sempervirens* which occurs naturally along California's coast from Oregon to Monterey County. Coastal redwood is an important commercial tree species in California. California's big tree, *Sequoiadendron giganteum,* goes by several names including redwood, Sierra redwood, and giant sequoia. It is confined to a few groves in the Sierra Nevada Range, and is valued mainly for its majestic beauty.

[15] For example, a stand fully stocked with small, low-volume tanoak trees but having two or three large redwood trees per acre would have been classified as redwood type in 1953; in 1975 the same stand would have been classified as tanoak.

Redwood trees still occur on an estimated 1,415,000 acres. From 1965 to 1975, about 211,000 acres of redwood type were logged. Most of this acreage is likely to have redwoods – either residual trees or stump-sprouts. The total area in which redwood is likely to occur exceeds 1,600,000 acres, as shown in the following tabulation:

Forest type category	Acres
Timberland in redwood type	643,000
Other forest types on timberland containing redwood trees[16]	658,000
Redwood types in parks[17]	114,000
Total estimated area in which redwood trees are known to occur	1,415,000
Redwood type logged 1965-75[18]	211,000
Total forest area in which redwood trees are likely to occur[19]	1,626,000

Public agencies hold 11 percent of the area in which redwood occurs; private owners, 89 percent. Of the total redwood area, 7 percent is set aside in parks (table 4 and fig. 18).

Figure 17. – Houses in young-growth redwood stands effectively remove the land from timber use.

Figure 18. – Of the total redwood area in California, 7 percent is set aside in Parks. Some of the very best redwood sites are in these Parks. Jedediah Smith State Park, Del Norte County.

[16] Includes 5,000 acres of unproductive forest.

[17] May exclude as much as 21,000 acres of other types with redwood present. Does not include the 1978 additions to the Redwood National Park. Total area in the additions was about 48,000 acres; details on type, condition, and volume are not available. Most of the 48,000 acres is assumed to be redwood type.

[18] About 60 percent is estimated to have been clear-cut and 40 percent partially cut. Residual or stump-sprout redwood trees are likely to be present in most of the area.

[19] Excludes residential developments and other "non-forest" lands where redwood trees are still growing (fig. 17).

Table 4--Area of forest land containing coastal redwood by land class and ownership, California, 1975
(In thousand acres)

Land class and category	National Forest1/	National Park	Other public	Forest industry	Other private timber growers	Farmer and miscellaneous private	All ownerships
Timberland:							
Plurality of stocking	16	--	18	308	10	291	643
Redwoods logged 1965-75	0	--	14	152	0	45	211
Other types containing redwood	0	--	17	315	17	304	653
Total	16	--	49	775	27	640	1,507
Productive reserved	2	23	89	2/	0	0	3/114
Unproductive	0	0	0	0	0	5	5
Total all classes	18	23	138	775	27	645	1,626
Percent of total area	1.1	1.4	8.5	47.6	1.7	39.7	100

1/National Forest redwoods occur as stringers in steep canyons in Monterey County at the southern extremity of the species range.
2/A number of timber companies have established demonstration forests and public parks in the redwoods, estimated to cover less than 1,000 acres totally. They are not permanently reserved from timber cutting; hence, they are included as timberland.
3/May exclude as much as 21,000 acres of other types containing redwood.

Noncommercial Forest Types

Productive reserved. – The 1,377,000 acres of productive forest in Parks, Wilderness, and other reservations vary from superlative redwood stands in stream bottoms near the coast to sparse stands of pines and firs near upper timberline in the mountains (fig. 19).

Figure 19. – True fir and lodgepole pine forests in the Caribou Wilderness, Lassen National Forest. Though classified as "productive," these high-elevation forests have low timber yield potential. True fir and lodgepole pine make up about half of the productive forest in California's wilderness. About 23 percent of National Forest Wilderness is productive forest, 36 percent is unproductive forest, and 41 percent is nonforest.

They include about 7 percent of the total forest area containing redwood, 7 percent of the total productive Douglas-fir type, 11 percent of the productive true fir type, 8 percent of the ponderosa pine group, and most of the giant sequoia. Table 5 shows these areas by forest type group and ownership; table 6 shows the acreage of deferred areas in National Forests being considered for possible Wilderness designation.

Unproductive. – Unproductive forests in the high mountains (fig. 20) and in arid forest zones (figs. 21 and 22) that are incapable of growing 20 cubic feet of industrial wood per acre per year or are too rocky (fig. 23) or steep to manage for timber products amount to 22,216,000 acres. These forests are valuable as wildlife habitat, watershed protection, and scenery. Large areas are grazed by livestock. Currently, very little of the wood growth on these lands is being used. Some fuelwood and fenceposts are cut from the oak woodland[20] (fig. 24), and saw logs are occasionally cut from the pine or fir types. In the future some of these lands, especially the chaparral and hardwood types, may be used as a source of energy. Table 7 shows the area of unproductive forest, by type and ownership group.

[20] For example, about 1.5 million cubic feet of fuelwood was harvested by timber operators in 1976 (State of California, Department of Forestry 1947-77, 1977 issue), and 48,000 fuelwood cutting permits were issued by the USDA Forest Service. Some of this fuelwood was cut in the oak woodland.

Table 5--Area of productive-reserved forest land by forest type group and ownership, California[1/]
(In thousand acres)

Forest type group[2/]	National Forest	National Parks	State Parks	County and municipal	Private	All ownerships
Douglas-fir[3/]	94	86	22	3	--	205
Redwood	2	23	79	10	--	114
Giant sequoia	--	7	4/	--	--	7
True firs[5/]	210	255	9	--	--	474
Ponderosa pine[6/]	149	228	11	4	1	393
Lodgepole pine	15	109	1	--	--	125
Noncommercial conifers	--	1	1	--	--	2
Hardwoods	9	33	2	4/	--	44
Unclassified	--	5	--	6	2	13
All groups	479	747	7/125	23	3	1,377

1/ Information for National Forests is as of January 1, 1977; for other areas, 1975.
2/ Based on plurality of stocking.
3/ Includes bigcone Douglas-fir.
4/ Less than 500 acres.
5/ Includes white, California red, and Shasta red firs; also includes small amounts of western white pine and mountain hemlock.
6/ Includes Jeffrey, sugar, knobcone, Coulter, and Monterey pines; and incense-cedar.
7/ A small amount of productive-reserved forest land in southern California is combined with unproductive-nonreserved.

Table 6--Area of productive-deferred forest land[1/] in National Forests by forest type group, California, January 1, 1977

Forest type group[2/]	Thousand acres
Douglas-fir	51
Ponderosa pine	108
True firs	81
Lodgepole pine	21
Hardwoods	7
All groups	268

1/ Areas under study for possible wilderness classification as of January 1, 1977. Does not include study areas in the Roadless Area Review and Evaluation program (RARE II) of the USDA Forest Service.
2/ Based on plurality of stocking.

Figure 20.– Unproductive forest on granitic soil in the Desolation Valley Wilderness, Eldorado National Forest. The vegetation in this high elevation site includes Jeffrey pine, lodgepole pine, California red fir, huckleberry oak, and mountain white thorn.

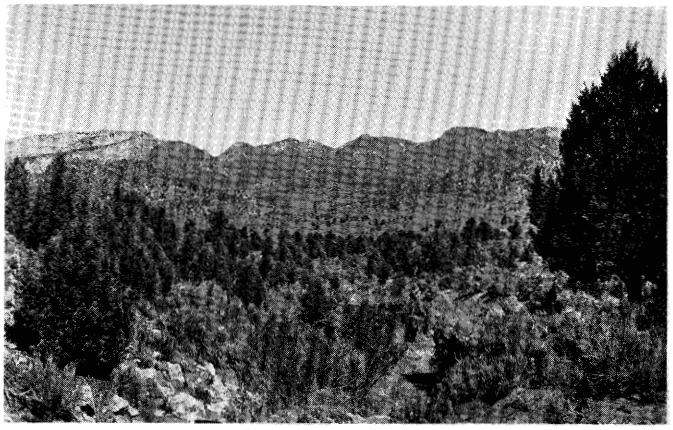


Figure 21. – Pinyon-juniper forest in Mono County. This type covers 2.7 million acres in California, mostly near the Nevada border.

A

B

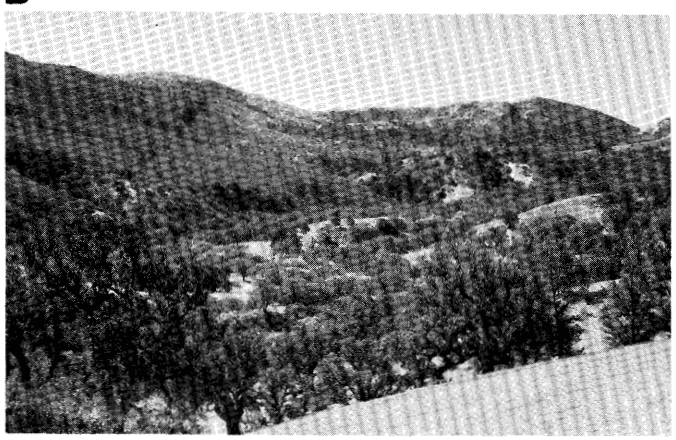


Figure 22. – A, MacNab cypress trees and chaparral consisting of manzanita and ceanothus, Colusa County; and B, chaparral grading into oak woodland, Lake County. Chaparral, consisting of many species of brush and short trees, covers 7.6 million acres in California.

Figure 23. – Ponderosa pine and western juniper grow in pockets of soil in scabrock in the lava-flow country of Modoc County. Such areas produce less than 20 cubic feet of wood per acre per year and are considered unmanageable for continuous timber crops. About 2.3 million acres of ponderosa pine type is classified as unproductive forest.

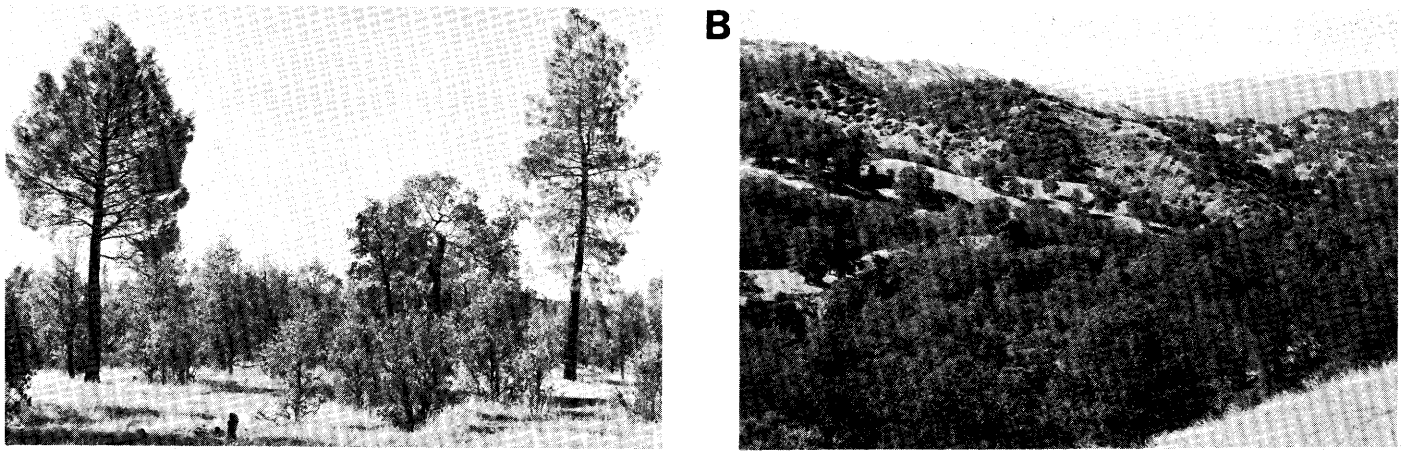


Figure 24. — Oak woodland, consisting of California blue oak and interior live oak, with scattered Digger pine, occurs as a belt 450 miles long in the western foothills of the Cascades and Sierra Nevada and in the interior Coast Ranges. The total area of oak woodland, including several tree species, is 5.8 million acres. A, Shasta County; B, Mendocino County.

Table 7--Area of unproductive forest by forest type group and ownership, California, 1975
(In thousand acres)

Forest type group	National Forest Wilderness and other reservations	National Forest outside reservations	National, State, and other parks, and reservations	Outside National Forests, parks and reservations	All areas
Douglas-fir	18	227	1	29	275
Ponderosa and Jeffrey pines[1/]	206	1,382	89	637	2,314
True firs[2/]	315	1,148	42	96	1,601
Redwood	--	--	--	5	5
Lodgepole pine	49	179	225	188	641
Commercial hardwoods	4	613	3	699	1,319
Chaparral	132	761	177	6,516	7,586
Pinyon-juniper	8	350	48	2,290	2,696
Oak woodland	10	164	74	5,531	5,779
All groups	742	4,824	659	[3/]15,991	22,216

[1/] Includes sugar, Coulter, knobcone, Monterey, and Bishop pines; and incense-cedar in National Forests.
[2/] Includes white, grand, California and Shasta red firs, western white pine, and mountain hemlock stand intermingled with true fir stands in high mountain forests.
[3/] Includes a small amount of productive reserved in southern California.

Timber Volume

California timberlands contain an estimated 49.7 billion cubic feet of wood in sound growing stock trees, 5-inch d.b.h. and larger, and 235.6 billion board feet (Scribner rule) in sound sawtimber trees, 11-inch d.b.h. and larger. The State ranks third in the Nation in the amount of standing softwood sawtimber, with 13 percent of the total on only 3 percent of the Nation's timberland. Over 60 percent of the softwood volume is on National Forest lands (see table 8).

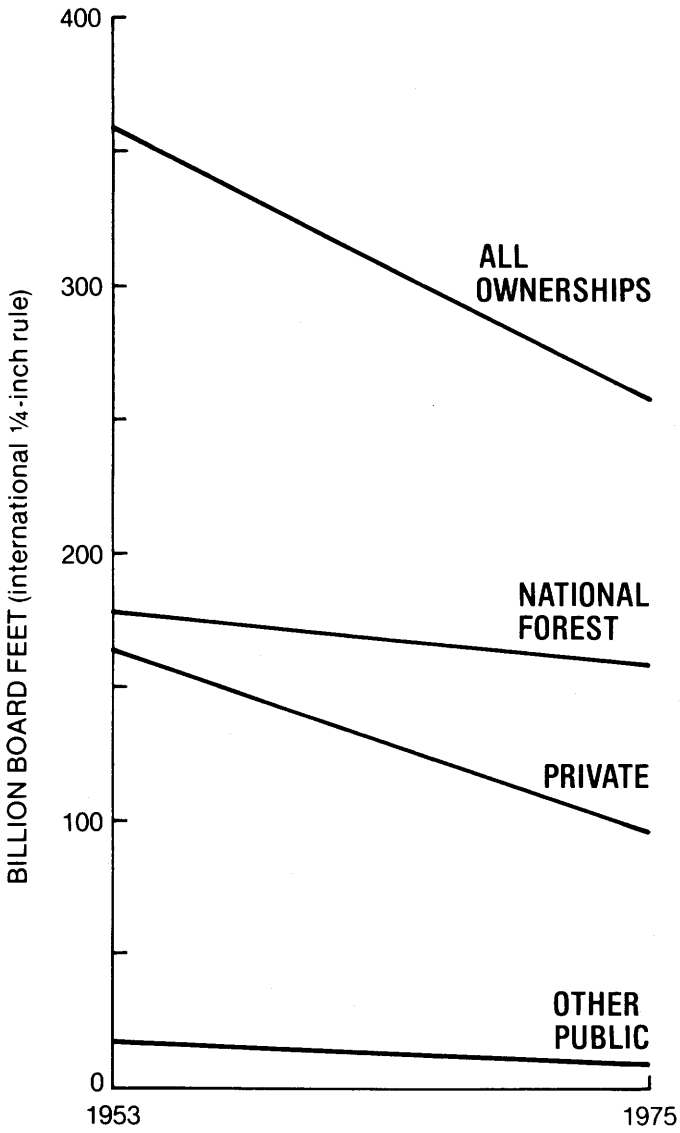


Figure 25. – Trends in sawtimber volume on California timberland by ownership, 1953-75.

Timber volume on California timberland has declined during the past two decades. A comparison of 1975 volume estimates with those published for 1953 (USDA Forest Service 1954) shows a net reduction in softwood sawtimber of 101 billion board feet (fig. 25 and table 27, appendix). Reported timber harvest during that period was 117 billion board feet and estimated growth was about 60 billion. Roughly, 5-10 billion board feet were set aside in parks, Wilderness, and deferred areas. The remaining difference includes volume lost or unaccounted for in land clearings, fires, storms, and epidemics, and in sampling errors in both inventories.

Redwood and Douglas-fir volume declined the greatest amount – 41 percent and 38 percent respectively. Incense-cedar and minor conifers (mostly lodgepole pine, knobcone pine, and hemlocks) remained nearly constant. Hardwood volume increased by 35 percent (fig. 26 and table 28, appendix).

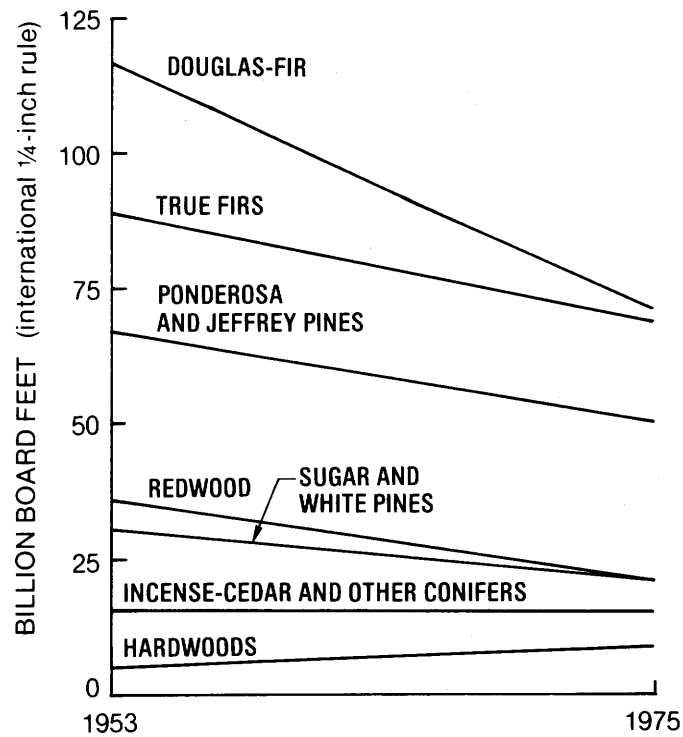


Figure 26. – Trends in sawtimber volume on California timberland by species, 1953-75.

Table 8--Net volume of growing stock and sawtimber on timberland by ownership, California, 1975

Ownership	Growing stock			Sawtimber					
	Softwoods	Hardwoods	Total	Softwoods	Hardwoods	Total	Softwoods[1]	Hardwoods[2]	Total
	Million cubic feet			Million board feet (Scribner rule)			Million board feet (International 1/4-inch rule)		
National Forest	28,072	1,134	29,206	142,883	2,814	145,697	157,958	2,955	160,913
Other public	1,108	283	1,391	5,668	560	6,228	6,356	572	6,928
Forest industry	7,457	679	8,136	35,940	1,181	37,121	40,883	1,206	42,089
Other private timber growers	3,068	121	3,189	15,091	177	15,268	[3]	[3]	[3]
Farmer and miscellaneous private	6,269	1,476	7,745	28,246	3,090	31,336	50,397	3,342	53,739
All ownerships	45,974	3,693	49,667	227,828	7,822	235,650	255,594	8,075	263,669

[1] Includes trees 9.0-inch d.b.h. and larger.
[2] Includes trees 11.0-inch d.b.h. and larger.
[3] Included with farmer and miscellaneous private.

The decline in volume has been concentrated in large trees. In 1953, 89 percent of the softwood sawtimber volume was in trees 21-inch d.b.h. and larger compared with 78 percent in 1975. Percent of hardwood volume in trees 21-inch d.b.h. and larger also declined, though total hardwood volume increased. Two factors caused this: small hardwood trees restocked several hundred thousand acres of logged and burned land (fig. 27), and many of the large hardwoods standing in 1953 were killed when associated softwoods were logged, or were damaged and became cull trees.

About 60 percent of the current softwood sawtimber volume in trees 21-inch d.b.h. and larger, and 67 percent in trees 29-inch d.b.h. and larger are in National Forest ownership.

In addition to the 49.7 billion cubic feet of sound growing stock trees, there is an estimated 2.3 billion cubic feet of wood in rough and rotten cull trees and in dead trees (fig. 28 and table 29, appendix). This volume is widely scattered, usually in broken, rotten, crooked, or forked trees that are costly to handle. It is a potential resource that could be used for many purposes. Cull and dead trees contain about 4 percent of the total sound wood volume in National Forests, averaging 135 cubic feet per acre and 6 percent of the total sound wood volume outside National Forests averaging 147 cubic feet per acre.

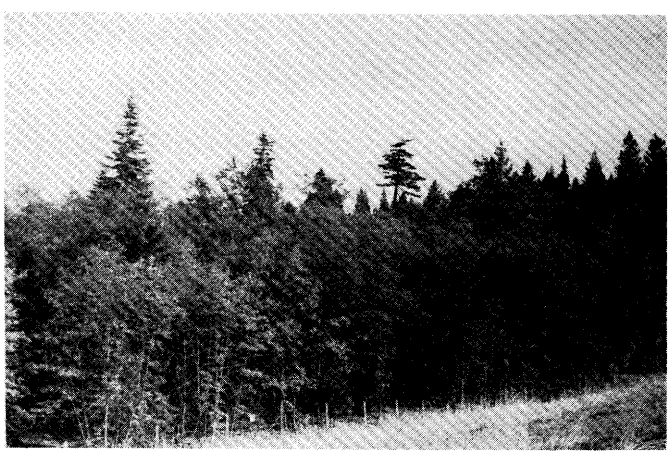


Figure 27. – Small hardwood trees have stocked several hundred thousand acres of logged and burned land in California.

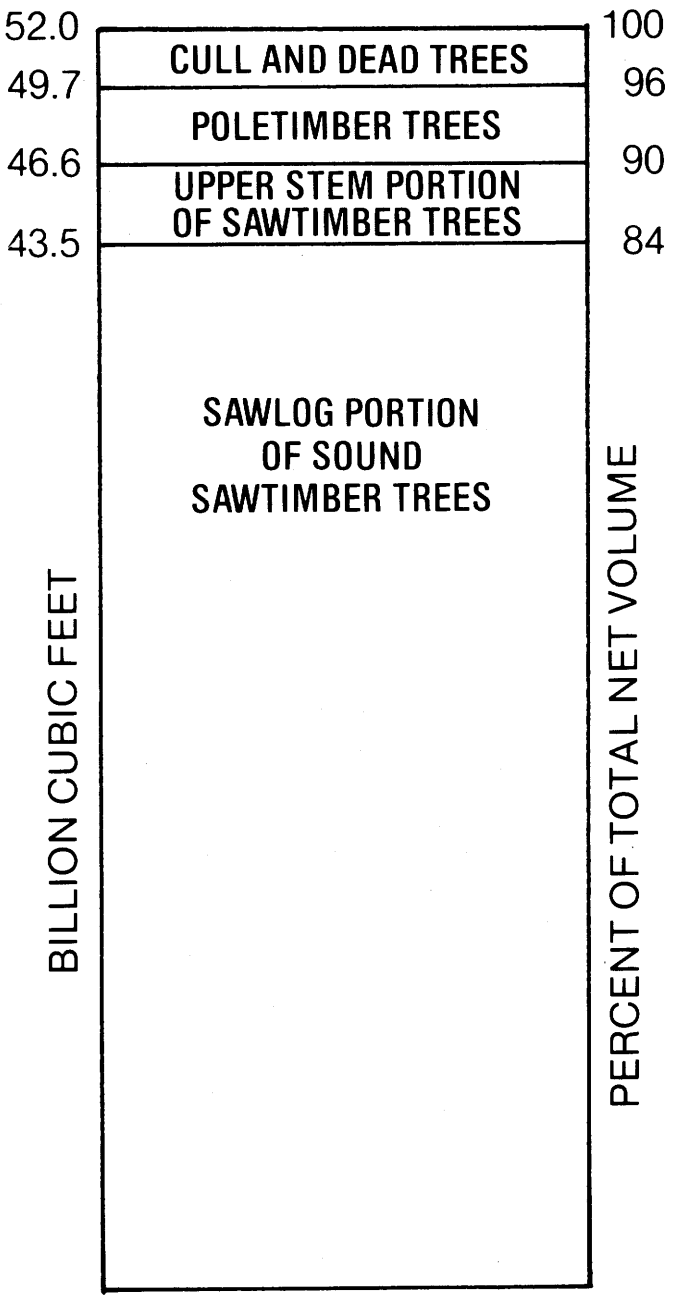


Figure 28. – Net volume of timber on California timberland by class of timber, 1975.

Timber Productivity and Growth

Productivity

The amount of wood that a forest produces depends on several factors, including climate, soil, tree species, and stocking condition. The productive capacity of timberlands in California is extremely variable. Some alluvial soils in the mild, rainy north coast area are capable of growing 400 or more cubic feet per acre per year if well stocked with healthy redwood trees (fig. 29). These same soils can grow 200 or 250 cubic feet of Douglas-fir, or as much as 150 cubic feet of hardwoods. At the other extreme are serpentine and peridotite soils in the Coast Ranges and western slopes of the Sierra Nevada and granitic and volcanic soils in the arid interior that will barely grow 20 cubic feet of Jeffrey pine or ponderosa pine (fig. 30). Throughout the State are extensive areas capable of growing at least 85 cubic feet of wood per acre per year if well stocked with productive coniferous species such as ponderosa pine, sugar pine, Douglas-fir, and white fir (table 9 and fig. 31).

Figure 29. – The best redwood sites in the north coast are capable of growing 400 or more cubic feet of wood per acre annually. This well stocked young-growth redwood stand is on Simpson Timber Company land, Humboldt County..

Figure 30. – Stands near arid timberline may produce less than 20 cubic feet of wood annually. This ponderosa pine stand is in the Modoc National Forest.

Table 9--Area of timberland by biological potential (site class) and ownership, California, 1975
(In thousand acres)

Biological potential (site class)	National Forest	Other public	Forest industry	Other private timber growers	Farmer and miscellaneous private	All ownerships
Cubic feet						
165 or more	533	44	686	100	501	1,864
120-164	824	72	633	151	721	2,401
85-119	1,918	99	502	255	792	3,566
50-84	3,576	199	542	436	1,033	5,786
20-49	1,317	85	325	406	504	2,637
All classes	8,168	499	2,688	1,348	1/3,551	16,254

1/Excludes 6,000 acres in central coast and 39,000 acres in southern California for which information is not available.

Figure 31.— Two-story ponderosa pine and white fir stand capable of growing 120 cubic feet per acre annually, Plumas County.

California contains 3 percent of the Nation's timberland and has about 9 percent of the area capable of growing 120 or more cubic feet per acre annually. California has 13 percent of the Nation's timberland capable of growing 165 or more cubic feet. The estimated biological potential (site class)[21] for all of California's timberland averages 97 cubic feet per acre compared with 75 for the entire United States (USDA Forest Service 1973a). These estimates are based on yield tables developed for fully stocked even-aged stands of single species. The estimates of biological potential do not necessarily indicate the yield potential of stands currently occupying the land and are considered to be less than the potential of intensively managed stands on the more amenable sites. They do provide a rough gage for monitoring forest management success. They also are useful in ranking the potential of lands for allocating funds for forest intensification and for setting priorities.

Growth

On all ownerships combined, the net annual growth on timberland in 1975 was 0.8 billion cubic feet and 3.6 billion board feet (table 10). Net annual softwood growth averaged 46 percent of the land's estimated potential. Gross annual growth, which includes wood grown each year in trees that die, averaged 54 percent of the land's potential. National Forests have the highest growth rate relative to the land's potential while forests owned by forest industry have the highest absolute growth rate (table 11).

[21] See definition, page 132.

Table 10--Net annual growth of growing stock and sawtimber on timberland by ownership, California, 1975

Ownership	Growing stock	Sawtimber
	Million cubic feet	Million board feet (Scribner rule)
National Forests	379.7	1,663.0
Other public	21.9	90.1
Forest industry	162.5	748.3
Other private timber growers	56.5	245.9
Farmer and miscellaneous private	181.0	835.0
All ownerships	801.6	3,582.3

Table 11--Average biological potential (site class), growth, and mortality of softwoods on timberland by ownership, California, 1975

Ownership	Biological potential (site class)	Gross growth	Mortality	Net growth	Net growth as percent of biological potential	Gross growth as percent of biological potential
	Cubic feet per acre per year				Percent	
National Forest	86	54	9	45	52	63
Other public	92	40	10	30	33	43
Forest industry	115	61	8	53	46	53
Other private timber growers	82	46	7	39	48	56
Farmer and miscellaneous private	101	47	6	41	41	47
All ownerships	97	52	8	44	46	54

Measurable growth on National Forests is generally higher relative to the land's potential than on private lands for three reasons:

1. Most of the very productive private land in the north coast area has been logged. Extensive areas are either occupied by stands too young to have measurable growth, or are inadequately stocked with desirable trees. Growth can be expected to increase on these lands as young stands develop and as the inadequately stocked areas are reforested. Reforestation efforts on private lands have increased in recent years and promise better forest yields in the future (see table 32, appendix).

2. National Forest lands have lower innate productivity, but most are stocked by trees of measurable growth size. Extensive areas are occupied with stands near the age of maximum growth, especially in the Sierra Nevada.

3. Most of the private lands in the interior have been selectively logged one to several times. These areas still support sawtimber stands, but about 2 million acres are occupied with trees that are diseased, damaged, suppressed, or of undesirable species (see the section on treatment opportunities, regeneration cutting, pages 35,36).

Growth varies by geographic area because of differences in the yield potential of the land and the species, age, and condition of forest stands. National Forest growth ranges from a high of 87 cubic feet per acre per year on the Stanislaus National Forest to a low of 6 cubic feet on the Angeles. The Stanislaus is a Sierra Nevada National Forest with extensive areas of healthy stands on productive land managed for timber use, while the Angeles is one of five National Forests in southern California with limited timber resources on relatively unproductive sites managed primarily for watershed, recreation, and wildlife habitat (see table 30, appendix). The central coast resource area has the fastest growing timber stands in private ownership, with average growth ranging from 96 to 129 cubic feet per acre. This area is generally well stocked with redwood and Douglas-fir stands approaching the age of maximum growth. Private lands in the northern interior have the lowest growth in the State, ranging from 28 to 36 cubic feet. This area has extensive areas of unproductive land and some heavily cutover stands in poor growing condition (see table 31, appendix).

Private lands in the north coast have the lowest growth relative to their potential. Much of the cutover area is stocked with trees too small to have measurable volume and growth,[22] and a substantial area is occupied with brush and hardwoods.

[22] Growth estimates for the north coast have been updated to account for cutting, ingrowth, and changing growth rates in uncut stands since the mid-1960's inventory.

Opportunities for Silvicultural Treatment

Demand for timber products is expected to grow rapidly (USDA Forest Service 1977b). California's timberland is producing only half its estimated potential. These two facts lead to the question: How can California's forest productivity be increased?

One way that future timber yields can be increased is by intensifying forest management activities now. Proven silvicultural techniques can be applied to forest stands that are in poor timber producing condition in order to improve forest yields. In the following section information on stand condition, past and present silvicultural accomplishments, planned activities, and opportunities for additional silvicultural treatments are summarized and discussed.

Some silvicultural treatment has been done for many years (fig. 32), and a considerable area is now being treated annually. In 1977, 83,000 acres in California were planted or seeded to trees (table 32, appendix). Forest industries planted and seeded 37,449 acres, the greatest on record and a five-fold increase since the mid-1960's when about 7,000 acres were planted and seeded. The total area of silvicultural activities, counting timber harvesting and salvaging timber killed by the 1975-77 drought and pest epidemics, is about 1 million acres (table 12).

Nurseries in California (fig. 33) in fiscal year 1977 produced about 63 million seedlings as shown in the following tabulation:

Nursery owner	October 1, 1976 - September 30, 1977 (Thousand trees)	Percent
National Forest	20,016	32
State	3,420	5
Other public	227	trace
Forest industry	39,833	63
Total	63,496	100

The silvicultural treatments considered in this report are based strictly on the physical condition of timber stands and site quality. A cost-benefit analysis might show that some physical opportunities cannot be justified economically. Some areas may be unavailable for intensive management because of concern for nontimber values, local ordinance, or other factors for which information was not gathered.

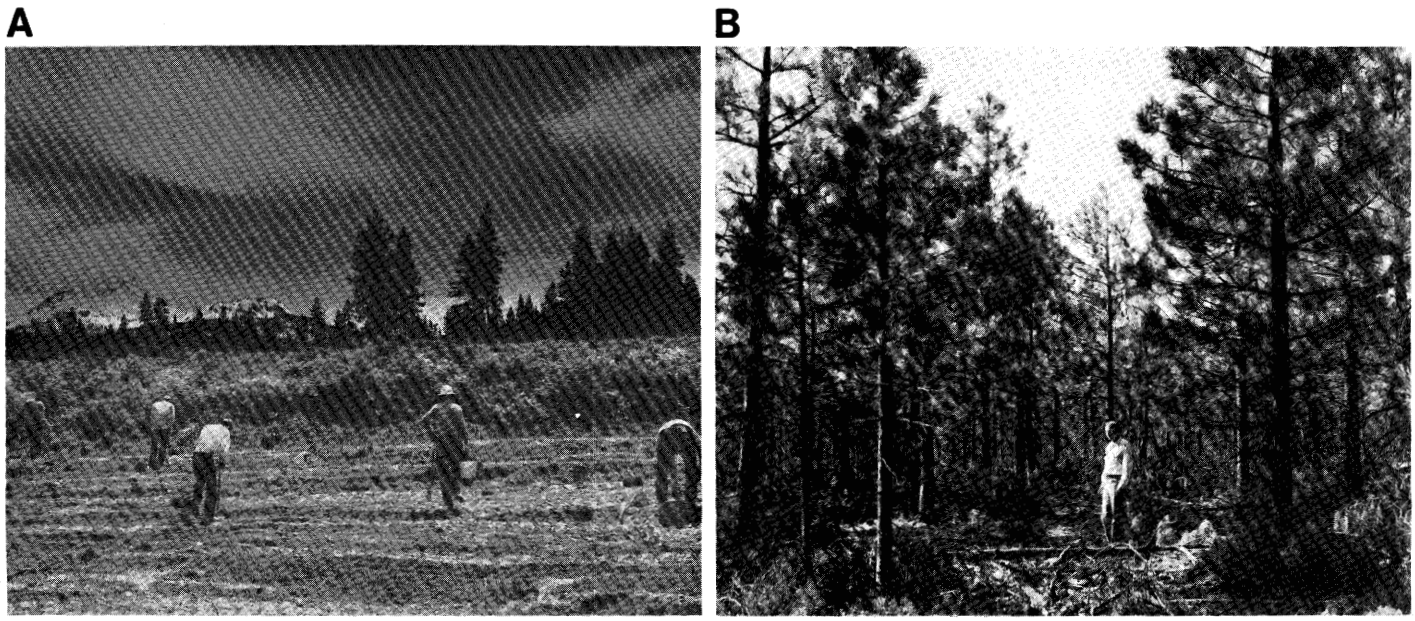


Figure 32. – Trees have been planted in or thinned from public and private forests for many years: A, Tree planters in the Deer Hollow Project, Lassen National Forest, 1961; B, Thinned ponderosa pine plantation, Collins Pine Co., 1977.

Figure 33. – Masonite Corporation's tree nursery in Mendocino County.

Table 12--Approximate area of timberland in annual management activities by silvicultural treatment and ownership[1/], California, 1977-78

(In acres)

Silvicultural treatment	National Forest	Other public	Forest industry and other private timber growers	Farmer and miscellaneous private	Total of available data
Treatments not involving timber harvest:					
Planting and seeding	33,719	2,202	42,582	4,557	83,060
Site preparation for planting	25,581	NA	NA	NA	25,581
Site preparation for natural regeneration	14,024	25	20,394	72	34,515
Treatment for releasing	8,909	45	13,455	8,453	[2/]55,124
Precommercial thinning	24,262				
Pruning	315	NA	NA	NA	315
Fertilizing	409	NA	NA	NA	409
Prescribed burning to control understory	1,914	NA	NA	NA	1,914
Total no-harvest treatments	109,133	2,272	76,431	13,082	200,918
Timber harvest treatments:			Ownerships combined[3/]		
Clearcutting	19,600	NA	15,700		35,300
Selective cutting[4/]	22,800	NA	286,100		308,900
Shelterwood and seed tree cutting	73,200	NA	46,900		120,100
Intermediate cutting (includes commercial thinning)	52,100	NA	42,400		94,500
Sanitation-salvage cutting	164,600	NA	92,300		256,900
Other	--	NA	84,800		84,800
Total harvest treatments	[5/]332,300	--	568,200		900,500
All treatments	441,433	2,272	657,713		1,101,418

NA = not applicable.

