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TIMBER RESOURCES OF NORTHERN INTERIOR CALIFORNIA 1970

Charles L. Bolsinger

PACIFIC NORTHWEST
FOREST AND RANGE EXPERIMENT STATION
U.S. DEPARTMENT OF AGRICULTURE, FOREST SERVICE
PORTLAND, OREGON

Renewable resources evaluation research is a nationwide project of the Forest Service authorized by the McSweeney-McNary Forest Research Act of 1928 and subsequent amendments, and the Renewable Resources Planning Act of 1974 (Public Law 93-378). The purposes of renewable resources evaluation research are to inventory and evaluate the current amount, condition, and output from renewable resources on forests and rangelands and assess future trends in supply of and demand on these resources as a basis for formulating policies and programs. Resurveys are made periodically to update basic information.

Renewable Resources Evaluation Surveys are conducted throughout the 50 States by the U.S. Forest Service Experiment Stations. The Pacific Northwest Forest and Range Experiment Station at Portland, Oregon, is responsible for the States of Alaska, California, Hawaii, Oregon, and Washington.

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The gathering and preparation of the timber resource information in this report has been a long, involved process requiring the cooperation of many people.

Regions 5 and 6 of the Forest Service, U.S. Department of Agriculture, supplied field plot data for National Forest lands. County tax assessors furnished ownership information for lands outside National Forests. The California Division of Forestry provided maps and timber production data. Other public agencies and many private landowners cooperated by permitting forest inventory crews to enter or cross lands and provided maps, aerial photographs, and other useful information.

The Renewable Resources Evaluation Research project of the Pacific Northwest Forest and Range Experiment Station gathered and processed all information from lands outside National Forests, processed the information supplied by the National Forests, and prepared this report. Thousands of man-days were required, including the time of:

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TIMBER RESOURCES OF NORTHERN INTERIOR CALIFORNIA, 1970

Reference Abstract

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This report summarizes a timber resource inventory in Lassen, Modoc, Siskiyou, Shasta, and Trinity Counties, California. Included are detailed tables of forest area, timber volume, growth, mortality, and removals and a discussion of the current timber resource and timber industry situation.

Keywords: Forest surveys (North Central California), resources (forest), statistics (forest).

RESEARCH SUMMARY

Resource Bulletin PNW-65

1976

California's Northern Interior (Lassen, Modoc, Siskiyou, Shasta, and Trinity Counties) has a relatively sparse population and extremely diverse climate, topography, soils, and vegetation.

Forest industries provide about 25 percent of the employment in the five-county area. Currently there are over 40 wood products mills, including lumber mills, veneer and plywood plants, pulp and board plants, and a post, pole, and piling installation. The trend since the 1940's has been toward fewer and larger mills. Lumber production dominates, though veneer and plywood have increased.

The area contains about 9.6 million acres of forest land, of which 6.0 million is classified as commercial, 3.2 million as unproductive, and 0.4 million acres as productive reserved in Parks and Wilderness. Public agencies own 60 percent of the commercial forest; 40 percent is privately owned. About 26 percent of public and 18 percent of private commercial forest land are expected to yield little timber in the future due to economic and environmental constraints and ownership objectives.

Since 1953, about 80,000 acres of commercial forest have been converted to roads, reservoirs, powerlines, grazing lands, residential and recreational developments, and other permanent clearings; 355,000 acres were reclassified from commercial to noncommercial. Recently developed methods of determining productivity were used as well as several

years of experience in problem areas such as some of the nonstocked burns. About 16,000 acres of National Forest land formerly classified as reserved were placed in the commercial forest category.

Ownership changes of commercial forest land include an increase in National Forest and forest industry land, and a decrease in other public and miscellaneous private holdings.

Douglas-fir, ponderosa pine, and true firs are the most common types. Most forest lands are fairly well stocked with trees; but the condition of many cutover stands, especially on private lands, is poor, resulting in lower growth rates and higher mortality than would be expected in well-managed forests.

Total volume in growing stock and sawtimber trees in 1970 is estimated at 15.9 billion cubic feet or 86.0 billion board feet (International 1/4-inch rule). National Forests own 70 percent of this, other public agencies 2 percent, and private landowners 28 percent.

Since 1953, standing timber volume has declined about 21 percent—17 percent on public lands and 45 percent on private lands. Pines and Douglas-fir are declining more rapidly than other species.

Total net annual growth is about 0.25 billion cubic feet or 1.25 billion board feet. National Forest lands account for 63 percent of the cubic-foot growth and have the highest per-acre growth rate (45 cubic feet per acre). Private lands, though potentially more productive than National Forest lands, have a lower current growth rate (34 cubic feet per acre on forest industry land, 37 cubic feet on other private). Annual mortality is about 45 million cubic feet or 222 million board feet. National Forests have the lowest mortality rate relative to inventory volume. The lower per-acre growth and higher mortality rates on private lands are due primarily to the poor condition of the logged and burned areas, which amount to about 75 percent of these private ownerships. Growth has been increasing, however, and there are reasons to expect better performance in the future.

Salvable dead timber volume is nearly equal to the annual timber cut, but much of this can not be salvaged economically.

The annual timber cut has remained fairly constant for the past 20 years, ranging between 1.3 and 1.5 billion board feet; but there has been a decided shift from private to public timber and from the eastern part of the area to the west. The annual cut apparently could be maintained indefinitely at 1.3 billion board feet if the average annual growth could be increased from 173 board feet per acre to 216 (or from about 40 cubic feet to 50). This seems possible, biologically; but it would require more intensive forestry and for some ownerships a change in management objectives.

PREFACE

Numerous reports on the timber resources of California have been published, beginning with a section in Charles S. Sargent's "Report on the Forests of North America (exclusive of Mexico)" in 1880; but not until the late 1940's was a comprehensive field inventory made. In 1954 USDA Forest Service Forest Survey Release No. 25, "Forest Statistics for California," was published. This report included forest area data by county and public and private ownerships and timber volume by subregions of the State. The volume data for the 1954 report were collected on 1,527 commercial forest plots established throughout the State. Individual reports for Siskiyou (1950), Shasta (1954), and Trinity (1951) Counties that showed forest area detail, but no volume figures, were also published from some of the same data used in Release No. 25.

The results of a reinventory of California forest resources in 1962 were published in Resource Bulletin PSW-4, "Commercial Forest Area and Timber Volume in California, 1963" (Oswald and Hornibrook 1966). The reinventory consisted of a remeasurement of about 15 percent of the 1,527 plots established for the 1950-54 inventory. The information was not developed by county.

The report you are reading summarizes the latest timber resource inventory in Lassen, Modoc, Siskiyou, Shasta, and Trinity Counties, California. A total of 1,859 commercial forest plots were established in the five-county area. These plots were selected from a much larger number of aerial photo plots—43,885 aerial photo plots were examined, including plots in commercial and noncommercial forest and nonforest areas. (See "Inventory Procedures," page 72, for details.)

Forests have played a prominent role in the socioeconomic scene during the past 125 years and will continue to be important to the people in the five-county area, as well as to the State and the Nation. This report is a point-in-time examination of the ever-changing forest resource. Though focusing primarily on the timber resources of the forests, that is, the amount and kind of wood available to meet people's needs, the information presented here may also be useful to people concerned with other resources of the forest, including grazing, water, clean air, wildlife, and recreation.

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THE SETTING

California's Northern Interior is sparsely populated, having about 14 percent of the total land area in California but less than 1 percent of the population. The population density for the five-county area is 6.4 persons per square mile; but over half of the people live in Shasta County, mostly in and near Redding, the largest city in the area. Other major towns and cities are Susanville, Yreka, Alturas, Weaverville, and Weed.

Between 1960 and 1970, the population of the five-county area increased 14 percent compared with 27 percent for the entire State. The increase was essentially all in Shasta and Lassen Counties. Siskiyou County's population increased only 1 percent, Modoc County decreased 11 percent, and Trinity County decreased 22 percent.

The area is rather remote from California's population centers. Redding is 167 miles from Sacramento and 231 miles from San Francisco. Modoc County is one of the remotest areas in the State; Alturas, the county seat, is 312 miles from Sacramento and 379 miles from San Francisco.

The five-county area is extremely diverse in climate, topography, soils, and vegetation. The rugged Coast Ranges and Klamath Mountains (fig. 1) occupy the western portion of this

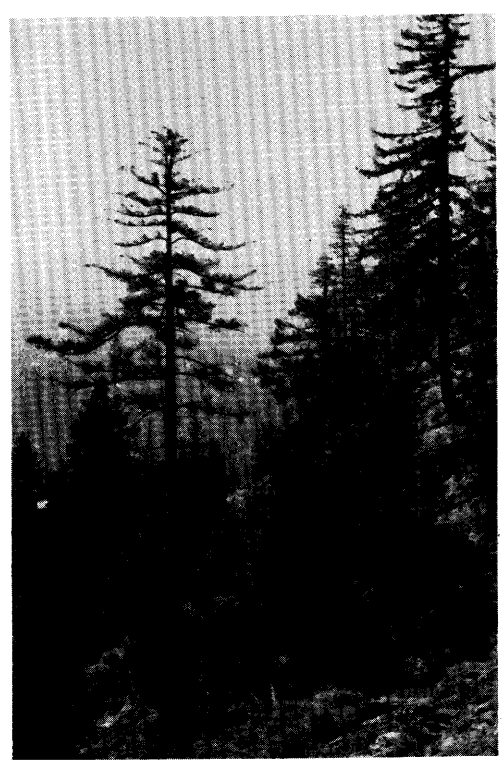

Figure 1.—The Coast Ranges and Klamath Mountains in the western part of the Northern Interior are heavily timbered, but many areas are difficult to manage due to steepness and rockiness.

area, with peaks up to 9,038 feet high and deep, narrow canyons cutting down to 400-500 feet along the Humboldt County line in Siskiyou and Trinity Counties. The southern Cascade Range occupies most of the eastern portion of the area where the 4,000- to 6,000-foot plateaus and rolling uplands are broken by occasional canyons and dotted by numerous volcanic peaks, including 14,162-foot Mount Shasta (fig. 2) and 10,466-foot Lassen Peak. The Warner Mountains in the extreme northeastern corner of the area are narrow and abrupt, a block-fault range with peaks up to 9,934 feet. The Sacramento River heads in the Northern Interior, and the northern tip of the Sacramento Valley separates the Coast Ranges from the Cascades in southern Shasta County. The east slopes of the Cascades grade into the arid Great Basin in eastern Lassen County.

The climate is variable because of the mountains which affect temperature and modify the moisture-laden westerly winds. Precipitation ranges from 50-60 inches or more in the western Siskiyou and Trinity Counties and in some of the higher mountains in Shasta County to less than 10 inches in extreme eastern Lassen and Modoc Counties and also in the Klamath-Tule Lake area in northeastern Siskiyou and northwestern Modoc Counties. The

Figure 2.—Mount Shasta in southern Siskiyou County. The forests near timberline are primarily Shasta red fir and white fir; lower slopes in the picture are forested with mixed-conifer stands of Douglas-fir, white fir, ponderosa and sugar pines, and incense-cedar, with scattered stands of lodgepole pine on some burned areas. The smooth-textured gray patches are brushfields in burned areas that have not reforested.

frost-free period ranges from nearly 8 months in the Sacramento Valley in Shasta County to less than 3 months in the higher mountains in Lassen and Modoc Counties and 4 to 5 months in much of Trinity and western Siskiyou Counties.

Soils are extremely variable due to the diversity of the climate and parent material. Very productive soils derived from volcanic and metamorphic rocks are common in the Northern Interior, but in some areas there are soils derived from granite, peridotite or serpentine (fig. 3), and limestone, which are relatively low in productivity. Some soils on steep slopes, especially those derived from granite and metamorphic rocks, are extremely unstable (fig. 4) and cause logging, roadbuilding, and forest management problems.

Natural vegetation reflects the topography, climate, and soils and ranges from grassland and oak-savannah in the Sacramento Valley, through chaparral, Digger pine, and broadleaf woodland (fig. 5) in the foothills of both the Coast Ranges and Cascades, to forests of ponderosa pine, mixed conifers, and high elevation forests of true firs. Jeffrey pine occurs on peridotite/serpentine areas throughout the forested area and in mixed stands of other species on volcanic soils in the eastern portion of the area. On the lower eastern slopes of the Cascades, ponderosa-Jeffrey pine forests grade into sagebrush steppe, often intermixed with juniper, mountain-mahogany, and scrub black oak along the forest fringe

Figure 3.—This stand of Jeffrey pine near Weaverville in Trinity County is growing on soil derived from serpentine rock. Such areas are naturally low in productivity. The better timber stands on the hill in the background are growing on soils derived from schistose rock.

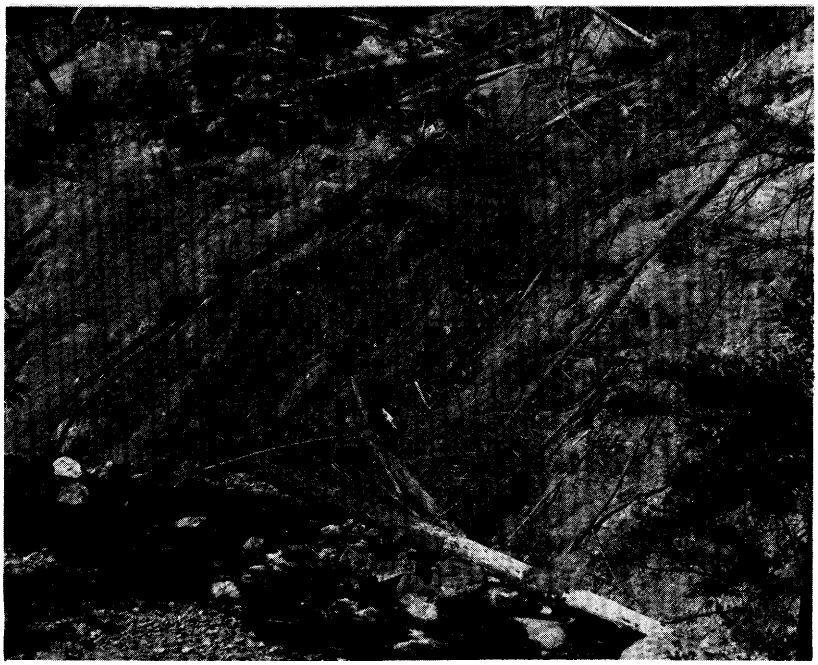

Figure 4.—A natural landslide along a stream in the Trinity National Forest, an example of an area that could be classified by the Forest Service as "special" [water influence zone] or "marginal" due to unstable soil.

Figure 5.—Blue oak-grassland type with scattered Digger pine in the lower foothills of the southern Cascade Range in Shasta County. Blue oak and other noncommercial oak types occupy about 560,000 acres or roughly 6 percent of the forest land in the Northern Interior.

(fig. 6). (See page 70 for a list of the major woody plants and their occurrence in the Northern Interior, California.)

Forest fires (fig. 7), grazing, logging, mining (fig. 8), and other activities by man have altered the vegetation throughout the area. Many of today's stands of young pine and fir originated on sites deforested within the past 125 years. Extensive areas that were once forested now support only shrubs and grass, and there is evidence that conifers once grew in some areas now occupied only by hardwoods. In eastern Lassen County, juniper and in some cases Jeffrey pine have been slowly encroaching on rangeland in the forest-steppe transition zone. Changes due to man and nature

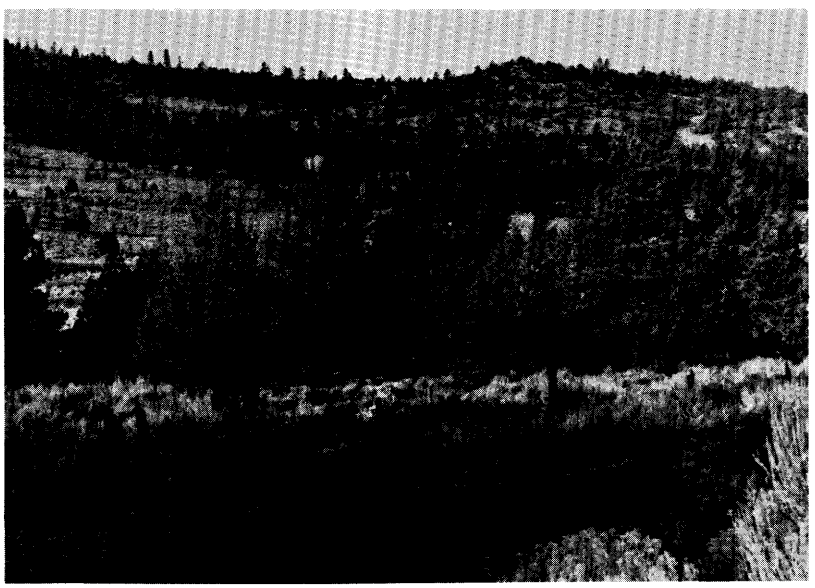

Figure 6.—Jeffrey-ponderosa pine stands grading into juniper-sagebrush at the lower forest fringe in Lassen County.

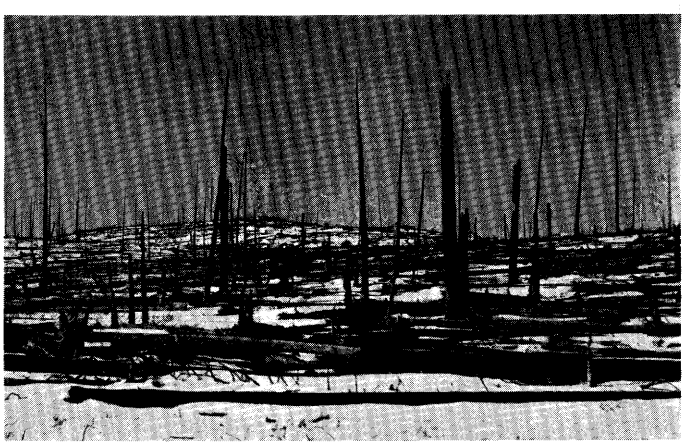

Figure 7.—Timber killed in the Antelope Mountain Burn, Lassen National Forest, one of many forest fires that have occurred in the Northern Interior.

Figure 8.—Mine dredgings in Trinity County are still essentially nonforested after several decades.

are still taking place and will continue, perhaps at an increasing rate as demands for various resources increase.

The forests play a prominent role in the socioeconomic scene in the Northern Interior, providing employment in the forest products industries (fig. 9) and generating additional employment in construction, trade, services, public and private forestry positions, watershed management, and the outdoor recreation industry. Unlike the forest products industry which has generally stabilized, at least in terms of volume of wood cut, forest recreation continues to expand (fig. 10). Outdoor recreation use in 1970 in the five-county area was estimated to total 101 million participation days. By 1990 it is projected to total 177 million participation days, a 75-percent increase in 20 years.[1] Goods such as Christmas trees, pine cones, bark dust, mushrooms, and many others both tangible and intangible, originate in the forests of northern interior California. The water, wildlife, minerals, fossils, archeological sites, and scenery are important to the 150,000 people living in the area, as well as to many from outside.