1/ These data are presented to indicate the approximate area being treated annually in California forests. Sources: U.S. Forest Service, State summary, reforestation and stand improvement report 24.24s, compiled at Fort Collins, Colorado, January 1979; USDA Forest Service (1964-78, 1978 issue); State of California forest practice report, 1977, Sacramento, California, 1978; and U.S. Forest Service, Pacific Southwest Region data on file, 1978.

2/ Reported as timber stand improvement for owners other than National Forests.

3/ Timber harvest plans as filed for 1977, presented as the best indicator of acres actually treated. Includes nonfederal public lands and all private lands.

4/ Includes all partial cutting not reported as other harvest treatments.

5/ Actual accomplished treatments, fiscal year 1977.

Treatment Opportunities Examined

Information on stand condition was examined to determine treatment opportunities.[23] Specific treatments identified, by stand condition, are:

Stand Condition	Treatment Opportunity[24]
Conifer sawtimber with 5,000 or more board feet per acre:	
Low growth, stocked with understory conifers	Overstory removal
Low growth, not stocked with understory conifers	Regeneration cutting
High growth	Commercial thinning or no treatment[25]
Poletimber or young sawtimber conifers with less than 5,000 board feet per acre:	
Without cull trees or hardwoods	Precommercial thinning or no treatment[25]
With cull trees or hardwoods	Improvement cutting
Poletimber or sawtimber hardwoods without understory conifers	Stand conversion
Conifer seedlings and saplings:	
Without overtopping brush or hardwoods	Precommercial thinning or no treatment[25]
With overtopping brush or hardwoods	Cleaning or releasing
Nonstocked or inadequately stocked	Planting

Activities that would be expected to increase yields wherever applied, such as fertilization, genetic tree improvement, using large planting stock, mycorrhiza root inoculation, or irrigation, were not considered.

Treatment Opportunities Outside National Forests

Most of the 8.1 million acres of timberland outside National Forests have been logged. Some uncut old-growth stands can still be found, mainly in remote mountain regions, and considerable residual volume has been left in many logged stands. Volume in some young-growth stands on land logged decades ago is as great as the volume in many uncut old-growth stands (fig. 34). Much of the more recently logged area is now forested with seedling, sapling, or poletimber stands. Older logging, mining, fires, insect and disease epidemics, storms, and unsuccessful attempts to convert forest to pasture have left extensive areas of productive land stocked with low value hardwoods, rotten and damaged conifers, and brush. Because of the longer history of disturbance on private lands than on National Forests and the various objectives pursued by the many owners, opportunities for silvicultural treatment on these lands are more extensive and varied (fig. 35).

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[23] Detailed information for National Forests was not available. Treatment opportunities for National Forests shown on pages 45-46 are based on region-wide resource summaries and statements of expected treatment acreages.

[24] See appendix, p. 134 for criteria used in assessing treatment opportunities.

[25] Thinning may or may not be an opportunity depending on age of trees, site characteristics, species mix, and objectives of the forest manager.

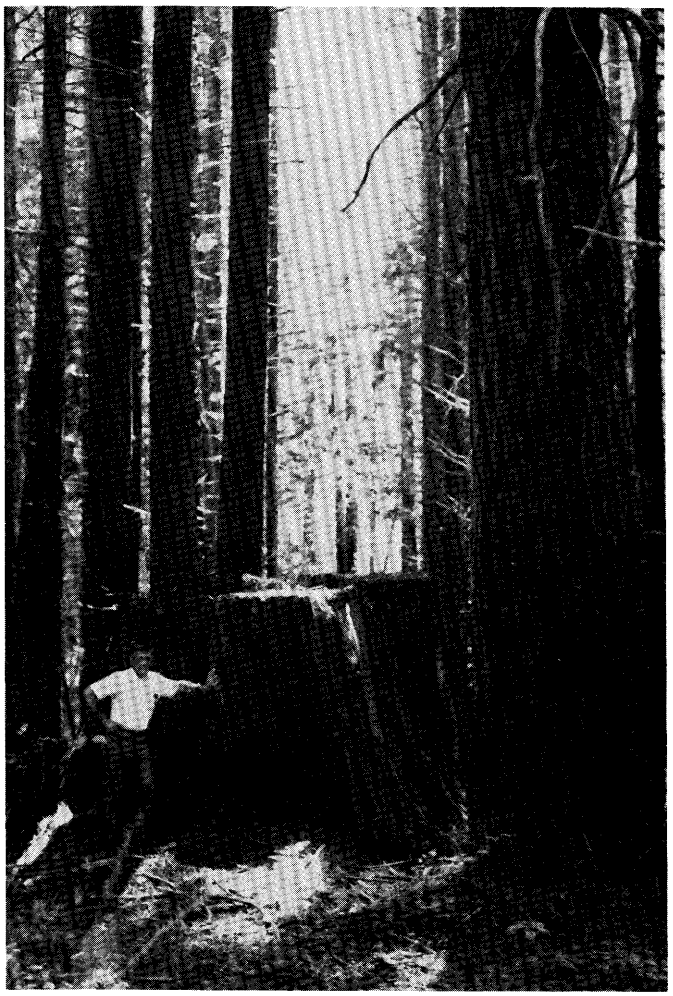


Figure 34. – Young-growth redwood trees surround the stump of a redwood tree logged several decades ago. Young stands like this may contain 70,000 to 100,000 board feet of timber per acre. Simpson Timber Company land, Humboldt County.

Figure 35. – Private lands offer a variety of forest treatment opportunities. This forestscape in Mendocino County includes conifer thinning opportunities, nonstocked areas, and low value hardwoods.

Area by stand condition and treatment class is shown for the major ownerships outside National Forests in table 51, appendix. These estimates are based on inventories conducted from 1965 to 1972. The north coast resource area was inventoried first – in 1965-67. The data for this area were updated using aerial photographs, cutting records, and reforestation records. Data for the rest of California are considered recent enough to reflect the general situation currently. See appendix, p. 134, for the criteria used to assess treatment opportunities.

A discussion of the treatment opportunities identified for ownership outside the National Forests follows:

Treatment: Overstory removal

Stand condition: Sawtimber stands with 5,000 or more board feet per acre in merchantable conifers, having low cubic-foot growth (less than 60 percent of the site's capacity), and 30 percent or more stocking in desirable understory conifers.

Remarks: Careful removal of slow-growing overstory trees will give undamaged young trees more light, space, moisture, and nutrients to increase their growth (fig. 36). In all ownerships outside National Forests,

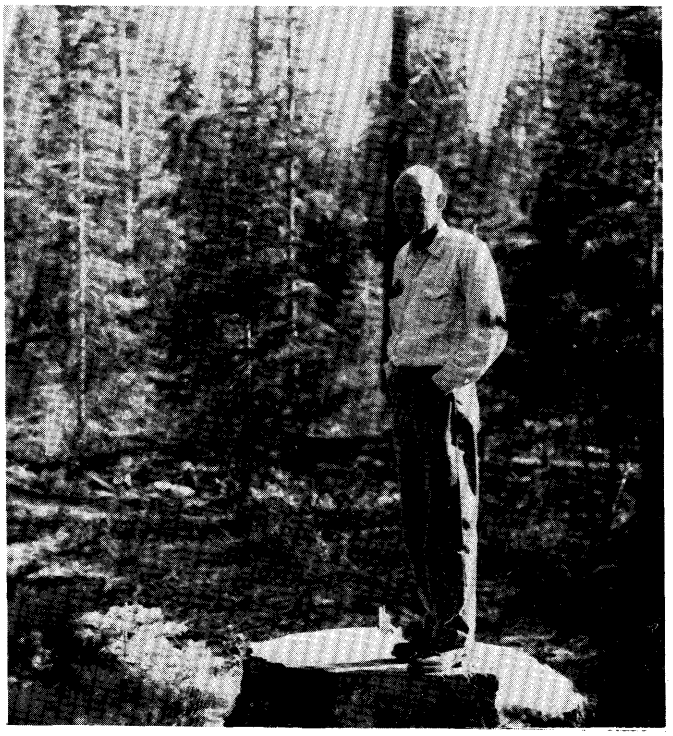


Figure 36. – Large old trees have been removed from this mixed conifer stand on timber company land in Plumas County. Young trees already present in the understory are now free to grow.

the estimated area suitable for overstory removal is 272,000 acres (see the following tabulation and detailed tables in the appendix).

Area	Forest industry and other private timber growers		Farmer and miscellaneous private	
	Acres	Percent of ownership[26]	Acres	Percent of ownership
North coast	50,000	4	26,000	2
Other areas	125,000	4	71,000	4
State total	175,000	4	97,000	3

Treatment: Regeneration cutting

Stand condition: These stands are similar to those described in overstory removal above, except they have no understory.

Remarks: Net growth in these stands is low, sometimes negative, because of mortality. Removing the slow-growing trees and restocking with desirable trees would increase future yield. The total estimated area of these stands outside National Forests is 1,926,000 acres (see the following tabulation and detailed tables in the appendix).

Area	Other public		Forest industry and other private timber growers		Farmer and miscellaneous private	
	Acres	Percent of ownership	Acres	Percent of ownership	Acres	Percent of ownership
North coast	93,000	41	277,000	23	254,000	16
Other areas	76,000	28	855,000	30	371,000	19
State total	169,000	34	1,132,000	28	625,000	18

[26] Percent of ownership figures, based on the sample data, indicate how much of the total timberland in the given ownership is in this treatment opportunity class. For example, 4 percent of all other stands sampled in forest industry and other private timber growers ownership were opportunities for overstory removal.

Three general categories of these slow-growing sawtimber stands exist. Some stands may fit in two or all three categories:

1. Old stands that have lived well beyond the age of cubic-foot growth culmination. These are the least common.

2. Residual cutover stands with major components of hardwoods or incense-cedar.

3. Residual cutover stands consisting of damaged or diseased trees (fig. 37).

Categories 2 and 3 above are the most common, occupying 1.9 million acres. An examination of cutover stands in mixed conifer type in private ownership in Shasta and Tuolumne Counties showed that the proportion of basal area in hardwoods and incense-cedar was 15-30 percent more after stands were selectively logged. In Shasta County almost half of all privately owned forests consisted of cutover stands in which 30 percent or more of the basal area was in hardwoods and/or incense-cedar. In many stands, the only trees left that were over 20-inch d.b.h. were hardwoods and/or incense-cedar. These trees compete with smaller trees of more desirable species and become the primary seed bearers that restock the forest.

Figure 37. – Forest industry-owned stand in Butte County after three selective cuttings which removed sugar pine, ponderosa pine, and Douglas-fir and left the white fir. Decay has entered many trees damaged by logging, and most trees are infected with dwarf mistletoe. Dense brush has prevented seedling establishment. The stand is growing about 20 cubic feet of wood annually, yet the land could produce over 100 cubic feet. Low-growth sawtimber stands like this cover about 2 million acres outside National Forests. Growth potential on these lands can be realized only if the stands are removed and new stands are established.

Although hardwoods and incense-cedar are important to wildlife, add to the beauty of California forests, and have increased in value in recent years, the trees of these species that currently stock much of the cutover forests are poor timber producers. About two-thirds of the hardwoods are rotten culls or species that have no market value other than for firewood. Many of the incense-cedars are defective and most are slow-growing (figs. 38, 39, and 40). If these species are to contribute to the commercial timber supply in the future, considerable research on their silvical characteristics will be necessary, and markets must develop for the small trees produced in the short rotations planned.

Treatment: Commercial thinning or no treatment.

Stand condition: Sawtimber stands with 5,000 or more board feet per acre in merchantable conifers with high cubic-foot growth (60 percent or more of the site's capacity).

Remarks: These stands are in good condition (see fig. 29, for example). They are contributing most of the current wood growth on lands outside National Forests in the State. Many could be thinned commercially. Studies conducted in various parts of the world indicate that thinning generally does not increase total fiber yields; it does yield wood and income at an early date and by concentrating the fiber on fewer trees, thinning results in greater recovery for some products.[27] Whether or not a given stand in this category should be thinned depends more on the owner's objectives than on the condition of the stand.

[27] Lang et al. (1978) found that dense stands of westside Sierra Nevada mixed conifers were more susceptible to bark beetle attack than open stands. Thinning may reduce insect-caused mortality.

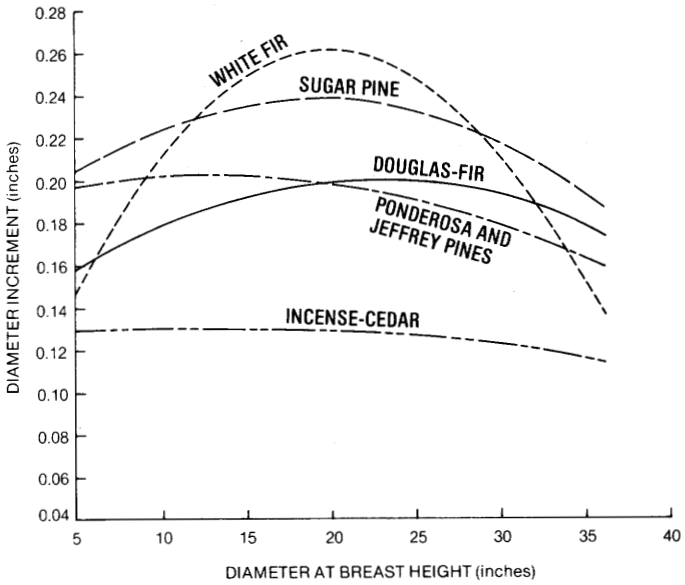


Figure 38. – Current annual diameter increment by species in selectively logged stands in private ownership, cubic-foot site classes 4, 5, and 6, Shasta County, California.

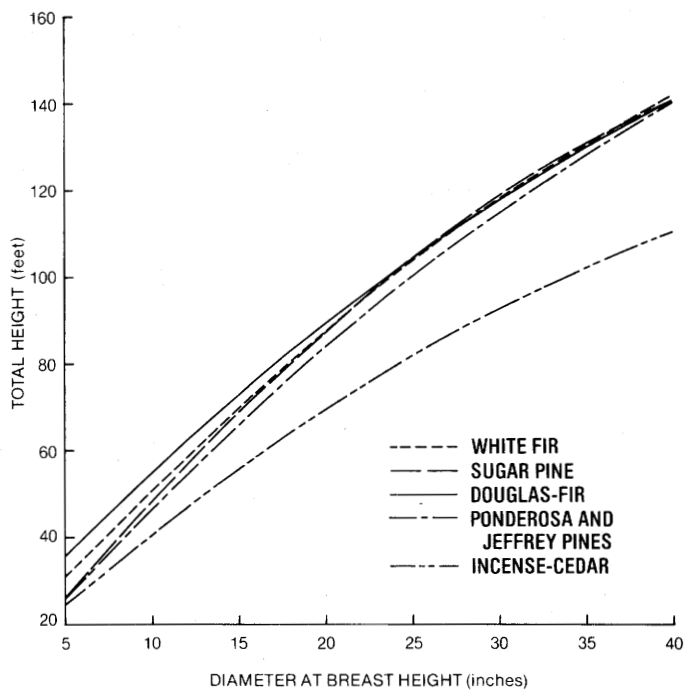


Figure 39. – Total height over d.b.h. by species in selectively logged stands in private ownership, cubic-foot site classes 4, 5, and 6, Shasta County, California.

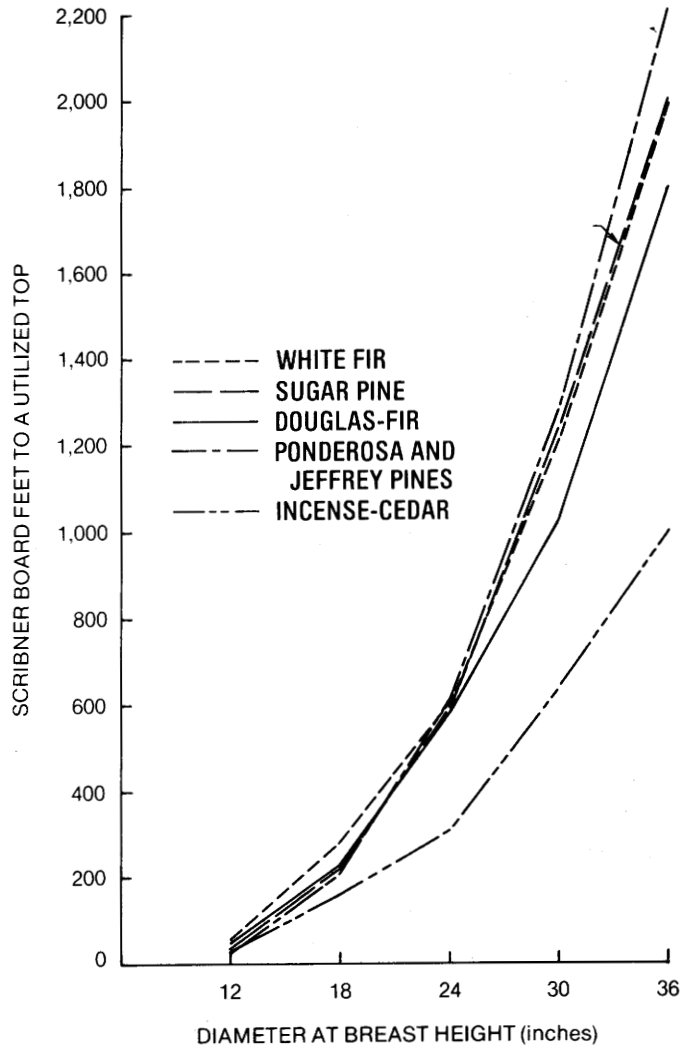


Figure 40. – Gross board-foot volume in the five major species in selectively logged stands in private ownership, cubic-foot site classes 4, 5, and 6, Shasta County, California.

In all ownerships outside National Forests, fast-growing young sawtimber stands cover 1,831,000 acres (see the following tabulation and detailed tables in the appendix).

Area	Other public		Forest industry and other private timber growers		Farmer and miscellaneous private	
	Acres	Percent of ownership	Acres	Percent of ownership	Acres	Percent of ownership
North coast	30,000	13	235,000	20	217,000	14
Other areas	59,000	22	785,000	28	505,000	26
State total	89,000	18	1,020,000	25	722,000	20

Treatment: Precommercial thinning or no treatment

Stand condition: Moderately to well-stocked poletimber or young sawtimber conifers with less than 5,000 board feet per acre, or conifer seedlings and saplings (fig. 41).

Remarks: These stands are stocked with enough well-distributed trees to utilize the site's potential over a 70- to 100-year rotation. For shorter rotations, some of these stands may not have enough trees to utilize the site's full potential. Little can be done about this, however; the lower yields will have to be accepted. About 60 percent of the poletimber stands and 70 percent of the seedling and sapling stands (stands in which 30 percent or more of the area is in over-stocked thickets) are candidates for precommercial thinning.

Figure 41. – Well-stocked stand of young Douglas-fir and redwood on forest industry property. Most stands like this have over-dense thickets that could be thinned. About a million acres outside National Forests in all forest types are moderately to well-stocked with young conifers.

For the entire State outside National Forests, these stands occupy 1,038,000 acres, including 565,000 acres of poletimber and young sawtimber conifers and 473,000 acres of sapling and seedling conifers[28] (see the following tabulation and detailed tables in the appendix).

Area	Other public		Forest industry and other private timber growers		Farmer and miscellaneous private	
	Acres	Percent of ownership	Acres	Percent of ownership	Acres	Percent of ownership
North coast	1,000	—	48,000	4	40,000	3
Other areas	30,000	13	632,000	22	287,000	15
State total	31,000	6	680,000	17	327,000	9

[28] Does not include seedling or sapling stands that have been established on north coast lands logged since 1965-67.

Treatment: Improvement cutting

Stand Condition: Moderately to well-stocked poletimber or young sawtimber conifers with less than 5,000 board feet per acre, and 30 percent or more of the stand occupied by cull conifers or large hardwood trees (fig. 42).

Remarks: Removing "weed" trees that compete with desirable trees in most cases will increase growth of usable wood. On lands outside National Forests, 318,000 acres are suitable for improvement cutting (see the following tabulation and detailed tables in the appendix).

Area	Other public		Forest industry and other private timber growers		Farmer and miscellaneous private	
	Acres	Percent of ownership	Acres	Percent of ownership	Acres	Percent of ownership
North coast	—	—	48,000	4	84,000	5
Other areas	21,000	8	57,000	2	108,000	6
State total	21,000	4	105,000	3	192,000	5

Treatment: Stand Conversion

Stand condition: Poletimber or sawtimber hardwoods with understory conifers on less than 30 percent of the area.

Remarks: Some hardwood species may indirectly benefit timber production. Red alder, for example, can fix nitrogen in the soil and may thwart the spread of *Phellinus weirii,* a conifer root-rotting fungus. On harsh sites, especially south-facing slopes in the interior Coast Ranges, a light overstory of hardwood may promote establishment of conifer seedlings.

In terms of industrial timber production, hardwoods have been a liability. Though they make up 9 percent of the State's timber volume and account for 10 percent of the total cubic-foot annual growth, they amount to less than one-quarter of 1 percent of the State's log consumption by forest product mills (Howard 1974, Howard and Hiserote 1978). The hardwoods are an untapped resource that could be used many ways.

California hardwood trees are often crooked, forked, and sprawling (figs. 42, 43, and 44). They are difficult and costly to log and process, and they usually get damaged in partial cutting. Wood-rotting fungi enter wounds in hardwoods more readily than in associated pitchy conifers.

Figure 42. – Large cull hardwoods are restricting the development of young Douglas-firs in this privately owned stand in Mendocino County.

Figure 43. – Tanoak and madrone stand in Humboldt County. Less than 30 percent of this stand contains understory Douglas-fir.

Figure 44. – California black oak in Shasta County with a scattered understory of ponderosa pine, sugar pine, and Douglas-fir.

Over 20 species of hardwoods grow in California forests, but only 2 or 3 species have been used to any degree. Inventory data show that about 30 percent of the hardwood trees on timberland are of species or form used by forest industries, and many of these have but one usable 8-foot log. Of the total hardwood cubic-foot volume in all species, 28 percent is in sound sawlogs, compared with 89 percent for softwoods.

Although some of the better hardwood stands are manageable for timber products, removing hardwoods and establishing conifer stands in most cases could substantially increase the amount of usable wood produced. Of hardwood stands outside National Forests in California, 866,000 acres were on sites capable of growing conifers, including 518,000 acres (60 percent) on land capable of growing 85 or more cubic feet of conifer timber per acre per year (see the following tabulation and detailed tables in the appendix).

Area	Other public		Forest industry and other private timber growers		Farmer and miscellaneous private	
	Acres	Percent of ownership	Acres	Percent of ownership	Acres	Percent of ownership
North coast	50,000	22	149,000	12	396,000	25
Other areas	29,000	11	81,000	3	161,000	8
State total	79,000	16	230,000	6	557,000	16

Figure 45. – Timber company forester examining deer-browsed Douglas-fir seedling that is being crowded out by hardwood saplings and ceanothus brush, Mendocino County.

Treatment: Cleaning or releasing

Stand condition: Moderately to well-stocked sapling and seedling conifers with competing or overtopping brush or hardwoods (fig. 45) on 30 percent or more of the area.

Remarks: Cleaning or releasing accomplishes the same thing as improvement cutting – it releases desirable trees from competition by undesirable vegetation. On lands outside National Forests, 176,000 acres were identified as suitable for cleaning or releasing (see the following tabulation and detailed tables in the appendix).[29]

Area	Other public		Forest industry and other private timber growers		Farmer and miscellaneous private	
	Acres	Percent of ownership	Acres	Percent of ownership	Acres	Percent of ownership
North coast	5,000	2	13,000	1	57,000	4
Other areas	1,000	–	22,000	1	78,000	4
State total	6,000	1	35,000	1	135,000	4

[29] Does not include opportunities for cleaning or releasing in stands established on north coast lands logged since 1965-67.

Treatment: Planting

Stand condition: Nonstocked and inadequately stocked land (less than 30 percent of the area stocked with sapling or seedling conifer trees).

Remarks: Most of these areas are occupied by vegetation and/or slash. Some kind of site preparation will usually be necessary before they can be planted (fig. 46). At the dates of inventory, there were 1,331,000 acres of planting opportunities outside National Forests, including 616,000 acres in the north coast and 715,000 acres in the rest of the State.

Figure 46. – Most forest areas in California restock to brush if not reforested soon after logging or burning. Site preparation is usually necessary before trees can be planted. This burned area in Siskiyou County is covered with dense manzanita, ceanothus, and bitter cherry brush.

The data for the north coast were collected during 1965-67. Events and natural processes since then have altered the condition of the forest in this area of high growth potential, heavy logging, and intensified forest management. Available information was combined with some assumptions to approximate the area of planting opportunities in the north coast in 1975. For 1975, the approximated area of planting sites is 374,000 acres. This figure is speculative but is considered a more reasonable statement of forest conditions on which to base forestry programs than the 1965-67 estimate of 616,000 acres. The approximate area of planting opportunities in the north coast for 1975 was determined as follows:

Item	Acres
Planting opportunities in 1965-67	616,000
Logging (clearcuts only)[30] 1964-75	+196,000
Redwood sprouting in areas clearcut 1964-75[31]	–126,000
Planting and seeding 1964-75[32]	–157,000
Assumed natural increase in stocking[33]	–155,000
Approximated area of north coast planting opportunities in 1975	374,000

[30] Sixty percent of the logged area was estimated to have been clearcut.

[31] Total redwood area logged in each ownership multiplied by 0.6. See USDA Forest Service (1965, p. 666) for a discussion on the ability of redwood to sprout after logging.

[32] This assumes that all planting and seeding resulted in stands at least 30 percent stocked with desirable conifers and that none of the reported acreage was planted or seeded more than once. Reforestation rates varied by ownership – 132,000 out of 157,000 acres were on forest industry lands.

[33] Inadequately stocked areas of seedlings and saplings in each ownership were assumed to increase in stocking at the rate of 7 percent per decade. McArdle, Meyer, and Bruce (1961) showed that understocked Douglas-fir stands increase in stocking at the rate of 4 percent per decade; Lindquist and Palley (1963) stated that redwood sprouts occupy the site and increase in size more rapidly than associated species during the first few years following the harvest of old-growth trees (see fig. 47).

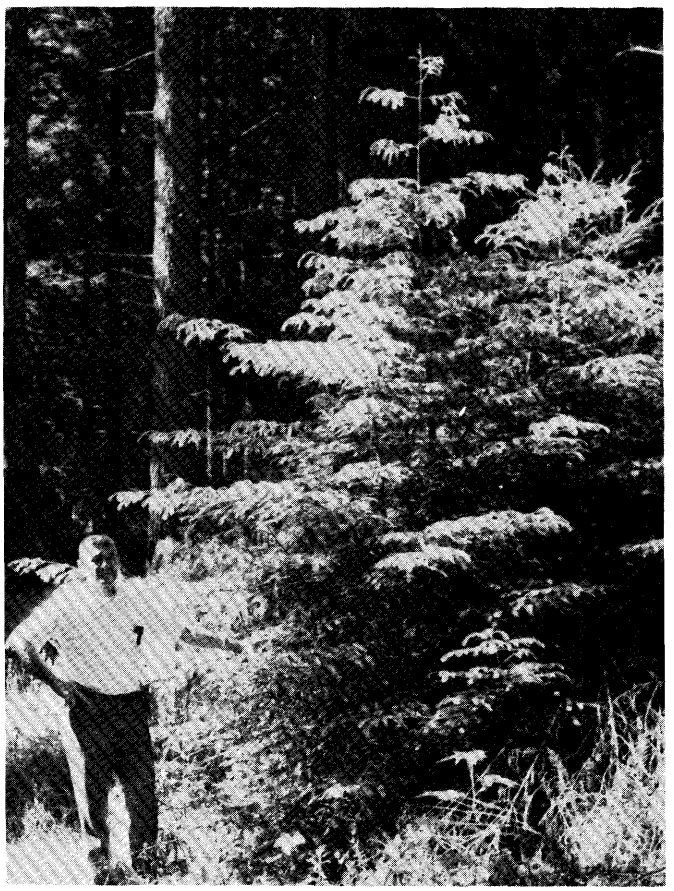


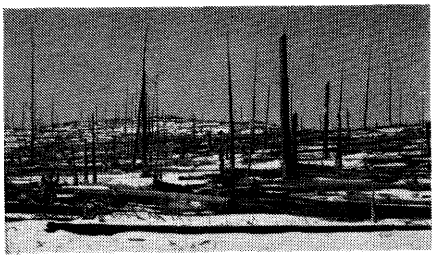
Figure 47. – Redwood stump sprout less than two full growing seasons after logging. Simpson Timber Company land, Humboldt County.

For the rest of the State, the data are newer and are accepted as representing current conditions. Outside National Forests, the State has 1,089,000 acres considered to be suitable for planting, including 454,000 acres or 42 percent that is capable of growing 85 or more cubic feet of conifer timber per acre per year (see the following tabulation and detailed tables in the appendix).

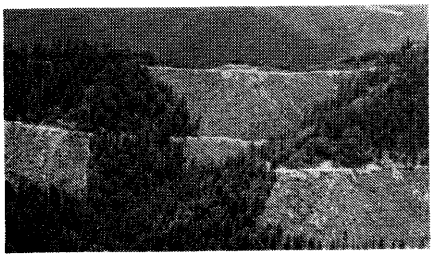
For all private and other public lands, the reforestation situation is similar to that on National Forests: the acreage reforested annually is only slightly greater than the area deforested by logging and burning (fig. 48).

Area	Other public		Forest industry and other private timber growers		Farmer and miscellaneous private	
	Acres	Percent of ownership	Acres	Percent of ownership	Acres	Percent of ownership
North coast	22,000	10	23,000	2	329,000	21
Other areas	53,000	20	281,000	10	381,000	19
State total	75,000	33	304,000	8	710,000	20

Current plantable area



+ Annual acreage clearcut



+ Annual acreage burned

– Annual acreage reforested

= Complete reforestation

Figure 48. – The reforestation equation. The current rate of reforestation is just keeping up with the areas logged and burned annually on all ownerships. Extra effort will be necessary to reforest the older nonstocked areas.

Forest industries and other private timber growers have greatly increased reforestation efforts on their lands during the past few years; reforestation on farmer and miscellaneous private lands has increased but little (see the following tabulation and details in table 32, appendix).

Ownership	Acres planted and seeded per year	
	1964-65	1976-77
Forest industries and other private timber growers	7,900	30,691
Farmer and miscellaneous private	2,900	4,903

On other public lands, over three-fourths of the area that could be planted is classified as low site. Much of this is in hot, steep, rocky country in and near the chaparral-oak-conifer forest transition zone (see the following tabulation and details in tables 51-69, appendix).

Ownership	Percent of planting opportunities by cubic-foot site class		
	High 165+	Medium 85-164	Low 20-84
Other public	3	21	76
Forest industry and other private timber growers	17	34	49
Farmer and miscellaneous private	10	36	54

Nearly 60 percent of the planting opportunities on sites capable of growing 85 or more cubic feet of wood per acre are on farmer and miscellaneous private lands.

Treatment Opportunities in National Forests

National Forest lands are stocked mainly with softwood sawtimber stands (softwood sawtimber trees are 9-inch d.b.h. or larger). By stand size, timberland in National Forests is distributed as follows:

Stand Size	Thousand acres	Percent
Sawtimber	6,367	78
Poletimber	993	12
Sapling and seedling	491	6
Nonstocked	317	4
Total	8,168	100

The predominant treatment opportunity in sawtimber stands is regeneration cutting – removing the trees and restocking. This is done in conformance with land use plans that incorporate various resource values. Timber harvesting in National Forests is scheduled as much as possible in older stands, insect- or disease-infested stands, high mortality areas, and other areas where cutting will yield timber as well as promote increased future growth.

In 1977, treatments in National Forests of the Pacific Southwest Region that involved timber harvesting were accomplished on 332,300 acres (see table 12). About 88 percent of the harvest treatments were in the standard component,[34] 9 percent were in the special component, and 3 percent were in the marginal component.

Other major treatment opportunities on National Forest lands are discussed below.

Stand conversion. – Hardwood stands are important as watershed protection and habitat, and they add to the diversity of forest scenery. They occupy 426,000 acres of timberland in the National Forests. Most of this area is capable of growing more valuable softwoods, though it is predominantly on sites of low productive potential in the foothills and forest fringes where softwood stands are usually difficult to establish. The hardwoods on sites capable of growing at least 85 cubic feet of softwood per acre per year occupy 153,000 acres (see table 13); 273,000 acres of hardwood type are on sites with lower productive capacity.

[34] See pages 64,65 for a discussion of National Forest commercial forest components.

Precommercial thinning. – In many stands, overcrowding slows tree growth, thereby lengthening the time required for trees to reach merchantable size. Precommercial thinning early in the life of such stands can "weed out" diseased and deformed trees and undesirable species, and can create growing space for "crop" trees. Though such thinning produces no immediate revenue, it can greatly increase yields over time.

About 134,000 acres of seedlings, saplings, and poletimber stands in National Forests have been identified as precommercial thinning opportunities.

Releasing. – In many areas, brush and low-value hardwood trees grow up and around desirable conifers, thereby restricting conifer development and curtailing yields. Removal of these undesirable plants will "release" the conifers from competition. About 122,000 acres of adequately stocked conifer seedlings, saplings, and poletimber in National Forests have been identified as releasing opportunities.

Planting nonstocked areas. – Nonstocked timberland in California National Forests in 1975 totaled 317,000 acres.[35] About 85,000 acres are areas recently logged or burned; the balance is older nonstocked areas and forest lands recently purchased by the U.S. Forest Service that are nonstocked. Nearly 400,000 acres of National Forest land have been planted[36] since 1961.

An average of about 30,000 acres per year have been reforested during the past 5 years, slightly more than the area clearcut during that period and about 10,000 acres more than the planned area to be clearcut in the future. About 10,000 acres per year of stocked timberland burned in wildfires from 1964 to 1975;[37] 63,000 acres burned in 1977, one of California's worst fire years.

The recent rate of reforestation is just keeping up with the area being deforested. Nonstocked areas do reforest naturally, but the process is often slow and dependent on the right combination of weather conditions, favorable seedbed, a good seed crop, and a low population of seed-eating animals. The better forest sites often restock first to brush unless planted soon after logging. Tree stocking builds up very slowly once the brush is established. The Forest Service is planning to accelerate reforestation efforts with the intent of eliminating the nonstocked backlog as soon as possible.[38] Nursery capacity is being expanded to provide additional planting stock. A considerable proportion of the 317,000 acres of nonstocked land is on relatively unproductive sites, often in remote areas (fig. 49). Table 13 shows that 194,000 acres or 61 percent of the nonstocked area is capable of growing less than 85 cubic feet of wood per acre per year.

Figure 49. – Much of the nonstocked forest land in National Forests is on relatively unproductive sites in the high mountains. Tahoe National Forest near Donner Pass.

[35] Excludes areas burned by wildfire in 1977.

[36] Includes about 30,000 acres that were seeded and may also include some areas seeded or planted more than once.

[37] USDA Forest Service (1964-75) wildfire statistics show that 127,180 acres of timberland in National Forests burned over the 12-year period 1964-1975, or 10,598 acres per year; 95 percent is assumed to have been stocked when burned: 10,598 acres x 0.95 = 10,068 acres.

[38] Alternate program directions that are being considered under the Resources Planning Act (USDA Forest Service 1978) include a range of reforestation goals depending on the mix of resource values to be produced and funding. The most intensive reforestation alternative would eliminate the nonstocked areas by 1985, if all projected planting were successful.

Table 13--Area of timberland in poletimber, seedling and sapling conifers, hardwoods, and nonstocked condition in National Forests, by biological potential (site class), California, 1975

(In thousand acres)

Stand condition	Biological potential (site class)			Total
	High 165+ cubic feet	Medium 85-164 cubic feet	Low 20-84 cubic feet	
Poletimber conifers	96	180	664	940
Seedling and sapling conifers	32	155	260	447
Hardwoods	3	150	273	426
Nonstocked	10	113	194	317

The Best Opportunities for Increasing Timber Yields

The preceding section discussed the broad stand conditions that exist in California forests. Table 14 shows the net annual growth by these stand conditions. Of the eight conditions listed, four are not apparent problems. These are: (1) cut since inventory, (3) high-growth sawtimber, (4) conifer poletimber and young sawtimber in good condition, and (7) seedling and sapling stands. These four conditions account for 45 percent of the area and 77 percent of the current softwood growth. The remaining four conditions account for 55 percent of the area and 23 percent of the current softwood growth. These are the major underproductive forest conditions in California.

Table 15 shows the area in the four major underproductive stand conditions by ownership class for lands outside National Forests and includes available information for National Forests. Table 16 shows current and potential growth in the four major underproductive stand conditions.

The first two unproductive conditions – hardwood stands and nonstocked and inadequately stocked areas – can be dealt with now. Although some areas may be difficult to rehabilitate because of environmental factors such as slope and aridity, hardwood stands in general, could be replaced with conifers; nonstocked areas, landowners willing, could be reforested, with adequate funding, personnel, equipment, and planting stock. The current softwood growth on the 2.7 million acres in these conditions averages about 4 cubic feet per acre. If these areas were at least 60 percent stocked with healthy conifers, their average growth 70 years after planting, would be 189 million cubic feet. This is 70 cubic feet per acre, 17 times the current growth rate in these areas (table 17). This amounts to 23 percent of the current softwood growth and 12 percent of the estimated potential in all ownerships in California.

Table 14--Net annual growth on all timberlands outside National Forests, by stand condition, California, 1975[1/]

Stand condition	Area	Softwood growth	Current softwood growth per acre
	Thousand acres	Million cubic feet	Cubic feet per acre per year
1. Cut since inventory (north coast)[2/]	326	5.2	16.0
2. Low-growth sawtimber	2,198	60.1	27.3
3. High-growth sawtimber	1,831	225.5	123.2
Conifer poletimber and young sawtimber:			
4. In good condition	565	32.7	57.9
5. Improvement cutting needed	318	13.2	41.5
6. Hardwoods on conifer sites	866	7.2	8.3
Saplings and seedlings:			
7. Growth on stand at time of inventory	891	9.9	16.5
Ingrowth (north coast only)[3/]	--	4.8	
8. Non- and inadequately stocked	1,089	1.4	1.1
Total	8,084	360.0	44.5

[1/] Growth for stands in the north coast that were not logged since inventory and were larger than sapling size was updated to 1975 by stand-growth models.

[2/] Growth on residuals: 2,000 cubic feet per acre X 0.02 growth rate X 130,000 acres partially cut = 5.2 million cubic feet.

[3/] Growth on sapling and seedling stands was projected on a stand-by-stand basis starting with the stand at time of inventory and moving it ahead to 1975 at normal yield table rates. These acres are not to be added to the total.

Table 15--Area of timberland in major underproductive condition by stand condition and ownership, California, 1975

(In thousand acres)

Stand condition	National Forest	Other public	Forest industry	Other private timber growers	Farmer and miscellaneous private	Total
Hardwood stands	426	79	179	51	557	1,292
Nonstocked areas and inadequately stocked sapling and seedling stands	1/317	75	148	156	710	1,406
Moderately to well-stocked conifer poletimber or young sawtimber stands with less than 5,000 board feet per acre and 35 percent or more stocked with hardwoods or cull conifers	No data	21	75	30	192	318
Low-growth conifer sawtimber stands with 5,000 or more board feet per acre	No data	169	881	426	722	2,198
Total of available data	743	344	1,283	663	2,181	5,214

1/Nonstocked only.

Table 16--Potential growth of timberland in major unproductive condition by stand condition, treatment opportunity, ownership group, area of timberland, and current growth, California, 1975

Stand condition	Treatment opportunity	Ownership	Area	Current softwood growth	Potential growth1/	Potential increase in growth	Potential increase as a percent of potential growth
			Thousand acres	- Million cubic feet per year -			Percent
Hardwood stands	Remove hardwoods and plant conifers	National Forest	426	2/4	28	24	86
		Other lands	866	7	61	54	88
Nonstocked areas and inadequately stocked sapling and seedling stands	Prepare site and plant conifers	National Forest	3/317	0	22	22	100
		Other lands	1,089	1	58	57	98
Moderately to well-stocked conifer poletimber or young sawtimber stands with less than 5,000 board feet per acre and 35 percent or more stocked with hardwoods or cull conifers	Improvement cutting	National Forest	No data	--	--	--	--
	Remove hardwoods and cull conifers	Other lands	318	13	18	5	28
Low-growth conifer sawtimber stands with 5,000 or more board feet per acre	Regeneration cutting	National Forest	No data	--	--	--	--
		Other lands	2,198	60	273	213	78
Total of available data			5,214	85	460	375	81

1/ Potential annual growth shown in this column for hardwood stands and non- or inadequately stocked areas is the mean annual growth over 70 years that could be realized if the areas were at least 60 percent stocked with healthy conifers. For the other conditions, it is the potential growth at the mean age of these stands if they were at least 60 percent stocked with healthy conifers.

2/ Estimated by using the per-acre growth rates from hardwood stands outside National Forests.

3/ Nonstocked only; data not available on inadequately stocked sapling and seedling stands.

Table 17--Area and prospective annual yield of timberland suitable for hardwood stand conversion and planting opportunities by ownership group, and biological potential (site class), California, 1975

Ownership group, treatment and biological potential (site class)	Treatable area	Prospective mean annual yield 70 years after planting	
	Thousand acres	Million cubic feet	Cubic feet per acre
National Forest:			
Hardwood stand conversion, medium and high sites	153	17	111
Hardwood stand conversion, low sites	273	11	40
Total hardwood stand conversion	426	28	66
Planting, medium and high sites	123	14	114
Planting, low sites	194	8	41
Total planting	317	22	69
Total National Forest	743	50	67
Outside National Forest:			
Hardwood stand conversion, medium and high sites	518	57	110
Hardwood stand conversion, low sites	348	14	40
Total hardwood stand conversion	866	71	82
Planting,[1/] medium and high sites	456	51	112
Planting,[1/] low sites	635	12	27
Total planting	1,091	68	62
Total outside National Forest	1,957	139	71
All ownerships:			
Hardwood stand conversion	1,292	99	77
Planting	1,408	90	64
Total	2,700	189	70

[1/] North coast planting opportunities as determined from mid-1960's data were adjusted from 616,000 to 374,000 acres to account for changes due to logging, redwood sprouting in logged areas, planting and seeding, and the assumed natural increase in stocking.

If only the stand conversion and planting opportunities on sites capable of growing at least 85 cubic feet per acre were treated, the total area covered would be 1,248,000 acres, or 46 percent of the total; but the prospective harvest in 70 years would be 9.8 billion cubic feet, or 82 percent of the total. In other words, 80 percent of the potential increase in yields could be realized by treating less than half of the land in these conditions (fig. 50). About 22 percent of the stand conversion and planting opportunities on sites capable of growing 85 cubic feet per acre (high and medium sites) are in National Forests and 78 percent are outside National Forests (table 18). By ownership, the area on these sites is distributed as follows:

Ownership	Percent of treatable area on medium and high sites
National Forest	22
Other public	4
Forest industry	15
Other private timber growers	5
Farmer and miscellaneous private	54
Total	100

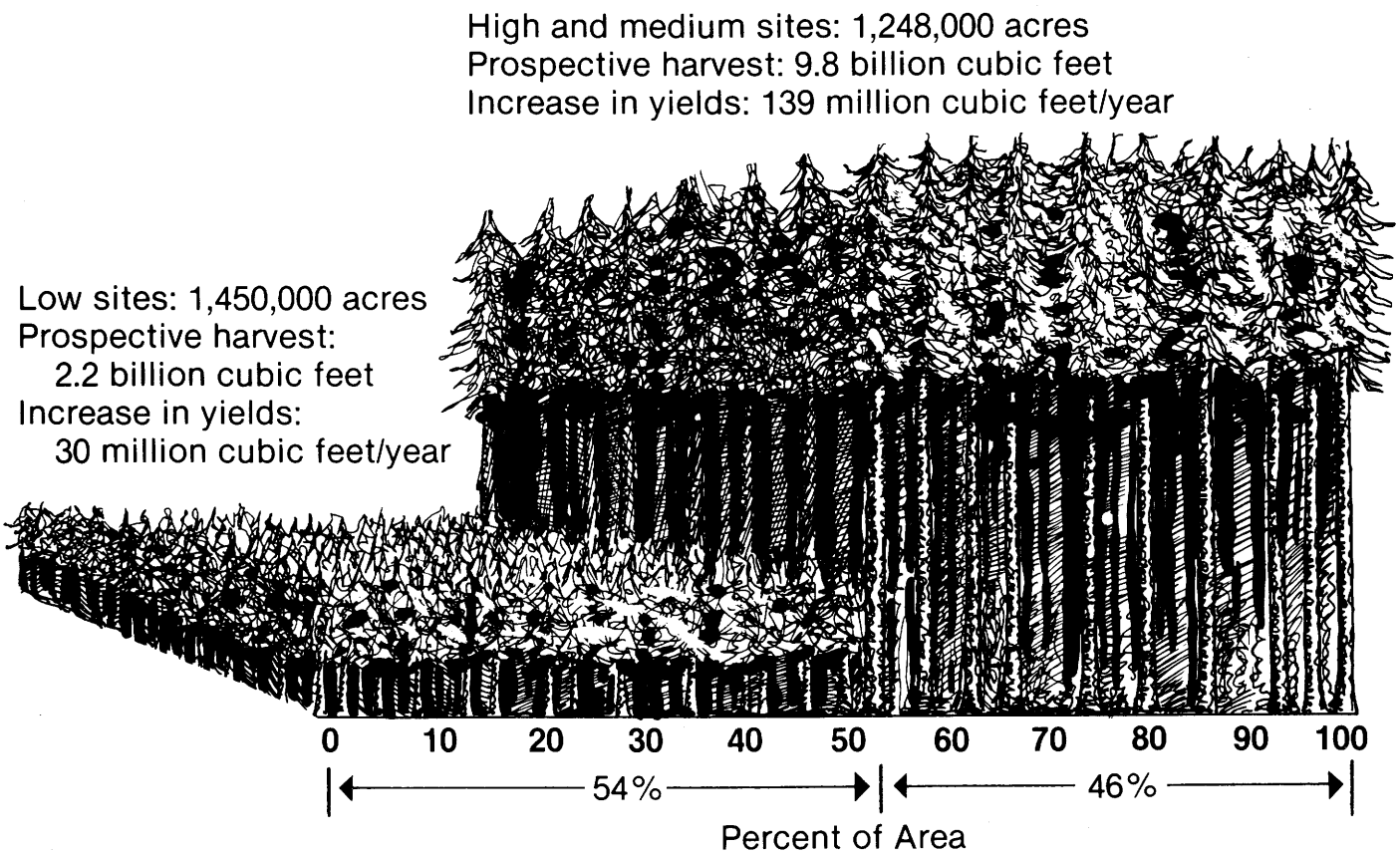


Figure 50. – About 80 percent of the potential increase in timber yield from planting understocked land and replacing hardwoods with conifers could be realized by treating less than half of the area in these conditions.

Table 18--Area and prospective annual yield of timberland on high and medium sites suitable for hardwood stand conversion and planting opportunities by ownership, California, 1975

Ownership	Treatment opportunities			Prospective mean annual yield 70 years after planting	
	Hardwood stand conversion	Planting	Total		
	- - - - Thousand acres - - - -			Million cubic feet	Cubic feet per acre
National Forest	153	123	276	112	31
Other public	28	18	46	130	6
Forest industry	127	54	181	116	21
Other private timber growers	11	57	68	103	7
Farmer and miscellaneous private	352	325	677	109	74
All ownerships	671	577	1,248	111	139

The other two underproductive forest conditions (opportunities for improvement cutting and regeneration cutting) present a problem not so easily solved. The poletimber and young sawtimber stands that could benefit from improvement cutting occupy 318,000 acres outside National Forests. The current "loss" in productivity in these stands is only 5 million cubic feet per year (table 16), but the potential loss may be much greater. As these stands grow older, the difference between actual growth and potential growth will probably increase. Without improvement cutting, the relative growth in some stands may increase naturally; but in many stands, the hardwoods and cull conifers will continue to compete with the higher-valued conifers. Most of these stands if selectively logged in the manner practiced historically in California will become low-growth residual sawtimber stands. Improvement cutting now would result in higher future yields. Currently most of the small trees that make up these young, low-volume stands have little value in the California market. Improving these stands cannot be paid for with the material removed. Future demand for wood may change this, but treatment of these stands today can be done only as an investment.

Low-growth conifer sawtimber stands occupy 2.2 million acres or 27 percent of the commercial forest land outside National Forests.[39] They are producing 60 million cubic feet per year, yet they could be producing 273 million (table 16). The loss in productivity on these lands outside National Forests is greater than the total loss in hardwood stands and nonstocked areas on all ownerships including National Forests.

Fourteen percent or 300,000 acres of these stands are uncut old-growth stands with an average softwood volume of 43,000 board feet per acre. Growth averages 32 cubic feet per acre in these stands. The remaining 1.9 million acres are cutover stands in poor growing condition with an average softwood volume of 13,000 board feet per acre and an average growth of 26 cubic feet per acre. These stands have resulted from removal of the more valuable trees in sequential logging operations.

[39] Sawtimber stands on National Forests total 6.4 million acres. The area of low-growth stands is unknown but thought to be substantial.

The low-growth stands need drastic treatment – usually clearcutting and planting – if the land is to produce to its capacity.[40] It is obviously not possible, nor desirable, to harvest the 37 billion board feet of timber in these stands in a short time. This volume is about 13 times that harvested annually from lands outside National Forests, and 8 times the volume harvested from all lands including National Forests, counting mortality salvage. At the time these stands are logged, however, is the time to do what is necessary to get a vigorous young stand started. Unfortunately not much of this is being done. Instead, selective cutting continues to keep these stands in poor growing condition (see table 12). By ownership, the 2.2 million acres in these stands are distributed as follows:

Ownership	Percent of area
Other public	8
Forest industry	40
Other private timber growers	19
Farmer and miscellaneous private	33
	100

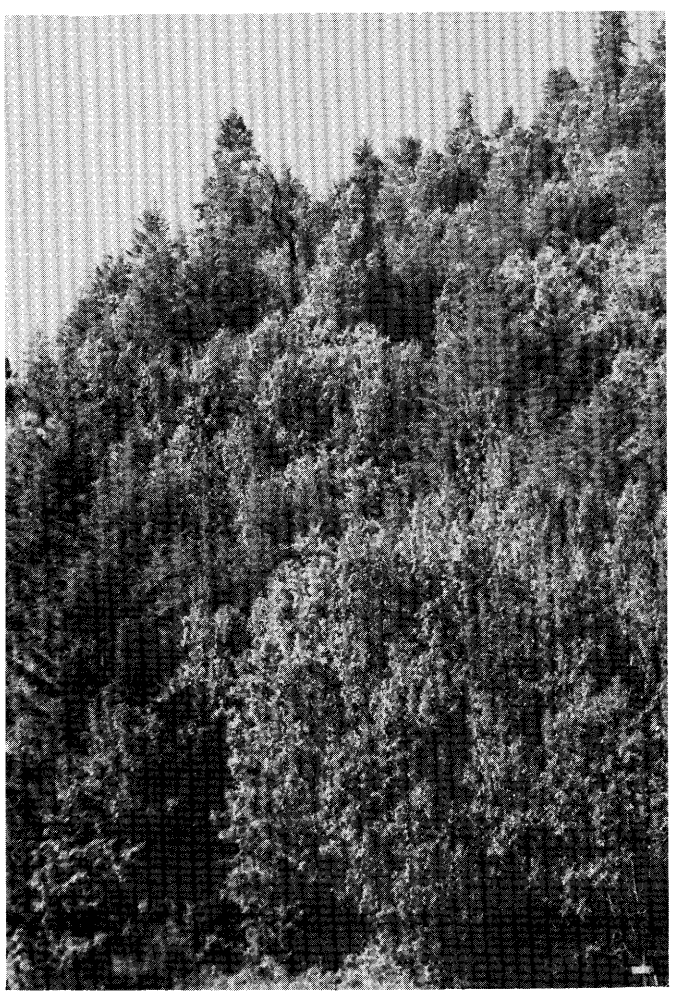
[40] Important to successful regeneration and to capturing the yield potential of the land is immediate restocking. If delayed for a year or more, brush and other vegetation usually become established, making restocking more difficult and costly.

Figure 51. – Steep slopes like this are costly to treat and often prone to erosion and soil slippage. This 130-percent slope in Humboldt County was logged about 20 years ago. In 1977 it was covered with a mixture of bigleaf maple, tanoak, madrone, California-laurel, willow, blue blossom ceanothus, and Douglas-fir clumps that could be thinned. Can such areas be managed for successive crops of timber?

Physical Factors Affecting Feasibility of Silvicultural Treatment

In the analysis of treatment opportunities outside National Forests, dollar costs and benefits, effect on nontimber values, or other social consequences were not considered. They should be taken into account before an extensive treatment program can be undertaken. For example, converting all nonstocked areas to conifer plantations or removing all competing hardwoods from conifer stands would probably not be justifiable economically and would reduce the habitat for a number of animals.

The physical nature of the land itself bears on the costs and benefits of treatment, how a silvicultural treatment might affect other resources, and the social acceptance of various treatments. Three physical factors considered in this study are: (1) the land's productivity expressed as site class, (2) steepness of slope (fig. 51), and (3) stockability (see definition of stockability, page 133).



Treatment opportunity data were developed by site class for all resource areas and ownerships. They are shown in tables 51-69 in the appendix. For example, table 57 shows that of the 84,000 acres of improvement cutting opportunities on farmer and miscellaneous private lands in the north coast, 34,000 acres or 40 percent are on low sites. The increase in yields afforded by improvement cutting on these low sites may not pay for the cost of treatment.

Slope information was not collected on all coastal area inventory plots. In a study done for the California State Water Resources Control Board (Jones and Stokes Associates, Inc. 1973), all land in the north coast area was rated by erosion hazard. The basic criteria were soil type and depth, slope percent, and annual precipitation. Forest inventory plots were located on the erosion hazard maps and used as a means to estimate commercial forest area by erosion hazard class in north coast counties. The following tabulation shows the results:

Erosion hazard	Percent of commercial forest land
Low to moderate	17
High	46
Very high	37

Forest managers in the north coast area will have to consider the erosion hazards prevalent there if forest productivity and other resource values such as fisheries and clean water are to be maintained (fig. 52).

In California's interior, steepness of the land and limited stockability restrict forest manageability. Slopes over 45 percent are usually difficult to manage regardless of stockability because of operating costs, erosion hazard, and safety risk; lands incapable of supporting 60 percent of full stocking as shown in normal yield tables (Dahms 1964; Dunning and Reineke 1933; McArdle, Meyer, and Bruce 1961; Meyer 1961; Schumacher 1926, 1930) are considered by the author to be difficult to manage regardless of slope. These areas are harsh, often rocky, and difficult to reforest.

Of all timberland outside National Forests in California's interior, 31 percent are difficult to stock or have steep slopes (table 19). Only 26 percent of forest industry lands are difficult to stock or have steep slopes. Other public agencies have most of the lands difficult to manage: 41 percent.

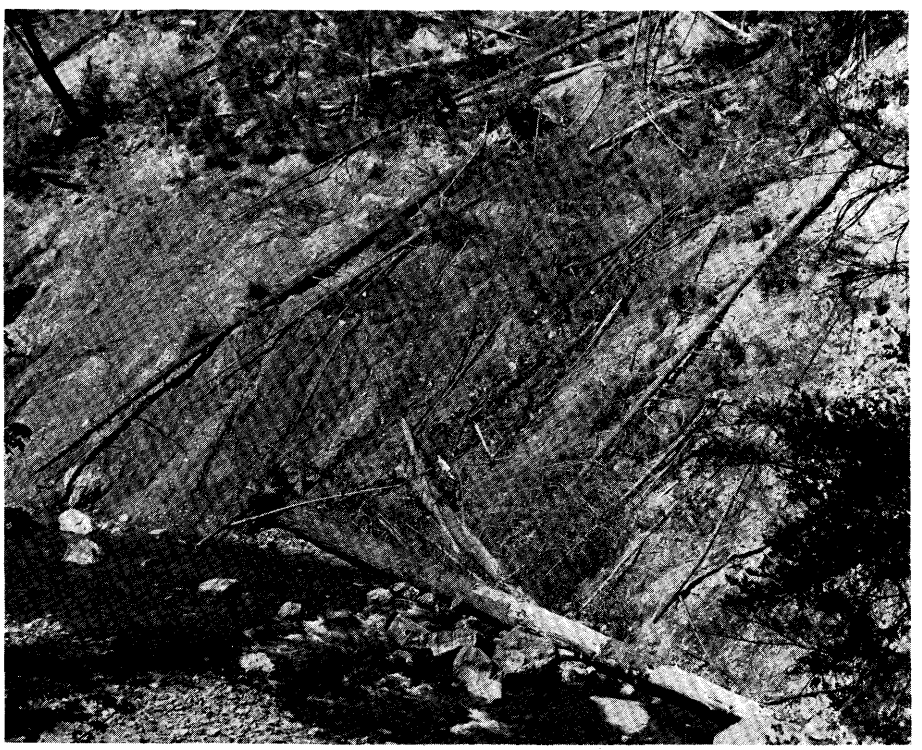


Figure 52. – Landslides have long plagued land managers in California Coast Ranges.

Table 19--Area of timberland outside National Forests by ownership and by stockability and slope percent class[1/], California interior, 1975

Ownership	Stockability 60 percent plus, and slopes 0-45 percent (amenable sites)		Stockability 60 percent or less, and/or slopes greater than 45 percent (problem sites)		Total	
	Thousand acres	Percent	Thousand acres	Percent	Thousand acres	Percent
Other public	160	59	109	41	269	100
Forest industry	1,098	74	392	26	1,490	100
Other private timber growers	887	66	461	34	1,348	100
Farmer and miscellaneous private	1,329	68	633	32	1,962	100
Total	3,474	69	1,595	31	5,069	100

[1/]Excludes southern California.

Tables 61 through 69 in the appendix show treatment classes by site class, resource area, and stockability and slope class for private lands in the interior. Table 62 shows, for example, that 55,000 acres or 40 percent of the planting opportunity on other private timber-growers' lands in the northern interior are on steep slopes or sites with limited stockability.

Forest-Damaging Agents

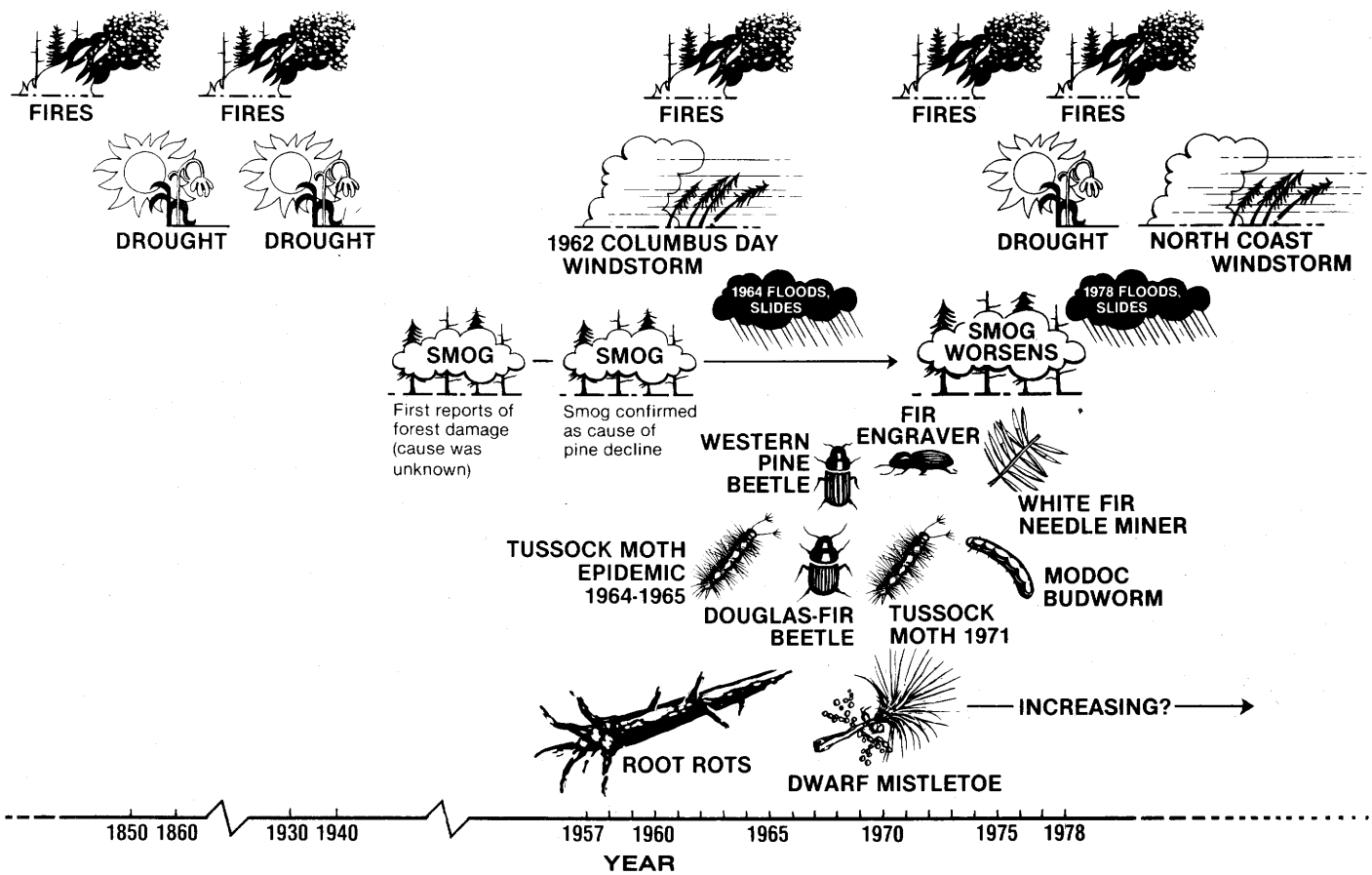
A history of California forests could be, to a large extent, a chronology of calamities (fig. 53). Forest management is very much a continuous battle against forest-damaging agents. If forest managers are to increase future timber yields through intensive management, they must also intensify their efforts in forest protection and damage control.

Figure 53. — California forests have been besieged by numerous epidemics and catastrophes in the past 128 years.

Fire

Fire protection[41] is probably the most important management activity in California's highly flammable forests. The forest fire fighting organizations of California are well known and effective. Since 1964, the average acreage burned per year has changed little, although the number of fires has more than tripled (fig. 54). Still, the occasional catastrophic year reminds us of the devastating potential of fire (fig. 55).

[41] Fire, properly used, can be a useful wildland management tool. The discussion here deals strictly with uncontrolled fire.



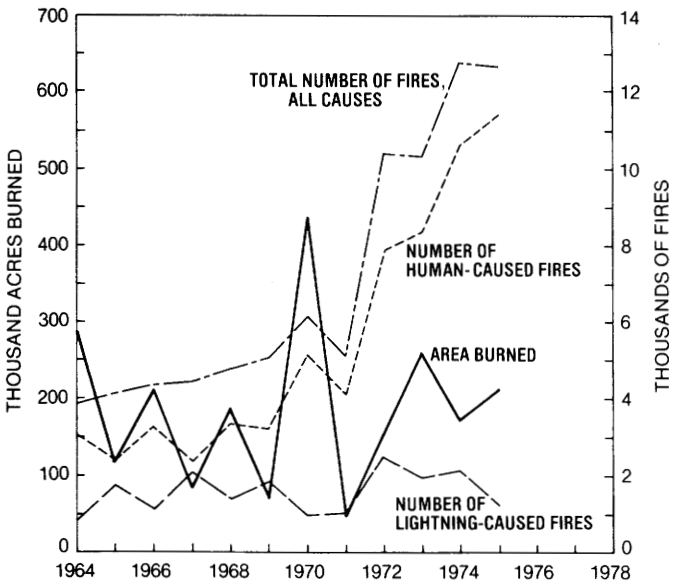


Figure 54.– Total acres burned and number of wildfires by cause in California, 1953-74 (State of California, Division of Forestry 1953-74).

Figure 55.– In 1977, one of California's worst wildfire years, about 175,000 acres of commercial forest burned.

The annual average value of resources damaged on the 42 million acres of State-protected lands[42] in California over the period 1964-74 was $22 million (State of California, Division of Forestry 1953-74, 1964-74 issues). Forest inventory data collected in 1970 through 1972 in California's interior show an estimated annual fire-caused mortality of 12 million board feet of sawtimber. This is roughly 3 percent of the total volume lost to mortality (table 20). Most of the volume in

[42] Included are areas contracted by the State to other agencies.

Table 20--Annual sawtimber mortality by cause, northern interior, Sacramento, and San Joaquin resource areas, California[1/]

Cause of death	Annual mortality	Percent
	Million board feet (Scribner rule)	
Insects[2/]	107	23
Weather[3/]	74	16
Disease	48	11
Logging[4/]	19	4
Suppression	17	4
Fire	12	3
Animals	2	--
Unknown/unclassified	177	39
Total	[5/]456	100

[1/] Estimated over a 5-year period ending at the date of inventory: 1966-70 to 1968-72 for all but Siskiyou County (1964-68). These data are not available for other resource areas.

[2/] Includes trees weakened by disease, weather, smog or other agents, then killed by insects.

[3/] Includes trees weakened by disease or other agents, then killed by weather.

[4/] Includes trees killed by uprooting, breaking, or other logging damage but does not include trees sawn down and left in the woods.

[5/] The estimate of mortality is probably conservative; trees salvaged between time of death and inventory were not included.

the fire-caused mortality was potentially salvable. Of more significance to forest yields is the effect of fire on plantations and submerchantable trees. Fire in young trees usually results in a total loss because small trees are generally not salvable. When a 25-year-old stand burns, a quarter century's growth is completely lost.

As the large, old-growth trees are removed and more of the forest is occupied by small trees, the relative effect of a fire on yields will be more severe, and less of the fire-killed volume will be salvable.

Fire statistics indicate that all of the increase in fire is human-caused (see fig. 54). The predicted increase in recreational use of forests and intensification of timber management will increase the likelihood of wildfires placing an additional burden on forest owners, managers, and protection agencies.

Insects

Many species of insects attack California forests. As the character of the forest changes from open stands of large trees to dense stands of small trees, the kinds of insect problems change. Sound forest management generally will minimize losses to insects, but continued research is needed if management knowledge is to keep up with the changing insect problems (fig. 56).

A brief chronology of some of California's worst forest insect problems since 1965 follows[43] (California Forest Pest Control Action Council 1964-75):

1964-65	California's worst Douglas-fir tussock moth epidemic.
1966	Douglas-fir beetle epidemic, one of California's worst.
	Jeffrey pine beetle attack; started in old trees, moved to dense poletimber.
1967	Western pine beetle outbreak attacked ponderosa pines in drought stricken areas.
1968	Western pine beetle infestation.
	Fir engraver beetle infestation (fig. 57).
1970	Douglas-fir tussock moth infestations.
	Western pine and Douglas-fir beetle losses high locally (fig. 58).
1971	Tussock moth infestation worsened.
	Fir engraver damage high.
1972	Various bark beetles at moderate levels.
1973	Modoc budworm outbreak – largest forest defoliator outbreak on record in California.
1974	Budworm epidemic continued.
	White fir sawfly outbreak.
1975	White fir needleminer, an associate of the budworm, continued to damage trees after the budworm population dropped.
1976-77	Severe bark beetle losses of trees weakened by drought. Several species were involved.

[43] Office records of USDA Forest Service, Pacific Southwest Region.

Figure 56. – Spraying ponderosa pines with Lindane before western pine beetle attack. A pilot project near a recreation site on the Los Padres National Forest.

Figure 57. – The top of this white fir was killed by the fir engraver beetle which entered the tree at dwarf mistletoe infections on the bole. Lassen County.

Insect-caused mortality in California's interior was estimated at 107 million board feet per year during a period of relatively normal infestation levels (table 20), 23 percent of total mortality. This is roughly equal to the annual timber harvested from all ownerships in Sierra and Yuba Counties combined.

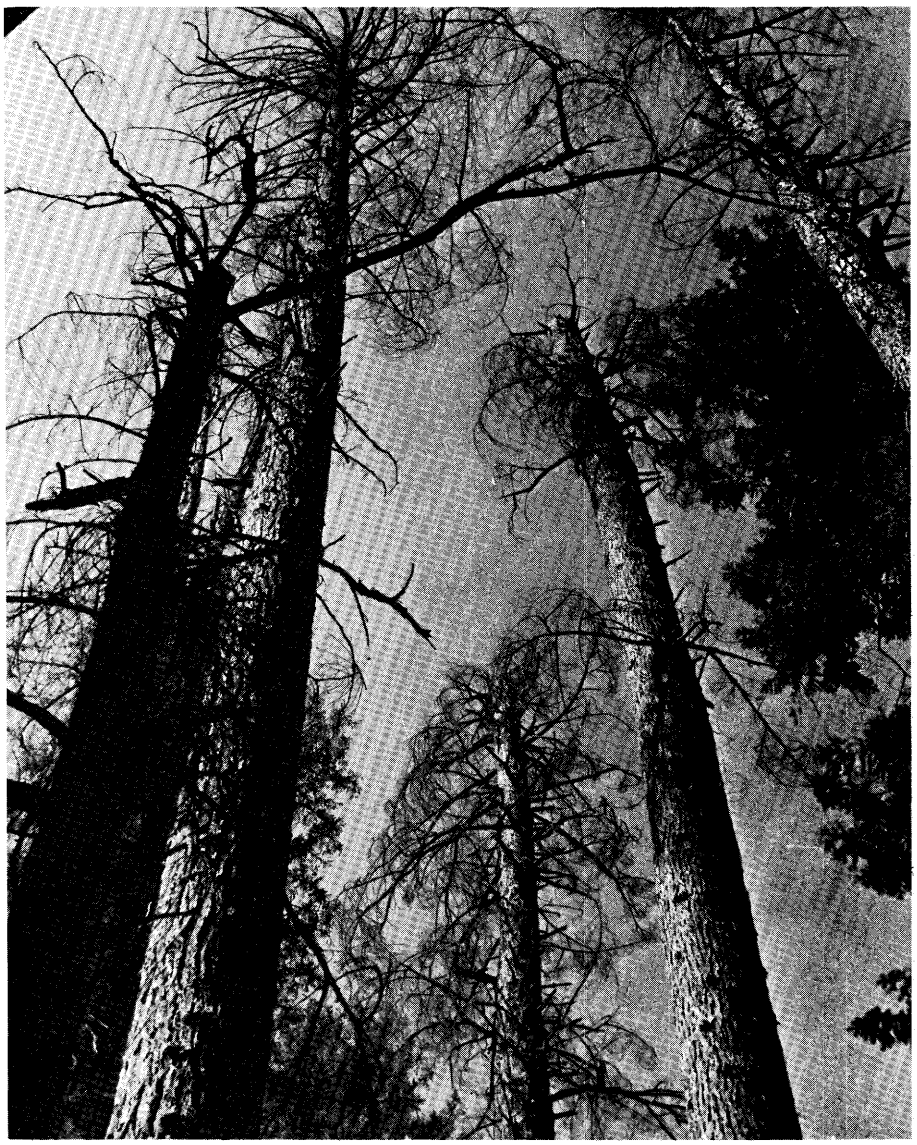


Figure 58.—Douglas-fir trees killed by the Douglas-fir beetle. Trinity National Forest.

In addition to killing trees, insects – especially defoliators – weaken millions of trees, reducing their growth. Extensive insect damage occurs in plantations and natural stands of young trees. Insects causing damage include the pine needle-sheath miner, pine tip moth, pitch moths, the reproduction weevil, pine resin midge, Douglas-fir bud mite and the native pine shoot moth. From 1971 to 1975, the total acreage infested by defoliators and insects that attack young trees ranged from 100,000 acres a year to 450,000 acres (California Forest Pest Control Action Council 1964-75, 1971-75 issues).

A number of insects attack hardwood trees in California. Some of these may have potential for releasing conifers from competition, a kind of biological management tool. Some insects are of no interest to timber managers but may be of concern to wildlife biologists, or those who are looking to the currently noncommercial hardwoods as a source of energy. Included are the fall webworm, tent caterpillar, satin moth, alder flea beetle, and the common California oakworm that has defoliated oaks in scenic areas from Mendocino County to Kings County.

Diseases

Less spectacular than the effects of fire or insects, forest diseases are nonetheless a serious forest management problem in California. Three root diseases that weaken trees' resistance to insects, weather, or other diseases and sometimes kill trees outright are *Fomes annosus, Armillaria mellea,* and *Verticicladiella wagnerii.* They attack both large and small trees of several species. In 1966, for example, *A. mellea* killed young pines and firs in several campgrounds and plantations and also weakened the roots of a giant sequoia 24 feet in diameter, causing it to fall (California Forest Pest Control Action Council 1964-75, 1967 issue).