[1]Source: State of California, Department of Parks and Recreation.

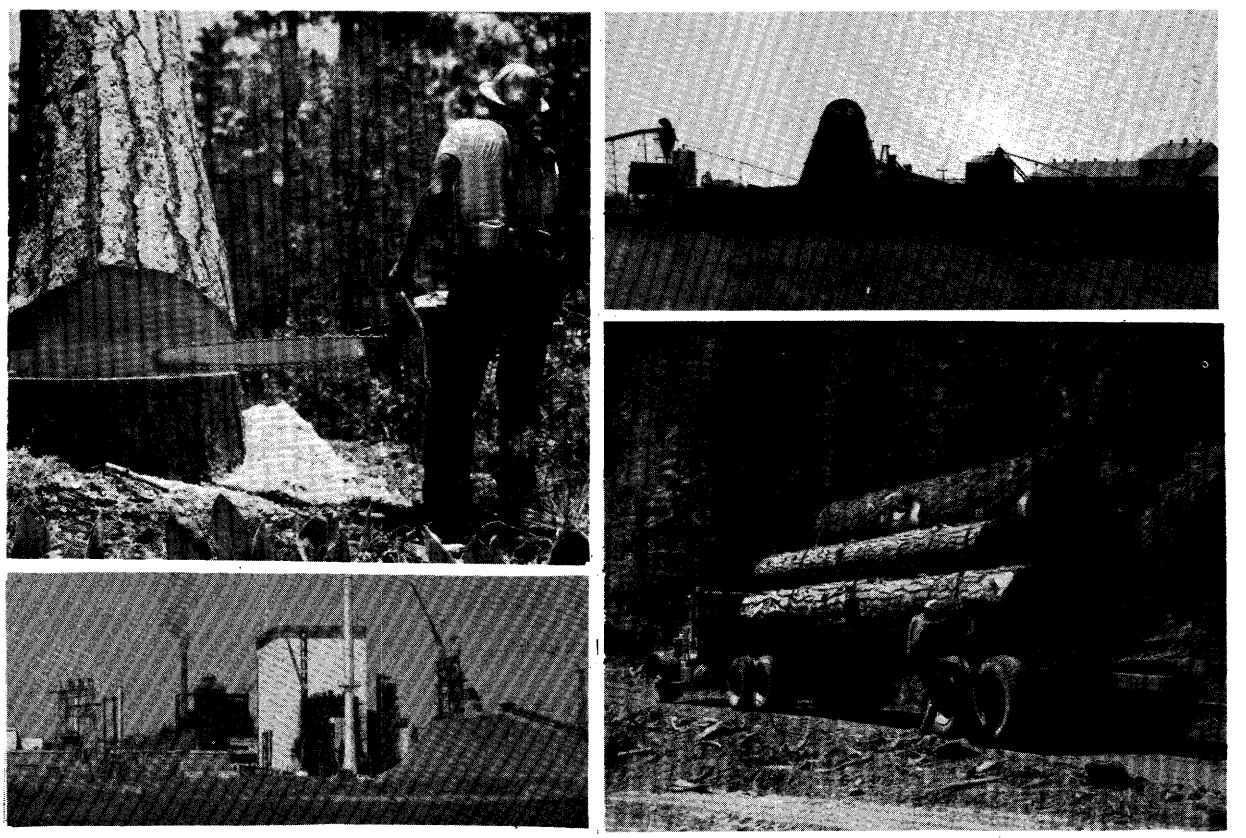

Figure 9.—Forest industries are important to the economy of northern interior California.

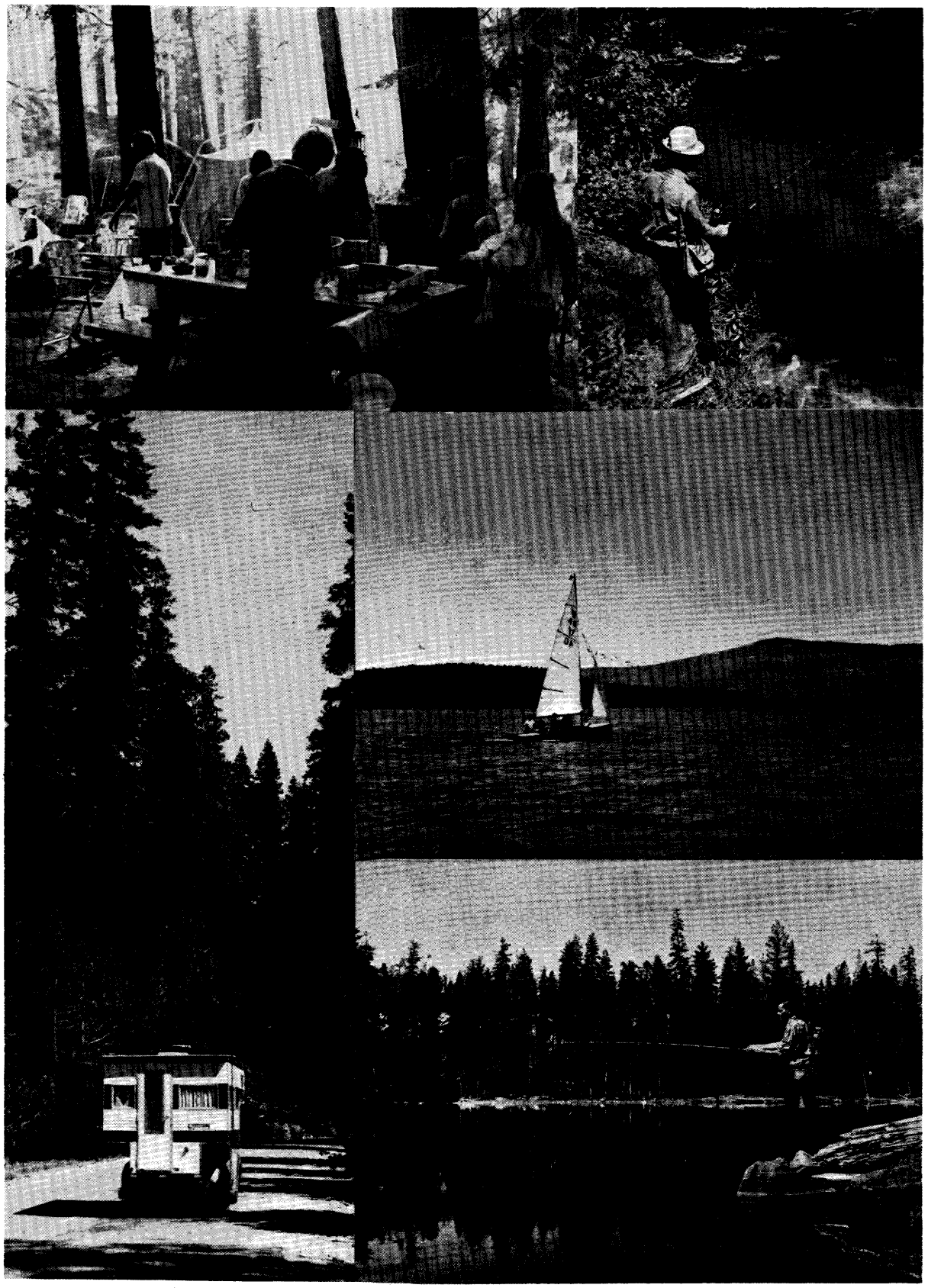

Figure 10.—The forests provide many forms of recreation.

THE FOREST INDUSTRY

Lumber dominates the forest industries

Plywood Production has increased

The trend has been toward fewer, larger mills

In 1972 there were 44 wood products mills in the five-county area—37 lumber mills, 5 veneer and plywood plants, and 2 pulp and board plants. In addition there was at least one post, pole, and piling plant. Lumber production dominates the forest industry, accounting for 89 percent of the total log consumption, compared with 98 percent in 1946. Veneer and plywood mills consume the other 11 percent, compared with 2 percent in 1946. The pulp and board industry relies entirely on mill residues in the form of chips, sawdust, shavings, and bark. The trend in the lumber industry in the Northern Interior, as throughout the Pacific Coast States, is toward fewer and larger mills, though recently a few small-log facilities have been built. Table 1 shows number of mills and percent of log consumption by industry for selected years.

Table 1--*Number of mills and percent of log consumption, by industry in California's Northern Interior for selected years, 1946-72*[1]

Industry[2]	1946	1956	1962	1968	1972
Lumber:					
Number of mills	132	107	53	45	37
Percent of log consumption	98	94	([3])	89	89
Veneer and plywood:					
Number of mills	3	7	6	5	5
Percent of log consumption	2	6	([3])	11	11
Pulp and board:					
Number of mills	1	1	1	3[4]	2
Total number of mills	136	115	60	53	44

[1]Sources: Forest Survey Release 6 (Burks and others 1948)
Forest Survey Release 20 (May 1953)
Forest Survey Release 20 (May and Baker 1957)
Forest Survey Release 34 (May 1958)
Forest Survey Release 35 (May and Baker 1958)
Resource Bulletin PSW-2 (Muerle and Hornibrook 1965)
California Timber Industries-1968 (Barrette and others 1970)
Resource Bulletin PNW-52 (Howard 1974)

[2]Includes only those sectors of the forest products industry for which time series data are available.

[3]Data not available for the Northern Interior because they were combined with other areas to avoid disclosure.

[4]Includes 2 processes at 1 location.

Forest industries provide for 17 percent of area's employment

Forest industries in the Northern Interior including logging, lumber and plywood manufacturing, millwork, prefabrication, wood preserving, and other wood products, and pulp and paper manufacturing[2] employed about 7,900 persons in 1973.[3] This was about 17 percent of the total reported employment in the five-county area and about 9 percent of the total employment in all forest industries[4] in California.

Logging accounted for about 18 percent of the forest industrial employment in the Northern Interior in 1973, sawing and planing mills 55 percent, veneer and plywood 12 percent, and pulp and paper and other wood products manufacturing 15 percent. Though 89 percent of log consumption in 1972 was by the lumber industry, (table 1) this sector accounted for only 67 percent of the nonlogging employment. The veneer and plywood sector, on the other hand, used 11 percent of the total logs consumed in 1972 but accounted for 14 percent of the nonlogging employment.

More timber is cut than is processed in Northern Interior counties

Northern Interior forests also contribute directly to forest industrial employment in other areas. In 1972, about 100 million more board feet (or about 8 percent more logs) were cut in the Northern Interior woods than were processed in mills in the area. Logs were shipped mainly to the north coast, the Sacramento Valley, and to Oregon. Trinity County is the largest net exporter; it processed less than half of the logs cut in the county in 1972 and transported 36 percent outside the Northern Interior. Lassen and Modoc Counties are also net exporters, but Siskiyou and Shasta counties process more logs than are cut in these counties.

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[2] Standard Industrial Codes 2411-2499, and 2621 (U.S. Office of Management and Budget 1972).

[3] Source: State of California, Department of Human Resources Development.

[4] Standard Industrial Codes 2411-2499, and 2611-2661 (U.S. Office of Management and Budget 1972).

FOREST AREA

Ownership

69 percent of the area is forest, including . . .

- **43 percent commercial forest**
- **23 percent unproductive forest**
- **3 percent productive reserved in parks and wilderness**

In the five counties of Lassen, Modoc, Siskiyou, Shasta, and Trinity, 9,678,000 acres or 69 percent of the total land area is classified as forest land. Commercial forest land[5] totals 6,028,000 acres or 43 percent of the total land area. Included are the upland areas, where virtually all the commercial conifer trees grow, and some hardwood sites along streams. Unproductive forest land totals 3,211,000 acres or 23 percent of the total land area. Included as unproductive forest are the oak stands(fig. 5) in the foothills below the conifer zone, juniper, chaparral, forested areas that are too steep and rocky to harvest or manage for continuous production of wood, forest lands incapable of growing 20 cubic feet of wood per acre because of limiting moisture (fig. 11) or soil toxicity, and upper timberline forests (figs. 12 and 13). Productive forest land reserved by law in National Forest Wilderness and National, State, and County Parks totals 439,000 acres or 3 percent of the land area.

[5]See "Definition of Terms," page 73.

Figure 11.—This forest fringe area in Modoc County near Adin is incapable of growing 20 cubic feet of wood per acre per year. Individual trees are growing reasonably well, but the area will support very few trees, per acre, due to limiting moisture.

Figure 12.—Upper timberline in the Salmon-Trinity Alps. The sparse stand shown in this picture includes Shasta red fir, mountain hemlock, and the relatively rare foxtail pine.

Figure 13.—Upper Canyon Creek Lake in the Salmon-Trinity Alps, bordered by low-site forests classified as unproductive.

National Forests contain 58 percent of the commercial forest but—

Not all acres will produce full yields of timber . . .

- **5 percent requires modified timber management practices**
- **17 percent has low yield expectations in the near future**

National Forests contain 3,474,000 acres or about 58 percent of the commercial forest land. Included are all or portions of the Lassen, Modoc, Shasta, Trinity, Klamath, Six Rivers, Mendocino, and Plumas National Forests of Region 5 and small portions of Region 6's Rogue River National Forest and Region 4's Toiyabe National Forest.

Not all of the 3,474,000 acres of commercial forest land in National Forests is or will be managed primarily to produce timber. In many areas the protection of other resource values requires that timber harvesting be modified. These areas, classified by the Forest Service as "special component," may yield considerably less timber than areas that are managed primarily for timber production. About 5.3 percent of the total commercial forest land in the National Forests in the Northern Interior is in this category. Included are the Whiskeytown-Shasta-Trinity National Recreation Area, travel and water influence zones, and forest land bordering some developed sites.

Another category of land from which less than full timber production can be expected is the "marginal component." This amounts to about 16.8 percent of National Forest commercial forest land in the Northern Interior. Included are extensive areas of low value hardwoods and other species (mostly knobcone pine) presently low in demand; soils that are unstable (fig. 4), shallow (fig. 14), and rocky; areas not now economically loggable because of access or terrain; and nonstocked areas that will not be reforested because of lack of funds.

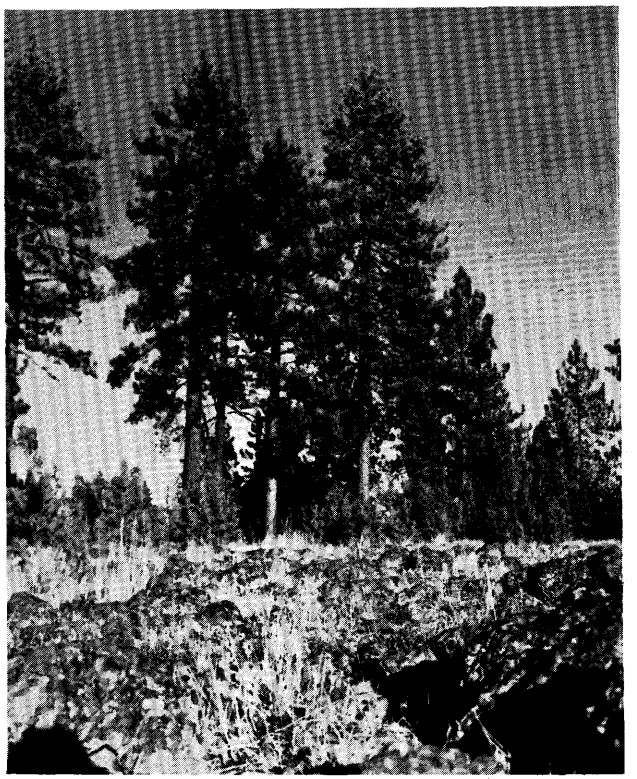

Figure 14.—Extensive areas of scab rock and small "pockets" of soil stocked with Jeffrey and ponderosa pines and western juniper occur in the lava-flow country in and near the Modoc National Forest. Such areas may support marketable trees but are difficult to manage and have low future yield expectations.

- **3½ percent may become wilderness**

- **1 percent is not planned for timber management**

Other public agencies hold about 2 percent of the commercial forest

About 124,000 acres or 3.5 percent are in areas being studied for possible inclusion in wildernesses.

Commercial forest land in experimental forests, recreation and administrative sites, and isolated tracts where sustained periodic harvest is impractical is in a category called "unregulated." Sustained yield timber production is not planned for these areas, which amount to about 1.3 percent of the total commercial forest land in National Forests.

The Bureau of Land Management, Bureau of Indian Affairs,[6] other Federal and State agencies, and counties and municipalities administer 154,000 acres or about 2 percent of the total commercial forest land.

[6]Indian lands are privately owned, but have been included here as public.

40 percent is privately owned including . . .

- **11 percent by timber companies**
- **19 percent by non-mill-operating corporations—**

  90 percent of which is owned by 4 corporations who manage for timber production and 10 percent by banks and land developers

- **10 percent of total commercial forest is owned by farmers and other non-corporate owners**

Privately owned commercial forest land is estimated at 2,400,000 acres or about 40 percent of the total in the Northern Interior.

At the time the fieldwork was done for this inventory, 679,000 acres or 11 percent of the total commercial forest land was owned by timber industry companies operating wood processing mills. Miscellaneous private corporations other than mill-operating timber companies owned 1,125,000 acres or 19 percent of the total. Since the inventory was completed, a number of land transactions have taken place. Over 150,000 acres of commercial forest land have been transferred from miscellaneous private corporate owners to forest industry. The tables in this report do not reflect these transactions.

Of the 1,125,000 acres of miscellaneous private corporate commercial forest land, about 90 percent was owned by four corporations. Even though these firms do not operate wood processing mills, timber production has been and will probably continue to be one of their land management objectives. Most of the remaining 10 percent of the commercial forest land in miscellaneous private corporate ownership is held by land developers and subdividers, banks, and other financial institutions.

Ranchers, farmers, and noncorporate miscellaneous private owners held 596,000 acres or 10 percent of the total commercial forest land.

Not all commercial forest in other public and private ownerships will produce full yields

2 percent of other public forests are in nontimber uses; half of these are marginal for timber production

2 percent of private forests are in nontimber use and 14 percent are marginal

As with National Forests, not all commercial forest land in other public or private ownership is currently manageable for full timber yields because of physical factors or conflict with other uses. An attempt was made to classify other public and private commercial forest land into timber management intensity and suitability categories similar to those used by the National Forests. To do this, each field plot was examined and placed into one of several categories based strictly on physical evidence.