Other damaging diseases include the rusts, cytospora canker, needle diseases, heart-rotting fungi, and dwarf mistletoe.

Dwarf mistletoe, considered to be ". . . the most serious disease agent infesting forests of western North America . . .",[44] reduces growth and seed production, invites insect attack, and kills trees outright. About 21 percent of California's timberland is infested with dwarf mistletoe in several conifer species (Bolsinger 1978b). About 15 percent of National Forest lands and 25 percent of other lands are infested. In the three major species, the area infested is:

Species	Area infested (Thousand acres)
Douglas-fir	646
Ponderosa and Jeffrey pines (fig. 59)	924
True firs	1,002

Dwarf mistletoe infections are common in the interior, but rare on the west slopes of the Coast Ranges.

[44] Quote from the announcement of *A Symposium on Dwarf Mistletoe Control Through Forest Management,* Berkeley, Calif., April 11-13, 1978.

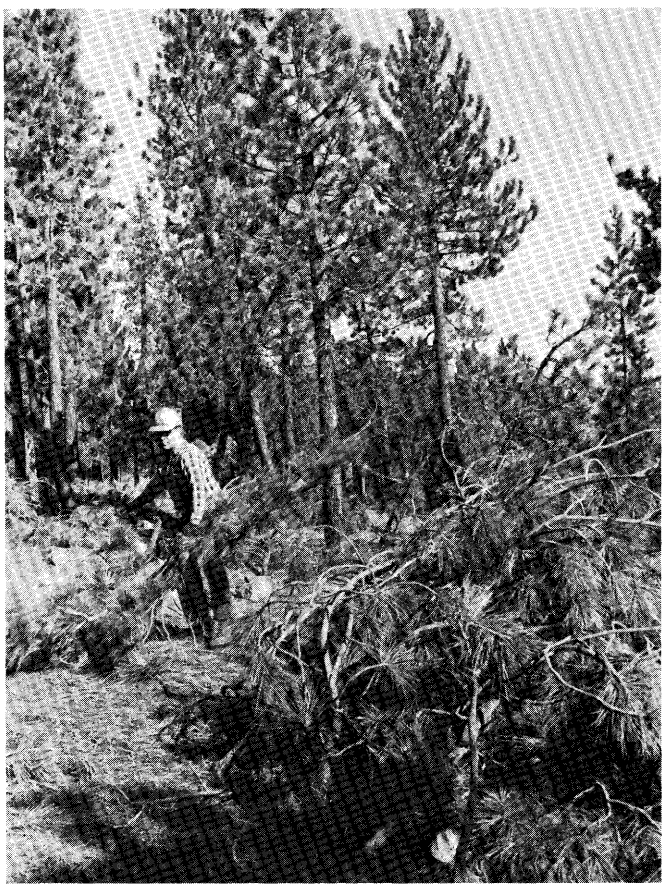


Figure 59. – Piling pruned limbs and small trees cut in dwarf mistletoe control project in ponderosa pine. Los Padres National Forest.

Weather Damage

Windthrow or windsnap are periodically widespread in California forests, often associated with root disease or heart rot. Other kinds of weather damage experienced in recent years include late spring frosts; foliage burn on sunny, windy days when the ground is frozen; hail; heavy snow; ice storms; and drought. The 1975-77 drought in California was particularly severe. A survey of 12 National Forests found 12.3 million trees killed by drought, or weakened by drought and finished off by bark beetles and/or disease. These trees contained an estimated 8.6 billion board feet. The greatest damage was to ponderosa pine, sugar pine, and white fir. Further loss may be forthcoming as insects continue to work on drought-weakened trees.

In California's interior, the annual estimated mortality attributed to disease and weather over the 5-year period ending in 1972 was 122 million board feet (table 20).

Animal Damage

Many of the wild animals that delight forest visitors, attract hunters, and add to the richness of life also damage and kill forest trees. Deer browsing on young conifers is a serious animal damage problem in parts of California (fig. 60). Extensive damage by pocket gophers in plantations in northern California has occurred. Other damaging animals include mice, rabbits, porcupines, elk, and bear.

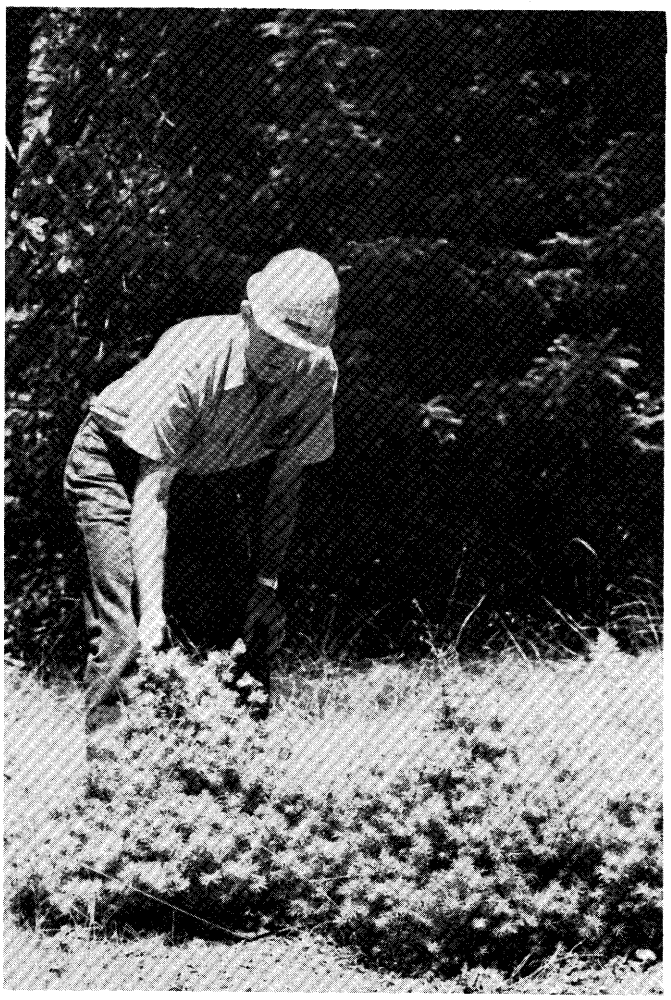


Figure 60. — These deer-browsed Douglas-fir trees in Mendocino County are 18 years old. Trees of the same age that escaped damage in this area are about 40 feet high. The loss of wood production attributable to deer in this stand is about 130 cubic feet per acre, over 18 years.

People-Caused Forest Damage

Many of the activities of people damage trees, either directly or indirectly. Causes range from logging to air pollution.

Logging damage to uncut trees caused about 4 percent of the estimated annual timber mortality in California's interior (table 20). Logging damage serious enough to threaten trees' chances of surviving for 10 years was found on 20 percent or more of residual trees on 130,000 acres on private lands in the interior (based on sample plots in recently logged stands).

Chemical damage to trees has occurred along powerlines and near homesites and industrial installations throughout the State. Soil compaction or tree root disruption by machinery, animals, and even people in some areas can weaken or kill trees (California Forest Pest Control Action Council 1964-75).

Smog damage is a serious and growing forestry problem in California (California Forest Pest Control Action Council 1964-75). In the last 1940's, unhealthy ponderosa pines were noted in the Arrowhead-Crestline area in San Bernardino County, but not until 1957 was air pollution confirmed as the cause. By that time thousands of trees had died. In many cases insects finished off the smog-weakened trees. A survey in 1969 revealed that 161,000 acres in southern California were affected; 3 percent of the trees were killed and 15 percent were severely damaged (California Forest Pest Control Action Council 1964-75, 1970 issue). By 1975, smog damage had spread throughout southern California and was killing trees on the western slopes of the Sierra Nevada as far north as Fresno County. Data from smog-evaluation plots on the Los Padres and Sequoia National Forests indicate that severity of damage is increasing.

The problems posed by forest-damaging agents are complex and cut across many disciplines. Many of the problems are clearly related to more than one forest use or resource, and treatments done on a one-use basis may be counterproductive. For example, controlling deer damage to a Douglas-fir plantation may be at odds with desired wildlife goals if not carefully planned.

Availability of Forest Land for Timber Production

National Forests

National Forests contain over 60 percent of California's standing timber volume and half of the timberland. They are managed for continuous production of various commodities and amenities including outdoor recreation, water, fish and wildlife, timber, and forage for livestock (USDA Forest Service, Pacific Southwest Region 1975a). Timber management is planned within a framework of all recognized resource values. Timber is sold on the stump to purchasers who are required to remove trees according to a detailed contract. Through the contract, provisions are made to protect nontimber resource values, maintain timber yield, and minimize waste.

In developing National Forest timber management plans (USDA Forest Service 1977a, section 2412 Land classification), the timberland has been classified into four components which bear on timber management intensity:

1. **Standard component**: Regulated timberland on which crops of industrial wood can be grown and harvested with adequate protection of forest resources under the provisions of the timber sale contract (fig. 61).

2. **Special component**: Regulated timberland for which multiple use plans require specially designed treatment to achieve other resource objectives. Also included are areas where timber management activities are delayed pending multiple use planning and management decisions, travel and water influence zones, peripheral portions of developed sites (fig. 62), classified recreation areas, and areas where timber harvest is a secondary or minor management objective.

Figure 61.– Young stand of ponderosa pine and Jeffrey pine on standard component commercial forest land. Tahoe National Forest, Nevada County.

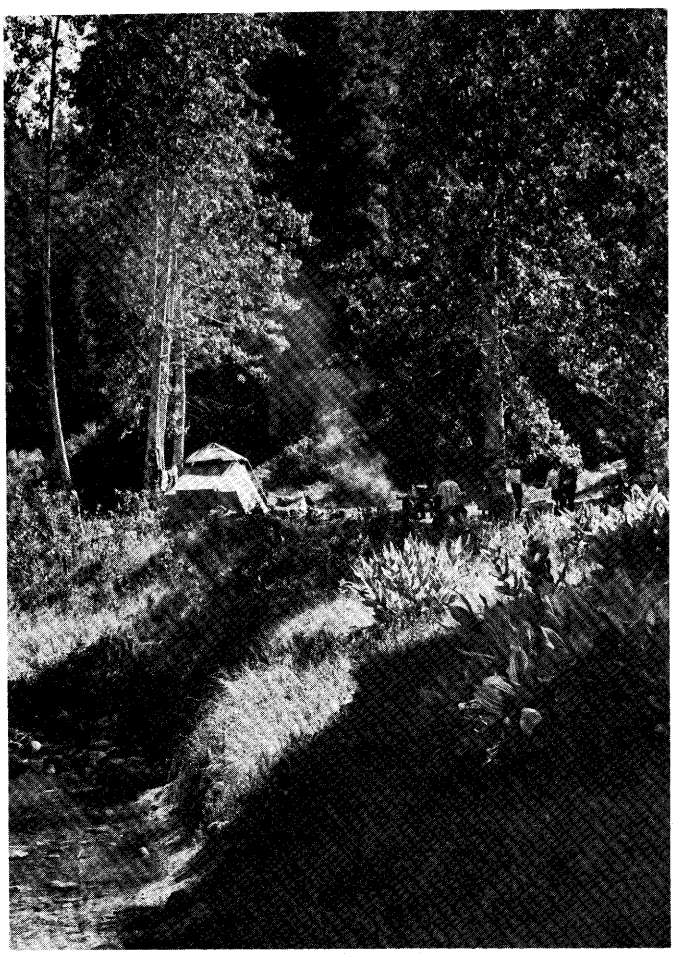


Figure 62.– Forests adjacent to developed campgrounds, such as this one in the Sierra National Forest, are classified as special component. Timber production in such areas is a secondary objective.

3. **Marginal component**: Regulated timberland not qualifying as standard or special primarily because of excessive development cost, low product value (fig. 63), or constraints from resource protection. Included may be sites requiring unusual logging techniques such as helicopters, areas where harvesting is blocked until roads are constructed, or species not presently in demand. Also included is the backlog of nonstocked areas that would otherwise be classed as standard, but cannot be reforested without funding.

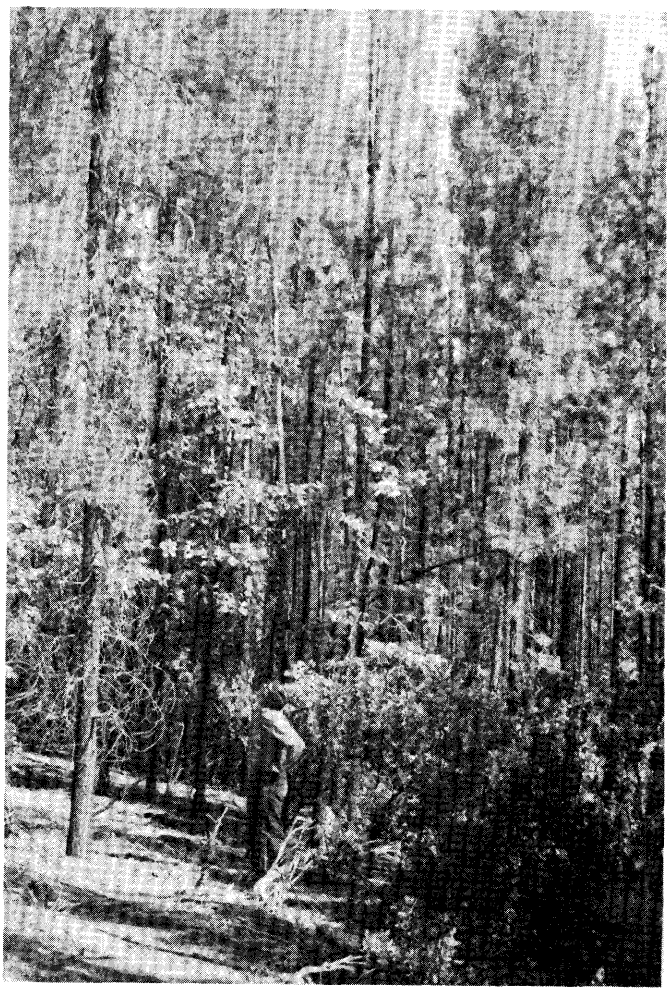


Figure 63.— Knobcone pine, a low-value species, on marginal component timberland. Mendocino National Forest, Glenn County.

4. **Unregulated component**: This is timberland that will not be managed for timber production under sustained yield principles. It includes:

a. Experimental forests.

b. Existing and planned recreation development sites, special interest areas, and administrative sites where timber harvest is not a major goal of management such as ranger stations, guard stations, nurseries, etc.

c. Isolated tracts of timberland where sustained periodic harvest is impractical.

The bulk of the timber comes from the standard component, which consists of the most manageable land. The other components yield some timber, but they are less dependable. In National Forests in the Pacific Southwest Region, which comprise 98 percent of U.S. Forest Service land in California, the standard component amounts to 62 percent of the timberland but contributes 90 percent of the programed harvest (table 21).

Over the 3-year period 1973-75, the removals from all California National Forests averaged 106 percent of the potential yield from the standard component and 83 percent of the potential yield from all components (table 22) (USDA Forest Service 1976). Removals measured in cubic feet amounted to 85 percent of the softwood cubic-foot growth. Scribner board-foot removals amounted to 107 percent of the board-foot softwood growth.

It would appear that the recent annual harvest level in National Forests of about 1.8 billion board feet could be maintained indefinitely. The high estimated biological potential – nearly twice the current growth rate – seem to indicate that intensified forest management could eventually increase the growth rates so that more timber could be harvested. Before the long-run timber productivity can be determined, however, more information is needed on management techniques and response, resource interactions, and demand for various outputs; and the area devoted to timber production must be clearly defined and stabilized. Because these problems are not likely to be solved in the near future, the area of land devoted to timber use and the exact amounts of timber to be harvested are somewhat uncertain.

Table 21--Percent of timberland, programed harvest, and timber sold in National Forests of the Pacific Southwest Region, by timberland component, California, 1977

Timberland component	Timberland	Programed harvest in 1977	Timber sold sold in 1977
Standard	62	90	84
Special	11	6	5
Marginal	24	4	11
Unregulated	3	0	0
All components	100	100	100

Table 22--Current annual timber removals, and removals as percent of potential yield from standard components and all components of National Forest timberland, by National Forest group, California

National Forest group	Current annual removals[1]	Removals as percent of potential yield from standard components[1]	Removals as percent of potential yield from all components
	Cubic feet per acre per year		
Northwestern California[2]	38	97	74
Northeastern California[3]	29	111	81
Northern Sierra Nevada[4]	49	117	91
Southern Sierra Nevada[5]	43	103	86
Southern California[6]	9	[7]	112
All groups	37	106	83

[1] Average for 1973-75.

[2] Includes Klamath, Mendocino, Six Rivers, Trinity, and California portion of Rogue River and Siskiyou National Forests.

[3] Includes Lassen, Modoc, and Shasta National Forests.

[4] Includes Eldorado, Plumas, and Tahoe National Forests.

[5] Includes Sequoia, Sierra, Stanislaus, and California portion of Toiyabe National Forests.

[6] Includes Angeles, Cleveland, Los Padres, San Bernardino, and California portion of Inyo National Forests.

[7] Four of the five National Forests in southern California have no land classified as standard component.

Other Public Agencies

Lands administered by the U.S. Department of the Interior, Bureau of Land Management (BLM) are managed for sustained yield under multiple use principles defined in the Federal Land Policy and Management Act of 1976 (Public Law 94-579). These lands total about 240,000 acres in scattered parcels throughout the State.

In 1975 the cut from BLM lands was 46 million board feet. The average cut during the period 1965-75 was 33 million (Ruderman 1976). The current annual allowable cut on BLM lands, based on a new forest inventory, is 25 million board feet (Scribner rule). This is a reduction from the allowable cut of 51 million board feet, based on an older forest inventory. The new allowable cut incorporates nontimber values and the effect of fragile sites on forest productivity.[45]

Indian lands are managed under the guidance of the U.S. Department of the Interior, Bureau of Indian Affairs to provide income for the Indian owners. These lands are privately owned, though historically they have been classified as part of the public lands. They total about 100,000 acres in the larger Reservations (mainly the Hoopa Valley in Humboldt County and the Tule River in Tulare County) and scattered parcels. Timber is managed on a sustained-yield basis with a long-term allowable harvest equal to the land's capacity under planned management intensity. In 1977, 38 million board feet were harvested from Indian forests. The average cut during the period 1965 to 1977 was 49 million board feet (Ruderman 1979).

State-owned timberland includes seven State Forests and scattered parcels of other State lands. Four of the State Forests are managed for timber production by full-time forestry staffs. The total acreage in these four forests is about 68,000 acres (State of California Department of Forestry 1977):

State Forest	County	Resource area	Acres
Boggs Mountain	Lake	Sacramento	3,464
Jackson	Mendocino	North coast	50,505
Latour	Shasta	Northern interior	9,013
Mountain Home	Tulare	San Joaquin	4,562
Total			67,544

[45] Personal communication with BLM staff in Sacramento.

All categories of State lands classified as timberland in the Forest Service inventory total 79,000 acres.

The State Forests are used primarily for forestry experiments and demonstrations. Timber sales are closely supervised to assure that these goals are reached. In 1977, 28 million board feet were cut on State lands. The average cut during the period 1965-77 was 36 million board feet.

Private Lands

The area in private ownership in California that is classified as timberland totals 7,632,000 acres (see tabulation, page 10). By no means is all this land available for growing and harvesting timber, though much of it has been logged in the past.

Perhaps most dependable of the private lands for timber production are the 2,688,000 acres owned by companies that operate forest products mills, and the 1,348,000 acres owned by other companies that grow timber for sale to the companies that operate mills. These companies have forestry staffs (fig. 64) and manage timber on a continuous-yield basis. The total acreage in these ownerships has increased over the years. Though intensity of timber management varies from company to company, investment in mills and high quality timberland is some assurance that the companies will continue to produce timber. These companies cut an estimated 2.1 billion board feet of timber from their lands in 1972 and 2.2 billion in 1976.

Timberland owned by farmers and ranchers totals 1,646,000 acres. Miscellaneous private owners including nonfarmer individuals, banks, churches, real estate development companies, and other organizations hold 1,950,000 acres of commercial forest. Included are some timberlands being managed by consulting foresters and many tracts that are logged sporadically but are not managed specifically to grow timber. The total area of farmer and miscellaneous private forest has decreased due to grazing, clearing, residential development and other conversions, and purchases by timber companies and government agencies.

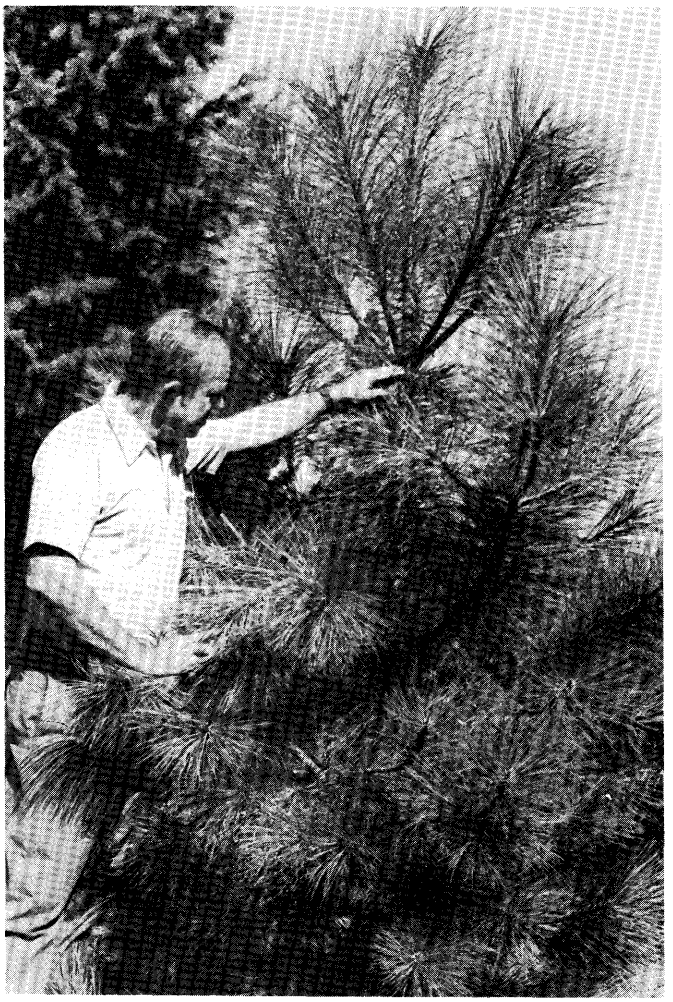


Figure 64. – Company forester examining a ponderosa pine in October 1977 which was planted in 1971. Butte County.

About 950 million board feet of timber was cut from the farmer and miscellaneous private lands in 1972, and 761 million in 1976.[46]

It is not possible to determine how much of the 3,596,000 acres in this ownership class will be used for timber production. The timber preserve zoning requirements of the Z'Berg-Warren-Keene-Collier Forest Taxation Reform Act of 1976 (State of California 1976) will eventually provide a basis for determining the acreage of forest used for timber production. (The main purpose of the Act, however, is to encourage landowners to keep land in forestry use and producing higher yields.) A preliminary list of properties compiled by the State Board of Equalization indicates that about 2.0 million acres of the 3.6 million acres are currently assessed for other than timber use. These areas probably cannot be depended upon for timber production in the future.

Size of forested property and place of owner's residence are sometimes related to the owner's ability or willingness to manage for timber production. A study by Extension Forestry, University of California, was conducted to learn more about the forest owners in California so that extension programs can be more effective. Data collected in this study show that half to three-fourths of the acreage in nonindustrial ownership in Humboldt, Lassen, Mendocino, Plumas, Shasta, Sierra, and Tuolumne Counties is in properties 500 acres or larger in size, and is held by only 5 to 12 percent of the owners (see table 23 for details). Properties 5,000 acres or larger in these counties represent 0.6 percent of the total number of properties, but contain 24 percent of the total area.[47]

Place of owner's residence varies considerably from one geographic area to another. In Humboldt County, for example, 72 percent of the forest landowners live in the County, compared with only 14 percent in Sierra County. For all counties studied, 50 percent

[46] Based on the reported log consumption by ownership (Hiserote and Howard 1978).

[47] This information was provided jointly by Dr. Robert J. Laacke, formerly Extension Forester, University of California, Berkeley, and Gary Crawford, graduate student in Urban and Regional Planning, California State University, Fresno.

Table 23--Percent of owners of forested properties and of acreage by acreage class for all farmer and miscellaneous private ownerships, Humboldt, Lassen, Mendocino, Plumas, Shasta, Sierra, and Tuolumne Counties, California, 1976-78

County	Acreage class								
	4-19	20-39	40-119	120-499	500-999	1,000-4,999	5,000-9,999	10,000+	Total
	Percent of owners								
Humboldt	18	13	31	25	5	6	1	1/	100
Lassen	33	14	23	19	5	5	1/	1/	100
Mendocino	25	16	32	19	4	2	1/	1/	100
Plumas	36	19	24	15	4	2	1/	1/	100
Shasta	35	17	28	15	4	2	0	1/	100
Sierra	34	15	20	21	5	4	1/	0	100
Tuolumne	15	12	38	27	4	3	0	0	100
	Percent of acreage								
Humboldt	1/	1	5	16	11	36	18	13	100
Lassen	1	1	4	14	12	38	11	19	100
Mendocino	1	2	10	20	11	28	13	14	100
Plumas	2	3	8	20	16	25	18	9	100
Shasta	3	4	13	26	18	27	0	8	100
Sierra	1	2	6	25	17	40	8	0	100
Tuolumne	1	2	15	38	19	24	0	0	100

Sources: Dr. Robert J. Laacke, former Extension Forester, University of California, Berkeley, and Gary Crawford, graduate student in Urban and Regional Planning, California State University, Fresno.
1/Less than 0.6 percent.

of the forest landowners live in the county in which the property is located or in an adjacent county; 42 percent live elsewhere in the State, and 8 percent live out of State (see the following tabulation).

Location of property	Place of owner's residence			
County	In-county	Adjacent county	Elsewhere in State	Out-of-State and foreign
	Percent of owners			
Humboldt	72	2	21	5
Lassen	28	12	51	9
Mendocino	37	9	46	8
Plumas	30	10	44	16
Shasta	38	5	50	7
Sierra	14	12	64	10
Tuolumne	40	9	47	4
Average of all above counties	43	7	42	8

During the inventory of California's interior and central coastal forests, numerous nonforest developments in process were encountered (fig. 65). Included were recreational and residential developments, grazing clearings, and others. Plots were established in these areas if they were still forested. Summary data from these plots are included in this report. Most of these areas will probably be lost to timber production. Some of the timber on these tracts may be marketed as the land is cleared. Small trees will probably be stacked and burned. In some areas much of the timber will be left standing (fig. 66). The total area of productive forest in these areas as determined from sample plots at the time of inventory (1970-72) was 221,000 acres. This is about 11 percent of the farmer and miscellaneous private timberland in the interior and central coast areas.

Figure 65. – Aerial view of unfinished recreational-residential development on high site timberland in Calaveras County. About 220,000 acres of privately owned timberland were being developed for nonforest use in California at the time of the inventory.

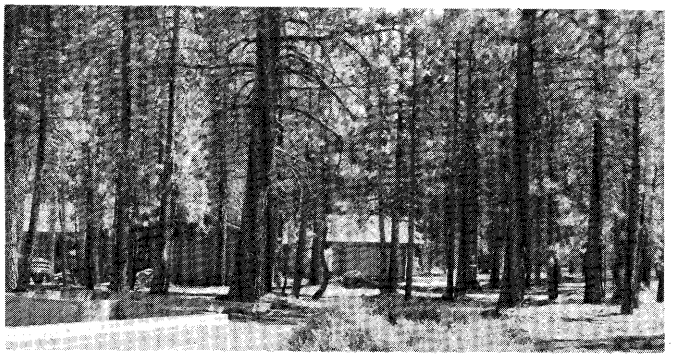


Figure 66. – New houses in the pines. An unfinished residential development in Plumas County.

Total softwood volume on these 221,000 acres was 2.3 billion board feet (Scribner rule), or about 14 percent of the total on farmer and miscellaneous private lands in the interior and central coast areas. Net annual growth in these stands was 10.1 million cubic feet, 11 percent of the total. About 18,000 acres were redwood type, 33,000 acres Douglas-fir type, and 34,000 acres mixed conifer type, including Douglas-fir and/or sugar pine. Much of the remaining 136,000 acres was in ponderosa and Jeffrey pine types. The developments were usually on flat to gently sloping lands; and with the exception of grazing clearings, they were generally in heavy conifer timber stands.

Timber Harvest: Past, Present, and Future

Past and Present

Since 1900, well over 200 billion board feet of softwood timber have been logged and processed in California. The peak of California's timber cutting was in 1955 when over 6 billion board feet were hauled from the woods (State of California, Department of Forestry 1947-77). Since then, the cut has declined to about 4.5-5.0 billion. Cutting in early years was predominantly on private lands. Later, as the cut declined on private lands, the National Forest cut increased (see fig. 67).

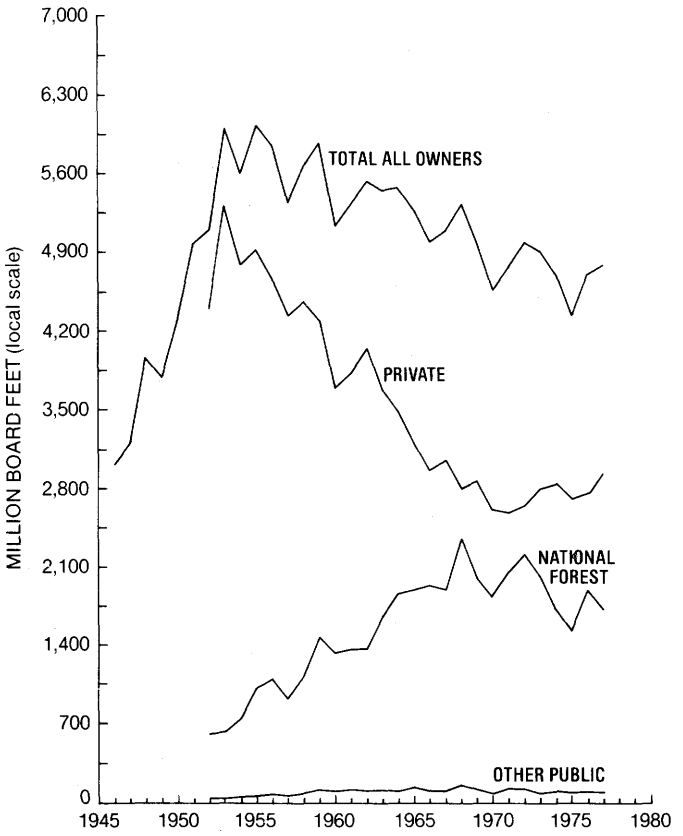


Figure 67. – Timber harvest in California, 1946-77, by ownership.

In 1976, 4,731 million board feet were harvested in California, 42 percent from public forests and 58 percent from privately owned forests:

Ownership	Million board feet (local scale)	Percent
National Forest	[48] 1,890	40
Other public	[49] 84	2
Forest industries[50]	2,154	45
Farmer and miscellaneous private[50]	603	13
Total	[51] 4,731	100

Timber harvested in the north coast resource area in 1976 amounted to 39 percent of the State total. The remaining 61 percent was harvested in the interior, as shown below:

Resource area	Million board feet (local scale)	Percent
North coast	1,825	39
Central coast and southern California	34	–
Northern interior	1,292	27
Sacramento	1,035	22
San Joaquin	545	12
Total	4,731	100

Timber cutting in the north coast has fluctuated considerably since the 1950's. In the interior the cut has remained fairly stable, especially in the Sacramento and San Joaquin resource areas (fig. 68). Very little timber has been cut in the central coast since the 1930's, though this area has produced lumber products for well over a century (Wilson 1938). California's first power sawmill was established in this area in 1841; and from 1842 to 1937 over 275 mills operated in San Mateo, Santa Cruz, and Santa Clara Counties.

[48] Reported by Intermountain, Pacific Southwest, and Pacific Northwest Regions of the USDA Forest Service.

[49] Reported by the State of California; U.S. Department of the Interior, Bureau of Indian Affairs, and Bureau of Land Management.

[50] Based on reported log consumption by forest products mills (Hiserote and Howard 1978).

[51] Total reported by California Department of Forestry.

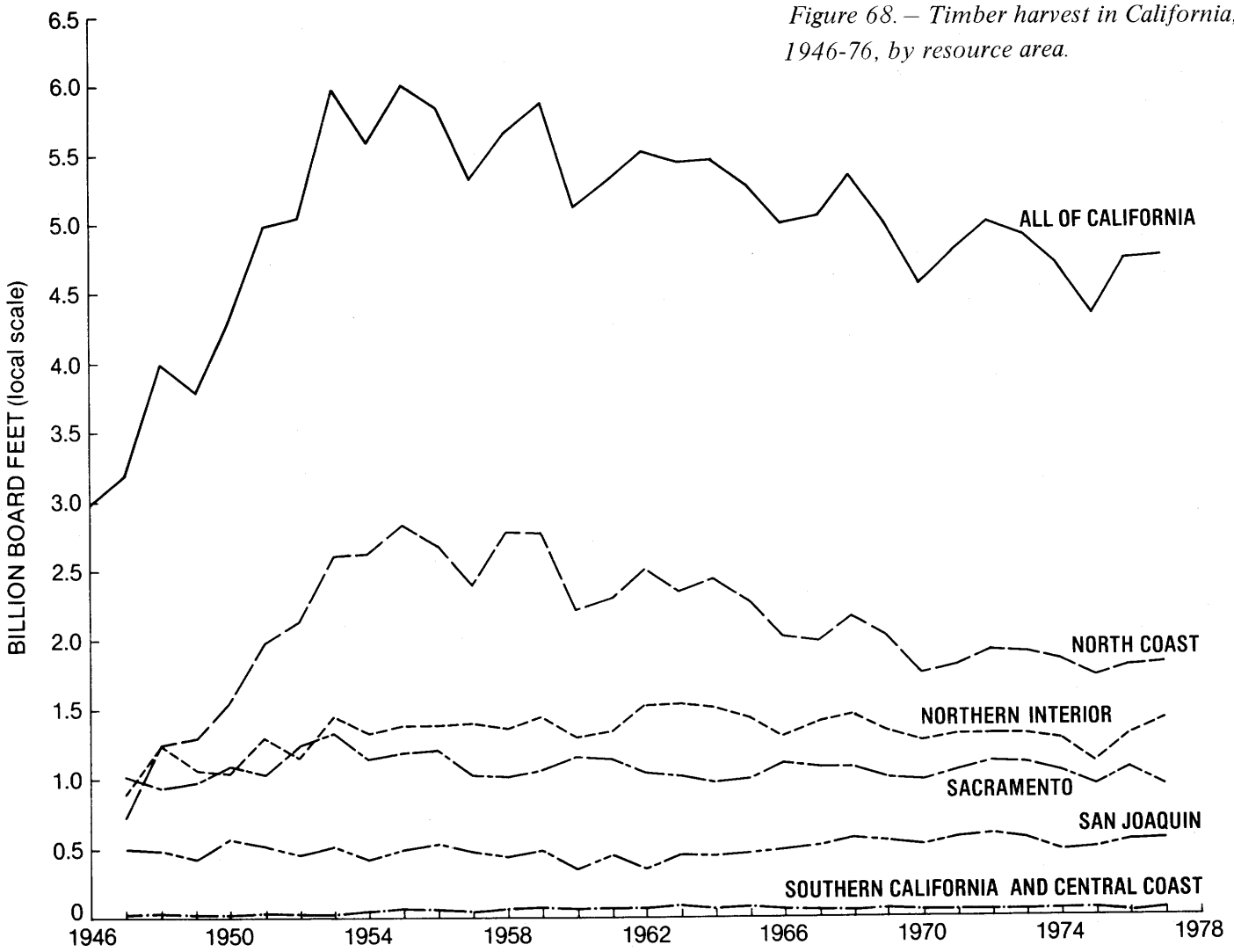


Figure 68. – Timber harvest in California, 1946-76, by resource area.

California's forest industries have relied almost exclusively on old-growth timber (fig. 69) until recent years. As the available old growth has been logged, a gradual transition to young growth has taken place. Still, 70 percent of the 1976 log consumption was from trees 100 years or older:

Year	Old growth (100+ years)	Young growth (less than 100 years)
	— — — Percent of log consumption — — —	
1968	80	20
1972	73	27
1976	70	30

The increase in the use of young growth is notable in the coastal areas where much of the old growth on private lands has been logged and little government timber exists. In 1976, 39 percent of the timber sawn in the central coast and north coast lumber mills was from trees less than 100 years old. Industries in the northern interior resource area use the largest proportion of old growth:

Resource area and region	Old growth (100+ years)	Young growth (less than 100 years)
	— Percent of logs sawn in 1976 —	
North coast	62	38
Central coast	9	91
Average coastal region	61	39
Northern interior	80	20
Sacramento	74	26
San Joaquin	70	30
Average interior region	75	25

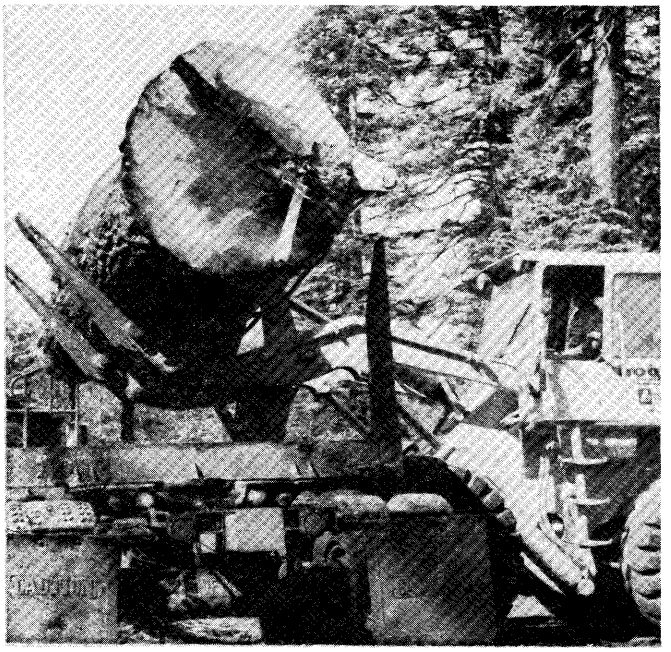


Figure 69. – Old-growth timber still makes up 70 percent of California's timber harvest. The large red fir log was cut in the Sierra National Forest.

Changing Size and Species

The changing mix of log sizes will require more diversity in logging and processing facilities in the future. Though an increasing volume in small logs from young trees is being used, large logs will make up a substantial part of the resource for many decades (fig. 70). Softwood trees 29-inch d.b.h. and larger make up 67 percent of the inventory on National Forests and 33 percent of the inventory on other ownerships.

The mix of species harvested has changed over the years because of the changing market and species availability (table 24). Douglas-fir was used very little before the post-World-War II housing boom and the concomitant rise of the veneer-plywood industry. In 1956, Douglas-fir amounted to 44 percent of total consumption as north coast owners of Douglas-fir timber took advantage of the new market. Now Douglas-fir amounts to about one-quarter of California's industrial wood consumption.

Figure 70. – Large trees such as this Douglas-fir in Glenn County are gradually disappearing from California forests but will be part of the resource for a long time.

True firs made up only 13 percent of total consumption as late as 1956 and amounted to only 19 percent in 1976. Because of the large inventory in true firs (28 percent of softwood sawtimber volume), especially in National Forest old-growth stands, some increase in the cut in this species might be expected in the future.

Redwood accounted for nearly half of California's timber production for a short period at the turn of the century. It has remained relatively constant, proportionally, at slightly less than 20 percent for the past 20 years. The volume and growth potential of redwood indicate this species could continue to be an important part of California's timber resource provided all redwood areas remain in timber production. Because of pressures to use redwood forests for nontimber purposes, it is difficult to predict the future contribution of this species to the timber supply.

Table 24--Consumption of logs in mills by species, California, selected years 1869-1976

Year[1/]	Douglas-fir		True firs		Redwood		Ponderosa pine		Sugar pine		Incense-cedar		Other softwoods		Hardwoods		All species	
	Million board feet, local scale	Percent	Million board feet, local scale	Percent	Million board feet, local scale	Percent	Million board feet, local scale	Percent	Million board feet, local scale	Percent	Million board feet, local scale	Percent	Million board feet, local scale	Percent	Million board feet, local scale	Percent	Million board feet, local scale	Percent
1869	30	8	0	0	75	21	204	58	35	10	--	0	10	3	0	0	354	100
1899	18	2	0	0	360	49	286	39	52	7	1	trace	20	3	1	trace	738	100
1906	127	9	68	5	660	49	347	26	130	10	12	1	4	trace	1	trace	1,349	100
1931	105	11	66	7	210	22	458	48	100	10	18	2	1	trace	2/	trace	958	100
1946	551	19	435	15	252	9	1,243	44	292	10	68	2	11	1	2/	trace	2,852	100
1956	3,090	44	936	13	1,197	17	1,194	17	410	6	113	2	79	1	0	0	7,019	100
1962	2,134	39	857	16	939	18	881	17	399	7	173	3	3/	3/	26	trace	5,410	100
1968	1,763	32	1,226	23	1,000	18	860	16	438	8	176	3	3/	3/	14	trace	5,477	100
1972	1,467	27	1,186	22	1,019	19	1,381	25	4/	4/	221	4	164	3	13	trace	5,451	100
1976	1,282	27	879	19	915	19	1,012	22	178	4	194	4	220	5	8	trace	4,688	100

Sources: Burks et al. (1948), May (1953), May and Baker (1957) May (1958), May and Baker (1958), Muerle and Hornibrook (1965), Barrette et al. (1970), Howard (1974), Hiserote and Howard (1978).

1/ 1869-1931 data are based on lumber production; 1946 data are based on log consumption by lumber mills; 1962-1976 data are based on log consumption by all industries.

2/ Less than 500,000.

3/ Included with incense-cedar.

4/ Ponderosa pine and sugar pine combined.

Ponderosa and sugar pines accounted for nearly 70 percent of California's industrial wood use in 1869 and over 50 percent as late as 1946 (fig. 71). Since 1956 they have contributed 23 to 26 percent of the total. Though many ponderosa pine plantations will result in substantial volume of this species in the somewhat distant future, the declining inventory would suggest some reduction in ponderosa pine consumption in the near future. Sugar pine consumption will probably decline even more.

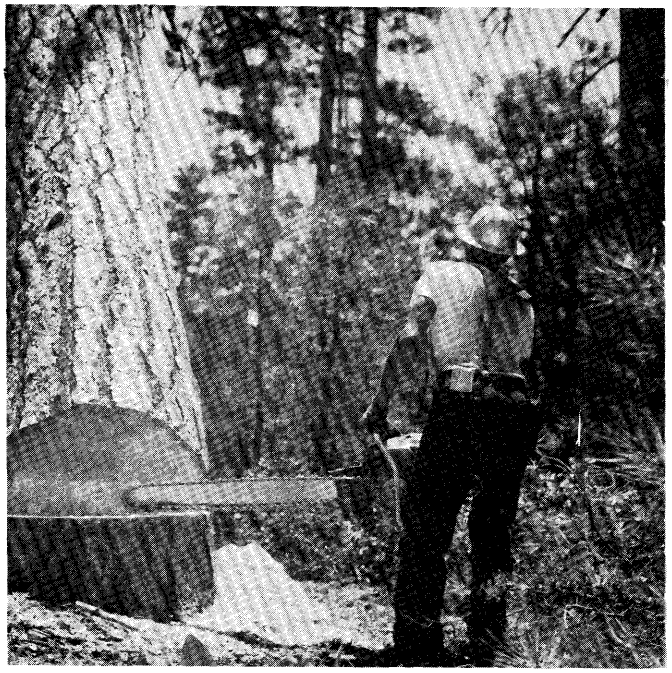


Figure 71.– Felling a ponderosa pine, Lassen National Forest. Proportionally, the harvest of ponderosa pine has declined since the 1940's.

Other softwoods, including incense-cedar (fig. 72), have been of minor importance to California forest industries. Incense-cedar has recently increased in value and is being used for some of the products traditionally made of redwood and western redcedar. The opportunities to increase the use of incense-cedar are limited, however. It accounts for only 4 percent of the softwood volume, and its growth potential is less than that of associated conifers on most sites.

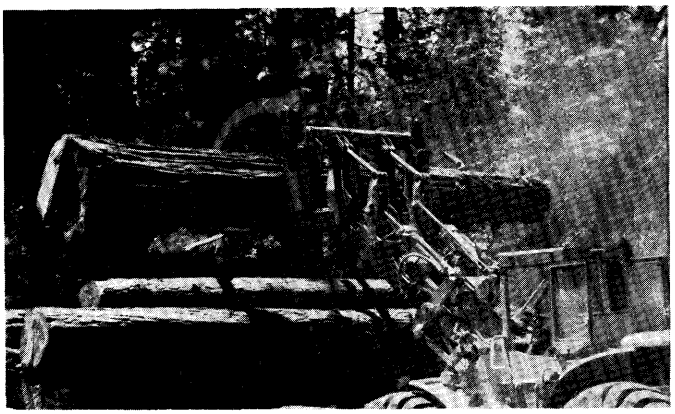


Figure 72.– Loading an incense-cedar log, Sequoia National Forest.

Over 25 species of hardwoods grow in California forests, including 17 that are classified as commercial.[52] The total volume in these 17 species is 7.8 billion board feet, and their annual growth is about 132 million board feet. They have been used very little by the industry but are currently being considered as a potential source of energy or pulp.

Future Timber Harvest

While the real price of lumber and other forest products has increased, the amount of timber harvested from all ownerships has decreased (fig. 73). National Forest timber harvests increased from less than 1.0 billion board feet in the early 1950's to 1.5-2.0 billion board feet in the 1970's; but this was not enough to compensate for the decrease in timber harvest from private lands – from 4.7-5.3 billion in the early 1950's to 2.6-2.9 billion in the 1970's. In recent years, private timber harvests have leveled off; but studies based on analyses of growth, harvest, and inventory stocks indicate that further decreases in private timber harvests can be expected, especially in the northern part of the State (Gedney, Oswald and Fight 1975; Oswald 1978). Recent forest investments and planned intensification in forestry activities will result in increased timber yields, but the benefits cannot be realized until well after the year 2000. A shortfall in private timber supply is likely to occur before then.

[52] See Griffin and Critchfield (1972) for details on California hardwood species and their distribution.

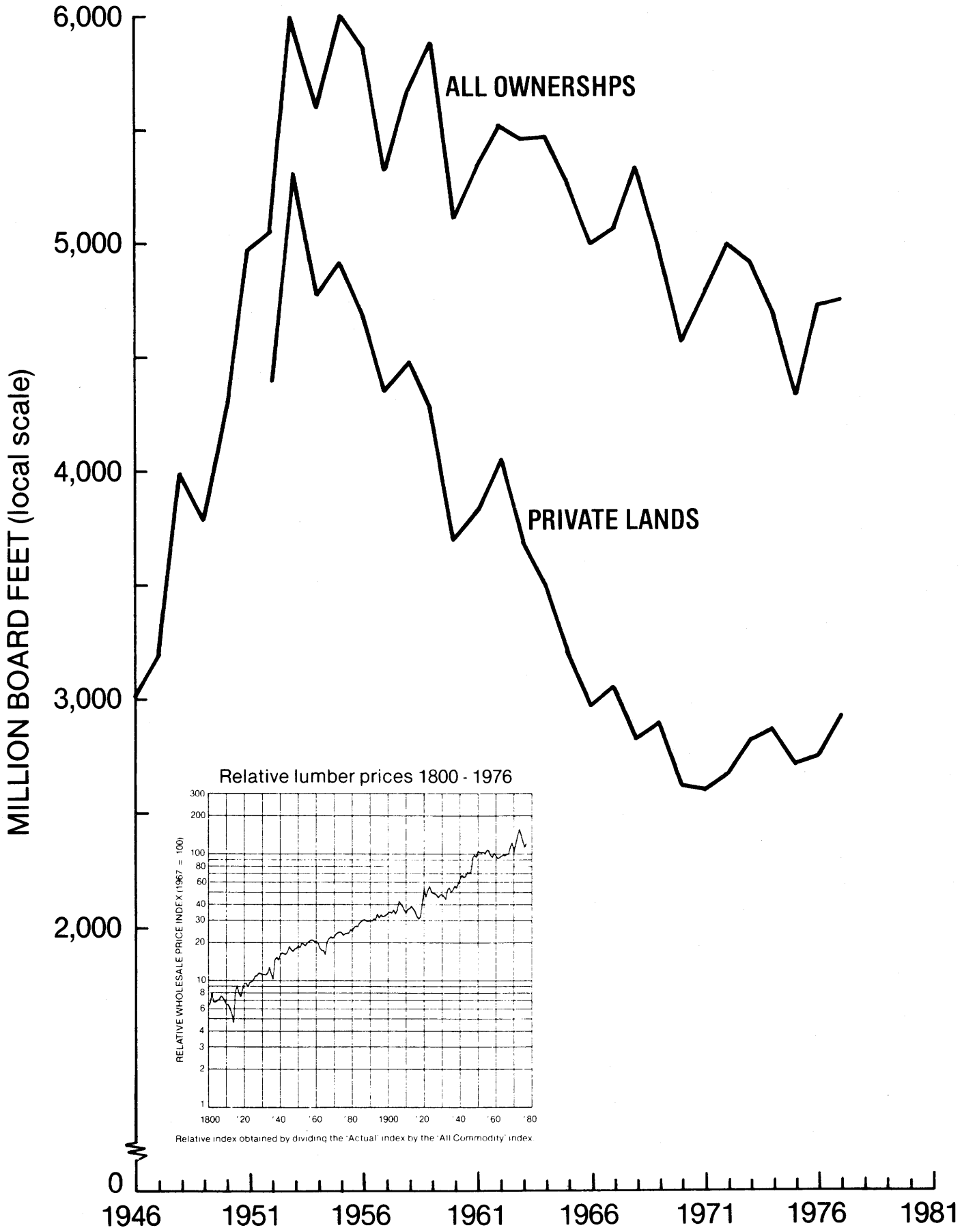


Figure 73. – Timber harvest in California on private lands and all ownerships, 1946-77, and relative lumber prices in the United States, 1800-1976. Source for lumber prices: Phelps (1977).

Forest Industries and Employment

Although National Forest timber harvests have doubled since the early 1950's, in recent years they have more or less stabilized. The National Forest Management Act of 1976 (Public Law 94-588) and the accompanying proposed rules for land and resource management planning do not set specific timber cutting levels. They provide flexible guidelines determining the size of cutting units, silvicultural systems, and area to be treated during a given period. Long-run harvest levels are not to exceed the land's potential under management. Departures from the traditional non-declining even-flow policy are possible but only after much debate. The rules call for screening land for the suitability of timber production which is likely to reduce the total area managed for timber. As with private lands, recent increases in forest management activities in National Forests will result in higher future yields. Whether or not this will offset reductions in yields resulting from other decisions is difficult to determine now.

Many opportunities exist for intensified forestry investments on both public and private lands that could result in increased timber yields in the future. Opportunities also are present to vary near-future cutting rates on both public and private lands to alter future timber availability. A program to capitalize on these opportunities would be very complex, involving political, economic, and technical considerations.

In 1976, there were 200 primary forest products mills in California, including 142 lumber mills, 21 veneer and plywood plants, 17 pulp and board plants, and 20 "other industry" plants – including shake and shingle; post, pole, and piling; and export facilities. Since 1962, 85-86 percent of the industrial wood processed in California has been made into lumber (fig. 74) and 10-13 percent has gone into plywood (table 25). The pulp and board industry uses very little roundwood – mill residues (chips) make up most of its raw material supply.

Though relative consumption by the various sectors of the forest products industry has remained fairly constant for many years, changes in the number of firms and mills continue. From 1962 to 1976, the number of sawmills declined from 297 to 142 and the number of veneer and plywood mills declined from 39 to 21. The trend in forest industries in California, as throughout the Pacific Coast States, has been toward fewer and larger firms with greater plant capacity and larger land holdings.

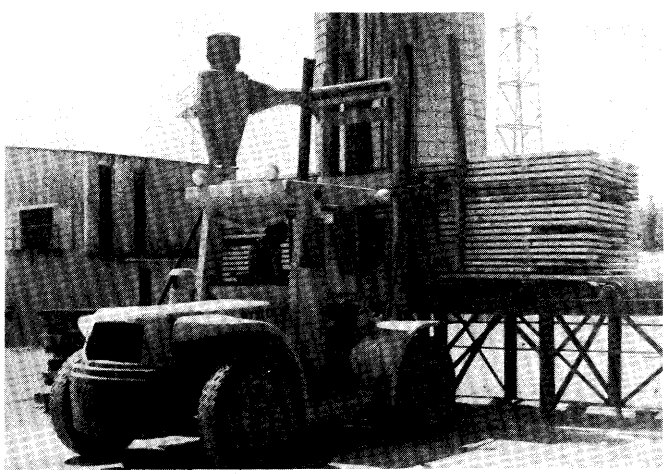


Figure 74. – About 85 percent of the timber harvested in California forests is sawn into lumber. Bendix Forest Products Corporation mill, Madera County.

Table 25--Number of forest products mills and percent of log consumption by industry sector, California, selected years 1946-76

Industry	1946	1956	1962	1968	1972	1976
Lumber:						
Number of mills	907	695	297	216	176	142
Percent of log consumption	95	91	85	86	86	86
Veneer and plywood:						
Number of mills	2	21	39	26	25	21
Percent of log consumption	2	7	13	10	12	12
Pulp and board:						
Number of mills	--	9	11	17	18	17
Percent of log consumption	--	1	1/	1/	1/	1/
Other:						
Percent of log consumption	3	1	2	4	2	2

Sources: Burks et al. (1948), May (1953), May and Baker (1957), May (1958), May and Baker (1958), Muerle and Hornibrook (1965), Barrette et al. (1970), Howard (1974), Hiserote and Howard (1978).

1/Less than 0.5 percent. The pulp board industry relies almost entirely on mill residues in the form of chips.

Table 26--Employment in forest industries by resource area and industry sector, California, 1975
(In number of employees)

Resource area	Logging	Sawmills and planing mills	Veneer and plywood mills	Other wood products mills	Pulp and paper mills	Total
North coast	1,350	7,875	1,316	2,193	773	13,507
Central coast	47	277	0	2,329	9,632	12,285
Northern interior	940	3,562	682	428	462	6,074
Sacramento	859	3,591	16	4,518	1,135	10,119
San Joaquin	318	2,682	0	3,790	2,438	9,228
Southern California	46	386	499	15,159	20,137	36,227
All areas	1/3,560	18,373	2,513	28,417	34,577	87,440

Source: State of California, Employment Development Department (1960-75).

1/Does not include contract log haulers and may exclude some independent ("gyppo") loggers.

Conclusions

Forest industries in California employed 87,440 persons in 1975 (table 26). This is about 1.2 percent of total employment and 5.5 percent of manufacturing employment in the entire State. The importance of forest industries varies geographically. They account for over 70 percent of manufacturing employment in 13 counties and over 20 percent of total employment in 20 counties (table 34, appendix). Most of the forest industry employment in southern California and the central coast and some in the Sacramento resource areas do not depend directly on California-grown timber. Roughly 50,000-55,000 persons do depend on California's timber for jobs.

From 1960 to 1975, forest industry employment declined the most in the north coast resource area. (See Zivnuska et al. (1965) for a detailed discussion of forest industry employment in the 1960's.) Employment declined very little in all interior areas combined, though a number of counties dropped slightly (northern interior counties, for example) while other counties increased (Tulare and Yuba, for example).

In a number of counties, forest industry employment declined in number of persons employed but increased as a percent of manufacturing employment. This situation is notable in rural counties with somewhat weak economies such as Lassen, Modoc, Plumas, Siskiyou, and Trinity (see fig. 75).

Many of the counties in which timber has been the economy's foundation are facing an adjustment period because of declining timber supplies. Planners are grappling with questions like: How can we allocate remaining timber stands without sacrificing future yields? Should the economy be diversified, and if so, how? Can a program of forestry intensification save the current forest economy? Wrapped up in these questions are other resource concerns; changing attitudes of society; changing technology; and changing regional, national, and worldwide demand-supply relationships.

California could produce more timber than it has been producing. Current timber growth is only half of the State's biological potential. Forest management intensification during the past few years will result in increased future yields. A much more concerted effort is needed if the State's output is to be maintained or increased. In many cases an increase in timber production can be realized only at the expense of other resource values.

In the long run, California's timber productivity will be dictated by people's decisions more than by the biological potential of the State's forests.

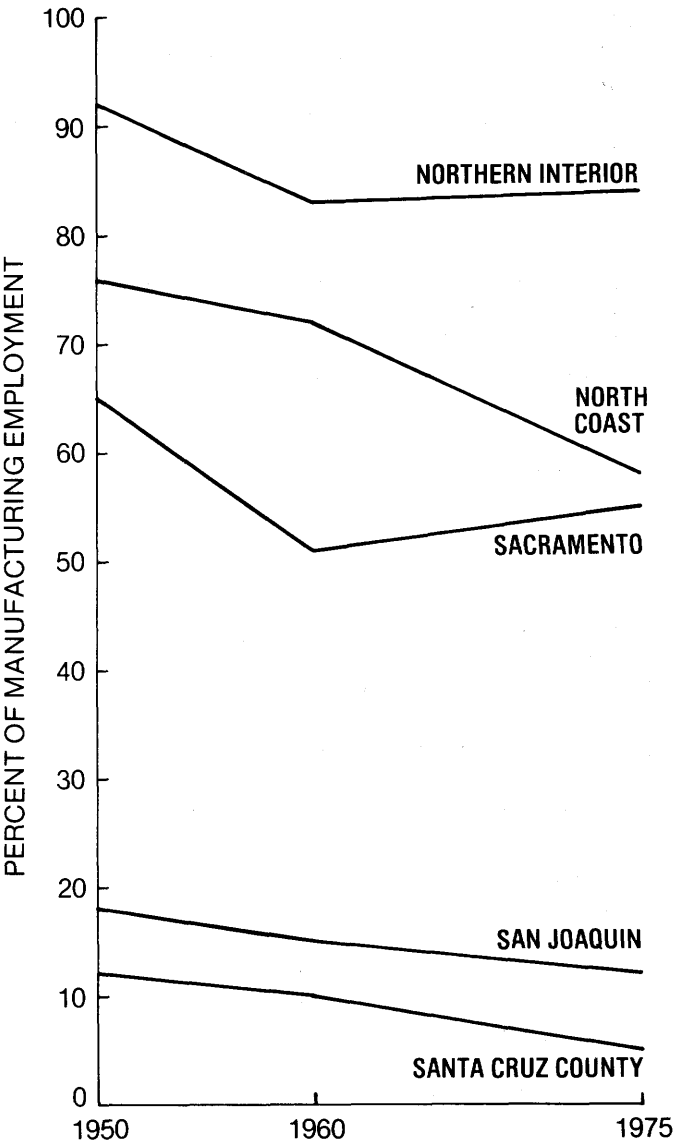


Figure 75. — Employment in forest industries as a percent of manufacturing employment by geographic area in California, 1950, 1960, and 1975.

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Appendix

Table 27--Net volume of growing stock and sawtimber on timberland by ownership, California, 1953 and 1975

Ownership	Growing stock			Sawtimber		
	1953	1975	Percent change	1953	1975	Percent change
	Million cubic feet[1/]			Million board feet (International 1/4-inch rule)[2/]		
National Forest	32,656	29,206	-11	178,913	158,206	-12
Other public	2,791	1,391	-50	14,898	6,809	-54
Private	30,964	19,071	-38	166,190	93,679	-44
Total and average	66,411	49,668	-25	360,001	258,694	-28

1/Includes trees 5.0-inch d.b.h. and larger.
2/Includes trees 11.0-inch d.b.h. and larger. Sawtimber volume was not determined in 1953 for trees 9.0- to 10.9-inch d.b.h.

Table 28--Net volume of sawtimber on timberland by species, California, 1953 and 1975

Species	1953	1975	Percent change
	Million board feet[1/] (International 1/4-inch rule)		
Softwoods:			
Douglas-fir	116,912	71,893	-38
Ponderosa and Jeffrey pines	66,741	50,339	-25
Sugar and western white pines	29,515	21,497	-27
Redwood	36,124	21,239	-41
True firs	88,724	70,034	-21
Incense-cedar and other conifers	16,008	15,617	-2
Total softwoods	354,024	250,619	-29
Hardwoods	5,977	8,075	+35
All species	360,001	258,694	-28

[1/] Includes trees 11.0-inch d.b.h. and larger.

Table 29--Net volume of timber on timberland by class of timber, ownership group, softwoods, and hardwoods, California, 1975 (In billion cubic feet)

Class of timber	National Forest			Other ownerships			National Forest and other ownerships		
	Softwoods	Hardwoods	Total	Softwoods	Hardwoods	Total	Softwoods	Hardwoods	Total
Growing stock trees:									
Sawtimber trees--									
Saw-log portion	25.7	0.3	26.0	16.5	1.0	17.5	42.2	1.3	43.5
Upper-stem portion	1.2	.4	1.6	0.6	0.9	1.5	1.8	1.3	3.1
Total sawtimber	26.9	.7	27.6	17.1	1.9	19.0	44.0	2.6	46.6
Poletimber trees	1.2	.4	1.6	.8	.7	1.5	2.0	1.1	3.1
Total growing stock trees	28.1	1.1	29.2	17.9	2.6	20.5	46.0	3.7	49.7
Cull and dead trees:									
Rough trees	0.1	.3	0.4	0.1	.4	0.5	0.2	0.7	0.9
Rotten trees	.4	.1	.5	.3	.2	.5	.7	.3	1.0
Salvable dead trees	.2	1/	.2	.2	1/	.2	.4	1/	.4
Total cull and dead trees	.7	.4	1.1	.6	.6	1.2	1.3	1.0	2.3
Total all timber	28.8	1.5	30.3	18.5	3.2	21.7	47.3	4.7	52.0

[1/] Less than 50 million cubic feet.

Table 30--Gross and net growth and mortality of softwoods on timberland in National Forests by Forest, California, 1975

(In cubic feet per acre per year)

Forest Service Region and National Forest	Gross growth	Mortality	Net growth
Intermountain Region			
Toiyabe	48	4	44
Pacific Southwest Region			
Angeles	13	7	6
Cleveland	21	1/	21
Eldorado	82	4	78
Inyo	26	2	24
Klamath	57	10	47
Lassen	53	6	47
Los Padres	40	17	23
Mendocino	46	11	35
Modoc	35	6	29
Plumas	59	6	53
San Bernardino	23	4	19
Sequoia	42	6	36
Shasta	56	4	52
Sierra	46	20	26
Six Rivers	47	16	31
Stanislaus	94	7	87
Tahoe	74	9	65
Trinity	39	14	25
Pacific Northwest Region			
Rogue River	31	4	27
Siskiyou	20	4	16
Weighted average for all National Forests	54	9	45

1/Less than 0.5 cubic feet.

Table 31--Net annual growth and biological potential (site class) of softwoods on timberland by resource area, National Forest group, and ownership, California, 1975

(In cubic feet per acre per year)

Resource area[1] and National Forest group	Growth and potential	National Forest	Other public	Forest industry	Other private timber growers	Farmer and miscellaneous private
North coast, and northwestern California National Forests[2]	Net growth	36	28	60	--	36
	Biological potential	85	115	152	--	126
	Net growth as percent of potential	42	24	40	--	28
	Gross growth as percent of potential	58	35	43	--	33
Central coast	Net growth	--	24	96	129	97
	Biological potential	--	146	172	176	164
	Net growth as percent of potential	--	16	56	73	59
	Gross growth as percent of potential	--	24	56	73	60
Northern interior, and northeastern California National Forests[3]	Net growth	46	28	36	36	28
	Biological potential	89	68	87	77	72
	Net growth as percent of potential	52	41	41	46	39
	Gross growth as percent of potential	57	51	50	54	46
Sacramento, and northern Sierra Nevada National Forests[4]	Net growth	61	37	56	46	48
	Biological potential	91	72	92	96	81
	Net growth as percent of potential	67	52	61	48	60
	Gross growth as percent of potential	74	70	73	62	68
San Joaquin, and southern Sierra Nevada National Forests[5]	Net growth	48	35	56	56	54
	Biological potential	83	82	129	95	86
	Net growth as percent of potential	58	43	44	58	63
	Gross growth as percent of potential	71	49	60	69	71
Southern California National Forests[6]	Net growth	20	--	--	--	--
	Biological potential	53	--	--	--	--
	Net growth as percent of potential	38	--	--	--	--
	Gross growth as percent of potential	49	--	--	--	--

[1] For lands outside National Forests data are grouped by county as shown in figure 3.

[2] Includes California portion of Klamath, Mendocino, Rogue River, Siskiyou, Six Rivers, and Trinity National Forests.

[3] Includes Lassen, Modoc, and Shasta National Forests.

[4] Includes Eldorado, Plumas, and Tahoe National Forests.

[5] Includes Sequoia, Sierra, Stanislaus, and California portion of Toiyabe National Forests.

[6] Includes Angeles, Cleveland, Los Padres, San Bernardino, and California portion of Inyo National Forests.

Table 32--Acres of forest planting and seeding by ownership, California, 1964-77[1/]
(In acres)

Year	National Forest			Other public			Forest industry			Other private timber growers[2/]			Farmer and miscellaneous private			Total
	North coast	Other resource areas	State total	North coast	Other resource areas	State total	North coast	Other resource areas	State total	North coast	Other resource areas	State total	North coast	Other resource areas	State total	
1964	NA	NA	20,931	8	4,057	4,065	4,907	1,976	6,883	NA	NA	117	1,063	1,232	2,295	34,291
1965	NA	NA	18,569	26	4,107	4,133	6,352	0	6,352	NA	NA	2,281	1,461	2,026	3,487	34,822
1966	NA	NA	22,880	37	2,496	2,533	7,900	0	7,900	NA	NA	923	1,409	3,286	4,695	38,931
1967	NA	NA	27,357	32	2,858	2,890	6,826	380	7,206	NA	NA	311	2,110	3,541	5,651	43,415
1968	NA	NA	38,553	34	2,842	2,876	5,633	0	5,633	NA	NA	1,303	852	2,753	3,605	51,970
1969	NA	NA	29,656	16	2,533	2,549	11,050	6	11,056	NA	NA	926	870	3,050	3,920	48,107
1970	NA	NA	29,383	31	4,092	4,123	12,885	1,032	13,917	NA	NA	917	4,705	3,057	7,762	56,102
1971	NA	NA	25,957	37	2,658	2,695	18,429	1,739	20,168	NA	NA	475	1,544	3,996	5,540	54,835
1972	NA	NA	30,814	36	3,225	3,261	18,210	3,373	21,583	NA	NA	855	1,835	4,463	6,298	62,811
1973	NA	NA	31,358	150	3,174	3,324	17,186	3,472	20,658	NA	NA	1,542	4,266	3,974	8,240	65,122
1974	NA	NA	28,146	123	1,034	1,157	12,940	0	12,940	NA	NA	532	2,381	1,989	4,370	47,145
1975	NA	NA	30,175	11	960	971	10,388	7,423	17,811	NA	NA	2,551	1,604	3,306	4,910	56,418
1976	NA	NA	31,450	NA	NA	1,750	NA	NA	23,933	NA	NA	2,955	NA	NA	5,250	65,338
1977	NA	NA	33,719	NA	NA	2,202	NA	NA	37,449	NA	NA	5,133	NA	NA	4,557	83,060

NA = Not available.

1/ Based on fiscal years (from July 1 of the preceding year to June 30; except for 1976 which ran from July 1, 1975 to September 30, 1976; and 1977 which ran from October 1, 1976 to September 30, 1977). Sources: USDA Forest Service (1964-78) and field records of State of California, Department of Forestry, on file in Sacramento.

2/ Classified as "other industry" in the USDA Forest Service (1964-78) forest planting reports.

Table 33--Potential yield[1/] of timber in National Forests by Forest and timberland component, California, for the current planning period

Forest Service Region and National Forest	Standard component	Special component	Marginal component	Total for all components
	- - - Percent of potential yield - - -			Cubic feet per acre per year
Intermountain Region:				
Toiyabe	54	1	45	31.9
Pacific Southwest Region:				
Angeles	--	65	35	11.3
Cleveland	--	100	--	0.9
Eldorado	88	11	1	58.2
Inyo	70	1	29	15.7
Klamath	88	1	11	47.3
Lassen	84	1	15	39.3
Los Padres	--	100	--	4.7
Mendocino	95	2	3	43.0
Modoc	62	19	19	22.7
Plumas	67	2	31	54.3
San Bernardino	--	100	--	10.3
Sequoia	88	6	6	46.3
Shasta	67	6	27	50.8
Sierra	89	6	5	47.8
Six Rivers	69	--	31	59.0
Stanislaus	77	6	17	56.5
Tahoe	91	5	4	47.2
Trinity	63	1	36	50.8
Pacific Northwest Region:				
Rogue River	94	6	--	65.0
Siskiyou	100	--	--	45.0
Average for all National Forests	78	4	18	45.1

[1/] The maximum timber harvest planned for the next 10 years to achieve the optimum perpetual sustained-yield harvesting level attainable with intensive forestry on regulated areas.

Table 34--Employment in forest industry, percent of manufacturing employment, and percent of total employment by resource area and county, California, 1950, 1960, and 1975[1/]

Resource area and county	1950			1960			1975		
	Thousands of persons employed	Percent of manufacturing employment	Percent of total employment	Thousands of persons employed	Percent of manufacturing employment	Percent of total employment	Thousands of persons employed	Percent of manufacturing employment	Percent of total employment
North coast:									
Del Norte	0.9	90	30	2.3	92	38	1.5	94	35
Humboldt	8.7	89	33	11.1	87	30	6.9	83	24
Mendocino	4.1	92	29	4.3	81	25	3.5	79	24
Sonoma	.9	23	2	2.1	29	4	1.6	18	3
	14.6	76	18	19.8	73	18	13.5	58	13
Northern interior:									
Lassen	1.9	95	29	0.7	81	15	0.4	90	13
Modoc	.7	90	18	.3	80	10	.2	90	8
Shasta	2.3	88	18	3.2	83	16	3.0	79	13
Siskiyou	3.2	93	29	2.2	87	18	1.9	90	22
Trinity	.6	99	36	1.0	96	31	.6	99	31
	8.7	92	24	7.4	83	17	6.1	85	16
Sacramento:									
Lake	.1	56	4	.1	28	2	.1	32	2
Butte	1.8	55	8	1.4	45	5	1.4	40	5
Eldorado	1.3	90	22	.9	51	9	.7	70	6
Glenn	2/	--	--	.2	34	3	.1	17	2
Nevada	.4	63	6	.6	55	8	.5	50	8
Placer	.4	38	3	.7	28	4	.7	40	4
Plumas	1.5	95	30	.9	92	22	.8	96	28
Sierra	.2	83	21	.3	98	32	.2	NA	NA
Tehama	.5	59	6	1.5	68	17	1.5	78	22
Yuba	.6	65	7	.5	46	5	.8	69	8
	6.8	65	9	7.1	51	7	6.8	3/55	7
San Joaquin:									
Amador	.4	81	15	.5	66	15	.7	90	23
Calaveras	.7	72	26	.7	53	18	.1	22	4
Fresno	.9	10	1	1.3	8	1	1.5	8	1
Kern	.2	3	--	.1	1	4/	.2	2	4/
Madera	.2	26	2	.4	35	3	.4	19	3
Mariposa	.1	86	6	.1	53	3	2/	51	1
Tulare	.6	18	1	.4	8	1	1.4	17	2
Tuolomne	.8	85	19	.8	79	17	.6	87	11
	3.9	18	2	4.3	13	1	4.9	12	1
Central coast:									
Santa Cruz	.3	12	1	.5	10	2	.3	5	1

NA = Not available.

1/ Includes only heavily timbered counties with forest industry employment of 100 or more persons in 1950, 1960, or 1975.

2/ Less than 50 persons.

3/ Excludes Sierra County for which manufacturing employment was omitted to avoid disclosure.

4/ Less than 0.5 percent.