About 2 percent of other public commercial forest land is currently in areas where recreational development or other uses will reduce or possibly eliminate timber production. About 50 percent of the other public commercial forest is in areas with limiting physical or economic factors, including 29 percent in low-value species such as hardwoods and knobcone pine and arid fringe areas of juniper-pine or Digger pine, 3 percent in high elevations where forest regeneration has generally failed, and 18 percent in steep, rocky, and unstable areas and periodotite-serpentine soils.

About 2 percent of private commercial forest lands is in areas currently being developed for nontimber use (primarily residential sites), though trees are still present. Subdivisions for real estate development shown on the county assessor's records were not

included unless on-site construction had been started. About 14 percent of private commercial forest land is in areas with limiting physical or economic factors, including 10 percent in low-value species such as hardwoods and knobcone pine, and arid fringe areas of juniper-pine or Digger pine, 1 percent in high elevation problem areas, and 3 percent in steep, rocky, and unstable areas and peridotite-serpentine soils.

Even a larger area may produce little timber due to . . .

The previously described limitations or withdrawals total 18 percent of the commercial forest land outside National Forests. Although difficult to define, an even greater area has low probability of contributing to the future timber supply. Many sites have been difficult to restock in desirable conifers following logging. All of the hardwood areas except for a few bottomland stands show evidence of past conifer stocking, yet most of these areas are restocking in conifers very slowly, if at all. Forest fires and logging have caused these conifer sites to become stocked with hardwoods. More hardwood areas can be expected in the future, since fires and logging will continue. The Z'berg-Negedly Forest Practices Act of 1973 (California, State of, 1974) requires that considerable effort be made to restock conifers in logged areas, but some recalcitrant sites will not be satisfactorily reforested in spite of managers' efforts. Other areas that currently show no evidence of problems may indeed be difficult to manage due to soils, moisture, or other physical factors not currently apparent to the land managers. Finally, many landowners have objectives other than timber growing (fig. 15).

- **Difficult sites**
- **Objectives of owners**

Figure 15.—Many stands on private lands are growing less wood than possible because of the landowners' objectives. This privately owned stand in Lassen County is producing both wood and Christmas trees, but not without some trade offs.

Forest conversions will continue

Most commercial forest land is grazed, in some areas so heavily that seedling damage, soil compaction, and erosion have resulted. Several large residential developments are registered by the county assessors and will continue to take land out of timber production. Roadbuilding will continue, especially in the more inaccessible areas in the western part of the Northern Interior. Other forest conversions which have taken a considerable area out of timber use in the past—powerlines, reservoirs, canals, mining developments, etc.—will also continue.

Forest Types

Much of area is in mixed conifers

Much of the main forest zone of the Northern Interior is mixed-conifer type, consisting of various combinations of Douglas-fir, white fir, ponderosa and sugar pines (fig. 16), and incense-cedar. Fairly pure stands of Douglas-fir are found in the extreme western portion of the area (fig. 17) and also in small scattered stands elsewhere. Pure stands of white fir and/or red fir occur in the higher elevations above the mixed-conifer zone; in some areas they also contain western white pine, lodgepole pine, Jeffrey pine, mountain hemlock, foxtail pine (fig. 12), and Brewer spruce (fig. 18). Pure stands of ponderosa pine (fig. 19) occur mainly on the drier sites below the main forest zone in the western portion of the area and on the drier eastern slopes of the Cascade Range.

Figure 16.—Timber inventory crewman measuring a sugar pine on private land in Trinity County.

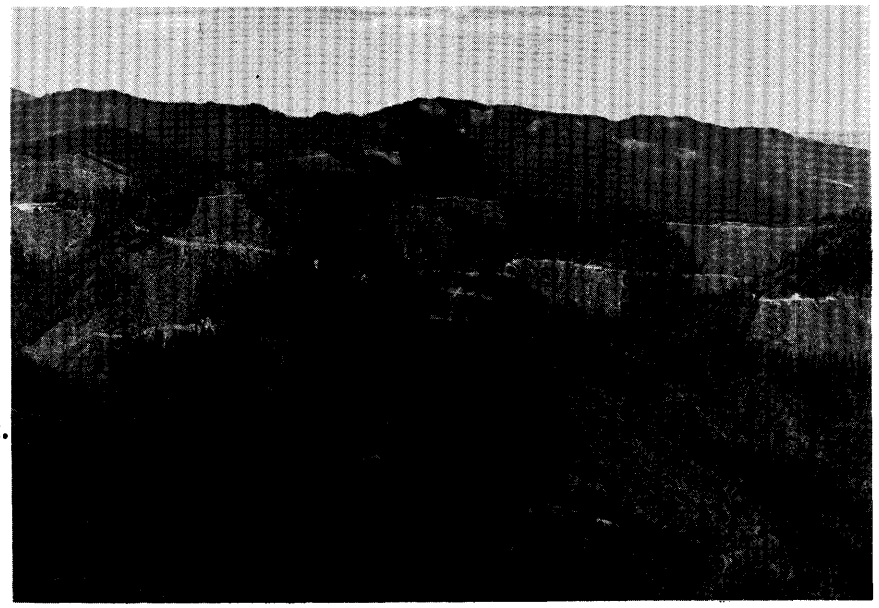

Figure 17.—Clearcut patches in Douglas-fir type in the extreme western portions of the Northern Interior on the Big Bar District of the Trinity National Forest.

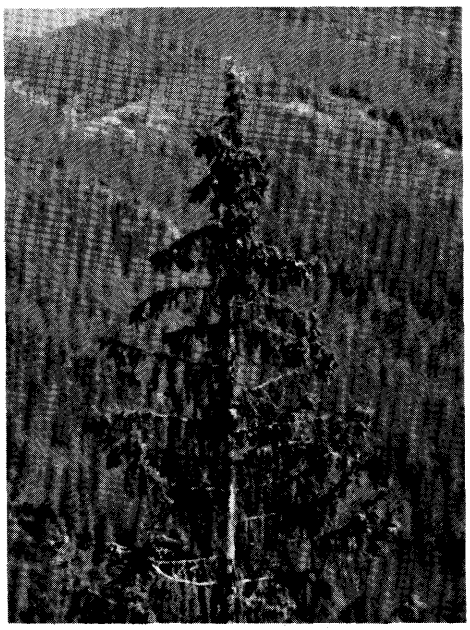

Figure 18.—Brewer spruce, a rare tree found only in the Siskiyou Mountains, grows near upper timberline.

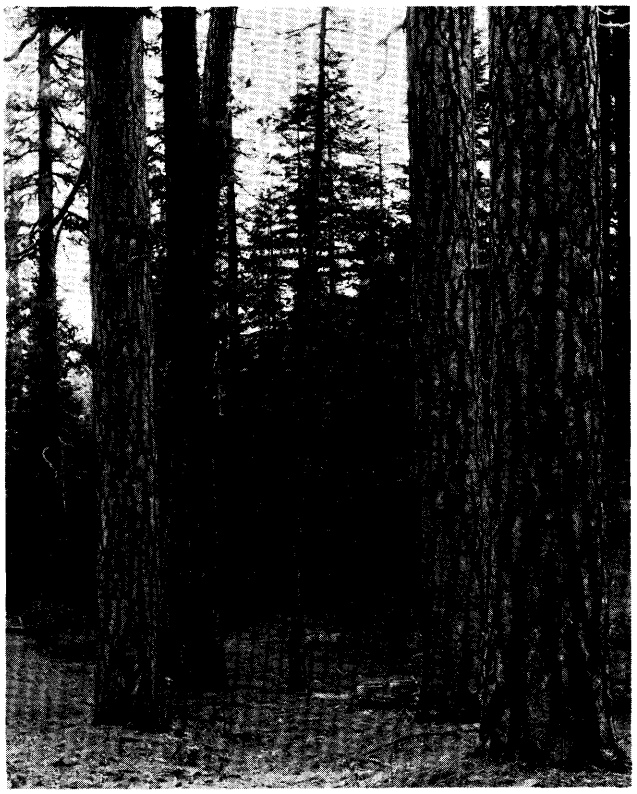

Figure 19.—This stand of large sawtimber in Lassen County is fairly typical of many areas of the mixed-conifer type. Ponderosa pine often forms small, even-aged "clusters" which are surrounded by other species. White fir is often present in the understory where less tolerant ponderosa pine usually cannot survive. Cutting the large pines has often resulted in an increase in white fir.

Douglas-fir is the most extensive type

Forest types (fig. 20) shown in this report are based on the plurality of tree stocking. A mixed-conifer stand, for example, that contains 40 percent Douglas-fir, 35 percent ponderosa pine, and 25 percent white fir would be classified as Douglas-fir type because this species has the plurality of stocking.

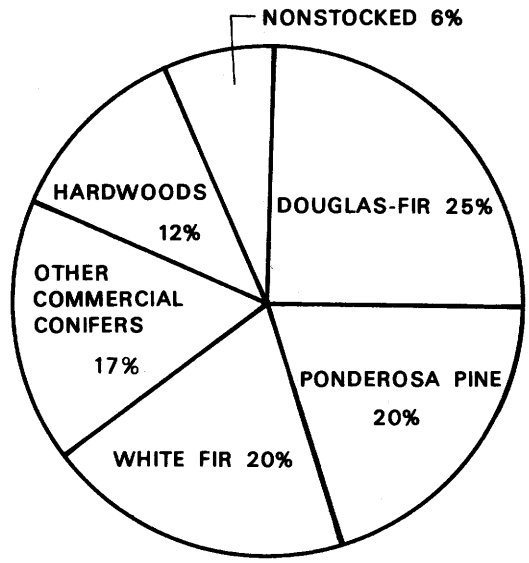

Figure 20.—Sixty-five percent of the commercial forest in northern interior California is Douglas-fir, ponderosa pine, and white fir types.

Stand Size and Age

75 percent of area is in sawtimber stands

Sawtimber stands occupy 4,503,000 acres or 75 percent of the total commercial forest area (fig. 21). About 62 percent of the sawtimber stands are on National Forest lands.

Poletimber stands occupy 399,000 acres, only 7 percent of the commercial forest area, and seedling and sapling stands (fig. 22) 722,000 acres or 12 percent.

Many sawtimber stands have been partially cut . . .

These stand-size figures alone give only a general view of the forest, since many sawtimber stands consist mainly of remnant trees in areas that have been selectively logged. These residual stands are difficult to characterize—some are well stocked with vigorous trees; some are overstocked and could be thinned; some

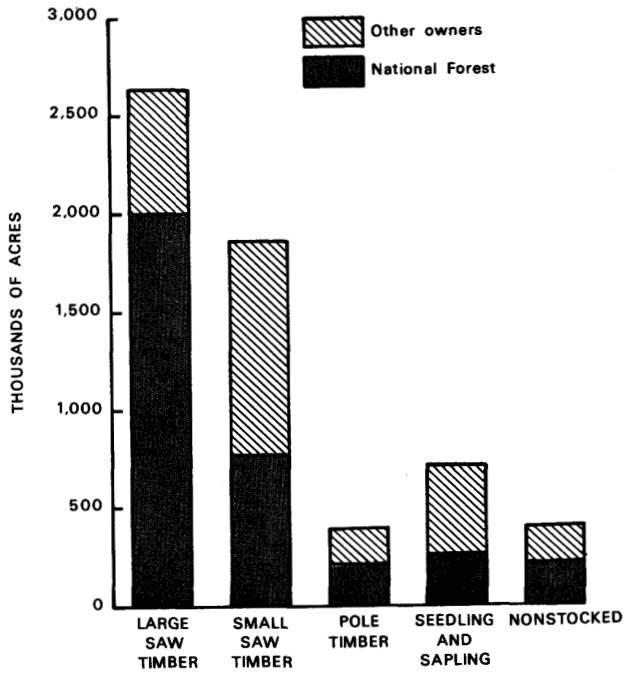

Figure 21.—Most of the commercial forest land in northern interior California is stocked with sawtimber stands. National Forests hold most of the large sawtimber.

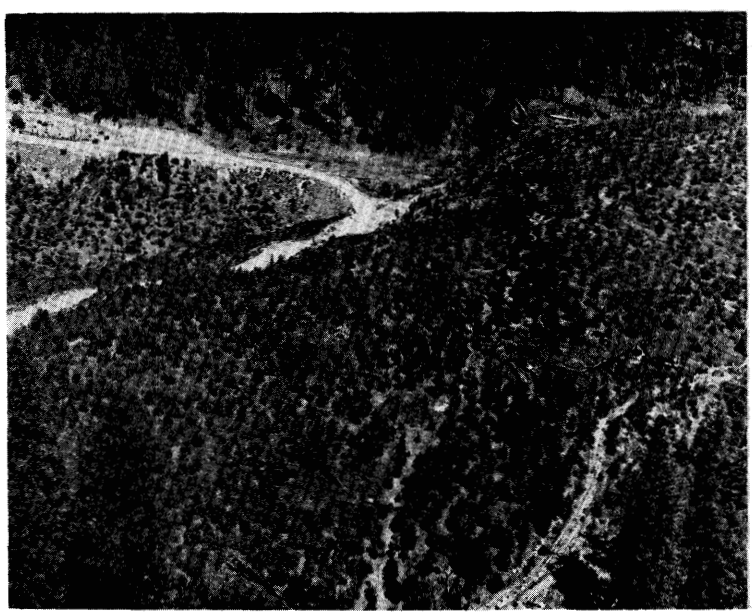

Figure 22.—Ponderosa pine plantation in a clearcut patch in Douglas-fir type in the Trinity National Forest. This area is well stocked except in the old spur roads, landings, and places where slash piles were burned. Seedling-sapling stands occupy 722,000 acres or 12 percent of the total commercial forest land in the Northern Interior.

And are difficult to characterize

are stocked with culls and damaged trees. Some are in rather poor condition because of patches of inhibiting brush, erosion and soil compaction due to logging, grazing, and other activities; and insects and disease.

One-third of the area is in old stands

About 33 percent of the commercial forest area is in stands over rotation age.[7] National Forests contain 75 percent of these older stands, which amount to 43 percent of total National Forest commercial forest area.

Much of the uncut older stands, in both public and private ownerships, is in steep mountains in the western part of the area with land stability problems and costly accessibility. Nearly all of the flat and gently-sloping lands have been logged.

Young stands occupy most of the flat and gentle-sloping land

Stands under rotation age occupy 60 percent of the commercial forest area. Much of this is in flat and gently rolling country in the eastern part of the area.

Forest Land Productivity

The forest area has been classified into productivity categories called cubic-foot site classes (table 7.) These categories are useful for ranking the **relative** capacity of the land to produce wood. They do not necessarily indicate the realizable potential of the forest. They are based on normal yield tables developed from natural, fully stocked, even-age stands of single species. Such yields could be realized across all acres only if all stands were even-aged and kept fully stocked with single species (fig. 23), if the forest were perfectly regulated with even-age class distribution, if all stands were clearcut exactly at the age of growth culmination, and if all were immediately restocked. These conditions will obviously not be met over large areas.

Forest industry lands have the highest per-acre potential

In Northern Interior California, forest industry lands are of highest average productivity, followed by National Forests, farmer and miscellaneous private, and other public, in that order. Total area capable of growing 85 or more cubic feet per acre per year amounts to:

47 percent of forest industry lands
34 percent of National Forest lands
30 percent of farmer and miscellaneous private lands
25 percent of other public lands

[7]Rotation age as used here: Lodgepole pine—100 years; other conifers, Shasta Trinity, and Western Siskiyou Counties—100 years; other conifers, Lassen, Modoc, and eastern Siskiyou Counties—140 years; hardwoods—50 years.

Figure 23.—This timber stand near McCloud is said to be the oldest successful ponderosa pine plantation in California. The stand is 53 years old and contains 7,200 cubic feet and 30,000 board feet per acre [Scribner rule], an example of the potential of some of the Northern Interior's forest land under intensive management.

Stocking Condition

72 percent of the area is adequately stocked, but . . .

Hardwoods occupy a large area of conifer land

About 72 percent of the commercial forest land is medium to well stocked, 22 percent is poorly stocked, and only 6 percent is nonstocked. Hardwood (largely California black oak, tanoak, and madrone) trees are included in these stocking figures. Since most hardwoods are relatively unimportant to the forest industry in this area, they are often considered a liability rather than an asset. Most of the 687,000 acres of hardwood types occur on land that has grown conifers in the past and could presumably grow conifers in the future. This in effect raises the area of nonstocked land to about 18 percent of the total commercial forest area. Much of the nonstocked and poorly stocked land, including some

hardwood types, is in arid forest fringe areas where forest regeneration is difficult.

In spite of the large area of hardwoods, the stocking condition, in terms of occupancy of trees, is relatively good, even in areas that have been extensively logged. This is due to the large variety of species that grow in the area, to the practice of selective logging, and to successful regeneration in recent years of logged and burned areas (fig. 22).

Stocking by ownership is . . .

Ownership	Stocked: Well (60+ %)	Medium (36-59%)	Poorly (11-35%)	Nonstocked[8] (0-10%)
	Percent			
National Forest	39	34	21	6
Other public	24	37	23	16
Forest industry	38	30	26	6
Farmer and miscellaneous private	34	39	20	7
All owners	37	35	22	6

Though the forest is fairly well stocked, many areas are not stocked with the best trees for timber growth. A detailed discussion appears in the section on growth and mortality.

[8]The nonstocked area excludes over 300,000 acres in old burns where reforestation efforts have failed. These areas are no longer considered commercial forest land. Had they been included, the nonstocked area would have amounted to about 11 percent of the total.

Changes in Forest Land Area

Commercial forest has decreased 419,000 acres in 17 years . . .

Between 1953 and 1970, there was a net decrease in commercial forest area of about 419,000 acres or 6.5 percent. Ownership shifting during this period makes it difficult to trace exact losses within an ownership class, but these general changes can be noted:

1. Physical losses of commercial forest land totaled about 80,000 acres. About 60 percent of this was on National Forest lands, and 40 percent was on private lands.

- **Including physical losses caused by roadbuilding (43,000 acres)**

The leading cause of forest loss was roadbuilding (fig. 24), accounting for about 43,000 acres or 54 percent. National Forests in the five-county area built about 5,000 miles of permanent logging roads between 1953 and 1970, and private owners about 2,500 miles. Not included are the numerous temporary roads, spurs, and skid trails necessary in logging. Highway construction and roads built to new housing developments also contributed to the loss of commercial forest land.