Table 35--Total land and total timberland area managed by the USDA Forest Service by Region and National Forest or management unit, California, 1975
(In thousand acres)

Region and National Forest or management unit	Total land	Total timberland
Intermountain Region:		
Toiyabe	632	120
Pacific Southwest Region:		
Angeles	650	31
Cleveland	416	12
Eldorado	575	314
Inyo	1,604	90
Klamath	1,672	1,016
Lassen	1,142	759
Los Padres	1,750	80
Mendocino	876	350
Modoc	1,635	558
Plumas	1,162	769
San Bernardino	631	119
Sequoia	1,303	456
Shasta	1,036	498
Sierra	1,286	534
Six Rivers	969	775
Stanislaus	897	464
Tahoe	781	521
Tahoe Basin management unit	108	46
Trinity	1,041	588
Total	19,534	7,980
Pacific Northwest Region:		
Rogue River	52	44
Siskiyou	32	24
Total	84	68
All Regions	20,250	8,168

Table 36--Area of timberland outside National Forests by county and ownership, California, 1975
(In thousand acres)

County	Other public	Forest industry	Other private timber growers	Farmer and miscellaneous private	Total private	All ownerships outside National Forests
Alameda	--	--	--	--	--	--
Alpine	2	--	--	16	16	18
Amador	1	22	4	37	63	64
Butte	10	113	46	79	238	248
Calaveras	8	64	2	60	126	134
Colusa	--	--	--	3	3	3
Contra Costa	--	--	--	--	--	--
Del Norte	--	143	--	21	164	164
Eldorado	11	99	5	167	271	282
Fresno	1	3	9	23	35	36
Glenn	--	20	--	11	31	31
Humboldt	130	527	--	741	1,268	1,398
Imperial	--	--	--	--	--	--
Inyo	--	--	--	2	2	2
Kern	1	--	--	34	34	35
Kings	--	--	--	--	--	--
Lake	--	12	--	47	59	59
Lassen	15	74	203	38	315	330
Los Angeles	--	--	--	1	1	1
Madera	--	3	3	9	15	15
Marin	--	--	--	7	7	7
Mariposa	1	1	--	43	44	45
Mendocino	98	468	--	628	1,096	1,194
Merced	--	--	--	--	--	--
Modoc	2	29	115	34	178	180
Mono	1	--	--	6	6	7
Monterey	1	--	--	26	26	27
Napa	--	--	--	36	36	36
Nevada	13	5	46	140	191	204
Orange	--	--	--	--	--	--
Placer	15	58	25	101	184	199
Plumas	4	138	73	93	304	308
Riverside	--	--	--	5	5	5
Sacramento	--	--	--	--	--	--
San Benito	--	--	--	--	--	--
San Bernardino	--	--	--	13	13	13
San Diego	1	--	--	16	16	17
San Francisco	--	--	--	--	--	--
San Joaquin	--	--	--	--	--	--
San Luis Obispo	--	--	--	1	1	1
San Mateo	1	8	--	35	43	44
Santa Barbara	--	--	--	--	--	--
Santa Clara	2	--	--	12	12	14
Santa Cruz	6	2	17	110	129	135
Shasta	67	221	388	173	782	849
Sierra	3	30	10	57	97	100
Siskiyou	24	233	213	265	711	735
Solano	--	--	--	--	--	--
Sonoma	1	60	--	199	259	260
Stanislaus	--	--	--	--	--	--
Sutter	--	--	--	3	3	3
Tehama	4	222	--	19	241	245
Trinity	46	76	167	171	414	460
Tulare	21	4	--	18	22	43
Tuolumne	7	52	3	53	108	115
Ventura	--	--	--	1	1	1
Yolo	--	--	--	2	2	2
Yuba	2	1	19	40	60	62
Total	499	2,688	1,348	3,596	7,632	8,131

Table 37--Net volume of growing stock and sawtimber on timberland outside National Forests by county and ownership class, California, 1975

County	Other public		Private		Total	
	Million cubic feet[1]	Million board feet[2] Scribner rule	Million cubic feet[1]	Million board feet[2] Scribner rule	Million cubic feet[1]	Million board feet[2] Scribner rule
Alpine	2	10	36	163	38	173
Amador	1	5	217	1,067	218	1,072
Butte	10	48	589	2,263	599	2,311
Calaveras	16	73	344	1,651	360	1,724
Colusa	--	--	2	9	2	9
Del Norte	--	--	468	2,256	468	2,256
Eldorado	30	130	924	4,512	954	4,642
Fresno	5	21	117	562	122	583
Glenn	--	--	87	481	87	481
Humboldt	524	2,607	3,043	12,830	3,567	15,437
Kern	2	9	73	321	75	330
Lake	--	--	85	408	85	408
Lassen	15	60	537	1,997	552	2,057
Madera	--	--	34	150	34	150
Marin	--	--	43	204	43	204
Mariposa	3	10	103	456	106	466
Mendocino	297	1,191	2,816	10,443	3,113	11,634
Modoc	3	10	242	828	245	838
Mono	--	--	17	79	17	79
Monterey	2	7	131	627	133	634
Napa	--	--	48	194	48	194
Nevada	17	59	481	2,258	498	2,317
Placer	29	134	644	3,277	673	3,411
Plumas	22	112	738	3,173	760	3,285
San Mateo	1	6	281	1,325	282	1,331
Santa Clara	2	11	77	357	79	368
Santa Cruz	40	160	621	2,571	661	2,731
Shasta	85	292	1,602	7,453	1,687	7,745
Sierra	4	13	359	1,868	363	1,881
Siskiyou	23	78	1,107	4,749	1,130	4,827
Sonoma	2	8	659	3,122	661	3,130
Sutter	--	--	4	18	4	18
Tehama	7	34	740	3,482	747	3,516
Trinity	145	642	1,216	5,783	1,361	6,425
Tulare	93	444	48	215	141	659
Tuolumne	8	34	325	1,526	333	1,560
Yolo	--	--	2	8	2	8
Yuba	3	11	136	611	139	622
Southern California[3]	2	11	83	433	85	444
Total[4]	1,393	6,230	19,079	83,730	20,472	89,960

[1] Includes trees 5.0-inch d.b.h. and larger.
[2] Includes trees 11.0-inch d.b.h. and larger.
[3] Includes Inyo, Los Angeles, Riverside, San Bernardino, San Diego, San Luis Obispo, and Ventura Counties.
[4] Totals may be off because of rounding.

Table 38--Net volume of growing stock on timberland in National Forests by Forest and species, California, 1975
(In million cubic feet)

Forest Service Region and National Forest	Douglas-fir	Ponderosa and Jeffrey pines	True firs	Hemlocks and spruce	Sugar and western white pines	Redwood	Giant sequoia	Incense-cedar	Other cedars	Lodgepole pine	Other softwoods	Total softwoods	Hardwoods	All species
Intermountain Region:														
Toiyabe	--	91	38	20	13	--	--	--	--	99	46	307	3	310
Pacific Southwest Region:														
Angeles	--	24	6	--	5	--	--	1	--	1	6	43	2	45
Cleveland	--	7	--	--	--	--	--	1	--	--	4	12	6	18
Eldorado	96	344	523	--	69	--	--	68	--	19	--	1,119	34	1,153
Inyo	--	73	57	6	4	--	--	--	--	25	--	165	--	165
Klamath	1,863	381	822	20	483	--	--	64	9	29	--	3,671	174	3,845
Lassen	93	660	1,141	--	175	--	--	63	--	79	1	2,212	8	2,220
Los Padres	4	57	14	--	5	107	--	--	--	--	16	203	35	238
Mendocino	622	265	268	--	103	--	--	25	--	--	20	1,303	43	1,346
Modoc	--	459	368	6	23	--	--	18	--	33	--	907	7	914
Plumas	415	691	1,244	--	293	--	--	133	--	15	--	2,791	47	2,838
San Bernardino	--	111	47	--	20	--	--	8	--	2	7	195	23	218
Sequoia	--	528	843	--	189	--	45	62	--	55	8	1,730	32	1,762
Shasta	495	339	382	--	132	--	--	56	--	14	--	1,418	35	1,453
Sierra	21	595	953	--	222	--	--	80	--	146	4	2,021	37	2,058
Six Rivers	2,223	93	428	--	178	--	--	43	28	--	1	2,994	276	3,270
Stanislaus	53	499	741	19	251	--	--	300	--	67	8	1,938	130	2,068
Tahoe	248	414	1,107	10	281	--	--	102	--	49	--	2,211	69	2,280
Trinity	1,652	392	241	--	222	--	--	35	--	--	1	2,543	163	2,706
Total	7,785	5,932	9,185	61	2,655	107	45	1,059	37	534	76	27,476	1,121	28,597
Pacific Northwest Region:														
Rogue River	81	11	79	9	12	--	--	3	--	1	1	197	--	197
Siskiyou	73	1	3	2	6	2	--	--	--	--	5	92	10	102
Total	154	12	82	11	18	2	--	3	--	1	6	289	10	299
All Regions	7,939	6,035	9,305	92	2,686	109	45	1,062	37	634	128	28,072	1,134	29,206

Table 39--Net volume of sawtimber on timberland in National Forests by Forest and species, California, 1975
(In million board feet, Scribner rule)

Forest Service Region and National Forest	Douglas-fir	Ponderosa and Jeffrey pines	True firs	Hemlocks and spruce	Sugar and western white pines	Redwood	Giant sequoia	Incense-cedar	Other cedars	Lodgepole pine	Other softwoods	Total softwoods	Hardwoods	All species
Intermountain Region:														
Toiyabe	--	378	176	100	69	--	--	--	--	426	110	1,259	10	1,269
Pacific Southwest Region:														
Angeles	0	151	30	0	29	0	0	2	0	7	31	250	8	258
Cleveland	0	46	1	0	0	0	0	3	0	0	19	69	19	88
Eldorado	494	2,222	2,775	--	454	--	--	364	--	94	--	6,403	174	6,577
Inyo	--	436	322	35	22	--	--	--	--	137	--	952	--	952
Klamath	9,508	1,743	3,839	64	2,545	--	--	267	45	69	109	18,189	232	18,421
Lassen	513	3,384	5,336	--	1,004	--	--	278	--	179	--	10,694	9	10,703
Los Padres	24	356	64	0	30	628	0	0	0	0	77	1,179	149	1,328
Mendocino	3,426	1,420	1,409	--	594	--	--	123	--	--	106	7,078	79	7,157
Modoc	--	2,050	1,588	22	116	--	--	59	--	89	--	3,924	12	3,936
Plumas	2,090	3,526	6,119	--	1,705	--	--	559	--	62	3	14,064	91	14,155
San Bernardino	0	690	230	0	110	0	0	18	0	11	56	1,115	64	1,179
Sequoia	--	2,643	4,221	--	946	--	226	310	--	276	41	8,663	151	8,814
Shasta	2,373	1,574	1,824	--	727	--	--	231	--	36	3	6,768	51	6,819
Sierra	115	3,611	5,308	--	1,302	--	--	392	--	649	4	11,381	175	11,556
Six Rivers	11,159	568	2,264	--	977	--	--	188	139	--	2	15,297	411	15,708
Stanislaus	241	2,404	3,488	64	1,260	--	--	1,181	--	383	42	9,063	698	9,761
Tahoe	1,133	2,209	5,332	31	1,570	--	--	374	--	171	--	10,820	118	10,938
Trinity	9,504	2,194	1,142	--	1,319	--	--	160	--	--	4	14,323	327	14,650
Total	40,580	31,227	45,292	216	14,710	628	226	4,509	184	2,163	497	140,232	2,768	143,000
Pacific Northwest Region:														
Rogue River	409	58	389	33	66	--	--	15	--	3	4	977	--	977
Siskiyou	421	4	12	10	31	12	--	3	1	--	21	515	36	551
Total	830	62	401	43	97	12	--	18	1	3	25	1,492	36	1,528
All Regions	41,410	31,667	45,869	359	14,876	640	226	4,527	185	2,592	632	142,983	2,814	145,797

Table 40--Net volume of growing stock on timberland outside National Forests by resource area, ownership, and species, California, 1975
(In million cubic feet)

Resource area and ownership	Douglas-fir	Ponderosa and Jeffrey pines	True firs	Hemlocks and spruce	Sugar and western white pines	Redwood	Giant sequoia	Incense-cedar	Other cedars	Lodgepole pine	Other softwoods	Total softwoods	Hardwoods	All species
North coast:														
Other public	435.6	4.3	14.9	--	9.5	143.6	--	1.1	--	--	--	609.0	213.7	822.7
Forest industry	891.9	18.1	86.5	63.9	1.4	2,064.0	--	3.9	8.5	--	--	3,138.1	477.4	3,615.5
Farmer and miscellaneous private	1,154.4	22.6	38.6	19.7	--	1,161.6	--	1.7	3.7	7.8	35.5	2,445.7	924.1	3,369.8
Total 1/	2,481.8	45.0	140.1	83.6	10.9	3,369.2	--	6.7	12.1	7.8	35.5	6,192.9	1,615.1	7,808.0
Central coast:														
Other public	2.1	1.6	--	--	--	29.2	--	--	--	--	--	33.0	11.5	44.5
Forest industry	6.9	--	--	--	--	60.9	--	--	1.3	--	--	69.2	6.9	76.1
Other private timber growers	3.3	--	--	--	--	42.3	--	--	2.4	--	--	48.1	9.8	57.9
Farmer and miscellaneous private	193.3	7.8	--	--	--	639.3	--	--	42.0	--	--	882.3	135.8	1,018.1
Total 1/	205.6	9.5	--	--	--	771.8	--	--	45.7	--	--	1,032.6	164.0	1,196.7
Northern interior:														
Other public	152.4	57.8	22.2	--	10.3	--	--	1.0	--	2.5	0.1	246.7	23.9	270.6
Forest industry	310.9	321.6	569.4	3.1	118.6	--	--	101.2	--	6.7	9.7	1,441.2	45.3	1,486.5
Other private timber growers	471.5	654.1	727.1	--	174.6	--	--	147.3	--	19.3	2.6	2,196.0	60.4	2,256.9
Farmer and miscellaneous private	347.6	277.3	104.4	0.6	27.1	--	--	46.2	--	17.0	--	820.3	136.6	956.9
Total 1/	1,282.3	1,310.8	1,423.1	3.8	330.6	--	--	295.8	--	45.5	12.8	4,704.7	266.3	4,971.0
Sacramento:														
Other public	33.1	36.3	16.6	--	7.7	--	--	11.4	--	--	--	105.1	17.2	122.2
Forest industry	436.9	535.3	765.2	4.7	310.5	--	--	196.9	--	53.8	--	2,303.3	120.6	2,423.9
Other private timber growers	78.1	75.5	427.1	--	41.1	--	--	77.6	--	43.6	--	743.0	45.9	788.9
Farmer and miscellaneous private	259.3	451.6	410.2	--	60.5	6.3	--	180.9	--	66.1	--	1,434.7	190.0	1,624.7
Total 1/	807.3	1,098.7	1,619.1	4.7	419.8	6.3	--	466.8	--	163.4	--	4,586.1	373.7	4,959.7
San Joaquin:														
Other public	1.1	27.9	16.7	--	16.5	--	38.3	12.3	--	--	--	112.9	16.0	128.8
Forest industry	12.6	189.3	184.3	--	52.0	--	--	67.1	--	--	--	505.3	28.8	534.1
Other private timber growers	24.2	31.7	12.0	--	4.1	--	--	5.4	--	2.9	--	80.3	5.3	85.6
Farmer and miscellaneous private	31.3	333.3	89.2	.6	58.1	--	--	86.2	--	14.8	--	613.5	79.4	692.9
Total 1/	69.2	582.2	302.3	.6	130.7	--	38.3	171.0	--	17.7	--	1,311.9	129.5	1,441.4
Southern California:														
Other public	2/	1.1	0.4	--	0.2	--	--	0.1	--	2/	.2	1.9	0.3	2.1
Farmer and miscellaneous private	0.9	42.2	14.0	--	6.6	--	--	1.9	--	0.7	6.2	72.6	10.5	83.1
Total 1/	1.0	43.3	14.4	--	6.8	--	--	2.0	--	.7	6.2	74.4	10.8	85.2
All resource areas:														
Other public	624.3	129.0	70.8	--	44.2	172.9	38.3	25.8	--	2.5	.7	1,108.5	282.5	1,391.1
Forest industry	1,659.1	1,064.3	1,605.4	71.7	482.5	2,125.0	--	369.2	9.8	60.5	9.7	7,457.0	679.0	8,136.1
Other private timber growers	1,821.2	761.3	1,166.2	--	219.8	42.3	--	230.3	2.4	65.8	2.6	3,067.9	121.4	3,189.3
Farmer and miscellaneous private	1,986.8	1,134.8	656.5	20.9	152.3	1,807.2	--	317.0	45.7	106.4	41.8	6,269.2	1,476.4	7,745.6
Total 1/	4,847.3	3,089.4	3,498.9	92.6	898.7	4,147.3	38.3	942.3	57.9	235.2	54.7	17,902.6	2,559.4	20,462.0

1/Totals may be off because of rounding.

2/Less than 50,000.

Table 41--Net volume of sawtimber on timberland outside National Forests by resource area, ownership, and species, California, 1975
(In million board feet, Scribner rule)

Resource area and ownership	Douglas-fir	Ponderosa and Jeffrey pines	True firs	Hemlocks and spruce	Sugar and western white pines	Redwood	Giant sequoia	Incense-cedar	Other cedars	Lodgepole pine	Other softwoods	Total softwoods	Hardwoods	All species
North coast:														
Other public	2,533.2	12.9	95.0	--	64.0	658.6	--	3.2	--	--	--	3,366.9	439.1	3,806.0
Forest industry	4,483.7	73.9	463.7	331.4	5.6	9,443.7	--	16.6	44.7	--	--	14,863.4	838.9	15,702.3
Farmer and miscellaneous private	5,459.4	121.0	158.4	83.8	--	5,072.7	--	3.2	14.1	30.5	147.1	11,090.2	1,859.6	12,949.8
Total1/	12,476.3	207.8	717.1	415.2	69.7	15,175.0	--	22.9	58.8	30.5	147.1	29,320.5	3,137.5	32,458.0
Central coast:														
Other public	13.3	9.9	--	--	--	139.8	--	--	--	--	--	163.1	19.5	182.5
Forest industry	39.3	--	--	--	--	288.7	--	--	3.1	--	--	331.1	8.5	339.6
Other private timber growers	13.9	--	--	--	--	135.0	--	--	1.3	--	--	150.1	10.1	160.2
Farmer and miscellaneous private	1,125.0	49.8	--	--	--	2,961.8	--	--	175.9	--	--	4,312.6	266.5	4,579.0
Total1/	1,191.5	59.7	--	--	--	3,525.4	--	--	180.3	--	--	4,956.9	304.6	5,261.5
Northern interior:														
Other public	652.8	237.5	94.4	--	47.4	--	--	3.7	--	12.9	--	1,048.7	33.1	1,081.8
Forest industry	1,470.5	1,433.4	2,542.1	6.0	652.9	--	--	398.1	--	13.6	26.9	6,543.5	96.5	6,640.0
Other private timber growers	2,320.9	3,030.1	3,651.8	--	979.7	--	--	580.1	--	56.0	9.5	10,628.2	112.4	10,740.6
Farmer and miscellaneous private	1,375.0	981.4	431.5	2.5	126.9	--	--	166.8	--	40.4	--	3,124.5	303.2	3,427.7
Total1/	5,819.1	5,682.5	6,719.8	8.5	1,806.9	--	--	1,148.7	--	123.0	36.4	21,344.9	545.1	21,890.0
Sacramento:														
Other public	171.3	170.4	77.4	--	43.5	--	--	43.9	--	--	--	506.5	35.0	541.5
Forest industry	2,136.0	2,595.2	4,090.0	22.2	1,721.0	--	--	744.4	--	287.5	--	11,596.4	163.2	11,759.6
Other private timber growers	367.4	333.6	2,400.1	--	211.3	--	--	327.6	--	216.8	--	3,856.7	42.6	3,899.3
Farmer and miscellaneous private	1,183.1	1,934.5	2,044.0	--	304.8	26.8	--	677.3	--	300.3	--	6,470.8	432.5	6,903.3
Total1/	3,857.8	5,033.6	8,611.4	22.2	2,280.7	26.8	--	1,793.2	--	804.5	--	22,430.3	673.3	23,103.6
San Joaquin:														
Other public	4.0	141.8	85.6	--	99.5	--	191.5	49.8	--	--	--	572.3	33.0	605.2
Forest industry	47.1	1,005.5	1,034.1	--	283.2	--	--	235.9	--	--	--	2,605.8	73.6	2,679.4
Other private timber growers	150.6	181.9	68.3	--	21.7	--	--	21.4	--	12.2	--	456.1	12.0	468.1
Farmer and miscellaneous private	143.4	1,553.1	472.1	--	298.5	--	--	324.2	--	58.6	--	2,851.2	192.2	3,043.3
Total1/	345.2	2,882.3	1,660.0	--	702.9	--	191.5	631.4	--	70.8	--	6,485.4	310.7	6,796.1
Southern California:														
Other public	0.1	6.4	1.6	--	0.9	--	--	0.1	--	0.1	0.9	10.2	0.9	11.1
Farmer and miscellaneous private	4.9	249.3	64.3	--	34.8	--	--	4.5	--	3.4	36.2	397.4	35.8	433.2
Total1/	5.0	255.7	65.9	--	35.7	--	--	4.6	--	3.5	37.1	407.6	36.7	444.3
All resource areas:														
Other public	3,374.8	579.0	354.0	--	255.4	798.4	191.5	100.7	--	13.0	.9	5,667.6	560.4	6,228.1
Forest industry	8,176.6	5,108.0	8,129.9	359.6	2,662.7	9,732.5	--	1,395.0	47.8	301.1	26.9	35,940.2	1,180.7	37,120.9
Other private timber growers	2,852.7	3,545.6	6,120.3	--	1,212.8	135.0	--	929.1	1.3	285.0	9.5	15,091.1	177.1	15,268.2
Farmer and miscellaneous private	9,290.8	4,889.1	3,170.2	87.5	765.0	8,061.3	--	1,176.0	190.0	433.2	183.3	28,246.5	3,090.3	31,336.8
Total1/	23,695.0	14,121.7	17,774.3	447.1	4,895.9	18,727.2	191.5	3,600.8	239.1	1,032.3	220.6	84,945.5	5,008.5	89,954.0

1/Totals may be off because of rounding.

Table 42--Net annual growth of growing stock on timberland in National Forests by Forest and species, California, 1975
(In million cubic feet)

Forest Service Region and National Forest	Douglas-fir	Ponderosa and Jeffrey pines	True firs	Sugar and western white pines	Redwood and giant sequoia	Other softwoods	Total softwoods	Hardwoods	All species
Intermountain Region:									
Toiyabe	--	1.3	0.5	0.1	--	3.2	5.1	0.1	5.2
Pacific Southwest Region:									
Angeles	--	0.1	1/	1/	--	0.1	0.2	--	0.2
Cleveland	--	.2	1/	--	--	.1	.3	--	.3
Eldorado	2.0	6.4	12.0	1.5	--	2.4	24.3	--	24.3
Inyo	--	1.4	.5	1/	--	.2	2.1	1/	2.1
Klamath	17.6	7.5	16.7	3.4	--	2.3	47.5	6.7	54.2
Lassen	0.9	9.1	22.6	1.5	--	1.6	35.7	.3	36.0
Los Padres	1/	.4	.2	1/	2/0.8	.5	1.9	--	1.9
Mendocino	5.0	3.0	3.1	1.0	--	.3	12.4	1.4	13.8
Modoc	--	8.5	7.4	.3	--	3/-.1	16.1	.2	16.3
Plumas	5.2	10.4	21.8	2.4	--	1.3	41.1	1.1	42.2
San Bernardino	--	1.1	.5	.2	--	.5	2.3	--	2.3
Sequoia	--	4.0	7.8	1.8	4/.9	1.6	16.1	.1	16.2
Shasta	9.7	8.0	9.8	2.1	--	1.4	31.0	1.3	32.3
Sierra	.1	3.5	6.7	1.5	--	2.0	13.8	.1	13.9
Six Rivers	18.3	.8	3.5	1.5	--	.6	24.7	--	24.7
Stanislaus	.9	7.2	15.0	5.3	--	11.9	40.3	--	40.3
Tahoe	4.2	6.8	15.8	2.9	--	2.2	31.9	1.7	33.6
Trinity	9.5	2.8	2.6	.1	--	.1	15.1	2.8	17.9
Total 5/	73.4	81.2	146.0	25.4	1.7	29.0	356.8	15.8	372.7
Pacific Northwest Region:									
Rogue River	.7	.1	.3	.1	--	.1	1.2	--	1.2
Siskiyou	.2	1/	.1	1/	--	.1	.4	.2	.6
Total	.9	.1	.4	.1	--	.2	1.6	.2	1.8
All Regions 5/	74.3	82.6	146.9	25.6	1.7	32.5	363.5	16.1	379.7

1/ Less than 50,000 cubic feet.
2/ Coastal redwood.
3/ Minus sign indicates that mortality exceeds gross growth.
4/ Giant sequoia.
5/ Totals may be off because of rounding.

Table 43--Net annual growth of sawtimber on timberland in National Forests by Forest and species, California, 1975
(In million board feet, Scribner rule)

Forest Service Region and National Forest	Douglas-fir	Ponderosa and Jeffrey pines	True firs	Sugar and western white pines	Redwood and giant sequoia	Other softwoods	Total softwoods	Hardwoods	All species
Intermountain Region:									
Toiyabe	--	4.7	1.9	0.5	--	4.9	12.0	0.3	12.3
Pacific Southwest Region:									
Angeles	--	0.8	0.1	.1	--	0.2	1.2	--	1.2
Cleveland	--	1.1	1/	--	--	.4	1.5	--	1.5
Eldorado	10.1	39.3	65.0	9.7	--	12.2	136.3	--	136.3
Inyo	--	7.6	3.1	.1	--	1.2	12.0	1/	12.0
Klamath	70.6	23.0	75.8	17.6	--	2.7	189.7	7.1	196.8
Lassen	3.9	33.8	95.5	7.5	--	3.4	144.1	.3	144.4
Los Padres	0.1	2.3	.9	.2	2/5.0	2.4	10.9	--	10.9
Mendocino	18.1	14.2	13.8	4.5	--	1.4	52.0	2.0	54.0
Modoc	--	25.4	32.8	1.4	--	1.5	61.1	1/	61.1
Plumas	21.7	44.2	108.0	11.9	--	5.5	191.3	1.8	193.1
San Bernardino	--	6.7	2.7	1.2	--	2.5	13.1	--	13.1
Sequoia	--	18.5	37.3	8.1	3/4.5	7.7	76.1	.5	76.6
Shasta	34.5	34.1	40.3	9.5	--	5.6	124.0	1.2	125.2
Sierra	.9	20.9	41.0	9.1	--	10.2	82.1	.6	82.7
Six Rivers	99.6	4.7	19.4	8.2	--	2.8	134.7	--	134.7
Stanislaus	3.1	35.5	61.6	22.6	--	33.8	156.6	--	156.6
Tahoe	19.6	31.8	80.0	15.5	--	9.4	156.3	4.0	160.3
Trinity	48.3	14.6	13.2	.2	--	1.2	77.5	6.0	83.5
Total 4/	330.5	358.5	690.5	127.4	9.5	104.1	1,620.5	23.5	1,644.0
Pacific Northwest Region:									
Rogue River	2.7	.4	.5	.5	--	.2	4.4	--	4.4
Siskiyou	1.0	1/	.2	1/	--	.3	1.5	.6	2.2
Total	3.7	.4	.7	.5	--	.5	5.9	.6	6.6
All Regions 4/	334.2	363.6	693.1	128.4	9.5	109.5	1,638.4	24.4	1,663.0

1/ Less than 50,000 board feet.
2/ Coastal redwood.
3/ Giant sequoia.
4/ Totals may be off because of rounding.

Table 44--Net annual growth of growing stock on timberland outside National Forests by resource area, ownership, and species, California, 1975
(In million cubic feet)

Resource area and ownership	Douglas-fir	Ponderosa and Jeffrey pines	True firs	Sugar and western white pines	Redwood	Giant sequoia	Incense-cedar	Other softwoods	Residuals and ingrowth[1]	Total softwoods	Hardwoods	All species
North coast:												
Other public	2.7	0.1	[2]-0.6	[3]	3.3	--	[3]	--	0.9	6.4	4.8	11.2
Forest industry	21.0	.6	1.5	[3]	42.0	--	[3]	2.3	4.9	72.3	14.3	86.6
Farmer and miscellaneous private	17.8	.8	.8	--	30.3	--	[2]-0.3	2.7	4.3	56.3	23.2	79.5
Total[4]	41.4	1.4	1.6	[3]	75.6	--	[2]-.2	5.0	10.0	135.0	42.3	177.3
Central coast:												
Other public	--	[2]-.1	--	--	0.3	--	--	--	--	0.2	0.7	1.0
Forest industry	0.1	--	--	--	.7	--	--	0.2	--	1.0	.4	1.4
Other private timber growers	.5	--	--	--	1.6	--	--	.1	--	2.2	.6	2.8
Farmer and miscellaneous private	3.0	[3]	--	--	11.9	--	--	3.0	--	17.9	2.4	20.3
Total[4]	3.6	[2]-.1	--	--	14.5	--	--	3.2	--	21.3	4.2	25.5
Northern Interior:												
Other public	2.4	1.3	.6	0.2	--	--	[3]	[3]	--	4.3	.6	5.0
Forest industry	4.2	3.2	11.8	2.6	--	--	.9	.2	--	22.9	.7	23.6
Other private timber growers	6.1	16.7	11.9	1.3	--	--	2.3	.6	--	39.0	2.2	41.2
Farmer and miscellaneous private	9.6	6.6	1.1	.7	--	--	.8	.2	--	19.0	2.1	21.0
Total[4]	22.3	27.8	25.4	4.8	--	--	4.0	1.0	--	85.2	5.6	90.8
Sacramento:												
Other public	[2]-.2	1.4	.9	.1	--	--	.1	--	--	2.3	.8	3.0
Forest industry	6.4	11.2	11.2	6.3	--	--	3.1	.7	--	38.9	3.4	42.3
Other private timber growers	1.3	2.9	3.8	1.4	--	--	1.3	[2]-.2	--	10.3	.8	11.1
Farmer and miscellaneous private	8.2	14.8	7.5	2.4	.2	--	4.9	.7	--	38.7	3.6	42.2
Total[4]	15.7	30.3	23.3	10.1	.2	--	9.4	1.1	--	90.2	8.5	98.6
San Joaquin:												
Other public	.1	.3	.2	.4	--	0.2	.2	--	--	1.5	.2	1.7
Forest industry	.3	3.3	3.0	.9	--	--	.9	--	--	8.3	.3	8.7
Other private timber growers	.2	.5	.2	.1	--	--	.2	.1	--	1.2	.1	1.3
Farmer and miscellaneous private	.6	9.9	1.8	2.3	--	--	1.3	.2	--	16.1	1.1	17.2
Total[4]	1.2	14.1	5.1	3.7	--	.2	2.5	.3	--	27.2	1.8	28.9
Southern California:												
Other public	--	[3]	[3]	[3]	--	--	[3]	[3]	--	[3]	--	[3]
Farmer and miscellaneous private	[3]	.3	.1	.1	--	--	[3]	.1	--	.7	--	0.7
Total[4]	[3]	.4	.1	.1	--	--	[3]	.1	--	.8	--	.8
All resource areas:												
Other public	5.0	3.0	1.1	.7	3.6	.2	.3	[3]	.9	14.7	7.1	21.9
Forest industry	32.0	18.4	27.5	9.7	42.7	--	4.9	3.4	4.9	143.4	19.1	162.5
Other private timber growers	8.1	20.1	15.8	2.9	1.6	--	3.7	.5	--	52.7	3.7	56.5
Farmer and miscellaneous private	39.1	32.4	11.2	5.4	42.4	--	6.9	6.9	4.3	148.7	32.3	181.0
Total[4]	84.2	73.9	55.6	18.7	90.4	.2	15.8	10.7	10.0	359.6	62.3	421.9

[1] Includes estimated growth on surviving (residual) trees in stands partially cut since the inventory, and growth on trees estimated to have grown into the 5-inch class since the inventory.

[2] Minus sign indicates that mortality exceeds gross growth.

[3] Less than 50,000 cubic feet.

[4] Totals may be off because of rounding.

Table 45--Net annual growth of sawtimber on timberland outside National Forests by resource area, ownership, and species, California, 1975
(In million board feet, Scribner rule)

Resource area and ownership	Douglas-fir	Ponderosa and Jeffrey pines	True firs	Sugar and western white pines	Redwood	Giant sequoia	Incense-cedar	Other softwoods	Residuals and ingrowth[1]	Total softwoods	Hardwoods	All species
North coast:												
Other public	13.1	0.5	[2]-3.4	0.2	16.8	--	[3]	--	3.0	30.2	10.0	40.3
Forest industry	89.5	2.6	8.9	.1	195.5	--	0.1	12.1	18.1	326.9	17.2	344.1
Farmer and miscellaneous private	82.8	4.4	1.9	--	143.1	--	[2]-.8	16.8	15.1	263.4	49.0	312.4
Total[4]	185.3	7.6	7.4	.3	355.5	--	[2]-.7	28.9	36.2	620.5	76.2	696.8
Central coast:												
Other public	--	[2]-.6	--	--	2.3	--	--	--	--	1.7	1.0	2.6
Forest industry	0.4	--	--	--	3.3	--	--	4.6	--	8.4	0.3	8.7
Other private timber growers	3.1	--	--	--	5.9	--	--	--	--	9.0	.3	9.2
Farmer and miscellaneous private	17.9	.1	--	--	68.7	--	--	16.0	--	102.8	4.8	107.6
Total[4]	21.4	[2]-.5	--	--	80.2	--	--	20.6	--	121.8	6.3	128.1
Northern Interior:												
Other public	17.8	5.5	3.3	1.1	--	--	[3]	[2]-0.1	--	27.7	.2	27.9
Forest industry	19.1	16.6	57.9	9.2	--	--	2.2	--	--	105.1	1.9	107.0
Other private timber growers	24.2	60.5	65.5	7.6	--	--	9.0	1.4	--	168.1	1.9	170.0
Farmer and miscellaneous private	47.1	28.5	5.2	3.7	--	--	3.8	.3	--	88.6	5.3	93.9
Total[4]	108.1	111.1	131.9	21.6	--	--	15.1	1.6	--	389.5	9.4	398.8
Sacramento:												
Other public	[2]-1.6	6.9	3.2	.7	--	--	.7	--	--	9.8	.6	10.4
Forest industry	41.9	70.1	66.0	39.3	--	--	12.0	3.8	--	233.2	3.1	236.3
Other private timber growers	5.9	17.7	25.0	6.7	--	--	4.4	[2]-1.2	--	58.6	.9	59.5
Farmer and miscellaneous private	34.4	80.5	57.2	12.6	1.2	--	20.5	3.7	--	209.9	6.7	216.6
Total[4]	80.6	175.2	151.4	59.3	1.2	--	37.6	6.3	--	511.6	11.3	522.8
San Joaquin:												
Other public	.4	2.7	0.9	2.4	--	1.2	.8	--	--	8.4	.4	8.8
Forest industry	1.0	17.3	24.9	4.9	--	--	3.2	--	--	51.3	1.0	52.3
Other private timber growers	1.4	2.9	.6	.7	--	--	.8	.4	--	6.8	.4	7.2
Farmer and miscellaneous private	6.5	55.5	16.8	12.4	--	--	4.9	.8	--	96.9	2.9	99.7
Total[4]	9.3	78.3	43.2	20.4	--	1.2	9.7	1.2	--	163.3	4.6	167.9
Southern California:												
Other public	[3]	.1	[3]	[3]	--	--	[3]	[3]	--	0.1	--	0.1
Farmer and miscellaneous private	[3]	2.4	.8	.3	--	--	.3	.9	--	4.7	--	4.7
Total[4]	[3]	2.4	.8	.3	--	--	.3	1.0	--	4.8	--	4.8
All resource areas:												
Other public	29.7	15.0	4.0	4.5	19.1	1.2	1.5	[2]-.1	3.0	77.9	12.3	90.1
Forest industry	152.0	106.6	157.7	53.4	198.9	--	17.6	20.6	18.1	724.9	23.5	748.3
Other private timber growers	34.6	81.1	91.1	15.1	5.9	--	14.2	.6	--	242.5	3.4	245.9
Farmer and miscellaneous private	188.6	171.4	81.9	29.0	213.0	--	28.7	38.5	15.1	766.3	68.7	835.0
Total[4]	404.9	374.1	334.7	101.9	436.8	1.2	62.0	59.7	36.2	1,811.5	107.8	1,919.3

[1] Includes estimated growth on surviving (residual) trees in stands partially cut since the inventory, and growth on trees estimated to have grown into the 5-inch class since the inventory.

[2] Minus sign indicates that mortality exceeds gross growth.

[3] Less than 50,000 board feet.

[4] Totals may be off because of rounding.

Table 46--Annual mortality of growing stock and sawtimber on timberland by National Forest group, and softwoods and hardwoods, California, 1975

National Forest group	Growing stock			Sawtimber		
	Softwoods	Hardwoods	Total	Softwoods	Hardwoods	Total
	- - - Million cubic feet - - -			Million board feet (Scribner rule)		
Northwestern California[1/]	34.7	1.8	36.5	195.0	5.3	200.3
Northeastern California[2/]	9.9	0.1	10.0	40.4	0.2	40.6
Northern Sierra Nevada[3/]	10.4	.2	10.6	48.1	.5	48.6
Southern Sierra Nevada[4/]	17.0	--	17.0	96.6	--	96.6
Southern California[5/]	1.9	.2	2.1	10.9	1.7	12.6
All groups	73.9	2.3	76.2	391.0	7.7	398.7

1/ Includes California portion of Klamath, Mendocino, Rogue River, Siskiyou, Six Rivers, and Trinity National Forests.