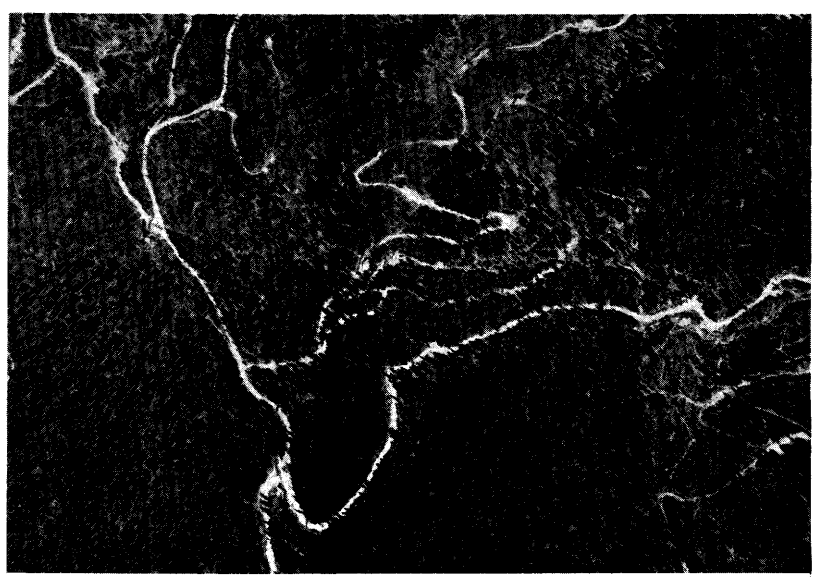

Figure 24.—Logging roads on the Shasta National Forest and adjacent private lands. Since 1953 about 7,500 miles of permanent logging roads have been built in the Northern Interior. Though today's technology and economics make roads necessary to manage forests, roads also reduce the total timber-growing potential of the land and affect other resources such as wildlife, scenery, and water.

- **Reservior construction (25,000 acres)**

Reservoir construction accounted for about 25,000 acres or 31 percent of the commercial forest loss. Over 50 reservoirs were built between 1953 and 1970, including many less than 100 acres in size and a few over 100 acres. Several were in nonforest areas. Trinity (Clair Engle) Lake (fig. 25) was the largest, covering 16,400 acres, mostly forested. Shasta Lake—29,500 acres—was completed in 1949 so is not included here as a forest loss.

- **And other clearings (12,000 acres)**

Forest clearing (fig. 26) for grazing, powerline construction, residential and recreational development, and miscellaneous clearings (mining, radar stations, airstrips, etc.) accounted for the remaining 12,000 acres or 15 percent.

Figure 25.—Portion of Trinity Lake, the largest of many reservoirs built in the Northern Interior since 1953. The reservoir has brought about further forest losses due to rerouting of flooded road and lakeside developments.

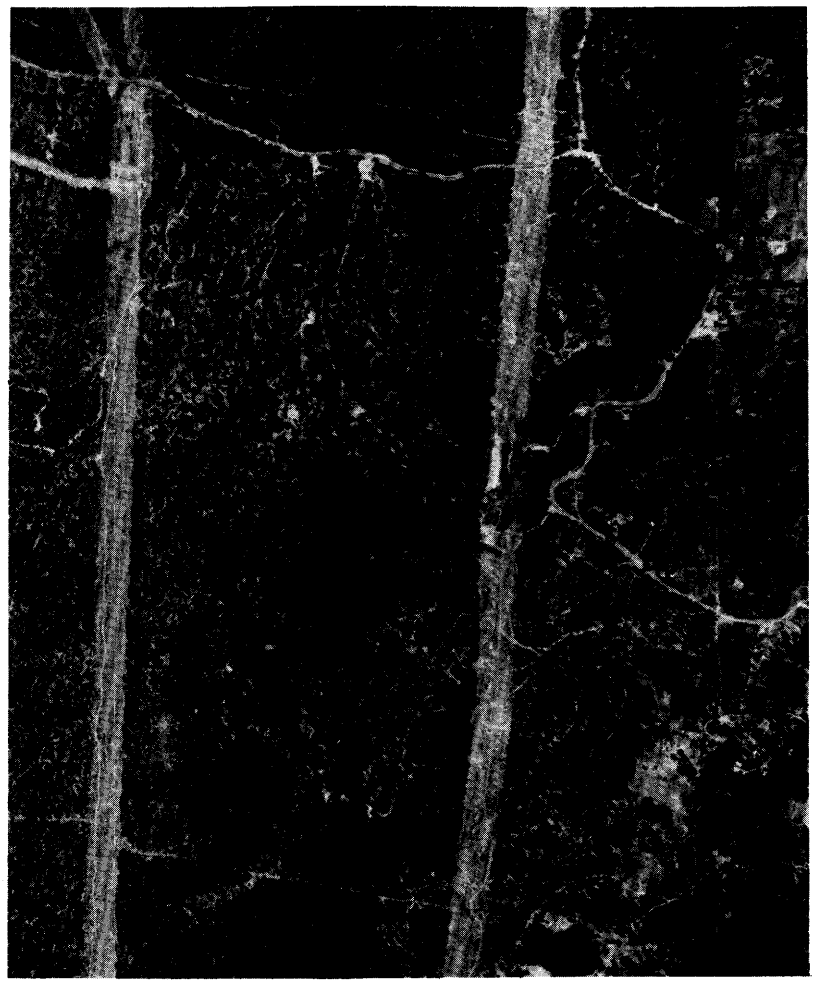

Figure 26.—Aerial view in Shasta County showing forest losses due to construction of powerlines, roads, reservoirs, and clearings for agriculture and homesites. The powerline rights-of-way are 300 feet wide, occupying about 36 acres for each mile in length.

- **Reclassification decreased commercial forest by 355,000 acres**

New techniques to assess stockability were used

2. Reclassification as noncommercial or nonforest of land formerly called commercial forest accounts for a reduction of about 355,000 acres since 1953. Of this, about 35,000 acres were in private ownerships. These lands were reclassified as noncommercial by an improved method of estimating productivity (MacLean and Bolsinger 1973a, 1973b) in areas where tree stocking is limited due to environmental factors.

About 320,000 acres of National Forest land formerly called commercial were reclassified as noncommercial or nonforest based on a closer inspection of the land and on experience gained since previous inventories. The Shasta National Forest carried the greatest reduction (about 225,000), but reductions also occurred

Some burned areas are considered nonstockable—hence not commercial

In the forest fringe, deforestation seems permanent

Is a change in climate occurring?

on the Lassen, Plumas, Mendocino, and Modoc National Forests. Included are extensive nonstocked burned areas where considerable investment in reforestation measures has failed. These areas are largely transition between the chaparral and pine and mixed-conifer vegetation types (fig. 27), or between sagebrush scrub and pine forest. Fires and other disturbance have pushed back the conifer forests along much of the forest transition zone in California (figs. 28, 29). The general lack of natural reforestation and failure of artificial reforestation attempts in this zone suggest a possible natural trend of forests retreating to higher (cooler, more moist) elevations with nonforest vegetation types replacing them at lower elevations. Numerous clues of migrating vegetation in California's past have been noted (Detling 1961, Munz and Keck 1970, Whittaker 1960). In the case of some of the nonstocked burns in the Northern Interior, no definite conclusion can be reached, since the period of observation represents an extremely short period of time. National Forest managers have based their decisions on substantial evidence that these deforested areas will not support timber-producing trees in the foreseeable future.

16,000 acres were reclassified as commercial from reserved categories

3. Since 1953, about 16,000 acres were reclassified from productive reserved to commercial forest. Included were parcels of the Marble Mountain, Salmon-Trinity Alps, and Yolla Bolly areas in Shasta, Siskiyou, and Trinity Counties. The Forest Service

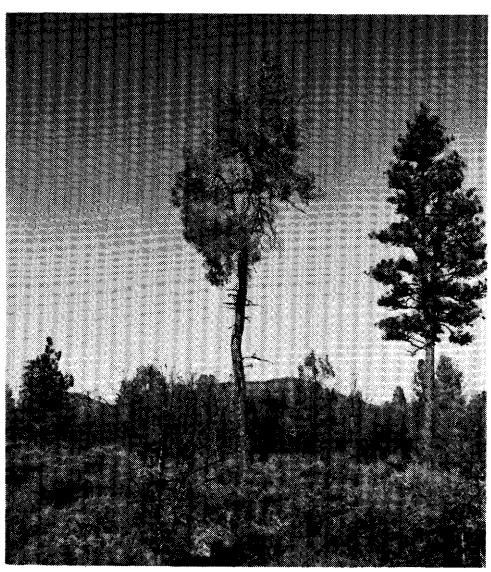

Figure 27.—This transition area between the chaparral-hardwood-Digger pine type and ponderosa pine type is considered noncommercial forest. Though the individual pine trees indicate a fairly high site, the overall area is not manageable for timber production.

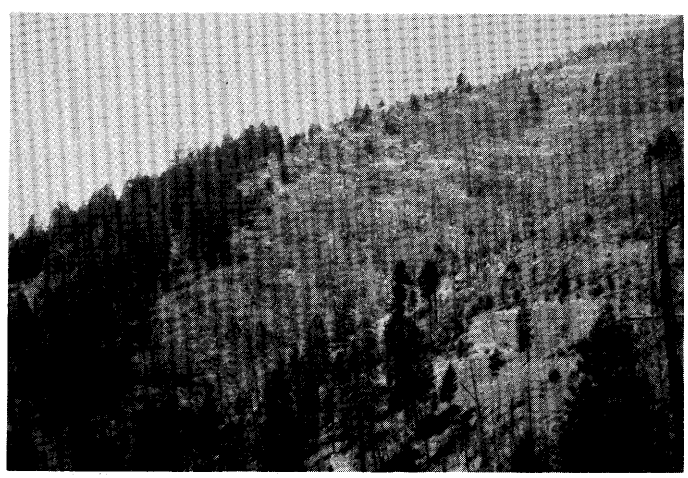

Figure 28.—This south-facing slope near the lower forest fringe zone in Siskiyou County was burned in the early 1960's and promptly planted in ponderosa pine. Nearly all the planted trees died, and very few natural trees have become established. Many nonforested slopes in this area show evidence of past occupancy by forests; but there is little evidence that they will support commercial stands in the foreseeable future.

Figure 29.—This area in Shasta County in the lower commercial forest zone once supported considerably more commercial conifer trees than are now present. Oak trees and manzanita brush now occupy much of the area. Though conifer seed source has been present for many decades, conifer stocking is not increasing.

has recently reviewed large areas for possible Wilderness classification, and in the process excluded some areas that had been carried as "reserved" by administrative decision but had not been set aside by law.

Ownership Changes

National Forests are gaining land

Other public lands are decreasing

National Forests have acquired about 40,000 acres of commercial forest land since 1953, mostly from private ownerships but also a small amount from other public agencies. Other public ownerships decreased by about 110,000 acres or 42 percent. Included were lands held by the Bureau of Land Management, Bureau of Indian Affairs, miscellaneous Federal agencies, and the State of California. Most of the other public land went into private ownership.

Private lands are changing owners—forest industry ownership is increasing; other private decreasing

Ownership of commercial forest land within the private sector has been changing rather continuously, but the greatest change occurred after this inventory was completed when about 150,000 acres transferred from miscellaneous private corporate to forest industry. The overall trend has been toward more forest industry-owned land and less miscellaneous private.

TIMBER VOLUME

Northern Interior forests contain 30 percent of California's timber . . .

Mostly in large softwood trees

National Forests hold most of the large timber . . .

In steep country in Siskiyou and Trinity Counties

Most of the volume is Doublas-fir, pines, and true firs

Commercial forest land in the Northern Interior contains 15.9 billion cubic feet and 86.0 billion board feet (International 1/4-inch rule) of standing timber, about 30 percent of California's total. About 99 percent is softwood species. About 64 percent of cubic-foot volume and 76 percent of board-foot volume are in trees 21.0-inch d.b.h. and larger.

National Forests have about 70 percent of the total volume, and 74 percent of the volume in trees 21.0-inch d.b.h. and larger (fig. 30). Siskiyou and Trinity Counties have the greatest concentrations of volume, much of it in mountainous areas that are presently unroaded and difficult to manage due to unstable soils and steep, rocky slopes.

Over 40 species of trees grow in the five-county area, but the bulk of the volume is in a few valuable conifer species. Douglas-fir, though rare in Lassen and Modoc Counties, is the most prevalent species in the Northern Interior, comprising 36 percent of the total cubic-foot volume. Ponderosa and Jeffrey pines account for 22 percent, white (fig. 31) and red firs for 24 percent, and sugar and western white pines comprise 8 percent. Of the remaining 10 percent of cubic-foot volume, over half is other conifers, including incense-cedar, lodgepole and knobcone pines; and the balance is hardwoods, largely California black oak, tanoak, and madrone.

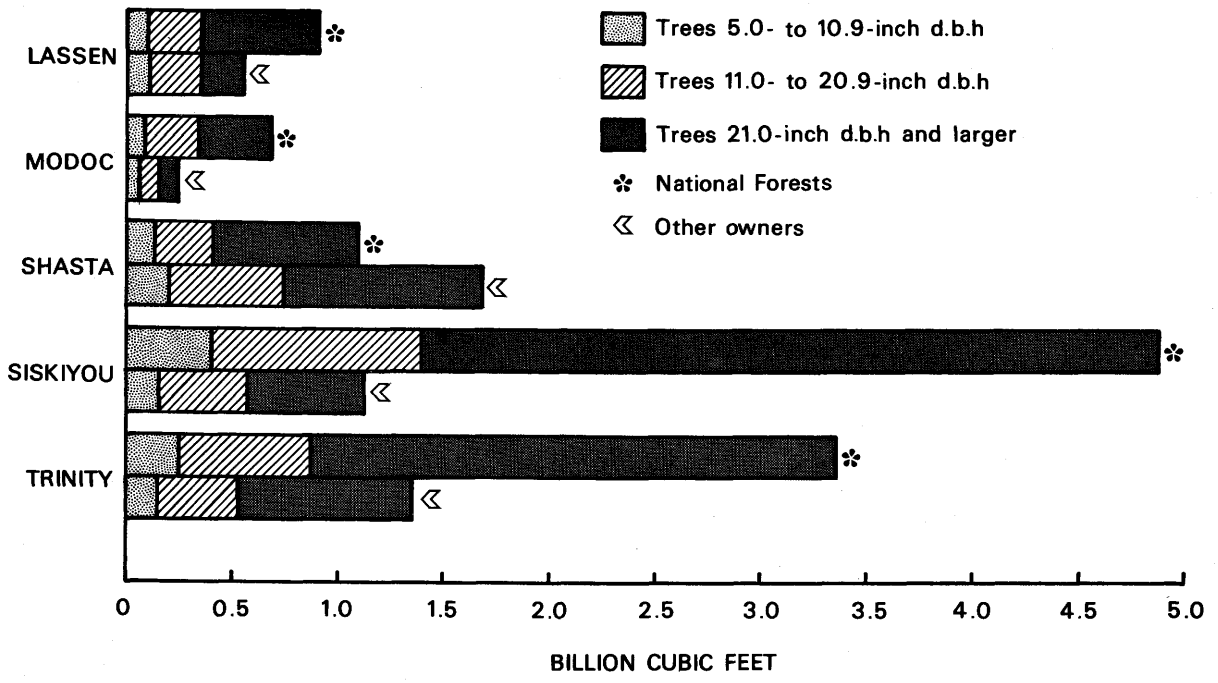

Figure 30.—Most of the volume is in large trees on National Forests; Siskiyou and Trinity Counties have two-thirds of the total.

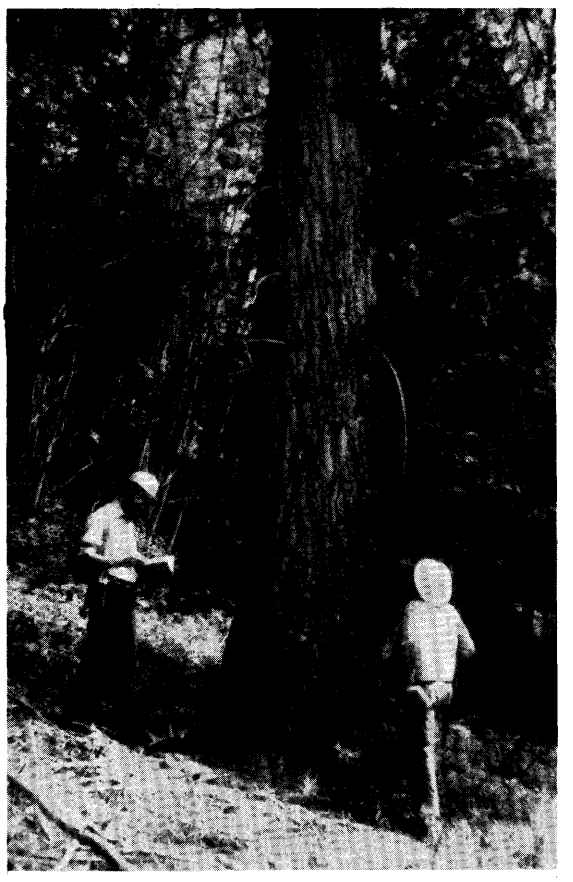

Figure 31.—Timber inventory crew appraising an old-growth white fir that is infected with Indian paint fungus [*Echinodontium tinctorium* E. & E.], a heart-rotting disease frequently found in both white and red firs in the Northern Interior.

National Forests hold 78 percent of the Douglas-fir volume, 60 percent of the ponderosa pine, and 65 percent of all other softwoods.

Total volume has declined 21 percent in 17 years

Since 1953, International 1/4-inch board-foot volume in trees 11.0 inches and larger has declined about 21 percent. Volume in public ownership has declined about 17 percent; volume in private ownership has declined about 45 percent.[9]

Hardwoods are increasing

Although no quantitative data are available, there is ample evidence that hardwood volume has increased during the past several decades. In much of the area, hardwoods such as California black oak, tanoak, and madrone occur naturally in conifer stands. Selective logging has often freed these hardwoods from competition by conifers, and some of the conifer stands that have been clearcut or burned have regrown to hardwoods. It is also evident from the common occurrence of large ponderosa and sugar pine stumps in stands now predominantly Douglas-fir, or more often white fir or incense-cedar, that the relative volume of ponderosa and sugar pines has decreased, and white fir and incense-cedar have increased.

Ponderosa and sugar pines are decreasing

[9] Statistics for 1953 are unpublished, on file at the Pacific Northwest Forest and Range Experiment Station, Portland, Oreg.

FOREST GROWTH AND MORTALITY

Annual growth is 246 million cubic feet

Total net annual growth in growing stock trees 5.0-inch d.b.h. and larger is 246.1 million cubic feet and in sawtimber trees 9.0 inches and larger, 1,254.8 million board feet (International 1/4-inch rule). About 92 percent of the cubic-foot growth is in conifers, largely white and red firs, Douglas-fir, and ponderosa and Jeffrey pines as shown in figure 32.

Annual mortality is 45 million cubic feet

Average annual mortality of trees 5.0 inches and larger for the 5-year period preceding the inventory was 44.9 million cubic feet; average annual mortality in sawtimber trees 9.0-inch d.b.h. and larger was 221.9 million board feet (International 1/4-inch rule). White and red firs, Douglas-fir, and ponderosa and Jeffrey pines accounted for 75 percent of the mortality (fig. 33). Sugar, white, and lodgepole pine mortality was proportionately higher than volume and growth in these species.