2/ Includes Lassen, Modoc, and Shasta National Forests.

3/ Includes Eldorado, Plumas, and Tahoe National Forests.

4/ Includes Sequoia, Sierra, Stanislaus, and California portion of Toiyabe National Forests.

5/ Includes Angeles, Cleveland, Los Padres, San Bernardino, and California portion of Inyo National Forests.

Table 47--Annual mortality of growing stock on timberland outside National Forests by resource area, ownership, and species, California, 1975
(In million cubic feet)

Resource area and ownership	Douglas-fir	Ponderosa and Jeffrey pines	True firs	Sugar and western white pines	Redwood	Incense-cedar	Other softwoods	Total softwoods	Hardwoods	All species
North coast:										
Other public	2.3	--	0.6	--	--	--	--	3.0	0.1	3.1
Forest industry	2.2	--	1/	--	2.7	--	0.1	4.9	1.6	6.6
Farmer and miscellaneous private	7.8	0.3	.4	0.3	--	--	.1	8.9	.4	9.3
Total 2/	12.3	.3	1.0	--	3.0	--	.2	16.8	2.1	18.9
Central coast:										
Other public	--	.1	--	--	--	--	--	0.1	--	0.1
Forest industry	--	--	--	--	--	--	--	--	--	--
Other private timber growers	--	--	--	--	--	--	--	--	--	--
Farmer and miscellaneous private	0.3	--	--	--	1/	--	.2	.5	.3	.8
Total 2/	.3	.1	--	--	1/	--	.2	.6	.3	.9
Northern Interior:										
Other public	.3	.1	.5	--	--	--	.1	1.0	.1	1.1
Forest industry	.3	2.1	1.7	0.1	--	.5	.1	4.8	1/	4.9
Other private timber growers	1.9	1.5	2.2	.8	--	.3	1/	6.8	.1	6.9
Farmer and miscellaneous private	1.4	.7	.8	.1	--	.5	.2	3.7	--	3.7
Total 2/	3.9	4.5	5.3	1.1	--	1.2	.5	16.4	.2	16.6
Sacramento:										
Other public	.7	1/	--	.1	--	.1	--	.8	--	.8
Forest industry	1.0	1.4	3.9	.7	--	.4	.2	7.6	--	7.6
Other private timber growers	.3	.2	1.6	--	--	--	.8	3.0	--	3.0
Farmer and miscellaneous private	--	1.7	2.8	.2	--	.5	.3	5.5	.3	5.8
Total 2/	2.1	3.3	8.2	1.0	--	1.0	1.4	16.9	.3	17.2
San Joaquin:										
Other public	--	.2	--	--	--	1/	--	.2	1/	.2
Forest industry	1/	1.0	1.9	--	--	.2	--	3.2	--	3.2
Other private timber growers	--	.2	--	--	--	--	--	.2	--	.2
Farmer and miscellaneous private	.1	.6	.3	.1	--	1.1	1/	2.2	1/	2.3
Total 2/	.1	2.1	2.2	.1	--	1.3	1/	5.9	.1	5.9
Southern California:										
Other public	1/	1/	1/	--	--	--	1/	1/	1/	1/
Farmer and miscellaneous private	1/	.2	1/	1/	--	1/	1/	.3	1/	.3
Total 2/	1/	.2	1/	1/	--	1/	1/	.3	1/	.3
All resource areas:										
Other public	3.3	.4	1.2	.1	--	.1	1/	5.1	.2	5.4
Forest industry	3.5	4.6	7.5	.9	2.7	1.1	.4	20.6	1.7	22.3
Other private timber growers	2.3	1.9	3.8	.8	--	.3	.9	10.0	.1	10.1
Farmer and miscellaneous private	9.6	3.5	4.3	.4	.4	2.1	.9	21.2	1.0	22.2
Total 2/	18.6	10.4	16.8	2.2	3.0	3.6	2.2	56.9	3.0	59.9

1/ Less than 50,000 cubic feet.
2/ Totals may be off because of rounding.

Table 48--Annual mortality of sawtimber on timberland outside National Forests by resource area, ownership, and species, California, 1975
(In million board feet, Scribner rule)

Resource area and ownership	Douglas-fir	Ponderosa and Jeffrey pines	True firs	Sugar and western white pines	Redwood	Incense-cedar	Other softwoods	Total softwoods	Hardwoods	All species
North coast:										
Other public	14.4	--	3.7	--	--	--	--	18.1	0.3	18.4
Forest industry	10.6	--	0.1	--	12.4	--	0.5	23.6	4.8	28.3
Farmer and miscellaneous private	45.2	1.2	2.6	--	0.2	--	.6	49.8	.7	50.6
Total 1/	70.2	1.2	6.4	--	12.6	--	1.2	91.5	5.8	97.3
Central coast:										
Other public	--	0.7	--	--	--	--	--	0.7	--	0.7
Forest industry	--	--	--	--	--	--	--	--	--	--
Other private timber growers	--	--	--	--	--	--	--	--	--	--
Farmer and miscellaneous private	1.8	--	--	--	2/	--	.9	2.7	--	2.7
Total 1/	1.8	.7	--	--	--	--	.9	3.4	--	3.4
Northern Interior:										
Other public	0.3	.4	.7	--	--	--	.2	1.5	.2	1.7
Forest industry	1.4	8.0	8.2	0.6	--	1.9	.6	20.7	--	20.7
Other private timber growers	7.3	7.0	9.5	3.7	--	0.9	--	28.4	--	28.4
Farmer and miscellaneous private	4.9	3.3	1.9	.6	--	2.2	.7	13.6	--	13.6
Total 1/	13.9	18.6	20.3	4.9	--	5.1	1.5	64.2	.2	64.4
Sacramento:										
Other public	3.9	--	--	.2	--	--	--	4.1	--	4.1
Forest industry	4.4	2.0	19.0	2.0	--	1.2	1.2	29.7	--	29.7
Other private timber growers	1.5	.5	6.8	--	--	--	4.0	12.8	--	12.8
Farmer and miscellaneous private	--	4.6	13.8	1.1	--	.9	.8	21.3	.4	21.7
Total 1/	9.8	7.1	39.6	3.3	--	2.1	6.0	67.9	.4	68.3
San Joaquin:										
Other public	--	.5	--	--	--	.1	--	.6	.1	.7
Forest industry	--	5.9	9.3	--	--	1.2	--	16.4	--	16.4
Other private timber growers	--	1.5	--	--	--	--	--	1.5	--	1.5
Farmer and miscellaneous private	--	1.5	1.1	.1	--	4.5	.2	7.3	--	7.3
Total 1/	--	9.3	10.4	.1	--	5.8	.2	25.8	.1	25.9
Southern California:										
Other public	2/	2/	2/	2/	--	2/	2/	2/	2/	2/
Farmer and miscellaneous private	.1	.8	.2	.1	--	2/	.1	1.5	.3	1.8
Total 1/	.1	.8	.2	.1	--	2/	.1	1.5	.3	1.8
All resource areas:										
Other public	18.6	1.5	4.4	.2	--	.1	.2	25.1	.6	25.7
Forest industry	16.3	15.9	36.6	2.6	12.4	4.3	2.2	90.4	4.8	95.1
Other private timber growers	8.7	9.0	16.3	3.7	--	.9	4.0	42.7	--	42.7
Farmer and miscellaneous private	52.1	11.4	19.6	1.9	.2	7.7	3.2	96.2	1.4	97.6
Total 1/	95.8	37.8	76.9	8.4	12.6	13.0	9.8	254.3	6.7	261.0

1/Totals may be off because of rounding.
2/Less than 50,000 board feet.

Table 49--Net volume of growing stock on timberland in all ownerships by species and diameter class, California, 1975

(In million cubic feet)

Species	Diameter class (inches)										
	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0 and larger	All classes
Softwoods:											
Douglas-fir	202	335	374	437	500	595	582	588	2,285	6,888	12,786
Ponderosa and Jeffrey pines	149	237	334	386	515	486	498	541	2,318	3,660	9,124
True firs	258	415	556	641	705	721	782	745	3,012	4,969	12,804
Hemlocks	3	2	8	6	9	6	11	7	39	38	129
Sugar pine	21	49	52	66	68	84	105	115	629	2,166	3,355
White pine	2	4	5	9	10	11	16	14	70	90	231
Redwood	28	56	90	132	172	243	254	274	953	2,100	4,302
Sitka spruce	--	--	4	--	--	4	5	8	19	8	48
Engelmann and other spruces	--	--	1	1	1	--	--	1	2	1	7
Redcedar	1/	1	--	--	--	--	--	2	4	11	18
Incense-cedar	70	103	106	110	138	129	122	127	411	688	2,004
Lodgepole pine	24	49	63	76	72	82	66	74	220	144	870
Other softwoods	12	8	20	21	23	25	14	14	53	107	297
Total softwoods 2/	769	1,259	1,613	1,885	2,213	2,386	2,455	2,510	10,015	20,870	45,975
Hardwoods:											
Cottonwood and aspen	1/	2	4	3	4	3	3	1/	1	1	21
Red alder	3	8	8	6	7	9	6	5	7	5	64
Oak 3/	132	199	201	175	166	142	125	108	362	186	1,796
Other hardwoods 4/	111	190	189	192	172	185	147	124	321	181	1,812
Total hardwoods 2/	246	399	402	376	349	339	281	237	691	373	3,693
All species 2/	1,015	1,658	2,015	2,260	2,562	2,725	2,736	2,747	10,706	21,243	49,668

1/Less than 500,000 cubic feet.
2/Totals may be off because of rounding.
3/About 60 percent is California black oak; 40 percent consists of California white oak, Oregon white oak, California live oak, canyon live oak, and interior live oak.
4/About 60 percent is tanoak; 30 percent is madrone; 10 percent consists mainly of big leaf maple and California laurel.

Table 50--Net volume of sawtimber on timberland in all ownerships by species and diameter class, California, 1975

(In million board feet, International 1/4-inch rule)

Species	Diameter class (inches)								
	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0 and larger	All classes
Softwoods:									
Douglas-fir	1,045	1,466	2,004	2,659	2,864	3,111	12,827	46,962	72,938
Ponderosa and Jeffrey pines	961	1,413	2,277	2,322	2,568	2,971	13,616	25,172	51,300
True firs	1,917	2,841	3,625	3,885	4,381	4,292	18,069	32,941	71,951
Hemlocks	19	18	42	25	46	37	204	236	627
Sugar pine	143	289	322	456	555	682	3,724	14,239	20,410
White pine	15	29	46	54	79	73	403	546	1,245
Redwood	195	306	694	1,156	1,267	1,418	5,041	11,357	21,434
Sitka spruce	10	--	--	19	27	42	114	76	288
Engelmann and other spruces	1	2	2	1/	1/	1/	2	2	9
Redcedar	--	--	3	1	1/	6	23	68	101
Incense-cedar	410	461	579	497	499	570	2,245	4,322	9,583
Lodgepole pine	186	279	328	399	335	404	1,275	936	4,142
Other softwoods	73	94	106	140	86	86	384	617	1,586
Total softwoods 2/	4,975	7,198	10,028	11,613	12,707	13,692	57,927	137,474	255,614
Hardwoods:									
Cottonwood and aspen	--	13	11	9	--	--	9	9	51
Red alder	--	16	25	29	24	23	33	29	179
Oak	--	485	504	450	412	389	1,408	782	4,430
Other hardwoods	--	393	404	467	383	365	918	489	3,419
Total hardwoods 2/	--	907	944	955	819	777	2,368	1,309	8,079
All species 2/	4,975	8,105	10,972	12,568	13,526	14,466	60,295	138,783	263,693

1/ Less than 500,000 board feet.

2/ Totals may be off because of rounding.

Table 51--Area of timberland outside National Forests by stand condition and treatment class at time of inventory, and ownership, California[1/]
(In thousand acres)

Stand condition and treatment class	Ownership												All ownerships		
	Other public			Forest industry			Other private timber growers			Farmer and miscellaneous private					
	North coast	Other resource areas	Total	North coast	Other resource areas	Total	North coast	Other resource areas	Total	North coast	Other resource areas	Total	North coast	Other resource areas	Total
Cut since inventory (north coast only)	30	--	30	179	--	179	--	--	--	117	--	117	326	--	326
Conifer sawtimber with 5,000 or more board feet per acre:															
Low growth															
Stocked with understory conifers															
Overstory removal	0	0	0	50	50	100	--	75	75	26	71	97	76	196	272
Not stocked with understory conifers															
Regeneration cutting	93	76	169	277	504	781	--	351	351	254	371	625	624	1,302	1,926
High growth															
Commercial thinning or no treatment	30	59	89	235	492	727	--	293	293	217	505	722	482	1,349	1,831
Poletimber or young sawtimber conifers with less than 5,000 board feet per acre:															
Without cull trees or hardwoods															
Precommercial thinning or no treatment	1	16	17	16	139	155	--	220	220	21	152	173	38	527	565
With cull trees or hardwoods															
Improvement cutting	0	21	21	48	27	75	--	30	30	84	108	192	132	186	318
Poletimber or sawtimber hardwoods without understory conifers:															
Medium and high sites															
Stand conversion	22	6	28	102	25	127	--	11	11	270	82	352	394	124	518
Low sites															
Stand conversion	28	23	51	47	5	52	--	40	40	126	79	205	201	147	348
Total stand conversion	50	29	79	149	30	179	--	51	51	396	161	557	595	271	866
Conifer seedlings and saplings:															
Without overtopping brush or hardwoods															
Precommercial thinning or no treatment	0	14	14	32	118	150	--	155	155	19	135	154	51	422	473
With overtopping brush or hardwoods															
Cleaning or releasing	5	1	6	13	5	18	--	17	17	57	78	135	75	101	176
Nonstocked or inadequately stocked:															
Medium and high sites															
Planting	7	10	17	154	34	188	--	57	57	210	102	356	415	203	616
Low sites															
Planting	12	43	55	45	91	136	--	99	99	119	279	423	201	512	715
Total planting	19	53	72	199	125	324	--	156	156	329	381	779	616	715	1,331
All classes	228	1/269	497	1,198	1,490	2,688	--	1,348	1,348	1,589	1,962	2/3,551	3,015	5,069	8,084

1/Excludes 2,000 acres for which information is not available. Dates of field data collection: north coast 1965-67; other resource areas 1968, 1970-72.
2/Excludes 6,000 acres of Monterey pine in the central coast resource area, and 39,000 acres in southern California for which information is not available.

Table 52--Area of timberland in other public ownership by stand condition and treatment class, stockability and slope class, and biological potential (site class), all resource areas, California[1/]

(In thousand acres)

Stand condition and treatment class	Areas capable of supporting 60 percent or more of full-tree stocking on slopes 0 to 45 percent				Areas incapable of supporting 60 percent of full-tree stocking and/or slopes greater than 45 percent				All areas			Total
	Biological potential (site class)				Biological potential (site class)				Biological potential (site class)			
	High	Medium	Low	Total	High	Medium	Low	Total	High	Medium	Low	
Cut since inventory (north coast only)	5	1	10	16	0	5	9	14	5	6	19	30
Conifer sawtimber with 5,000 or more board feet per acre:												
Low growth												
Stocked with understory conifers												
Overstory removal	0	0	0	0	0	0	0	0	0	0	0	0
Not stocked with understory conifers												
Regeneration cutting	8	71	20	99	8	14	48	70	16	85	68	169
High growth												
Commercial thinning or no treatment	14	25	21	60	4	1	24	29	18	26	45	89
Poletimber or young sawtimber conifers with less than 5,000 board feet per acre:												
Without cull trees or hardwoods												
Precommercial thinning or no treatment	1	0	11	12	0	3	2	5	1	3	13	17
With cull trees or hardwoods												
Improvement cutting	0	1	10	11	0	0	10	10	0	1	20	21
Poletimber or sawtimber hardwoods without understory conifers:												
Stand conversion	0	10	20	30	0	18	31	49	0	28	51	79
Conifer seedlings and saplings:												
Without overtopping brush or hardwoods												
Precommercial thinning or no treatment	0	1	5	6	0	2	6	8	0	3	11	14
With overtopping brush or hardwoods												
Cleaning or releasing	2	4	0	6	0	0	0	0	2	4	0	6
Nonstocked or inadequately stocked:												
Planting	0	15	23	38	2	0	32	34	2	15	55	72
All classes	30	128	120	278	14	43	162	219	44	171	282	497

[1/]Excludes 1,000 acres in southern California and 1,000 acres in the north coast for which information is not available. Dates of field data collection: north coast 1965-67; central coast 1972; northern interior 1968, 1970-71; Sacramento 1971; San Joaquin 1972.

Table 53--Area of timberland in forest industry ownership by stand condition and treatment class, and biological potential (site class), all resource areas, California[1/]

(In thousand acres)

Stand condition and treatment class	Biological potential (site class)			Total
	High	Medium	Low	
Cut since inventory (north coast only)	108	66	5	179
Conifer sawtimber with 5,000 or more board feet per acre:				
Low growth				
Stocked with understory conifers				
Overstory removal	36	38	26	100
Not stocked with understory conifers				
Regeneration cutting	207	416	158	781
High growth				
Commercial thinning or no treatment	187	282	258	727
Poletimber or young sawtimber conifers with less than 5,000 board feet per acre:				
Without cull trees or hardwoods				
Precommercial thinning or no treatment	11	60	84	155
With cull trees or hardwoods				
Improvement cutting	10	33	32	75
Poletimber or sawtimber hardwoods without understory conifers:				
Stand conversion	45	82	52	179
Conifer seedlings and saplings:				
Without overtopping brush or hardwoods				
Precommercial thinning or no treatment	6	33	111	150
With overtopping brush or hardwoods				
Cleaning or releasing	5	8	5	18
Nonstocked or inadequately stocked:				
Planting	71	117	136	324
All classes	686	1,135	867	2,688

[1/]Dates of field data collection: north coast 1965-67; central coast 1972; northern interior 1968, 1970-71; Sacramento 1971; San Joaquin 1972.

Table 54--Area of timberland in other private timber growers ownership by stand condition and treatment class, and biological potential (site class), all resource areas, California[1/]

(In thousand acres)

Stand condition and treatment class	Biological potential (site class)			Total
	High	Medium	Low	
Conifer sawtimber with 5,000 or more board feet per acre:				
Low growth				
Stocked with understory conifers				
Overstory removal	0	48	27	75
Not stocked with understory conifers				
Regeneration cutting	52	145	154	351
High growth				
Commercial thinning or no treatment	27	72	194	293
Poletimber or young sawtimber conifers with less than 5,000 board feet per acre:				
Without cull trees or hardwoods				
Precommercial thinning or no treatment	0	39	181	220
With cull trees or hardwoods				
Improvement cutting	3	9	18	30
Poletimber or sawtimber hardwoods without understory conifers:				
Stand conversion	3	8	40	51
Conifer seedlings and saplings:				
Without overtopping brush or hardwoods				
Precommercial thinning or no treatment	4	36	115	155
With overtopping brush or hardwoods				
Cleaning or releasing	0	3	14	17
Nonstocked or inadequately stocked:				
Planting	11	46	99	156
All classes	100	406	842	1,348

[1/] Dates of field data collection: north coast 1965-67; central coast 1972; northern interior 1968, 1970-71; Sacramento 1971; San Joaquin 1972.

Table 55--Area of timberland in farmer and miscellaneous private ownership by stand condition and treatment class, and biological potential (site class), all resource areas, California[1/]

(In thousand acres)

Stand condition and treatment class	Biological potential (site class)			Total
	High	Medium	Low	
Cut since inventory (north coast only)	29	88	0	117
Conifer sawtimber with 5,000 or more board feet per acre:				
Low growth				
Stocked with understory conifers				
Overstory removal	24	15	58	97
Not stocked with understory conifers				
Regeneration cutting	163	325	137	625
High growth				
Commercial thinning or no treatment	113	301	308	722
Poletimber or young sawtimber conifers with less than 5,000 board feet per acre:				
Without cull trees or hardwoods				
Precommercial thinning or no treatment	11	45	117	173
With cull trees or hardwoods				
Improvement cutting	5	73	114	192
Poletimber or sawtimber hardwoods without understory conifers:				
Stand conversion	63	289	205	557
Conifer seedlings and saplings:				
Without overtopping brush or hardwoods				
Precommercial thinning or no treatment	4	46	104	154
With overtopping brush or hardwoods				
Cleaning or releasing	13	51	71	135
Nonstocked or inadequately stocked:				
Planting	76	280	423	779
All classes	501	1,513	1,537	3,551

[1/] Excludes 6,000 acres in central coast and 39,000 acres in southern California for which information is not available. Dates of field data collection: north coast 1965-67; central coast 1972; northern interior 1968, 1970-71; Sacramento 1971; San Joaquin 1972.

Table 56--Area of timberland in forest industry ownership by stand condition and treatment class, and biological potential (site class), north coast resource area, California[1/]

(In thousand acres)

Stand condition and treatment class	Biological potential (site class)			Total
	High	Medium	Low	
Cut since inventory (north coast only)	108	66	5	179
Conifer sawtimber with 5,000 or more board feet per acre:				
Low growth				
Stocked with understory conifers				
Overstory removal	36	9	5	50
Not stocked with understory conifers				
Regeneration cutting	131	132	14	277
High growth				
Commercial thinning or no treatment	146	75	14	235
Poletimber or young sawtimber conifers with less than 5,000 board feet per acre:				
Without cull trees or hardwoods				
Precommercial thinning or no treatment	11	5	0	16
With cull trees or hardwoods				
Improvement cutting	10	28	10	48
Poletimber or sawtimber hardwoods without understory conifers:				
Stand conversion	42	60	47	149
Conifer seedlings and saplings:				
Without overtopping brush or hardwoods				
Precommercial thinning or no treatment	6	12	14	32
With overtopping brush or hardwoods				
Cleaning or releasing	5	8	0	13
Nonstocked or inadequately stocked:				
Planting	66	88	45	199
All classes	561	483	154	1,198

[1/] Dates of field data collection: Del Norte County 1965, Humboldt County 1966, Mendocino County 1967, Sonoma County 1965. Adjustments have been made to account for park expansion since dates of field data collection.

Table 57--Area of timberland in farmer and miscellaneous private ownership by stand condition and treatment class, and biological potential (site class), north coast resource area, California[1/]

(In thousand acres)

Stand condition and treatment class	Biological potential (site class)			Total
	High	Medium	Low	
Cut since inventory (north coast only)	29	88	0	117
Conifer sawtimber with 5,000 or more board feet per acre:				
Low growth				
Stocked with understory conifers				
Overstory removal	15	11	0	26
Not stocked with understory conifers				
Regeneration cutting	93	126	35	254
High growth				
Commercial thinning or no treatment	77	121	19	217
Poletimber or young sawtimber conifers with less than 5,000 board feet per acre:				
Without cull trees or hardwoods				
Precommercial thinning or no treatment	11	5	5	21
With cull trees or hardwoods				
Improvement cutting	5	45	34	84
Poletimber or sawtimber hardwoods without understory conifers:				
Stand conversion	53	217	126	396
Conifer seedlings and saplings:				
Without overtopping brush or hardwoods				
Precommercial thinning or no treatment	4	10	5	19
With overtopping brush or hardwoods				
Cleaning or releasing	10	37	10	57
Nonstocked or inadequately stocked:				
Planting	73	181	144	398
All classes	370	841	378	1,589

[1/] Dates of field data collection: Del Norte County 1965, Humboldt County 1966, Mendocino County 1967, Sonoma County 1965.

Table 58--Area of timberland in forest industry ownership by stand condition and treatment class, and biological potential (site class), central coast resource area, California[1/]

(In thousand acres)

Stand condition and treatment class	Biological potential (site class)			Total
	High	Medium	Low	
Conifer sawtimber with 5,000 or more board feet per acre:				
Low growth				
Stocked with understory conifers				
Overstory removal	0	0	0	0
Not stocked with understory conifers				
Regeneration cutting	4	0	0	4
High growth				
Commercial thinning or no treatment	1	3	0	4
Poletimber or young sawtimber conifers with less than 5,000 board feet per acre:				
Without cull trees or hardwoods				
Precommercial thinning or no treatment	0	0	0	0
With cull trees or hardwoods				
Improvement cutting	0	2	0	2
Poletimber or sawtimber hardwoods without understory conifers:				
Stand conversion	0	0	0	0
Conifer seedlings and saplings:				
Without overtopping brush or hardwoods				
Precommercial thinning or no treatment	0	0	0	0
With overtopping brush or hardwoods				
Cleaning or releasing	0	0	0	0
Nonstocked or inadequately stocked:				
Planting	0	0	0	0
All classes	5	5	0	10

[1/] Field data were collected in September and October 1972.

Table 59--Area of timberland in other private timber growers ownership by stand condition and treatment class, and biological potential (site class), central coast resource area, California[1/]

(In thousand acres)

Stand condition and treatment class	Biological potential (site class)			Total
	High	Medium	Low	
Conifer sawtimber with 5,000 or more board feet per acre:				
Low growth				
Stocked with understory conifers				
Overstory removal	0	0	0	0
Not stocked with understory conifers				
Regeneration cutting	6	0	0	6
High growth				
Commercial thinning or no treatment	3	0	0	3
Poletimber or young sawtimber conifers with less than 5,000 board feet per acre:				
Without cull trees or hardwoods				
Precommercial thinning or no treatment	0	0	0	0
With cull trees or hardwoods				
Improvement cutting	3	0	0	3
Poletimber or sawtimber hardwoods without understory conifers:				
Stand conversion	3	0	0	3
Conifer seedlings and saplings:				
Without overtopping brush or hardwoods				
Precommercial thinning or no treatment	0	0	0	0
With overtopping brush or hardwoods				
Cleaning or releasing	0	3	0	3
Nonstocked or inadequately stocked:				
Planting	0	0	0	0
All classes	15	3	0	18

[1/]Field data were collected in September and October 1972.

Table 60--Area of timberland in farmer and miscellaneous private ownership by stand condition and treatment class, and biological potential (site class), central coast resource area, California[1/]

(In thousand acres)

Stand condition and treatment class	Biological potential (site class)			Total
	High	Medium	Low	
Conifer sawtimber with 5,000 or more board feet per acre:				
Low growth				
Stocked with understory conifers				
Overstory removal	0	0	0	0
Not stocked with understory conifers				
Regeneration cutting	46	42	0	88
High growth				
Commercial thinning or no treatment	24	28	0	52
Poletimber or young sawtimber conifers with less than 5,000 board feet per acre:				
Without cull trees or hardwoods				
Precommercial thinning or no treatment	0	4	0	4
With cull trees or hardwoods				
Improvement cutting	0	6	3	9
Poletimber or sawtimber hardwoods without understory conifers:				
Stand conversion	10	7	0	17
Conifer seedlings and saplings:				
Without overtopping brush or hardwoods				
Precommercial thinning or no treatment	0	4	0	4
With overtopping brush or hardwoods				
Cleaning or releasing	3	0	0	3
Nonstocked or inadequately stocked:				
Planting	3	4	0	7
All classes	86	95	3	184

[1/] Excludes 6,000 acres of Monterey pine type for which information is not available. Field data were collected in September and October 1972.

Table 61--Area of timberland in forest industry ownership by stand condition and treatment class, stockability and slope class, and biological potential (site class), northern interior resource area, California[1/]
(In thousand acres)

Stand condition and treatment class	Areas capable of supporting 60 percent or more of full-tree stocking on slopes 0 to 45 percent				Areas incapable of supporting 60 percent of full-tree stocking and/or slopes greater than 45 percent				Total
	Biological potential (site class)				Biological potential (site class)				
	High	Medium	Low	Total	High	Medium	Low	Total	
Conifer sawtimber with 5,000 or more board feet per acre:									
Low growth									
Stocked with understory conifers									
Overstory removal	0	10	0	10	0	6	17	23	33
Not stocked with understory conifers									
Regeneration cutting	40	73	30	143	0	15	42	57	200
High growth									
Commercial thinning or no treatment	10	53	57	120	0	16	22	38	158
Poletimber or young sawtimber conifers with less than 5,000 board feet per acre:									
Without cull trees or hardwoods									
Precommercial thinning or no treatment	0	37	58	95	0	0	5	5	100
With cull trees or hardwoods									
Improvement cutting	0	0	0	0	0	0	0	0	0
Poletimber or sawtimber hardwoods without understory conifers:									
Stand conversion	0	6	0	6	0	4	5	9	15
Conifer seedlings and saplings:									
Without overtopping brush or hardwoods									
Precommercial thinning or no treatment	0	10	19	29	0	0	30	30	59
With overtopping brush or hardwoods									
Cleaning or releasing	0	0	0	0	0	0	5	5	5
Nonstocked or inadequately stocked:									
Planting	0	4	35	39	5	0	19	24	63
All classes	50	193	199	442	5	41	145	191	633

[1/] Dates of field data collection: Lassen and Modoc Counties 1971, Shasta and Trinity Counties 1970, Siskiyou County 1968. Adjustments have been made to account for ownership changes since dates of collection.

Table 62--Area of timberland in other private timber growers ownership by stand condition and treatment class, stockability and slope class, and biological potential (site class), northern interior resource area, California[1/]
(In thousand acres)

Stand condition and treatment class	Areas capable of supporting 60 percent or more of full-tree stocking on slopes 0 to 45 percent				Areas incapable of supporting 60 percent of full-tree stocking and/or slopes greater than 45 percent				Total
	Biological potential (site class)				Biological potential (site class)				
	High	Medium	Low	Total	High	Medium	Low	Total	
Conifer sawtimber with 5,000 or more board feet per acre:									
Low growth									
Stocked with understory conifers									
Overstory removal	0	24	13	37	0	20	10	30	67
Not stocked with understory conifers									
Regeneration cutting	33	86	72	191	5	23	56	84	275
High growth									
Commercial thinning or no treatment	20	21	93	134	0	18	55	73	207
Poletimber or young sawtimber conifers with less than 5,000 board feet per acre:									
Without cull trees or hardwoods									
Precommercial thinning or no treatment	0	29	118	147	0	0	54	54	201
With cull trees or hardwoods									
Improvement cutting	0	0	10	10	0	0	5	5	15
Poletimber or sawtimber hardwoods without understory conifers:									
Stand conversion	0	0	5	5	0	4	21	25	30
Conifer seedlings and saplings:									
Without overtopping brush or hardwoods									
Precommercial thinning or no treatment	4	24	61	89	0	12	44	56	145
With overtopping brush or hardwoods									
Cleaning or releasing	0	0	5	5	0	0	5	5	10
Nonstocked or inadequately stocked:									
Planting	7	16	58	81	4	10	41	55	136
All classes	64	200	435	699	9	87	291	387	1,086

[1/]Dates of field data collection: Lassen and Modoc Counties 1971, Shasta and Trinity Counties 1970, Siskiyou County 1968. Adjustments have been made to account for ownership changes since dates of collection.

Table 63--Area of timberland in farmer and miscellaneous private ownership by stand condition and treatment class, stockability and slope class, and biological potential (site class), northern interior resource area, California[1/]
(In thousand acres)

Stand condition and treatment class	Areas capable of supporting 60 percent or more of full-tree stocking on slopes 0 to 45 percent				Areas incapable of supporting 60 percent of full-tree stocking and/or slopes greater than 45 percent				Total
	Biological potential (site class)				Biological potential (site class)				
	High	Medium	Low	Total	High	Medium	Low	Total	
Conifer sawtimber with 5,000 or more board feet per acre:									
Low growth									
Stocked with understory conifers									
Overstory removal	0	4	13	17	0	0	4	4	21
Not stocked with understory conifers									
Regeneration cutting	0	33	30	63	0	18	16	34	97
High growth									
Commercial thinning or no treatment	0	26	38	64	0	0	35	35	99
Poletimber or young sawtimber conifers with less than 5,000 board feet per acre:									
Without cull trees or hardwoods									
Precommercial thinning or no treatment	0	16	54	70	0	0	0	0	70
With cull trees or hardwoods									
Improvement cutting	0	8	24	32	0	2	32	34	66
Poletimber or sawtimber hardwoods without understory conifers:									
Stand conversion	0	13	20	33	0	7	11	18	51
Conifer seedlings and saplings:									
Without overtopping brush or hardwoods									
Precommercial thinning or no treatment	0	23	41	64	0	0	18	18	82
With overtopping brush or hardwoods									
Cleaning or releasing	0	0	17	17	0	9	21	30	47
Nonstocked or inadequately stocked:									
Planting	0	29	64	93	0	0	54	54	147
All classes	0	152	301	453	0	36	191	227	680

1/ Dates of field data collection: Lassen and Modoc Counties 1971, Shasta and Trinity Counties 1970, Siskiyou County 1968. Adjustments have been made to account for ownership changes since dates of collection.

Table 64--Area of timberland in forest industry ownership by stand condition and treatment class, stockability and slope class, and biological potential (site class), Sacramento resource area, California[1/]

(In thousand acres)

Stand condition and treatment class	Areas capable of supporting 60 percent or more of full-tree stocking on slopes 0 to 45 percent				Areas incapable of supporting 60 percent of full-tree stocking and/or slopes greater than 45 percent				Total
	Biological potential (site class)				Biological potential (site class)				
	High	Medium	Low	Total	High	Medium	Low	Total	
Conifer sawtimber with 5,000 or more board feet per acre:									
Low growth									
Stocked with understory conifers									
Overstory removal	0	9	0	9	0	0	4	4	13
Not stocked with understory conifers									
Regeneration cutting	11	126	38	175	4	27	28	59	234
High growth									
Commercial thinning or no treatment	23	89	91	203	4	13	65	82	285
Poletimber or young sawtimber conifers with less than 5,000 board feet per acre:									
Without cull trees or hardwoods									
Precommercial thinning or no treatment	0	4	10	14	0	0	9	9	23
With cull trees or hardwoods									
Improvement cutting	0	0	13	13	0	0	7	7	20
Poletimber or sawtimber hardwoods without understory conifers:									
Stand conversion	0	5	0	5	0	4	0	4	9
Conifer seedlings and saplings:									
Without overtopping brush or hardwoods									
Precommercial thinning or no treatment	0	8	43	51	0	0	5	5	56
With overtopping brush or hardwoods									
Cleaning or releasing	0	0	0	0	0	0	0	0	0
Nonstocked or inadequately stocked:									
Planting	0	25	15	40	0	0	18	18	58
All classes	34	266	210	510	8	44	136	188	698

1/Field data were collected in 1971. Adjustments have been made to account for ownership changes since date of collection.

Table 65--Area of timberland in other private timber growers ownership by stand condition and treatment class, stockability and slope class, and biological potential (site class), Sacramento resource area, California[1/]
(In thousand acres)

Stand condition and treatment class	Areas capable of supporting 60 percent or more of full-tree stocking on slopes 0 to 45 percent				Areas incapable of supporting 60 percent of full-tree stocking and/or slopes greater than 45 percent				Total
	Biological potential (site class)				Biological potential (site class)				
	High	Medium	Low	Total	High	Medium	Low	Total	
Conifer sawtimber with 5,000 or more board feet per acre:									
Low growth									
Stocked with understory conifers									
Overstory removal	0	4	0	4	0	0	4	4	8
Not stocked with understory conifers									
Regeneration cutting	0	23	13	36	5	4	13	22	58
High growth									
Commercial thinning or no treatment	5	33	27	65	0	0	13	13	78
Poletimber or young sawtimber conifers with less than 5,000 board feet per acre:									
Without cull trees or hardwoods									
Precommercial thinning or no treatment	0	10	9	19	0	0	0	0	19
With cull trees or hardwoods									
Improvement cutting	0	9	0	9	0	0	0	0	9
Poletimber or sawtimber hardwoods without understory conifers:									
Stand conversion	0	0	9	9	0	4	5	9	18
Conifer seedlings and saplings:									
Without overtopping brush or hardwoods									
Precommercial thinning or no treatment	0	0	0	0	0	0	10	10	10
With overtopping brush or hardwoods									
Cleaning or releasing	0	0	4	4	0	0	0	0	4
Nonstocked or inadequately stocked:									
Planting	0	10	0	10	0	10	0	10	20
All classes	5	89	62	156	5	18	45	68	224

1/Field data were collected in 1971. Adjustments have been made to account for ownership changes since date of collection.

Table 66--Area of timberland in farmer and miscellaneous private ownership by stand condition and treatment class, stockability and slope class, and biological potential (site class), Sacramento resource area, California[1/]
(In thousand acres)

Stand condition and treatment class	Areas capable of supporting 60 percent or more of full-tree stocking on slopes 0 to 45 percent				Areas incapable of supporting 60 percent of full-tree stocking and/or slopes greater than 45 percent				Total
	Biological potential (site class)				Biological potential (site class)				
	High	Medium	Low	Total	High	Medium	Low	Total	
Conifer sawtimber with 5,000 or more board feet per acre:									
Low growth									
Stocked with understory conifers									
Overstory removal	9	0	34	43	0	0	6	6	49
Not stocked with understory conifers									
Regeneration cutting	10	57	13	80	0	10	20	30	110
High growth									
Commercial thinning or no treatment	5	74	95	174	0	14	60	74	248
Poletimber or young sawtimber conifers with less than 5,000 board feet per acre:									
Without cull trees or hardwoods									
Precommercial thinning or no treatment	0	15	29	44	0	0	16	16	60
With cull trees or hardwoods									
Improvement cutting	0	9	0	9	0	0	15	15	24
Poletimber or sawtimber hardwoods without understory conifers:									
Stand conversion	0	28	16	44	0	5	20	25	69
Conifer seedlings and saplings:									
Without overtopping brush or hardwoods									
Precommercial thinning or no treatment	0	9	0	9	0	0	31	31	40
With overtopping brush or hardwoods									
Cleaning or releasing	0	0	12	12	0	0	7	7	19
Nonstocked or inadequately stocked:									
Planting	0	58	59	117	0	6	57	63	180
All classes	24	250	258	532	0	35	232	267	799

[1/]Field data were collected in 1971. Adjustments have been made to account for ownership changes since date of collection.

Table 67--Area of timberland in forest industry ownership by stand condition and treatment class, stockability and slope class, and biological potential (site class), San Joaquin resource area, California[1/]

(In thousand acres)

Stand condition and treatment class	Areas capable of supporting 60 percent or more of full-tree stocking on slopes 0 to 45 percent				Areas incapable of supporting 60 percent of full-tree stocking and/or slopes greater than 45 percent				Total
	Biological potential (site class)				Biological potential (site class)				
	High	Medium	Low	Total	High	Medium	Low	Total	
Conifer sawtimber with 5,000 or more board feet per acre:									
Low growth									
Stocked with understory conifers									
Overstory removal	0	4	0	4	0	0	0	0	4
Not stocked with understory conifers									
Regeneration cutting	17	43	3	63	0	0	3	3	66
High growth									
Commercial thinning or no treatment	3	33	6	42	0	0	3	3	45
Poletimber or young sawtimber conifers with less than 5,000 board feet per acre:									
Without cull trees or hardwoods									
Precommercial thinning or no treatment	0	14	2	16	0	0	0	0	16
With cull trees or hardwoods									
Improvement cutting	0	0	1	1	0	3	1	4	5
Poletimber or sawtimber hardwoods without understory conifers:									
Stand conversion	3	0	0	3	0	3	0	3	6
Conifer seedlings and saplings:									
Without overtopping brush or hardwoods									
Precommercial thinning or no treatment	0	3	0	3	0	0	0	0	3
With overtopping brush or hardwoods									
Cleaning or releasing	0	0	0	0	0	0	0	0	0
Nonstocked or inadequately stocked:									
Planting	0	0	4	4	0	0	0	0	4
All classes	23	97	16	136	0	6	7	13	149

[1/] Field data were collected in 1972.

Table 68--Area of timberland in other private timber groups ownership by stand condition and treatment class, stockability and slope class, and biological potential (site class), San Joaquin resource area, California[1/]
(In thousand acres)

Stand condition and treatment class	Areas capable of supporting 60 percent or more of full-tree stocking on slopes 0 to 45 percent				Areas incapable of supporting 60 percent of full-tree stocking and/or slopes greater than 45 percent				Total
	Biological potential (site class)				Biological potential (site class)				
	High	Medium	Low	Total	High	Medium	Low	Total	
Conifer sawtimber with 5,000 or more board feet per acre:									
Low growth									
Stocked with understory conifers									
Overstory removal	0	0	0	0	0	0	0	0	0
Not stocked with understory conifers									
Regeneration cutting	3	6	0	9	0	3	0	3	12
High growth									
Commercial thinning or no treatment	0	0	6	6	0	0	0	0	6
Poletimber or young sawtimber conifers with less than 5,000 board feet per acre:									
Without cull trees or hardwoods									
Precommercial thinning or no treatment	0	0	0	0	0	0	0	0	0
With cull trees or hardwoods									
Improvement cutting	0	0	0	0	0	0	3	3	3
Poletimber or sawtimber hardwoods without understory conifers:									
Stand conversion	0	0	0	0	0	0	0	0	0
Conifer seedlings and saplings:									
Without overtopping brush or hardwoods									
Precommercial thinning or no treatment	0	0	0	0	0	0	0	0	0
With overtopping brush or hardwoods									
Cleaning or releasing	0	0	0	0	0	0	0	0	0
Nonstocked or inadequately stocked:									
Planting	0	0	0	0	0	0	0	0	0
All classes	3	6	6	15	0	3	3	6	21

[1/]Field data were collected in 1972.

Table 69--Area of timberland in farmer and miscellaneous private ownership by stand condition and treatment class, stockability and slope class, and biological potential (site ciass), San Joaquin resource area, California[1/]
(In thousand acres)

Stand condition and treatment class	Areas capable of supporting 60 percent or more of full-tree stocking on slopes 0 to 45 percent				Areas incapable of supporting 60 percent of full-tree stocking and/or slopes greater than 45 percent				Total
	Biological potential (site class)				Biological potential (site class)				
	High	Medium	Low	Total	High	Medium	Low	Total	
Conifer sawtimber with 5,000 or more board feet per acre:									
Low growth									
Stocked with understory conifers									
Overstory removal	0	0	0	0	0	0	1	1	1
Not stocked with understory conifers									
Regeneration cutting	14	26	6	46	0	13	17	30	76
High growth									
Commercial thinning or no treatment	7	38	22	67	0	0	39	39	106
Poletimber or young sawtimber conifers with less than 5,000 board feet per acre:									
Without cull trees or hardwoods									
Precommercial thinning or no treatment	0	2	3	5	0	3	10	13	18
With cull trees or hardwoods									
Improvement cutting	0	3	3	6	0	0	3	3	9
Poletimber or sawtimber hardwoods without understory conifers:									
Stand conversion	0	7	0	7	0	5	12	17	24
Conifer seedlings and saplings:									
Without overtopping brush or hardwoods									
Precommercial thinning or no treatment	0	0	0	0	0	0	9	9	9
With overtopping brush or hardwoods									
Cleaning or releasing	0	5	0	5	0	0	4	4	9
Nonstocked or inadequately stocked:									
Planting	0	2	22	24	0	0	23	23	47
All classes	21	83	56	160	0	21	118	139	299

[1/]Field data were collected in 1972.

Table 70--Confidence interval[1/] for the estimates of timberland, noncommercial forest, and growing stock volume, California

Resource area	Total timberland	Total noncommercial forest[2/]	Total growing stock volume
		Percent	
North coast:			
Del Norte County	±2.9	NA	±8.0
Humboldt County	±1.4	±17.0	±6.1
Mendocino and Sonoma Counties	±1.9	±4.3	±4.4
Central coast	±5.0	±1.6	±9.1
Northern interior	±1.1	±2.8	±1.9
Sacramento	±1.5	±4.0	±2.2
San Joaquin	±3.7	±1.8	±5.8

NA = not available.

[1/] By random sampling formula: 68-percent probability.

[2/] Includes only the forest area outside parks and other reservations determined by sampling methods. Type-mapping procedures were used for most reservations.

Sources of Timber Resource Data

The basic timber resource data for National Forests were collected by the Intermountain, Pacific Southwest, and Pacific Northwest Regions of the U.S. Forest Service. A combination of type mapping, and aerial photo and ground sampling procedures were used to inventory National Forests. About 3,600 field plots were established on timberland.

Detailed procedures for most of the National Forest inventories have been published in resource area reports (Oswald 1968, 1972, 1979; Bolsinger 1976, 1978a; and Wall 1978). Additional details are available from the Regional Foresters' offices. The dates of inventory are:

Region	National Forest	Inventory date[1]
Intermountain	Toiyabe	1975
Pacific Southwest	Angeles	1975
	Cleveland	1975
	Eldorado	1974
	Inyo	1964
	Klamath	1967
	Lassen	1970
	Los Padres	1975
	Mendocino	1971
	Modoc	1970
	Plumas	1969
	San Bernardino	1975
	Sequoia	1958
	Shasta	1968
	Sierra	1975
	Six Rivers	1966
	Stanislaus	1972
	Tahoe	1972
	Trinity	1969
Pacific Northwest	Rogue River	1967
	Siskiyou	1968

[1] Total area and total volume for most National Forests were adjusted to account for major changes since inventory date. Detailed statistics were prorated.

Timber resource data for lands outside National Forests except those in southern California were collected by the Renewable Resources Evaluation research unit of the U.S. Forest Service's Pacific Northwest Forest and Range Experiment Station (PNW), Portland, Oregon. Detailed procedures have been published in resource area reports and are available from the PNW Station. A total of 21,112 aerial photo plots were examined and 1,752 ground plots established on timberland. Photo and field plots were used to develop area and volume estimates by double sampling for stratification estimators as described by Cochran (1963). Figure 76 shows area, number of plots, and date of inventory by resource area. About 39,000 aerial photo plots and 1,500 field plots were examined on unproductive forest land. For lands outside National Forests in southern California, the basic data collected for Forest Survey Release 25, (USDA Forest Service 1954) and the California Fish and Wildlife plan, (State of California, Department of Fish and Game 1966) were used along with records of timberland and brushland conversions to approximate forest areas and timber volumes in 1975.

Data for the northern interior, Sacramento, and San Joaquin resource areas were accepted as of time of inventory, except for adjustments to account for major ownership changes, and to break out the "other private timber growers" from the miscellaneous private. For the north coast, revisions were made to account for Park expansion, cutting, growth on surviving (residual) trees, 5-inch d.b.h. and larger, and growth on trees estimated to have grown into the 5-inch or larger class since the inventories.

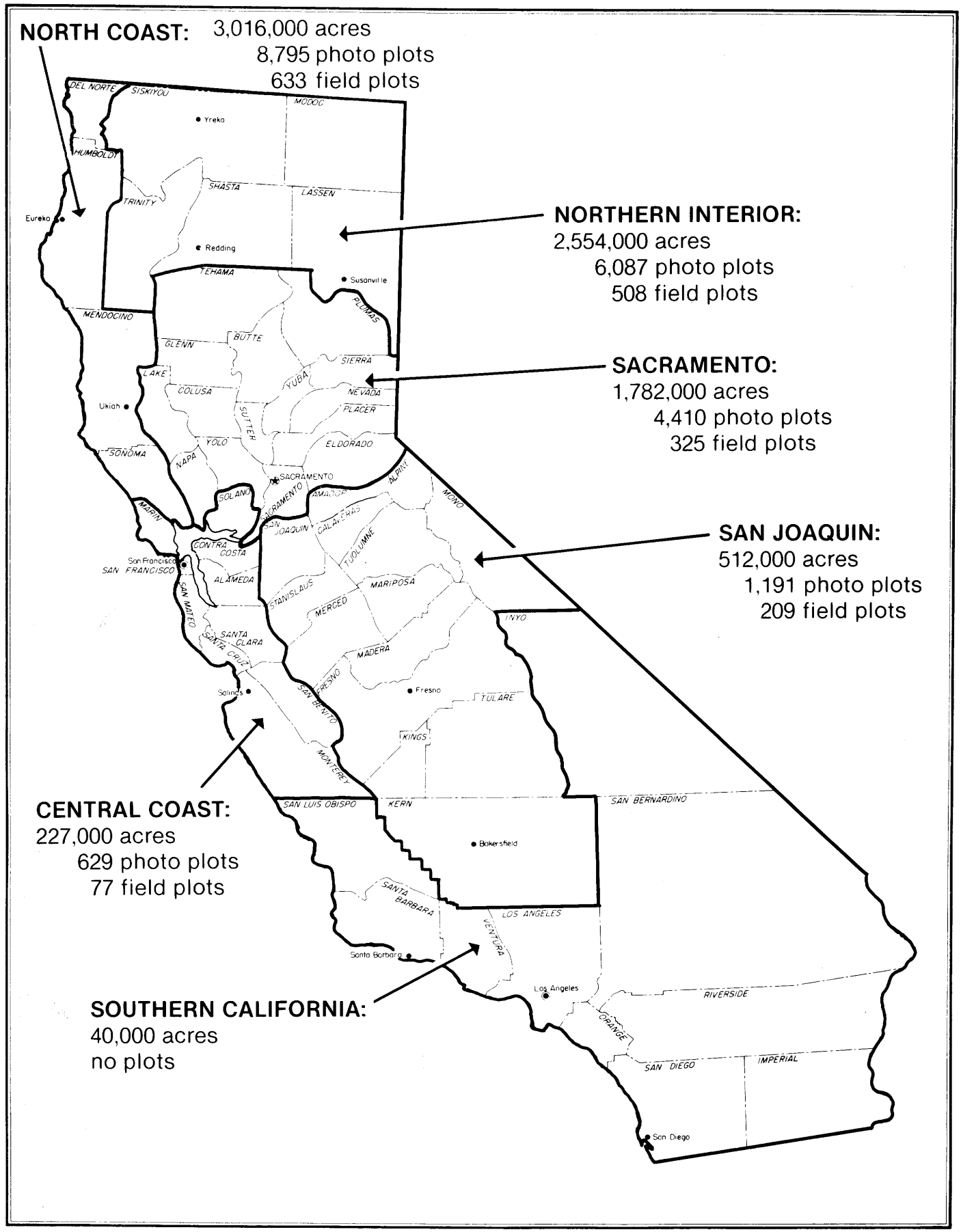


Figure 76. — Timberland area and number of field plots outside National Forests in California, by resource area.

Reliability of Timber Resource Data

The regional reports in which most of the timber resource data were originally published contain details on their reliability (see Bolsinger 1976, 1978a; Oswald 1968, 1972, 1979; Oswald and Walton 1966; Wall 1978). The confidence intervals of the area and volume estimates from these regional reports are shown in table 70.

Definition of Terms

Land Area

Total land area is that reported by the Bureau of the Census and includes dry land and land temporarily or partially covered by water (such as marshes, swamps, and river flood plains), streams, sloughs, and canals less than 1/8-mile wide, and lakes, reservoirs, and ponds less than 40 acres in area.

Forest land is at least 10 percent stocked by trees of any size or formerly had such tree cover, and is not currently developed for nonforest use. Minimum area of forest land recognized is 1 acre.

Nonforest land has never supported forests or was formerly forested and is currently developed for nonforest uses. Included are lands used for agricultural crops, improved pasture, residential areas, city parks, improved roads of any width and their right-of-way clearings, powerline clearings of any width, and 1- to 40-acre areas of water classified by the Bureau of the Census as land. If intermingled in forest areas, unimproved roads and other nonforest strips must be more than 120 feet wide, and clearings etc. more than 1 acre in size to qualify as nonforest land.

Forest Land Classes

Productive forest land is capable of producing 20 cubic feet per acre per year of industrial wood and is manageable for continuous timber crops.

Timberland is productive forest land not withdrawn for nontimber purposes.

Noncommercial forest land includes both productive-reserved and unproductive forest land.

Productive-reserved forest land is withdrawn from timber utilization through statute, ordinance, or administrative order but otherwise qualifies as timberland.

Productive-deferred forest land is designated for reserve status, but has not yet been dedicated.

Unproductive forest land is incapable of yielding crops of industrial wood products because of adverse site conditions such as sterile soil, poor drainage, high elevation, steepness, and rockiness.

Forest Types

Forest types are determined on the basis of species plurality of all live trees that contribute to stocking; both size and spacing are considered.

Tree Classes

GROWING STOCK

Sawtimber trees, poletimber trees, saplings, and seedlings; that is, all live trees except cull trees.

Sawtimber trees are growing stock trees 9.0-inch d.b.h. and larger (11.0 inches and larger for Scribner volume), live, and of commercial species. Softwood trees must contain at least one 12-foot saw log with a top diameter not less than 6 inches inside bark; hardwood trees must contain at least one 8-foot saw log with a top diameter not less than 8 inches inside bark. At least 25 percent of the board-foot volume in either a softwood or hardwood tree must be free of defect.

Poletimber trees are 5.0- to 8.9-inch d.b.h., live, and of commercial species, not less than 25 percent sound on a cubic-foot basis, and have no disease, defects, or deformities likely to prevent their becoming growing-stock sawtimber trees.

Seedling and sapling trees are less than 5.0-inch d.b.h., live, of commercial species, and have no disease, defects, or deformities likely to prevent their becoming growing-stock poletimber trees.

NONGROWING STOCK

Mortality trees are commercial species which have died from natural causes within a specified period and which were not cull trees at the time of death.

Salvable dead trees are standing or down, of commercial species, 11.0 inches or more in diameter; they contain 25 percent or more of sound volume and at least one merchantable 16-foot log for softwoods or one merchantable 8-foot log for hardwoods.

Cull trees are noncommercial species or live trees of commercial species 5.0-inch d.b.h. and larger with excessive defect and deformities, or if less than 5.0 inches, of such poor vigor they are not expected to grow to 5.0 inches.

Stand Size Classes

Sawtimber stands are at least 10 percent stocked with growing-stock trees, with half or more of this stocking in sawtimber and poletimber trees, and with sawtimber stocking equal to or greater than poletimber stocking. In large sawtimber stands, the majority of the sawtimber stocking is in trees 21.0-inch and larger at breast height. In small sawtimber stands, the majority of the sawtimber stocking is in softwood trees from 9.0- to 20.9-inch d.b.h. and hardwood trees 11.0- to 20.9-inch d.b.h.

Poletimber stands are at least 10 percent stocked with growing-stock trees, with half or more of this stocking in sawtimber and poletimber trees, and with poletimber stocking exceeding sawtimber stocking.

Sapling and seedling stands are at least 10 percent stocked with growing-stock trees, with more than half of this stocking in saplings, seedlings, or both.

Nonstocked areas of timberland are less than 10 percent stocked with growing-stock trees.

Timber Volume

LIVE SAWTIMBER

Net volume of live sawtimber trees of commercial species is measured in board feet. Net volume equals gross volume less deduction for rot, sweep, crook, and other defects that affect use for lumber.

Scribner rule is the common board-foot log rule used locally in determining volume of sawtimber. Scribner volume was computed on a 16-foot log basis to a California utilized top[2] for trees 11.0-inch d.b.h. and larger.

[2] Data for the utilization study are on file at the Pacific Southwest Forest and Range Experiment Station, Berkeley, California.

International 1/4-inch rule is the standard board-foot log rule adopted nationally by the Forest Service for the presentation of volume statistics. For calculating International 1/4-inch board-foot volume, the minimum diameter for softwood trees is 9.0-inch d.b.h. and the minimum log length is 12 feet with a small end diameter of 7.0 inches outside bark. The minimum diameter for hardwoods is 11.0-inch d.b.h., with a minimum log length of 8 feet and a small end diameter of 9.0 inches outside bark.

GROWING STOCK

Net volume in cubic feet of live sawtimber trees and live poletimber trees from stump to a minimum 4.0-inch top (of central stem) outside bark. Net volume equals gross volume less deduction for rot and missing bole sections.

INDUSTRIAL WOOD

All roundwood products, except fuelwood.

NET ANNUAL GROWTH

The net increase in volume of trees during a specified year. Components of net annual growth include: (a) the increment in net volume of trees at the beginning of the specified year surviving to the year's end, plus (b) the net volume of trees reaching the size class during the year, minus (c) the net volume of trees that died during the year, minus (d) the net volume of trees that became culls during the year.

Biological Potential (Site Class)

The amount of wood measured in cubic feet that forest land is capable of producing if fully stocked with suitable trees and grown to the age of mean annual growth culmination (70 to 80 years for most species on most sites). For all ownerships, estimated biological potential was based on tree height and age relationships and normal yield tables for natural even-aged stands of single species. For lands outside National Forests, yield table values were further discounted for

stockability limitations (see the following definition of stockability). Intensive forest management activities such as fertilization, genetic tree improvement, and stocking control may result in yields that exceed the biological potential of natural stands.

Stockability

The ability of forest land to support trees. In this report, land that is incapable of supporting 60 percent as many trees as shown in normal yield tables (Dahms 1964; Dunning and Reineke 1933; Lindquist and Palley 1963; McArdle et al. 1961; Schumacher 1926, 1930) is considered difficult to manage. These areas are harsh, often rocky, and difficult to reforest. Stockability was determined on each sample plot in California's interior using plant indicators, soil depth, and other physical factors as described by MacLean and Bolsinger (1973a and b, 1974).

Potential Yield (National Forests Only)

The maximum timber harvest planned for the next 10 years to achieve the optimum perpetual sustained-yield harvesting level attainable with intensive forestry on regulated areas. Potential yield is based on productivity of the land, conventional logging technology, standard cultural treatments, and interrelationships with other resource uses and the environment. Conventional logging technology and standard cultural treatments include all applicable systems for intensive management whether or not they are currently economical or in general use in the area. Excluded are the effects of intensive activities that remain speculative such as genetics, fertilization, and irrigation. For additional details, see Forest Service Manual (USDA Forest Service 1977a, section 2410, Timber management plans).

Programed Allowable Harvest (National Forests Only)

That part of the potential yield scheduled for harvesting in a specific year. It is based on current demand, funding, silvicultural practices, and multiple use considerations. Annually, a programed allowable harvest statement reflecting the expected level of financing and showing the scheduled mix of yield components.

Ownership Classes

National Forest lands are Federal lands which have been designated by Executive Order or statute as National Forests or purchase units and other lands under the administration of the Forest Service, including experimental areas and Bankhead-Jones Title III lands.

Other public lands are Federal lands other than National Forests, including lands administered by the Bureau of Land Management, Bureau of Indian Affairs, and miscellaneous Federal agencies, and lands owned by States, counties, and local public agencies, or lands leased by these governmental units for more than 50 years.

Forest Industry lands are owned by companies or individuals operating wood-using plants.

Other private timber growers' lands are lands owned by companies that manage forests for timber production but do not operate mills. Most of these companies belong to forest industry associations and are considered "timber industry" by the California Department of Forestry.

Farmer-owned lands are lands owned by operators of farms.

Miscellaneous private-corporate lands are owned by companies or corporations that do not operate wood-using plants. Included are corporate farms, some railroad lands, oil company lands, real estate and land-holding company lands, and lands held by banks, other financial institutions, and various other companies and corporations.

Miscellaneous private-noncorporate lands are privately owned lands other than forest industry, farmer-owned, or corporate lands.

Data and Criteria Used in Assessing Silvicultural Treatment Opportunities Outside National Forests

1. **5,000 board feet per acre** is an average minimum volume that most people feel could be recovered economically in most forest situations.

2. **Growth level.** Cubic-foot growth (periodic annual growth of desirable conifers) was chosen as a measure of stand performance to avoid assumptions about utilization associated with board-foot measures and also to account for growth on smaller trees. If a stand has 5,000 or more board feet of volume and is growing less than 0.6 times the mean annual increment at culmination age (0.6 MAI), it is assumed to be underutilizing the site. Fully-stocked stands of ponderosa pine or Douglas-fir will grow at a higher rate until they are about 90 to 100 years old. This is a reasonably long rotation period to produce the size of material being used in California. Shorter rotations will keep growth above 0.6 MAI provided stands are adequately stocked. Stands growing less than 0.6 MAI may be very old, young but poorly stocked (generally less than 35 percent stocked), made up of unproductive trees due to insect or disease infestations, logging damage, etc., or occupied primarily by hardwoods or other low-value trees.

3. **Basal area** per acre in low-volume stands is a measure of site occupied by all trees 5.0-inch d.b.h. and larger. The 50-square foot level corresponds roughly with the basal area of well-stocked stands of Douglas-fir, redwood, or ponderosa pine on mid sites that are at the threshold of the poletimber class.

4. **Stocking.** In the treatment analysis, stocking comes into play only if conifer volume is less than 5,000 board feet per acre.

Trees over 5.0-inch d.b.h. were tallied on a variable radius plot, and trees 6.0 inches high to 4.9 inches d.b.h. were tallied on a fixed radius plot (either 1/578-acre or 1/300-acre). In the north coast, stocking was based on a basal area standard determined from yield tables, using stand age and site index. For the interior, stocking was calculated individually for each tree as though it were in a stand with quadratic-mean diameter equal to its own diameter.

In the north coast, the stocking of trees smaller than 5.0 inches was discounted back from 5.0 inches based on the yield table data when in stands of larger trees. In seedling and sapling stands, one tree was considered to stock a point, or to equal 10-percent stocking. If both desirable conifer and weed trees were present, both were counted, unless the weed tree was smaller and overtopped by the desirable tree. Thus it is possible to have a stand 100-percent stocked with desirable conifers and 100-percent stocked with weed trees. The suggested treatment for such a stand would be thinning and removing the weed trees.

5. Only softwood trees are considered desirable in terms of volume, growth, or stocking. With rare exception, most forest lands in California will produce considerably more wood and more dollar value in conifers than in hardwoods.

6. Nonstocked areas have 10 percent or less stocking, or 9 or 10 points (1/300-acre plots) devoid of desirable conifers if seedling or sapling size. Inadequately stocked areas have 11- to 35-percent stocking, or 7 or 8 points devoid of desirable conifers if seedling or sapling size.

7. Medium- to well-stocked areas are at least 36 percent stocked. In seedling and sapling stands, at least 4 points must be stocked to qualify as medium stocked. (If three or more points are nonstocked in medium-stocked stands, some kind of treatment is required.)

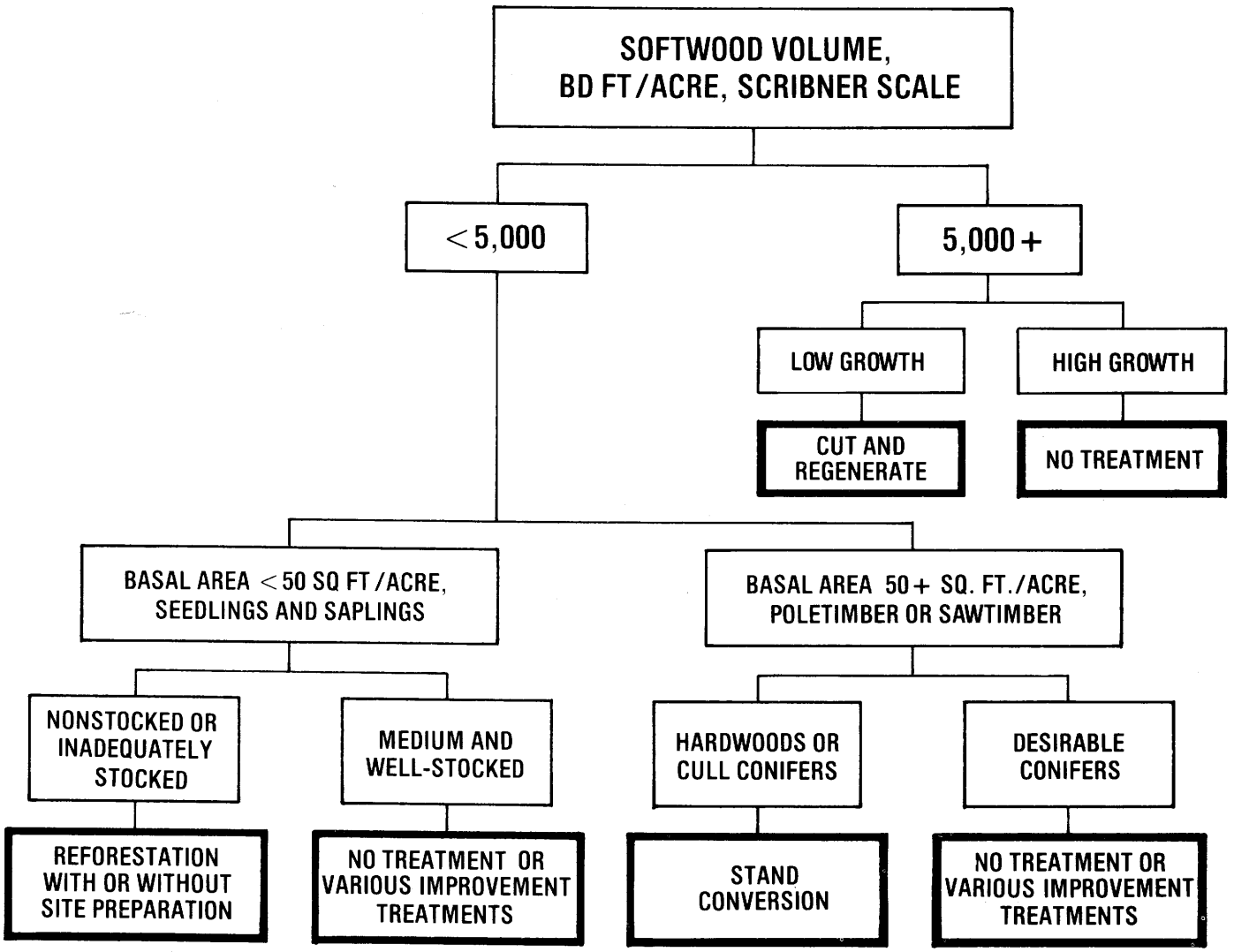
8. The data are shown by three site classes:

   High – 165 cubic feet per acre per year and greater
   Medium – 85 - 164 cubic feet per acre per year
   Low – 20 - 84 cubic feet per acre per year

9. Other data used in the analysis:

   Stockability percent
   Percent inhibiting brush
   Percent overstocked
   Percent slope.

SILVICULTURAL TREATMENT OPPORTUNITY ASSESSMENT ANALYSIS
Flow Chart



Scientific and Common Names of Plants Mentioned in This Report[3]

Abies concolor (Gord. & Glend.) Lindl.	white fir
Abies grandis (Dougl.) Lindl.	grand fir
Abies magnifica A. Murr.	California red fir
Abies magnifica var. *shastensis* Lemm.	Shasta red fir
Acacia greggii Gray	catclaw acacia
Acer macrophyllum Pursh	bigleaf maple
Adenostoma fasciculatum H. & A.	chamise
Aesculus californica (Spach) Nutt.	California buckeye
Alnus rhombifolia Nutt.	white alder
Alnus rubra (Bong.)	red alder
Arbutus menziesii Pursh	Pacific madrone
Arctostaphylos spp.	manzanita
Artemisia spp. L.	sagebrush
Ceanothus spp. L.	ceanothus
Cercis occidentalis Torr.	California redbud
Cercocarpos spp. HBK	mountain-mahogany
Cupressus spp. L.	cypress
Fraxinus latifolia Benth.	Oregon ash
Juglans spp. L.	walnut
Juniperus spp. L.	juniper
Libocedrus decurrens Torr.	incense-cedar
Lithocarpus densiflorus (Hook. & Arn.) Rehd.	tanoak
Pinus attenuata Lemm.	knobcone pine
Pinus aristata Engelm.	bristlecone pine
Pinus balfouriana Grev. & Balf.	foxtail pine
Pinus contorta Dougl.	lodgepole pine
Pinus coulteri D. Don	Coulter pine
Pinus jeffreyi Grev. & Balf.	Jeffrey pine
Pinus lambertiana Dougl.	sugar pine
Pinus monticola Dougl.	western white pine
Pinus muricata D. Don	bishop pine
Pinus ponderosa Laws.	ponderosa pine
Pinus radiata D. Don	Monterey pine
Pinus sabiniana Dougl.	Digger pine
Platanus racemosa Nutt.	California sycamore
Populus fremontii S. Wats.	Fremont cottonwood
Populus tremuloides Michx.	quaking aspen
Populus trichocarpa Torr. & Gray	black cottonwood
Prosopis spp. L.	mesquite
Prunus emarginata Dougl.	bitter cherry
Pseudotsuga macrocarpa (Vasey) Mayr	bigcone Douglas-fir
Pseudotsuga menziesii (Mirb.) Franco	Douglas-fir
Quercus agrifolia Née	coast live oak
Quercus chrysolepis Liebm.	canyon live oak
Quercus douglasii Hook. & Arn.	blue oak
Quercus garryana Dougl. var. *breweri* Jeps	Oregon white oak

[3] The source for most tree names is Little (1953); for other plants the source is Munz and Keck (1970). Griffin and Critchfield (1972) are authorities on tree distribution within California.

Scientific and Common Names of Plants Mentioned in This Report--Continued

Quercus kelloggii Newb.	California black oak
Quercus lobata Née	California white oak
Quercus wislizenii A. DC.	interior live oak
Salix L. spp.	willow
Sequoia sempervirens (D. Don) Endl.	redwood, coastal redwood
Sequoiadendron giganteum (Lindl.) Buchholz	giant sequoia, Sierra redwood
Tsuga mertensiana (Bong.) Carr.	mountain hemlock
Umbellularia californica (Hook. & Arn.) Nutt.	California-laurel

Metric Conversions

1,000 acres	=	404.69 hectares
1,000 cubic feet	=	28.3 cubic meters
1 cubic foot per acre	=	0.0700 cubic meter per hectare
1 square foot basal area per acre	=	0.2296 square meter per hectare
1 foot	=	30.48 centimeters
1 inch	=	2.540 centimeters

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Resources-Oriented Outline of California's History--Continued

930-40	Hoover Dam and San Francisco's Hetch-Hetchy water development built.
	25 reservoirs were built with 10,000 acre-feet capacity.
	Devastating forest fires; extensive damage to resources and property.
	Bankhead-Jones Farm Tenant Act of 1937 provided for purchase of lands to protect, improve, and develop natural resources.
940	Population in California reached 7 million.
941-45	World War II goaded the economy.
	Massive shift of wealth and people to southern California.
	State's funds for forest fire protection increased and a fire plan was developed which improved fire control.
	Smog damage to pines in southern California first reported; cause was unknown at the time.
	Lumber produced by 330 sawmills totaled 2.3 billion board feet.
945	Timber harvest approached 3 billion board feet, mostly from private lands.
	California Forest Practices Act. Two premises central to this Act (1) promoted continuous production of forest products from private lands, and (2) entrusted regulation as much as possible to the forest industry.
947	Plywood boom began. First plants of the period were California Veneer Co., at Klamath, and Humboldt Plywood Corp., at Arcata. This opened a market for California Douglas-fir, which had been used very little previously.
948	California's first major pulpmill built -- Fibreboard Products at East Antioch.
	Lumber produced by 984 sawmills totaled 3.97 billion board feet.
949	Lake Shasta built, California's largest manmade lake, with 4.5 million acre-feet capacity.
950	Population of California reached 12 million, a 71-percent increase since 1940.
	Lumber production topped 4 billion board feet.
	Plywood production reached 300 million square feet.
	From 1950 to mid-1960s, hardboard and particle plants were built; four large pulpmills were also built.
955	Total timber harvest peaked at 6 billion board feet, 85 to 90 percent from private lands. Much of the increase since 1945 was in the north coast.
957	Smog confirmed as cause of pine decline in southern California.
959	Lumber production peaked at nearly 6 million board feet.
960	Population in California reached 16 million.
	Irrigated croplands totaled 8 million acres.
	Multiple-Use Sustained Yield Act directed National Forest management.
960-61	Numerous forest fires occurred.
962	Columbus Day windstorm in northern part of State damaged forests extensively.
963	State legislation tightened forest fire laws and amended 1945 Forest Practices Act to obtain greater compliance.
964	Heavy rains in the north coast following large-scale logging and roadbuilding resulted in extensive erosion, flooding and stream sedimentation.
	National Wilderness Act passed.
	Plywood production peaked at 1.3 billion square feet.
	Lumber production reached 5 billion board feet.
964-65	Tussock moth infestation, worst recorded in history of California.
968	Redwood National Park, the Nation's 34th National Park, was dedicated.
969	Smog damage in southern California spread to three-county area.
	National Environmental Policy Act passed.
970	California Environmental Quality Act passed.
971	California Forest Practices Act declared invalid on grounds that the Board of Forestry was industry-dominated.
973	Z'Berg-Nejedly Forest Practice Act passed, setting forth standards aimed at maintaining forest productivity. A new Board of Forestry was appointed.
	Budworm outbreak in northern California -- worst recorded epidemic of a forest defoliator.
974	Smog damage spread northward to several National Forests and Sequoia and Kings Canyon National Parks.
975	Provisions of Forest Practice Act declared subject to requirements of California Environmental Quality Act in January 1975. A year-long battle between timber interests and environmentalists followed. Better rules and more workable guidelines resulted.
975-77	Severe drought, combined with insect and disease epidemics, killed millions of trees.
976	Z'Berg-Warren-Keene-Collier Forest Taxation Act designed to discourage premature timber cutting and to encourage landowners to keep land in forestry use.
977	California Forest Resource Assessment and Policy Act directed the Department of Forestry to assess and analyze the State's forest resources as basis for formulating forest policy.

The **Forest Service** of the U.S. Department of Agriculture is dedicated to the principle of multiple use management of the Nation's forest resources for sustained yields of wood, water, forage, wildlife, and recreation. Through forestry research, cooperation with the States and private forest owners, and management of the National Forests and National Grasslands, it strives — as directed by Congress — to provide increasingly greater service to a growing Nation.