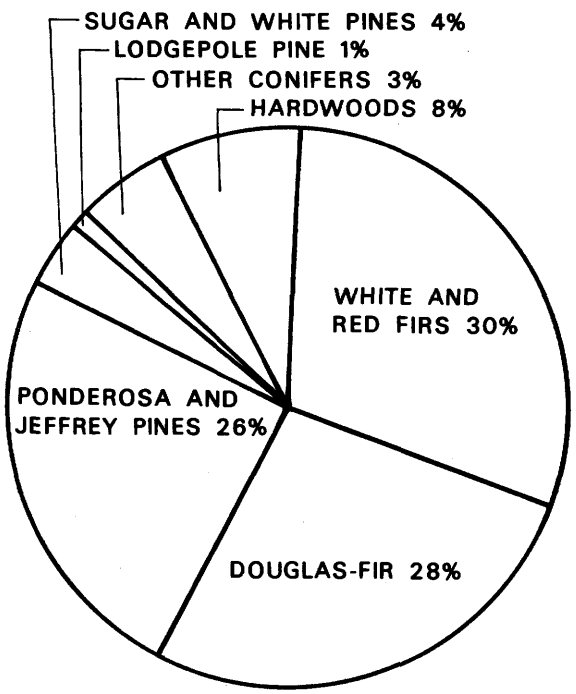

Figure 32.—Percent of net annual cubic-foot growth by species, California's Northern Interior, 1970.

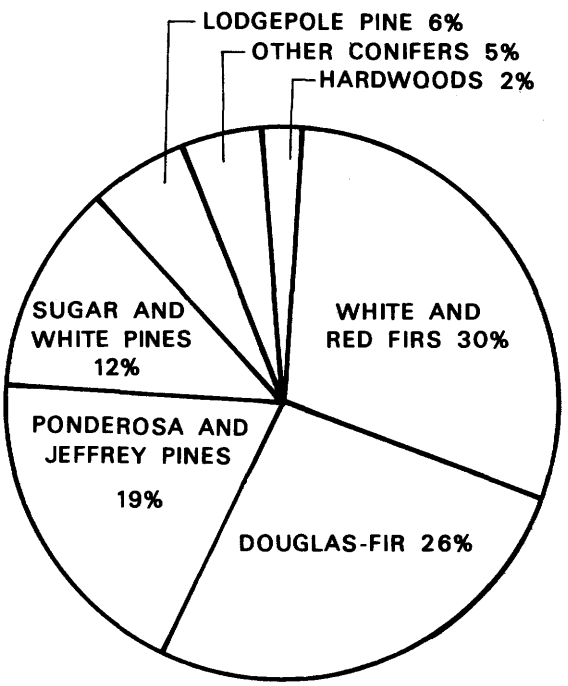

Figure 33.—Percent of annual mortality by species, California's Northern Interior, 1970.

White and red firs, ponderosa and Jeffrey pines, and hardwoods have high growth rates relative to inventory volume, and lodgepole pine has a high mortality rate:

Species	Net annual cubic-foot growth as a percent of total species volume	Annual cubic-foot mortality as a percent of total species volume
Douglas-fir	1.2	0.2
White and red firs	1.9	.3
Ponderosa and Jeffrey pines	1.8	.2
Sugar and white pines	.8	.4
Lodgepole pine	1.3	1.7
Incense-cedar	1.2	.4
Other conifers	1.3	.2
Hardwoods	2.9	.1
All species	1.5	.3

The leading cause of mortality was insects

For all species, the leading direct cause of mortality was insects (31 percent),[10] followed by: weather (13 percent), disease (13 percent), fire and logging (5 percent), and suppression (4 percent). The remaining 34 percent is in unclassified causes such as landslides, exposure due to stand disturbance (logging, roadbuilding, etc.), changing water table, soil compaction; man's activities such as damage by vehicles (other than logging), fence building, etc; and probably some unrecognized suppression, insects, and disease.

Annual growth per acre in the Northern Interior averages 41 cubic feet, and mortality averages 7 cubic feet per acre, as shown in table 2.

[10]The Modoc budworn outbreak of 1974, which affected 231,000 acres of true fir in northern California and southern Oregon, is not reflected here, because it occurred after the field survey was completed.

Table 2--*Growth and mortality by ownership, California's Northern Interior, 1970*[1]

Ownership	Total net growth	Total mortality	Net annual growth per acre	Annual mortality per acre	Gross growth per acre
	Million cubic feet		*Cubic feet*		
National Forest	155.2	28.3	45	8	53
Other public	5.0	1.1	32	7	39
Forest industry	22.8	4.2	34	6	40
Farmer and miscellaneous private	63.1	11.3	37	7	44
All owners	246.1	44.9	41	7	48

[1]Growth and mortality were estimated over various periods of time for different portions of the forest. See "Inventory Procedures," page 72.

National Forests have highest per-acre growth rates and lowest mortality related to timber volume

Table 2 shows that National Forests have the highest net and gross per-acre growth rates, but also the highest per-acre mortality. National Forests have the lowest mortality rate in terms of percent of inventory volume:

Ownership	Mortality as a percent of total cubic-foot volume within ownership
National Forest	0.26
Other public	.40
Forest industry	.29
Farmer and miscellaneous private	.35
All ownerships	.28

On the surface it seems paradoxical that National Forests with lower average per-acre productive potential and much older timber than private ownerships should have higher growth and lower mortality rates. A comparison of the stocking figures (see page **22**) only clouds the picture further, since private lands appear about as well stocked as National Forest lands.

A partial explanation of the mortality situation is simply that old-growth stands have lower mortality rates than young growth. Staebler (1955) found that in Douglas-fir in the Pacific Northwest

Mortality rates are higher in young stands

mortality culminates at about 80 to 90 years after which it drops off, and 60- to 70-year-old stands have higher mortality than stands of 130 years and over. A tabulation of volume and mortality by stand age groups in Lassen and Modoc Counties, where substantial areas of both young and old stands exist, suggests that these stands develop in a manner similar to Douglas-fir in the Pacific Northwest:

Stand age and ownership	Percent of total cubic-foot: Volume	Mortality
0-50 years		
National Forest	4	4
Other ownerships	8	21
50-100 years		
National Forest	42	56
Other ownerships	65	52
100 years and older		
National Forest	54	40
Other ownerships	27	27

The above data show that 46 percent of the volume on National Forests, but 60 percent of the mortality, is in stands less than 100 years old. For other ownerships, 73 percent of the volume and 73 percent of the mortality are in stands less than 100 years old. For all National Forests in the five-county area exclusive of the Klamath,[11] 66 percent of the volume, but only 54 percent of the mortality, was in trees 21.0 inches and larger.

The high mortality compared to volume in the 0- to 50-year age class on other ownerships—21 percent—suggests that something about these young stands is different from the 0- to 50-year stands on National Forests.

75 percent of private lands have been logged or burned

The plot data showed that about 75 percent of the commercial forest land in private ownership in the five-county area has been logged one to four times or burned in the past 100 years. The tree data from these plots indicated most areas were fairly well stocked but not with the best possible trees.

Lassen County growth compared with yield tables . . .

In an attempt to quantify objectively how younger stands and cutover areas are performing, the past 10-year periodic net annual growth for each stand sampled on private land in Lassen County was compared with the periodic net annual growth shown in yield tables. Lassen County was chosen because it has the greatest percentage of young stands and generally a longer history of cutting than other counties in the Northern Interior. For stands that were predominantly ponderosa or Jeffrey pines, Technical

[11]Data not available by diameter class.

Bulletin 630 (Meyer 1961) was used; for white fir stands, University of California Bulletin 407 (Schumacher 1926) was used. Site index was used to determine the basic productivity level, then was discounted to take care of stockability problems in the manner detailed in Research Paper PNW-152 (MacLean and Bolsinger 1973a). Stand age was assigned as the predominant age of the dominant and codominant trees. In a few stands consisting of young trees with a scattering of old residuals, the stand age chosen was that of the young trees. The difficulty in using this type of comparison is, of course, that many stands do not conform to yield table standards because of age spread, mixture of species, microsite inclusions, etc. Still, this analysis gives some ideas of how well stands are performing.

A total of 44 stands were examined. (See "Inventory Procedures," page 72, for details on plot selection.) The results:

- **Half of the stands are growing well**
- **About one-third are growing less than half of yield table growth rates**

Past 10-year periodic growth was equal to or greater than the yield table level for 41 percent of the stands, and 7 percent were less than 25 percent below the yield table level. This leaves 52 percent that were growing substantially below the yield table level, including 16 percent where yields were 50 to 76 percent of yield table levels, and 36 percent where yields were less than half of those indicated in yield tables.

Except for three nonstocked areas, there was no solid relationship between stocking and growth. A closer examination showed that many stands are stocked with poor timber-producing trees—slow-growing and vulnerable to insects, disease, and other mortality agents.

These conditions were noted:

Mistletoe, top or bole damage, and low vigor are common

Past cutting left many stands with low growth and high mortality

1. Dwarf mistletoe infections were recorded in 40 percent of the stands, half of which were considered to be heavily infected. (The western-wide dwarf mistletoe rating system developed by Forest Service pathologists was used to score the seriousness of infections.) Dwarf mistletoe is a light-demanding organism and has apparently increased greatly due to the opening up of stands by logging, road-building, and thinning by man, as well as by storms, insects, and disease.
2. Dead tops, top damage, and injuries due to logging and other mechanical factors were recorded in 64 percent of the stands sampled, though these agents usually affected less than 10 percent of any given stand.
3. Many trees left after logging were defective, poorly formed, and low in vigor, often suppressed before logging with little capacity to respond to release—since they can't respond, they often die. In many cases, trees were left standing simply because they had little market value. They often have little value in the woods as timber producers. These kinds of trees make up a small portion of undisturbed stands, but are significant in many residual stands because they control space where better trees could be growing. Many of these trees may be genetically inferior—leaving them as the major seed source may have resulted in genetic degradation of the younger stands now developing.

On the positive side, growth is increasing

A positive view of the forest situation is in order. Though many stands are growing much less wood annually than they could be, and total growth is currently about 30 percent less than the annual cut, there is ample evidence that growth is increasing. The current cutting rate of 1.3 billion board feet is reducing the inventory only 0.4 percent per year, whereas the average rate of decline between 1953 and 1970 was about 1.2 percent. Since the reported cut has remained nearly level, and no changes have been made in the scaling units, the improvement can be attributed only to an increase in net growth. Many cutover stands are beginning to recuperate.

The list of undesirable conditions that currently exist could be turned into a list of opportunities for increasing future growth rates. In fact many private landowners, particularly timber companies and certain large nontimber corporations, are now beginning to practice sound forestry (fig. 34). In the past, much of the private land was logged either with little regard for future timber production[12] or using methods which were sometimes destructive. The Z'Berg-Negedely Forest Practice Act of 1973 (California, State of, 1974) is aimed at assuring that the productivity of private forest lands is maintained.

[12]For example, between 1912 and 1944 all the timber was cut from about 760,000 acres of land belonging to the Red River Lumber Company in the Westwood area, after which the company sold its mill (Barrette and Lucke 1975).

Figure 34.—Brush windrowing for tree planting, and older plantations on private timber company property, Siskiyou County.

National Forests in the Northern Interior also have had a long history of cutting[13] but not to the extent found on private lands. Though most National Forest timber cutting has been planned with the objective of sustaining timber production while protecting the soil and other resource values, not all management efforts have been successful. Knowledge of how to manage some lands is still lacking; and man is still unable to stop the devastation of storms and has only partial control over fire, insects, and disease.

Conditions should improve on both public and private lands

Many problems of forest management are currently the objects of research efforts in the Western States. Included are forest regeneration, insect and disease control, logging and roadbuilding methods, and forest soil fertility, to name a few, all problems in California's Northern Interior. Both private and public forest managers should be better equipped to cope with forestry problems in the future.

SALVABLE DEAD TIMBER

Salvable dead volume equals the annual cut, but salvage is difficult due to . . .

In the five-county area there is an estimated 911 million board feet (International 1/4-inch rule) in salvable dead trees 11.0 inches and larger. Slightly less than half of this is on National Forests. Some dead wood is salvaged each year. Much of the salvable dead material is not currently attractive to timber operators, however, and an unknown percentage of the dead trees is in inaccessible areas.

- **Scattered occurrence**

Survey plot data show that much of the material is in low concentrations and presumably costly to log. Only 24 percent of the salvable dead volume is in concentrations of 5,000 or more board feet per acre, 23 percent is in concentrations of 2,000-4,999 board feet per acre, and 53 percent is in concentrations of less than 2,000 board feet per acre. There are also differences in deterioration rate by species, size, and cause of death which affect the degree to which dead trees are salvaged. Some species are low in desirability even when live and sound. Lodgepole pine, for example, has a lower market value than many species; because of its smaller size, checking and staining after death quickly reduce its value. This species accounts for 53 percent of the salvable dead volume on National Forests in Lassen and Modoc Counties. In general, Douglas-fir is the most durable after death. Ponderosa, Jeffrey, sugar, and white pines tend to become

- **Low value of some of the material**
- **High deterioration of some**

[13]Nearly 1 billion board feet were sold in one timber sale on the Lassen National Forest in 1922, for example. This sale was logged over a 32-year period. Cutting varied from 70 percent of the total volume in early years to a very selective "high risk" cut in later years.

checked and blue stained; but the impact affects lumber grade more than quantity recovered and is less in larger trees. White and red firs deteriorate rapidly after death, especially if killed by windthrow, mechanical breakage, or bark beetles such as the common fir engraver (*Scolytus ventralis*).

Over all ownerships in the five-county area, 38 percent of the salvable dead volume is Douglas-fir. Table 3 shows the distribution of the salvable dead volume.

Table 3--*Volume of salvable dead timber by species on National Forest and other public and private lands, California's Northern Interior, January 1, 1970*

Species	National Forest		Other public and private	
	Million board feet[1]	*Percent*	*Million board feet*[1]	*Percent*
Douglas-fir	230	50	119	26
Red and white firs	37	8	99	22
Ponderosa and Jeffrey pines	80	18	115	25
Sugar and white pines	52	12	80	17
Lodgepole pine	42	9	4	1
Incense-cedar	7	2	40	9
Hardwoods	5	1	1	--
Total	453	100	458	100

[1]International 1/4-inch rule.

TIMBER CUT

Northern Interior forests provide 27 percent of California's timber cut

In 1972 1.3 billion board feet (Scribner scale) of timber were cut in the Northern Interior. This was about 27 percent of the total cut in California. The Northern Interior has contributed 26 to 28 percent of the total cut in the State for several years. In 1946 and 1948, the Northern Interior cut was 32 percent of the State's total; but in 1955, it dropped to 23 percent, even though the total volume cut increased. This occurred because of the tremendous increase in cutting in the north coast counties (Oswald 1970) between 1946 and 1955.

The cut is shifting from private lands to National Forests

Since 1945, over 36 billion board feet (Scribner scale) of timber have been cut in the five-county area. Since 1953, the total cut has remained fairly constant, ranging between 1.3 and 1.5 billion board feet annually; but there has been a decided shift in the cut from private lands to public lands over this same period. (fig. 35) In 1955, about 80 percent of the cut came from private

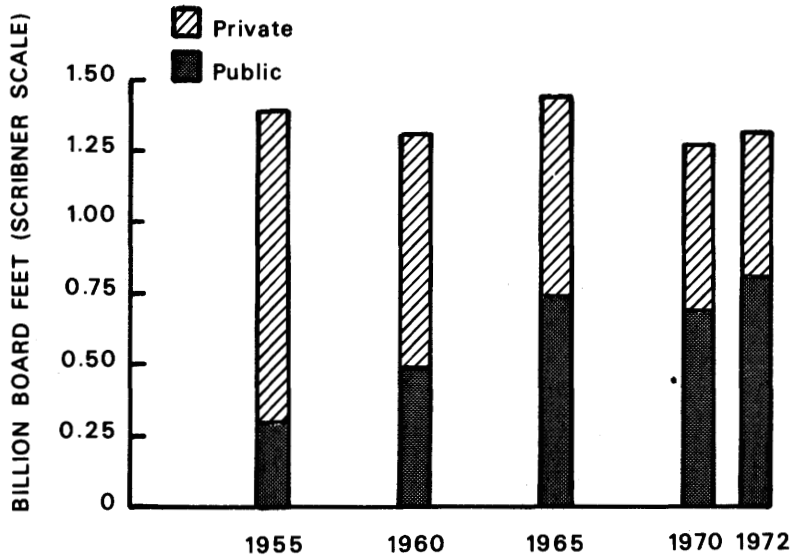

Figure 35.—Since 1955, public timber cut in California's Northern Interior has increased, and private timber cut has decreased.

lands and 20 percent from public lands (mostly National Forest). In 1972, 40 percent of the cut came from private lands and 60 percent from public lands. Private timber will contribute even a smaller proportion of the total cut in the near future because of the declining inventory and lower growth rates on private lands. A large portion of the remaining uncut old-growth timber in private ownership is in steep, unroaded areas. Accessibility and possibly restrictions due to environmental concerns are expected to limit the cutting rate in these remaining private old-growth stands. This situation could be altered slightly by some proposed land exchanges between the Forest Service and private corporations and by the development of improved methods of logging in steep, unstable country.

The cut has shifted from the east to the west—from Lassen and Modoc Counties to Siskiyou, Shasta, and Trinity

There has also been a shift in the cutting by county. Lassen County had the greatest cut in the Northern Interior in 1946, 1948, and 1949. In 1949, Lassen's cut of 340 million board feet was 32 percent of the total in the five-county area. In 1972 Lassen's cut was 98 million board feet, only 7 percent of the five-county total. A large drop in the cut in Lassen County between 1955 and 1956 has been associated with the closure of the Fruit Growers Supply Company mill at Westwood which for many years produced more lumber than any other sawmill in California. Modoc County's cut also dropped markedly in the early 1950's. For several years, Modoc County's cut amounted to 15 to 20 percent of the five-county total. In 1948 and 1950, the cut exceeded 200 million board feet; but

in 1953, it dropped to 86 million. In 1972, Modoc County's cut of 99 million board feet was about 7 percent of the total in the Northern Interior. The decline in cutting, in both Lassen and Modoc Counties, corresponds to the depletion of accessible timber on private lands.

Trinity County is likely to contribute more timber in the future

During the period that timber cutting delcined in Lassen and Modoc Counties, it increased sharply in Siskiyou, Shasta, and Trinity Counties. In 1972, Siskiyou County led with 464 million board feet and Shasta County was second with 406 million. Trinity County's cut was 235 million. The tremendous volume of uncut timber in Trinity County, about 11 billion board feet more than in Shasta County, suggests Trinity's cut may surpass Shasta's. It is reasonable to expect the future timber cut to be concentrated in Siskiyou and Trinity Counties, which combined contain nearly 70 percent of the timber in the five-county area, followed by Shasta then Lassen and Modoc, in that order.

Cutting initially was concentrated in ponderosa and sugar pines . . .

Later in Douglas-fir

Cut is now increasing in true firs and incense-cedar

A considerable change in the mix of species cut has also occurred over the years in the Northern Interior. In 1946, 75 percent of the timber cut was ponderosa and sugar pines; the percentage of these species has steadily declined to 39 percent of the total cut in 1972. Douglas-fir amounted to 13 percent of the cut in 1946, increased to 34 percent by 1956, then declined to 27 percent in 1972. White and red firs have steadily increased from 11 percent of the cut in 1946 to 26 percent in 1972, and incense-cedar has increased from 1 percent in 1946 to 6 percent in 1972. These changes have occurred mainly because the more valuable pines were cut first in much of the accessible country, followed by Douglas-fir, leaving the lower value white fir and incense-cedar. Changing market conditions and recent road-building into the higher elevation forests are also factors, occurring concurrently with and partly because of the growing scarcity of pine and Douglas-fir in the more accessible areas. In much of the easily accessible country such as the private lands near Burney, the cutting history is clearly recorded in the stumps: the oldest stumps are nearly all pine, younger stumps include Douglas-fir, and the most recent stumps include a lot of white fir and incense-cedar.

The cut in ponderosa and sugar pines will continue to decline

More Douglas-fir and true firs will be cut in the future

Ponderosa, Jeffrey, and sugar pines will contribute proportionately less to the total cut in the foreseeable future. The cut is presently 70 percent greater than growth in these species, and the prospect for growth in the next several decades is less in pines than in Douglas-fir and true firs. The current volume in small ponderosa pine trees (5.0 to 10.9 inches d.b.h.) is 55 percent less than in Douglas-fir and 45 percent less than in white fir. Selection cutting in the mixed-conifer type continues to promote Douglas-fir and white fir, and Douglas-fir is the major softwood species restocking the clearcut patches in the extreme western portion of the Northern Interior, though pines are being planted in some logged areas.

Douglas-fir is currently being cut at a rate 13 percent greater than growth. The inventory is declining as old-growth stands are

logged, but growth should increase in the future. Douglas-fir will contribute proportionately more to the total cut in the near future if the cut stays at current levels.

White and red firs are being cut at exactly their growth rate. They will also contribute proportionately more to the total cut in the near future.

Incense-cedar once had little value on the market because of limited use but is now being used for various purposes including interior decoration, rustic fences, and some construction. The current cutting rate of incense-cedar is three times the growth rate. No great increase in the future cut can be expected from this species, though the growth has apparently increased due to past timber cutting practices which have favored this species. In many stands heavier cutting of incense-cedar could promote the growth of more valuable species.

More lodgepole pine and other minor species could be cut

Lodgepole pine has been generally unused in the past, though in 1972 a small amount appeared in the consumption reports. Lodgepole pine, hardwoods, and minor conifers such as hemlock and knobcone pine account for about 41 million board feet or 4 percent of the growth per year, and could contribute to the total timber cut in a small way. However, much of the volume in these species is currently inaccessible and in concentrations too small for economic recovery.

In the near future, the softwood inventory will continue to decline, but . . .

The overall trend for the near future appears to be a continuing decline in the softwood inventory, but at a slackening rate as old-growth stands are cut out, young-growth stands develop, and growth increases in residual stands left after selective cutting. Improved utilization, of course, has resulted in some increase in wood supply, and this trend will continue.

It appears possible to maintain the current cutting level, if . . .

An annual cut of 1.3 billion board feet could be maintained indefinitely, it appears, if the 6 million acres of commercial forest land produced, instead of the current 173 board feet (41 cubic feet) per acre per year, an average of 216 board feet (51 cubic feet). This seems well within the capabilities of the area.

Growth could be increased 20-25 percent

More intensive forestry would be required

Forest management treatments have already been applied to some areas which will result in increased future growth. A much more concerted effort at all levels is necessary, however, if the growth rate is to be increased 20-25 percent. Such an increase would require that the land be restocked soon after logging, that losses from fires, insects, and disease be held to a minimum, and that leave trees not be damaged or destroyed in partial cutting. Stands would have to be upgraded by favoring the more vigorous trees of desirable species rather than the inferior trees and undesirable species such as hardwoods and incense-cedar. Land would have to be managed so that the soil itself is not damaged and that timber cutting is carefully scheduled to capture maximum growth.

In the long run the sustainable cutting level will be dictated by people's decisions more than by the biological potential of the forest.

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TABLES

Table 4--*Area by land class and county, California's Northern Interior, January 1, 1970*

(In thousand acres)

Land class	All counties	Lassen	Modoc	Siskiyou	Shasta	Trinity
Forest land:						
Commercial	6,028	725	614	2,188	1,223	1,278
Productive-reserved	439	26	21	165	68	159
Unproductive	3,211	489	609	860	823	430
Total	9,678	1,240	1,244	3,213	2,114	1,867
Nonforest land[1]	4,313	1,679	1,366	795	314	159
Total area[2]	13,991	2,919	2,610	4,008	2,428	2,026

[1]Includes cropland, pasture and range, swampland, industrial and urban areas, powerline clearings, railroads, all improved roads and highways, and 49,191 acres classified as water by Forest Survey standards but defined by the Bureau of the Census as land.
[2]Source: U.S. Bureau of the Census, Land and Water Area of the United States, 1971.

Table 5--*Area of commercial forest land, by ownership class and county, California's Northern Interior, January 1, 1970*

(In thousand acres)

Ownership class	All counties	Lassen	Modoc	Siskiyou	Shasta	Trinity
National Forest	3,474	395	434	1,453	374	818
Other public:						
Bureau of Land Management[1]	115	14	2	17	42	40
Bureau of Indian Affairs[1]	1	(2)	(2)	--	(2)	1
Miscellaneous Federal[1]	21	--	--	7	13	1
State[1]	14	1	--	--	11	2
County and municipal[1]	3	--	--	--	1	2
Total other public	154	15	2	24	67	46
Private:						
Forest industry	679	40	22	310	231	76
Farmer-owned	444	19	8	230	94	93
Miscellaneous private--corporate	1,125	238	148	161	389	189
Miscellaneous private--noncorporate	152	18	--	10	68	56
Total private	2,400	315	178	711	782	414
All ownerships	6,028	725	614	2,188	1,223	1,278

[1]Area of commercial forest land in specific other public ownerships was determined by proportioning the estimated total area in "Other public" ownership by number of photo plots in each ownership.
[2]Less than 500 acres.

Table 6--*Area of commercial forest land, by ownership and stand-size classes, California's Northern Interior, January 1, 1970*

(In thousand acres)

Stand-size class	All ownerships	National Forest	Other public	Forest industry	Farmer and miscellaneous private
Sawtimber stands:					
Large sawtimber[1]	2,645	2,001	20	217	407
Small sawtimber[2]	1,858	777	64	239	778
Total	4,503	2,778	84	456	1,185
Poletimber stands	399	216	20	51	112
Sapling and seedling stands	722	261	25	132	304
Nonstocked areas	404	219	25	40	120
All Classes	6,028	3,474	154	679	1,721

[1]Large sawtimber includes trees 21.0- inch d.b.h. and larger.
[2]Small sawtimber includes softwood trees 9.0- to 20.9-inch d.b.h. and hardwood trees 11.0- to 20.9-inch d.b.h.

Table 7--*Area of commercial forest land, by ownership and cubic-foot site classes, California's Northern Interior, January 1, 1970*

(In thousand acres)

Site class[1] (cubic feet)	All ownerships	National Forest	Other public	Forest industry	Farmer and miscellaneous private
165-224	282	157	2	44	79
120-164	555	283	13	111	148
85-119	1,194	715	23	165	291
50-84	2,639	1,763	57	195	624
20-49	1,358	556	59	164	579
All Classes	6,028	3,474	154	679	1,721

[1]A classification in terms of capacity for cubic-foot annual growth per acre at culmination of mean annual growth in fully-stocked stands.

Table 8--*Area of commercial forest land by stocking class of all growing-stock trees and ownership class, California's Northern Interior, January 1, 1970*

(In thousand acres)

Stocking percent[1]	All ownerships	National Forest	Other public	Forest industry	Farmer and miscellaneous private
80+	444	308	7	38	91
60-79	1,788	1,045	30	221	492
36-59	2,121	1,195	57	201	668
11-35	1,271	707	35	179	350
0-10	404	219	25	40	120
Total	6,028	3,474	154	679	1,721

[1]See "Definition of Terms," page 73.

Table 9--*Area of commercial forest land, by forest type and ownership class, California's Northern Interior, January 1, 1970*

(In thousand acres)

Forest type	All ownerships	National Forest	Other public	Forest industry	Farmer and miscellaneous private
Douglas-fir	1,526	1,070	38	122	296
White fir	1,185	612	15	206	352
Red fir[1]	158	95	--	20	43
Ponderosa pine	1,201	679	17	144	361
Jeffrey pine	350	247	3	23	77
Sugar pine	67	43	--	10	14
Western white pine	11	7	--	--	4
Lodgepole pine	77	42	--	13	22
Knobcone pine	8	8	--	--	--
Brewer spruce	3	3	--	--	--
Mountain hemlock	8	8	--	--	--
Incense-cedar	321	101	2	66	152
Port-Orford-cedar	6	6	--	--	--
California black oak	194	63	29	4	98
Oregon white oak	60	7	6	5	42
Pacific madrone	28	17	--	5	6
Other commercial hardwoods	373	231	19	21	102
Noncommercial conifers	16	9	--	--	7
Noncommercial hardwoods	32	7	--	--	25
Nonstocked	404	219	25	40	120
All types	6,028	3,474	154	679	1,721

[1]Includes California red fir and Shasta red fir.

Table 10--*Area of noncommercial forest land by ownership class and forest type and land class, California's Northern Interior, January 1, 1970*

(In thousand acres)

Land class and forest type	All ownerships	National Forest	Other public	Forest industry[1]	Farmer and miscellaneous private[1]
			RESERVED[2]		
Productive:					
Douglas-fir	63	61	2	--	--
True fir	212	166	46	--	--
Ponderosa pine	106	101	5	--	--
Jeffrey pine	11	--	11	--	--
Western white pine	15	13	2	--	--
Lodgepole pine	27	15	12	--	--
Mountain hemlock	4	--	4	--	--
Aspen	([3])	--	([3])	--	--
California black oak	1	--	1	--	--
Total	439	356	83	--	--
Unproductive:					
Douglas-fir	1	--	1	--	--
Ponderosa pine	1	--	1	--	--
Digger pine	([3])	--	([3])	--	--
Oak	37	37	([3])	--	--
Juniper	8	--	8	--	--
Chaparral	18	18	([3])	--	--
Noncommercial conifer	19	19	--	--	--
Low site	([3])	--	([3])	--	--
Unclassified	84	84	--	--	--
Total	168	158	10	--	--
Total reserved	607	514	93	--	--
			UNRESERVED-UNPRODUCTIVE		
Rocky	468	362	11	19	76
Low site	624	386	49	4	185
Juniper	979	325	322	9	323
Oak-madrone	521	28	63	6	424
Chaparral	271	133	37	7	94
Critical watershed	27	27	--	--	--
Adverse location	54	54	--	--	--
Subalpine	87	87	--	--	--
Willow	8	--	--	--	8
Other	4	4	--	--	--
Total unreserved	3,043	1,406	482	45	1,110

[1]No privately owned productive forest lands were identified as reserved.
[2]See "Inventory Procedures," page 72, for source of data.
[3]Less than 500 acres.

Table 11--Area of commercial forest land and volume of growing stock and sawtimber, by stand-age and ownership classes, California's Northern Interior, January 1, 1970

Stand-age class (years)	All ownerships			National Forest			Other public			Forest industry			Farmer and miscellaneous private		
	Area	Growing stock	Saw-timber	Area	Growing stock	Saw-timber	Area	Growing stock	Saw-timber	Area	Growing stock	Saw-timber	Area	Growing stock	Saw-timber
	Thousand acres	*Million cubic feet*	*Million board feet*[1]	*Thousand acres*	*Million cubic feet*	*Million board feet*[1]	*Thousand acres*	*Million cubic feet*	*Million board feet*[1]	*Thousand acres*	*Million cubic feet*	*Million board feet*[1]	*Thousand acres*	*Million cubic feet*	*Million board feet*[1]
Nonstocked	404	49	217	219	27	136	25	1	1	40	10	27	120	11	53
0 - 9	258	179	955	105	64	337	10	2	10	35	17	96	108	96	512
10 - 19	121	69	298	16	17	66	3	1	2	25	16	81	77	35	149
20 - 29	87	76	357	38	34	148	--	--	--	9	4	15	40	38	194
30 - 39	127	117	321	63	78	216	6	5	14	17	10	28	41	24	63
40 - 49	204	313	1,284	153	230	952	2	(2)	--	4	19	83	45	64	249
50 - 59	179	363	1,600	96	157	644	6	22	83	30	74	351	47	110	522
60 - 69	143	252	993	58	121	520	20	36	149	20	45	186	45	50	138
70 - 79	97	251	1,120	41	95	388	6	11	43	15	37	175	35	108	514
80 - 89	75	190	899	12	39	194	5	5	30	18	19	69	40	127	606
90 - 99	80	195	917	14	32	96	11	49	297	14	17	66	41	97	458
100 - 119	22	101	522	13	41	210	--	--	--	--	--	--	9	60	312
120 - 139	22	104	675	13	26	144	--	--	--	--	--	--	9	78	531
140 - 159	23	65	351	18	46	241	--	--	--	--	--	--	5	19	110
160 - 179	18	41	247	9	31	189	--	--	--	--	--	--	9	10	58
180 - 199	6	6	28	6	6	28	--	--	--	--	--	--	--	--	--
200 and over	343	1,958	12,385	281	1,675	10,529	--	--	--	7	47	311	55	236	1,545
Uneven-aged under rotation age	2,234	4,506	23,134	1,134	2,817	13,846	48	84	464	316	553	3,270	736	1,052	5,554
Uneven-aged over rotation age	1,585	7,066	39,710	1,185	5,390	31,426	12	55	227	129	581	2,796	259	1,040	5,261
All classes	6,028	15,901	86,013	3,474	10,926	60,310	154	271	1,320	679	1,449	7,554	1,721	3,255	16,829

[1]International 1/4-inch rule.

[2]Less than 500,000 cubic feet.

[3]Rotation age as used here: Lodgepole pine--100 years; other conifers, Shasta, Trinity, and western Siskiyou Counties--100 years; other conifers, Lassen, Modoc, and eastern Siskiyou Counties--140 years; hardwoods--50 years.

Table 12--*Net volume of growing stock and sawtimber on commercial forest land, by ownership class and by softwoods and hardwoods, California's Northern Interior, January 1, 1970*

Ownership classes	Average volume per acre	All species	Softwoods	Hardwoods
	Cubic feet	- - - - -*Million cubic feet*- - - -		
Growing stock:[1]				
National Forest	3,145	10,926	10,509	417
Other public	1,760	271	247	24
Forest industry	2,134	1,449	1,400	49
Farmer and miscellaneous private	1,891	3,255	3,062	193
All ownerships	2,638	15,901	15,218	683
	Board feet	- - - - -*Million board feet*- - - -		
Sawtimber (International 1/4-inch rule):[2]				
National Forest	17,360	60,310	59,621	689
Other public	8,571	1,320	1,286	34
Forest industry	11,125	7,554	7,446	108
Farmer and miscellaneous private	9,779	16,829	16,416	413
All ownerships	14,269	86,013	84,769	1,244
Sawtimber (Scribner rule):[3]				
National Forest	15,790	54,856	54,182	674
Other public	7,026	1,082	1,049	33
Forest industry	9,666	6,563	6,457	106
Farmer and miscellaneous private	8,278	14,247	13,841	406
All ownerships	12,732	76,748	75,529	1,219

[1]Includes trees 5.0-inch d.b.h. and larger.
[2]Includes softwood trees 9.0-inch d.b.h. and larger, and hardwood trees 11.0-inch d.b.h. and larger.
[3]Includes trees 11.0-inch d.b.h. and larger.

Table 13--*Net volume of growing stock and sawtimber on commercial forest land by county and ownership class, California's Northern Interior, January 1, 1970*

County	Total	National Forest	Other public	Forest industry	Farmer and miscellaneous private
	Million cubic feet				
Growing stock:[1]					
Lassen	1,470	918	15	84	453
Modoc	933	688	3	37	205
Shasta	2,787	1,100	85	576	1,026
Siskiyou	5,997	4,867	23	534	573
Trinity	4,714	3,353	145	218	998
Total	15,901	10,926	271	1,449	3,255
	Million board feet				
Sawtimber (International 1/4-inch rule):[2]					
Lassen	7,560	4,879	76	409	2,196
Modoc	4,626	3,528	14	189	895
Shasta	15,064	5,886	373	3,244	5,561
Siskiyou	32,185	26,957	85	2,528	2,615
Trinity	26,578	19,060	772	1,184	5,562
Total	86,013	60,310	1,320	7,554	16,829
	Million board feet				
Sawtimber (Scribner rule):[3]					
Lassen	6,299	4,242	60	292	1,705
Modoc	3,829	2,991	10	162	666
Shasta	12,984	5,239	292	2,732	4,721
Siskiyou	29,588	24,761	78	2,361	2,388
Trinity	24,048	17,623	642	1,016	4,767
Total	76,748	54,856	1,082	6,563	14,247

[1]Includes trees 5.0-inch d.b.h. and larger.
[2]Includes softwood trees 9.0-inch d.b.h. and larger, and hardwood trees 11.0-inch d.b.h. and larger.
[3]Includes trees 11.0-inch d.b.h. and larger.

Table 14--*Net volume of growing stock and sawtimber on commercial forest land, by stand-size class and by softwoods and hardwoods, California's Northern Interior, January 1, 1970*

Stand-size class	Average volume per acre	All species	Softwoods	Hardwoods
	Cubic feet	- - - - - - - *Million cubic feet* - - - - - - -		
Growing stock:[1]				
Large sawtimber stands	4,151	10,980	10,628	352
Small sawtimber stands	2,142	3,979	3,729	250
Poletimber stands	1,015	405	355	50
Sapling and seedling stands	676	488	457	31
Nonstocked areas	121	49	49	([4])
Total	2,638	15,901	15,218	683
	Board feet	- - - - - - - *Million board feet* - - - - - - -		
Sawtimber (International 1/4-inch rule):[2]				
Large sawtimber stands	24,457	64,688	64,012	676
Small sawtimber stands	9,502	17,654	17,170	484
Poletimber stands	2,699	1,077	1,045	32
Sapling and seedling stands	3,292	2,377	2,325	52
Nonstocked areas	537	217	217	--
Total	14,269	86,013	84,769	1,244
Sawtimber (Scribner rule):[3]				
Large sawtimber stands	22,498	59,506	58,843	663
Small sawtimber stands	7,631	14,178	13,704	474
Poletimber stands	2,028	809	778	31
Sapling and seedling stands	2,857	2,063	2,012	51
Nonstocked areas	475	192	192	--
Total	12,732	76,748	75,529	1,219

[1]Includes trees 5.0-inch d.b.h. and larger.
[2]Includes softwood trees 9.0-inch d.b.h. and larger, and hardwood trees 11.0-inch d.b.h. and larger.
[3]Includes trees 11.0-inch d.b.h. and larger.
[4]Less than 500,000 cubic feet.

Table 15--Net volume of growing stock on commercial forest land, by species and diameter class, California's Northern Interior, January 1, 1970

(In million cubic feet)

Species	Diameter class (inches at breast height)											
	All classes	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	29.0-38.9	39.0 and larger
Softwoods:												
Douglas-fir	5,801	103	158	192	200	226	244	239	227	857	1,260	2,095
White fir	3,180	94	141	190	207	215	211	205	194	712	696	315
Red fir[1]	666	11	13	21	25	32	43	48	49	179	156	89
Ponderosa pine	2,801	66	100	127	140	160	155	160	161	608	618	506
Jeffrey pine	703	16	21	31	39	42	39	38	48	166	165	98
Sugar pine	1,197	8	11	13	19	20	28	40	42	199	281	536
Western white pine	62	1	1	2	2	3	4	6	4	20	17	2
Lodgepole pine	165	11	18	22	28	20	16	12	12	20	6	--
Knobcone pine	38	1	1	3	3	13	7	4	2	4	--	--
Brewer spruce	6	--	(2)	(2)	1	1	--	--	1	1	2	--
Mountain hemlock	40	2	2	5	6	5	3	4	1	7	5	--
Incense-cedar	531	20	26	21	23	31	26	28	33	118	117	88
Port-Orford-cedar	19	(2)	(2)	--	2	(2)	1	2	(2)	7	5	2
Western redcedar	9	--	--	--	--	1	(2)	--	(2)	2	4	2
Total	15,218	333	492	627	695	769	777	786	774	2,900	3,332	3,733
Hardwoods:												
California black oak	261	25	30	22	20	26	19	20	18	49	26	6
Oregon white oak	41	6	7	3	5	4	1	3	3	6	3	--
Tanoak	95	6	11	16	10	6	7	5	7	21	3	3
Pacific madrone	126	8	19	15	14	12	14	10	10	19	4	1
Canyon live oak[3]	117	16	21	19	13	10	7	7	6	13	5	(2)
Other commercial hardwoods[4]	43	5	6	5	4	5	5	2	1	4	4	2
Total	683	66	94	80	66	63	53	47	45	112	45	12
All species	15,901	399	586	707	761	832	830	833	819	3,012	3,377	3,745

[1]Includes California red fir and Shasta red fir.
[2]Less than 500,000 cubic feet.
[3]Includes golden chinquapin.
[4]Primarily white alder, Fremont cottonwood, quaking aspen, and bigleaf maple.

Table 16--Net volume of sawtimber on commercial forest land, by species and diameter class, California's Northern Interior, January 1, 1970 (International ¼-inch rule)

(In million board feet)

Species	Diameter class (inches at breast height)									
	All classes	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	29.0-38.9	39.0 and larger
Softwoods:										
Douglas-fir	33,627	408	704	956	1,137	1,207	1,223	5,190	8,266	14,536
White fir	17,417	503	940	1,146	1,190	1,162	1,117	4,473	4,696	2,190
Red fir[1]	3,757	42	115	160	228	259	274	1,062	1,006	611
Ponderosa pine	14,856	383	525	658	669	751	803	3,459	4,022	3,586
Jeffrey pine	3,707	115	158	174	174	169	236	923	1,061	697
Sugar pine	7,503	26	64	97	144	215	241	1,201	1,811	3,704
Western white pine	344	(2)	8	12	20	34	24	122	108	16
Lodgepole pine	518	39	90	77	65	54	58	103	32	--
Knobcone pine	104	1	9	38	24	15	10	7	--	--
Brewer spruce	29	--	2	2	--	--	3	8	14	--
Mountain hemlock	154	3	23	19	7	26	8	40	28	--
Incense-cedar	2,595	79	120	146	117	132	165	638	681	517
Port-Orford-cedar	105	--	5	1	3	5	1	44	30	16
Western redcedar	53	--	--	3	1	--	2	7	26	14
Total	84,769	1,599	2,763	3,489	3,779	4,029	4,165	17,277	21,781	25,887
Hardwoods:										
California black oak	528	--	39	56	47	51	51	154	98	32
Oregon white oak	61	--	12	7	5	5	6	18	8	--
Tanoak	161	--	18	14	18	15	20	59	9	8
Pacific madrone	200	--	30	29	30	24	24	50	12	1
Canyon live oak[3]	198	--	30	27	19	28	19	52	21	2
Other commercial hardwoods[4]	96	--	9	13	20	8	7	14	20	5
Total	1,244	--	138	146	139	131	127	347	168	48
All species	86,013	1,599	2,901	3,635	3,918	4,160	4,292	17,624	21,949	25,935

[1] Includes California red fir and Shasta red fir.
[2] Less than 500,000 board feet.
[3] Includes golden chinquapin.
[4] Primarily white alder, Fremont cottonwood, quaking aspen, and bigleaf maple.

Table 17--Net volume of sawtimber on commercial forest land, by species and diameter class, California's Northern Interior, January 1, 1970 (Scribner rule)

(In million board feet)

Species	Diameter class (inches at breast height)									
	All classes	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	29.0-38.9	39.0 and larger
Softwoods:										
Douglas-fir	30,673	--	537	750	919	1,005	1,046	4,653	7,756	14,007
White fir	14,863	--	711	899	962	963	950	3,963	4,342	2,073
Red fir[1]	3,342	--	90	130	188	224	242	959	936	573
Ponderosa pine	13,212	--	280	473	548	653	721	3,232	3,840	3,465
Jeffrey pine	3,259	--	71	118	138	149	212	872	1,024	675
Sugar pine	6,926	--	41	67	110	174	200	1,067	1,701	3,566
Western white pine	298	--	5	9	15	27	19	105	102	16
Lodgepole pine	414	--	72	64	54	48	51	95	30	--
Knobcone pine	86	--	6	31	21	13	8	7	--	--
Brewer spruce	26	--	2	1	--	--	3	7	13	--
Mountain hemlock	122	--	14	13	5	20	7	37	26	--
Incense-cedar	2,161	--	71	101	88	104	136	556	625	480
Port-Orford-cedar	97	--	4	1	2	5	2	40	28	15
Western redcedar	50	--	--	3	2	--	1	7	24	13
Total	75,529	--	1,904	2,660	3,052	3,385	3,598	15,600	20,447	24,883
Hardwoods:										
California black oak	520	--	38	55	46	51	50	151	97	32
Oregon white oak	58	--	11	7	4	5	6	17	8	--
Tanoak	157	--	18	13	18	15	19	57	9	8
Pacific madrone	195	--	29	28	29	23	23	50	12	1
Canyon live oak[2]	196	--	29	28	18	27	19	52	21	2
Other commercial hardwoods[3]	93	--	8	11	19	8	7	15	20	5
Total	1,219	--	133	142	134	129	124	342	167	48
All species	76,748	--	2,037	2,802	3,186	3,514	3,722	15,942	20,614	24,931

[1]Includes California red fir and Shasta red fir.
[2]Includes golden chinquapin.
[3]Primarily white alder, Fremont cottonwood, quaking aspen, and bigleaf maple.

Table 18--*Net volume of growing stock on commercial forest land by species and ownership class, California's Northern Interior, January 1, 1970*

(In million cubic feet)

Species	All ownerships	National Forest	Other public	Forest industry	Farmer and miscellaneous private
Softwoods:					
Douglas-fir	5,801	4,519	153	318	811
White fir[1]	3,180	1,974	20	456	730
Red fir[2]	666	448	2	23	193
Ponderosa pine	2,801	1,672	49	353	727
Jeffrey pine	703	521	8	39	135
Sugar pine	1,197	880	10	98	209
Western white pine	62	48	--	2	12
Lodgepole pine	165	119	3	10	33
Knobcone pine	38	22	1	9	6
Brewer spruce	6	4	--	2	--
Mountain hemlock	40	39	--	1	([3])
Incense-cedar	531	235	1	89	206
Port-Orford-cedar	19	19	--	--	--
Western redcedar	9	9	--	--	--
Total	15,218	10,509	247	1,400	3,062
Hardwoods:					
California black oak	261	109	12	32	108
Oregon white oak	41	14	2	2	23
Tanoak	95	93	--	--	2
Pacific madrone	126	104	1	7	14
Canyon live oak[4]	117	77	8	6	26
Other commercial hardwoods[5]	43	20	1	2	20
Total	683	417	24	49	193
All species	15,901	10,926	271	1,449	3,255

[1]Includes small amount of grand fir.
[2]Includes California red fir and Shasta red fir.
[3]Less than 500,000 cubic feet.
[4]Includes golden chinquapin.
[5]Primarily white alder, Fremont cottonwood, quaking aspen, and bigleaf maple.

Table 19--*Net volume of sawtimber on commercial forest land, by species and ownership class, California's Northern Interior, January 1, 1970 (International 1/4-inch rule)*

(In million board feet)

Species	All ownerships	National Forest	Other public	Forest industry	Farmer and miscellaneous private
Softwoods:					
Douglas-fir	33,627	26,715	801	1,723	4,388
White fir[1]	17,417	10,683	106	2,471	4,157
Red fir[2]	3,757	2,584	11	104	1,058
Ponderosa pine	14,856	9,090	247	1,864	3,655
Jeffrey pine	3,707	2,752	45	179	731
Sugar pine	7,503	5,572	57	590	1,284
Western white pine	344	271	--	11	62
Lodgepole pine	518	370	14	39	95
Knobcone pine	104	63	--	31	10
Brewer spruce	29	25	--	4	--
Mountain hemlock	154	148	--	3	3
Incense-cedar	2,595	1,190	5	427	973
Port-Orford-cedar	105	105	--	--	--
Western redcedar	53	53	--	--	--
Total	84,769	59,621	1,286	7,446	16,416
Hardwoods:					
California black oak	528	202	16	70	240
Oregon white oak	61	16	2	3	40
Tanoak	161	156	--	--	5
Pacific madrone	200	159	1	17	23
Canyon live oak[3]	198	122	12	13	51
Other commercial hardwoods[4]	96	34	3	5	54
Total	1,244	689	34	108	413
All species	86,013	60,310	1,320	7,554	16,829

[1]Includes small amount of grand fir.
[2]Includes California red fir and Shasta red fir.
[3]Includes golden chinquapin.
[4]Primarily white alder, Fremont cottonwood, quaking aspen, and bigleaf maple.

Table 20--*Net volume of sawtimber on commercial forest land, by species and ownership class, California's Northern Interior, January 1, 1970 (Scribner rule)*

(In million board feet)

Species	All ownerships	National Forest	Other public	Forest industry	Farmer and miscellaneous private
Softwoods:					
Douglas-fir	30,673	24,854	653	1,492	3,674
White fir[1]	14,863	9,197	84	2,100	3,482
Red fir[2]	3,342	2,286	10	92	954
Ponderosa pine	13,212	8,293	201	1,675	3,043
Jeffrey pine	3,259	2,495	37	129	598
Sugar pine	6,926	5,184	47	545	1,150
Western white pine	298	233	--	10	55
Lodgepole pine	414	291	13	26	84
Knobcone pine	86	50	--	27	9
Brewer spruce	26	23	--	3	--
Mountain hemlock	122	117	--	3	2
Incense-cedar	2,161	1,012	4	355	790
Port-Orford-cedar	97	97	--	--	--
Western redcedar	50	50	--	--	--
Total	75,529	54,182	1,049	6,457	13,841
Hardwoods:					
California black oak	520	199	16	69	236
Oregon white oak	58	14	2	3	39
Tanoak	157	152	--	--	5
Pacific madrone	195	155	1	17	22
Canyon live oak[3]	196	121	12	12	51
Other commercial hardwoods[4]	93	33	2	5	53
Total	1,219	674	33	106	406
All species	76,748	54,856	1,082	6,563	14,247

[1]Includes small amount of grand fir.
[2]Includes California red fir and Shasta red fir.
[3]Includes golden chinquapin.
[4]Primarily white alder, Fremont cottonwood, quaking aspen, and bigleaf maple.

Table 21--*Net annual growth of growing stock and sawtimber on commercial forest land, by ownership class and by softwoods and hardwoods, California's Northern Interior, 1970*[1]

Ownership class	Growth per acre	All species	Softwoods	Hardwoods
	Cubic feet	- - - - -*Thousand cubic feet*- - - - -		
Growing stock:[2]				
National Forest	45	155,200	141,100	14,100
Other public	32	5,000	4,400	600
Forest industry	34	22,800	22,200	600
Farmer and miscellaneous private	37	63,100	58,700	4,400
All ownerships	41	246,100	226,400	19,700
	Board feet	- - - - -*Thousand board feet*- - - - -		
Sawtimber (International 1/4-inch rule):[3]				
National Forest	223	773,000	751,900	21,100
Other public	227	34,900	34,700	200
Forest industry	193	130,800	129,100	1,700
Farmer and miscellaneous private	184	316,100	308,600	7,500
All ownerships	208	1,254,800	1,224,300	30,500
Sawtimber (Scribner rule):[4]				
National Forest	185	644,400	623,800	20,600
Other public	181	27,900	27,700	200
Forest industry	146	99,400	97,700	1,700
Farmer and miscellaneous private	158	271,500	264,100	7,400
All ownerships	173	1,043,200	1,013,300	29,900

[1]See "Inventory Procedures," page 72, for actual period over which growth was measured.

[2]Includes trees 5.0-inch d.b.h. and larger.

[3]Includes softwood trees 9.0-inch d.b.h. and larger, and hardwood trees 11.0-inch d.b.h. and larger.

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

Table 22--*Net annual growth of growing stock on commercial forest land, by species and ownership class, California's Northern Interior, 1970*[1]

(In thousand cubic feet)

Species	All ownerships	National Forest	Other public	Forest industry	Farmer and miscellaneous private
Softwoods:					
Douglas-fir	68,700	46,300	2,400	4,500	15,500
White fir	65,000	40,500	500	8,900	15,100
Red fir[2]	8,000	7,200	100	-100[3]	800
Grand fir	(4)	(4)	--	--	--
Ponderosa pine	52,600	28,700	900	5,000	18,000
Jeffrey pine	11,700	7,800	300	900	2,700
Sugar pine	9,600	4,700	200	2,300	2,400
Western white pine	700	800	--	(4)	-100[3]
Lodgepole pine	2,200	1,300	(4)	300	600
Knobcone pine	100	(4)	--	--	100
Brewer spruce	(4)	(4)	--	(4)	--
Mountain hemlock	1,100	1,100	--	(4)	(4)
Incense-cedar	6,400	2,400	(4)	400	3,600
Port-Orford-cedar	200	200	--	--	--
Western redcedar	100	100	--	--	--
Total	226,400	141,100	4,400	22,200	58,700
Hardwoods:					
California black oak	6,100	3,200	500	400	2,000
Oregon white oak	900	500	100	(4)	300
Tanoak	3,400	3,300	--	--	100
Pacific madrone	3,200	3,000	(4)	100	100
Canyon live oak[5]	3,400	3,100	(4)	100	200
Other commercial hardwoods[6]	2,700	1,000	(4)	(4)	1,700
Total	19,700	14,100	600	600	4,400
All species	246,100	155,200	5,000	22,800	63,100

[1] See "Inventory Procedures," page 72, for actual period over which growth was measured.
[2] Includes California red fir and Shasta red fir.
[3] Negative growth results from annual mortality exceeding gross annual growth.
[4] Less than 50,000 cubic feet.
[5] Includes golden chinquapin.
[6] Primarily white alder, Fremont cottonwood, quaking aspen, and bigleaf maple.

Table 23--*Net annual growth of sawtimber on commercial forest land, by species and ownership class, California's Northern Interior, 1970 (International 1/4-inch rule)*[1]

(In thousand board feet)

Species	All ownerships	National Forest	Other public	Forest industry	Farmer and miscellaneous private
Softwoods:					
Douglas-fir	365,700	243,100	21,600	22,700	78,300
White fir[2]	379,700	229,700	3,000	58,600	88,400
Red fir[3]	49,900	39,600	600	600	9,100
Ponderosa pine	276,300	149,100	6,100	30,800	90,300
Jeffrey pine	53,600	33,800	2,100	4,700	13,000
Sugar pine	51,200	28,400	1,300	6,600	14,900
Western white pine	3,000	3,800	--	100	-900[4]
Lodgepole pine	8,400	6,800	-100[4]	1,200	500
Knobcone pine	200	200	--	--	--
Brewer spruce	400	300	--	100	--
Mountain hemlock	4,000	3,900	--	(5)	100
Incense-cedar	30,300	11,600	100	3,700	14,900
Port-Orford-cedar	1,100	1,100	--	--	--
Western redcedar	500	500	--	--	--
Total	1,224,300	751,900	34,700	129,100	308,600
Hardwoods:					
California black oak	10,200	4,600	(5)	1,200	4,400
Oregon white oak	800	300	(5)	(5)	500
Tanoak	5,000	5,000	--	--	(5)
Pacific madrone	7,500	7,200	(5)	100	200
Canyon live oak[6]	4,200	3,500	100	300	300
Other commercial hardwoods[7]	2,800	500	100	100	2,100
Total	30,500	21,100	200	1,700	7,500
All species	1,254,800	773,000	34,900	130,800	316,100

[1]See "Inventory Procedures," page 72, for actual period over which growth was measured.
[2]Includes small amount of grand fir.
[3]Includes California red fir and Shasta red fir.
[4]Negative growth results from annual mortality exceeding gross annual growth.
[5]Less than 50,000 board feet.
[6]Includes golden chinquapin.
[7]Primarily white alder, Fremont cottonwood, quaking aspen, and bigleaf maple.

Table 24--*Net annual growth of sawtimber on commercial forest land, by species and ownership class, California's Northern Interior, 1970 (Scribner rule)*[1]

(In thousand board feet)

Species	All ownerships	National Forest	Other public	Forest industry	Farmer and miscellaneous private
Softwoods:					
Douglas-fir	319,200	211,100	17,800	18,500	71,800
White fir[2]	306,700	185,200	2,700	41,400	77,400
Red fir[3]	44,400	34,000	600	1,200	8,600
Ponderosa pine	213,100	118,300	3,500	22,200	69,100
Jeffrey pine	44,700	28,400	2,100	4,000	10,200
Sugar pine	45,900	23,700	1,100	7,900	13,200
Western white pine	2,500	3,100	--	100	-700[4]
Lodgepole pine	5,500	4,000	-100[4]	1,100	500
Knobcone pine	100	100	--	--	--
Brewer spruce	400	300	--	100	--
Mountain hemlock	3,100	3,000	--	(5)	100
Incense-cedar	26,100	11,000	(5)	1,200	13,900
Port-Orford-cedar	1,100	1,100	--	--	--
Western redcedar	500	500	--	--	--
Total	1,013,300	623,800	27,700	97,700	264,100
Hardwoods:					
California black oak	10,101	4,600	(5)	1,200	4,300
Oregon white oak	800	300	(5)	(5)	500
Tanoak	5,000	5,000	--	--	(5)
Pacific madrone	7,300	7,000	(5)	100	200
Canyon live oak[6]	3,900	3,200	100	300	300
Other commercial hardwoods[7]	2,800	500	100	100	2,100
Total	29,900	20,600	200	1,700	7,400
All species	1,043,200	644,400	27,900	99,400	271,500

[1]See "Inventory Procedures," page 72, for actual period over which growth was measured.
[2]Includes small amount of grand fir.
[3]Includes California red fir and Shasta red fir.
[4]Negative growth results from annual mortality exceeding gross annual growth.
[5]Less than 50,000 board feet.
[6]Includes golden chinquapin.
[7]Primarily white alder, Fremont cottonwood, quaking aspen, and bigleaf maple.

Table 25--*Average annual mortality of growing stock on commercial forest land, by species and ownership class, California's Northern Interior, 1970*[1]

(In thousand cubic feet)

Species	All ownerships	National Forest	Other public	Forest industry	Farmer and miscellaneous private
Softwoods:					
Douglas-fir	11,900	8,100	300	300	3,200
White fir	10,200	6,200	500	1,800	1,700
Red fir[2]	3,100	1,800	(3)	400	900
Ponderosa pine	6,300	2,400	100	1,000	2,800
Jeffrey pine	2,400	1,800	--	100	500
Sugar pine	4,800	4,000	--	100	700
Western white pine	400	100	--	--	300
Lodgepole pine	2,800	2,300	100	--	400
Knobcone pine	(3)	(3)	--	--	--
Mountain hemlock	200	200	--	--	--
Incense-cedar	2,000	800	--	500	700
Total	44,100	27,700	1,000	4,200	11,200
Hardwoods	800	600	100	(3)	100
All species	44,900	28,300	1,100	4,200	11,300

[1]See "Inventory Procedures," page 72, for actual period over which mortality was estimated.
[2]Includes California red fir and Shasta red fir.
[3]Less than 50,000 cubic feet.

Table 26--*Average annual mortality of growing stock on commercial forest land, by species and ownership class, California's Northern Interior, 1970 (International 1/4-inch rule)*[1]

(In thousand board feet)

Species	All ownerships	National Forest	Other public	Forest industry	Farmer and miscellaneous private
Softwoods:					
Douglas-fir	56,300	39,500	500	1,600	14,700
White fir	52,400	33,600	1,200	9,800	7,800
Red fir[2]	15,400	9,500	--	2,300	3,600
Ponderosa pine	30,000	11,400	300	4,300	14,000
Jeffrey pine	13,800	10,600	--	200	3,000
Sugar pine	29,300	25,000	--	600	3,700
Western white pine	2,000	600	--	--	1,400
Lodgepole pine	11,100	9,500	200	---	1,400
Knobcone pine	([3])	([3])	--	--	--
Mountain hemlock	600	600	--	--	--
Incense-cedar	9,500	3,600	--	2,200	3,700
Total	220,400	143,900	2,200	21,000	53,300
Hardwoods	1,500	1,300	200	--	--
All species	221,900	145,200	2,400	21,000	53,300

[1]See "Inventory Procedures," page 72, for actual period over which mortality was estimated.

[2]Includes California red fir and Shasta red fir.

[3]Less than 50,000 board feet.

Table 27--*Average annual mortality of growing stock on commercial forest land, by species and ownership class, California's Northern Interior, 1970 (Scribner rule)*[1]

(In thousand board feet)

Species	All ownerships	National Forest	Other public	Forest industry	Farmer and miscellaneous private
Softwoods:					
Douglas-fir	48,400	34,500	300	1,400	12,200
White fir	45,000	30,100	600	9,100	5,200
Red fir[2]	13,800	8,500	--	2,100	3,200
Ponderosa pine	25,700	9,800	400	3,900	11,600
Jeffrey pine	12,800	10,100	--	([3])	2,700
Sugar pine	27,300	23,600	--	600	3,100
Western white pine	1,600	400	--	--	1,200
Lodgepole pine	9,900	8,400	200	--	1,300
Knobcone pine	([3])	([3])	--	--	--
Mountain hemlock	400	400	--	--	--
Incense-cedar	7,900	2,800	--	2,000	3,100
Total	192,800	128,600	1,500	19,100	43,600
Hardwoods	1,500	1,300	200	--	--
All species	194,300	129,900	1,700	19,100	43,600

[1]See "Inventory Procedures," page 72, for actual period over which mortality was estimated.

[2]Includes California red fir and Shasta red fir.

[3]Less than 50,000 board feet.

Table 28--*Reported timber production by county in California's Northern Interior and all of California, 1946-73*[1]

(In thousand board feet)

Year	Lassen	Modoc	Siskiyou	Shasta	Trinity	All counties	California
1946	294,530	177,890	172,030	232,510	73,040	950,000	3,001,780
1947	200,696	148,634	203,687	218,046	119,123	890,186	3,185,995
1948	360,959	209,920	291,746	257,399	132,850	1,252,874	3,983,213
1949	339,598	172,087	236,798	217,007	101,011	1,066,501	3,795,252
1950	229,952	222,636	266,240	221,332	105,115	1,045,275	4,303,011
1951	313,604	191,437	284,348	373,888	144,917	1,308,194	4,984,288
1952	167,224	155,082	330,142	296,864	214,271	1,163,583	5,057,036
1953	196,168	86,172	380,073	486,669	319,398	1,468,480	5,990,088
1954	241,752	70,040	425,187	347,483	252,061	1,336,523	5,600,310
1955	256,759	46,670	377,728	418,544	296,893	1,396,594	6,014,939
1956	169,185	73,512	469,317	412,056	266,406	1,390,476	5,861,634
1957	150,346	31,543	439,564	432,829	351,217	1,405,499	5,346,521
1958	54,261	40,711	389,440	537,573	347,985	1,369,970	5,675,392
1959	144,567	50,880	379,698	441,717	439,222	1,456,084	5,886,061
1960	98,182	42,296	315,325	552,685	305,842	1,314,330	5,136,649
1961	121,131	59,555	337,175	455,289	377,191	1,350,341	5,342,250
1962	126,662	60,301	410,145	568,926	369,601	1,535,635	5,538,928
1963	78,907	54,672	605,642	442,171	369,541	1,550,933	5,461,046
1964	134,313	48,463	494,411	530,721	317,742	1,525,650	5,476,265
1965	129,557	54,624	490,584	503,896	265,070	1,443,731	5,271,234
1966	110,974	91,762	465,472	421,560	220,058	1,309,826	5,008,318
1967	74,171	78,948	581,198	441,213	243,282	1,418,812	5,062,021
1968	88,559	85,171	582,723	459,238	255,647	1,471,338	5,343,898
1969	91,220	75,956	516,692	411,089	248,348	1,343,305	5,000,596
1970	81,384	99,371	469,350	401,951	214,637	1,266,693	4,565,827
1971	135,850	80,325	480,084	402,329	199,811	1,298,399	4,789,617
1972	97,800	98,803	463,624	405,883	244,332	1,310,442	5,000,507
1973	119,671	95,883	462,213	401,546	235,035	1,314,348	4,923,000

[1]Source: "Production of California Timber Operators," State Forest Notes published annually by California, Division of Forestry. Various log rules are used in California; no attempt was made to convert the data to a common base. However, the majority of the timber industry companies in the Northern Interior used the short-log Scribner rule.

Table 29--*Sampling errors of estimate of forest area and timber volume, California's Northern Interior, January 1, 1970*

Item	Estimated total	Sampling error in percent	
		68-percent probability	95-percent probability
Commercial forest land	6,028,000 acres	± 1.1	± 2.1
Noncommercial forest land	3,043,000 acres[1]	± 2.8	± 5.5
Volume:			
Growing stock	15,901 million cubic feet	± 1.9	± 3.7
Sawtimber (International 1/4-inch rule)	86,013 million board feet	± 2.2	± 4.2

[1]The total area of unproductive forest land shown in table 4 is 3,211,000 acres, of which 3,043,000 acres were determined by sampling methods. The remaining 168,000 acres were estimated by type-mapping procedures and are not subject to sampling error.

Table 30--*Approximate sampling error by size of estimate, California's Northern Interior, January 1, 1970*

Commercial forest land		Growing stock		Sawtimber	
Area	Sampling error[1]	Volume	Sampling error[1]	Volume	Sampling error[1]
Thousand acres	*Percent*	*Million cubic feet*	*Percent*	*Million board feet*[2]	*Percent*
6,028	1.1	15,901	1.9	86,013	2.2
1,762	2.0	14,346	2.0	44,507	3.0
783	3.0	6,376	3.0	25,035	4.0
440	4.0	3,587	4.0	16,022	5.0
282	5.0	2,295	5.0	4,006	10.0
70	10.0	574	10.0	1,780	15.0
31	15.0	255	15.0	1,001	20.0
18	20.0	143	20.0	640	25.0
11	25.0	92	25.0	445	30.0
8	30.0	64	30.0	327	35.0
6	35.0	47	35.0	250	40.0
4	40.0	36	40.0		

[1]By random sampling formula; 68-percent probability.
[2]International 1/4-inch rule.

APPENDIX

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

Reliability of Forest Resource Estimates

Forest Land Area and Timber Volume

The estimates of forest land areas and timber volume in Northern Interior California, are derived by sampling and thus have sampling errors. Sampling errors have been computed for the estimates of commercial forest land area, noncommercial forest land area, net cubic-foot volume of growing stock, and net board-foot volume (International 1/4-inch rule) of sawtimber. These sampling errors are presented in table 29 as a percent of the estimated total at the 68-percent and 95-percent probability levels. They may be interpreted as meaning that the odds are two out of three for 68-percent probability or 19 out of 20 for 95-percent probability and that the ranges shown include the true value (i.e., the results of a 100-percent inventory). For example, we can expect, with 95-percent confidence, that the estimate of total commercial forest land area—6,028,000 acres $\pm$ 2.1 percent (126,588 acres)—includes the true value.

In addition to measurable sampling errors, there may be other non sampling errors due to mistakes in judgment, measurement, and compilation. The magnitude of errors of this nature cannot be determined. However, such errors are kept to a minimum through training, supervision, field checking, and complete editing and machine verification in compiling the data.

The sampling error of any breakdown of these totals will be substantially greater than for the total. The smaller the breakdown, the larger the sampling error. An approximation of the increasing sampling error can be obtained from table 30, which shows the sampling error associated with smaller estimates.

Woody Plants of Northern Interior Forests

The list on page 70, compiled from Forest Survey field records, is presented to give the reader a general picture of the woody vegetation in the forests of the Northern Interior, that is, the more common and noteworthy trees, shrubs, and vines and some indication of where they grow. The list is by no means complete, and exceptions in occurrence can be found; for example, western juniper typically occurs in the noncommercial woodland zone east of the Cascade Range, occasionally west of the Cascades, and also near upper timberline. The zones used here are:

Zone A.—Sacramento Valley, below the foothill chaparral and woodland zone. This zone is found only in extreme southern Shasta County. Forests in this zone are generally confined to stream banks, are of relatively little importance for industrial use, are important to wildlife, help prevent erosion, and are pleasant to look at.

Zone B.—Foothills chaparral and noncommercial woodland zone (figs. 5, 6, 11, and 27), including forest fringe areas both east and west of the Cascade Range; generally corresponding to Merriam's Upper Sonoran Life Zone. Forests in this zone generally consist of trees or shrubs that have little industrial value but are important as wildlife habitat and watershed protection. In some areas the trees or shrubs have been removed to increase the grazing resources.

Zone C.—Lower elevation commercial forest zone (figs. 28 and 29), immediately above zone B; generally corresponding to the lower end of Merriam's Transition Life Zone. Historically, this zone has produced a considerable volume of timber; but management for continuous timber crops is often difficult due to the hot, dry environment which discourages regeneration of commercial conifers.

Zone D.—Major commercial forest zone (figs. 2, 4, 7, 8, 9, 15, 16, 17, 19, 22, 23 and 34), immediately above zone C; generally corresponding to the upper end of Merriam's Transition Life Zone and the lower end of Merriam's Canadian Life Zone. This zone has produced the bulk of the industrial wood used in the past; much of this area is quite amenable to forest management due to the favorable tree-growing environment.

Zone E.—Upper commercial forest zone (figs. 1 and 2), immediately above zone D; generally corresponding to the upper part of Merriam's Canadian Life Zone. An increasing amount of timber is being cut from these high elevation forests as a result of the growing scarcity of timber in the main forest zone. Because of the short growing seasons, harsh winters, and prevalence of rugged terrain and rocky, shallow soils, this zone is less amenable to forest management than zone D and in some areas will produce little to no timber in the future.

Zone F.—Upper timberline zone (figs. 2, 12, 13, and 18), immediately above zone E; generally corresponding to the lower end of Merriam's Hudsonian Life Zone. Trees in this zone are usually stunted and deformed and often grow only in clumps and groves in protected locations. Though some timber has been cut in this zone, continuous timber production is generally impossible due to the severe climate and steep, rocky terrain.

Woody Plants of Northern Interior Forests [1/]

Scientific name	Common name	A Sacramento Valley	B Chaparral-woodland	C Lower commercial forest zone	D Main commercial forest zone	E Upper commercial forest zone	F Upper timber-line
Quercus lobata Neé.	California white oak	w					
Populus fremontii S. Wats.	Fremont cottonwood	m, w					
Crataegus douglasii Lindl.	Hawthorn	m, w&e					
Platanus racemosa Nutt.	California sycamore	m, w					
Prunus virginiana L. var. *demissa* (Nutt.) Sarg.	Choke cherry	m, w&e					
Vitis californica Benth.	California wild grape	m, w					
Clematis ligusticifolia Nutt.	Western clematis	m, w&e					
Cephalanthus occidentalis L. var. *californicus* Benth.	Buttonbush	m, w					
Fraxinus latifolia Benth.	Oregon ash	m, w					
Prunus subcordata Benth.	Western plum	m, w&e	m, w&e				
Rhus diversiloba Torr. & Gray	Poison oak	w	w	w			
Alnus rhombifolia Nutt.	White alder	m, w	m, w	m, w			
Populus trichocarpa Torr. & Gray	Black cottonwood	m, w&e	m, w&e	m, w&e	m, w&e		
Acer macrophyllum Pursh	Bigleaf maple	m, w	m, w	m, w	m, w		
Rubus ursinus Cham. & Schlecht.	Trailing blackberry	w&e	w&e	w&e	w&e	w&e	
Salix L. spp.	Willow	w&e	w&e	w&e	w&e	w&e	
Quercus douglasii H. & A.	Blue oak		w				
Quercus wislizenii A. DC.	Interior live oak		w				
Adenostoma fasciculatum H. & A.	Chamise		w				
Aesculus californica (Spach) Nutt.	California buckeye		w				
Quercus chrysolepis Liebm.	Canyon live oak		w	w			
Quercus garryana Dougl. var. *breweri* Jeps.	Oregon white oak		w	w			
Ceanothus lemmonii Parry	Lemmon ceanothus		w	w			
Ceanothus cuneatus (Hook.) Nutt.	Wedgeleaf ceanothus		w	w			
Cercis occidentalis Torr.	Western redbud		w	w			
Pinus sabiniana Dougl.	Digger pine		w	w			
Cercocarpus HBK. spp.	Mountain-mahogany		w&e	w&e			
Juniperus occidentalis Hook.	Western juniper		e	e			
Garrya fremontii Torr.	Silktassel		w	w			
Lonicera interrupta Benth.	Chaparral honeysuckle		w	w			
Lonicera hispidula Dougl.	Hairy honeysuckle		w	w			
Rhamnus californica Esch.	Coffeeberry		w	w			
Rhamnus crocea Nutt. var. *ilicifolia* (Kell.) C. B. Wolf	Hollyleaf coffeeberry		w	w			
Chrysothamnus Nutt. spp.	Rabbit brush		e	e			
Artemisia L. spp.	Sage		e	e			
Haplopappus Cass. spp.	Goldenbush		w&e	w&e			
Rhus trilobata Nutt.	Skunkbush		w&e	w&e			
Umbellularia californica (H. & A.) Nutt.	California laurel		w	w			
Monardella Benth. spp.	Monardella		w&e	w&e			
Cupressus bakeri Jeps.	Modoc cypress		r	r			
Cupressus macnabiana A. Murr.	MacNab cypress		r	r			
Ptelea crenulata Greene	Western hop tree		w	w			
Heteromeles arbutifolia M. Roem.	Toyon		w	w			
Eriodictyon californicum (H. & A.) Torr.	Yerba santa		w	w			
Arctostaphylos manzanita Parry	Manzanita		w	w			
Arctostaphylos viscida Parry	Whiteleaf manzanita		w	w			

Arbutus menziesii Pursh	Pacific madrone	w	w			
Quercus kelloggii Newb.	California black oak	w&e	w&e	w		
Pinus attenuata Lemm.	Knobcone pine	w	w	w		
Amelanchier Medic. spp.	Serviceberry	w&e	w&e	w&e		
Purshia tridentata (Pursh) DC.	Bitterbrush	e	e	e		
Ribes L. spp.	Gooseberry/currant	w&e	w&e	w&e	w&e	w&e
Populus tremuloides Michx.	Quaking aspen	m, e	m, e	m, e	m, e	m, e
Pinus ponderosa Laws.	Ponderosa pine		w&e	w&e		
Pseudotsuga menziesii (Mirb.) Franco	Douglas-fir		w&e	w&e		
Pinus lambertiana Dougl.	Sugar pine		w&e	w&e		
Corylus cornuta Marsh. var. *californica* (A.DC.) Sharp	Hazel		w&e	w&e		
Symphoricarpos Duhamel spp.	Snowberry		w&e	w&e		
Ceanothus integerrimus H. & A.	Deer brush		w	w		
Arctostaphylos patula Greene	Greenleaf manzanita		w&e	w&e		
Ceanothus prostratus Benth.	Squaw carpet		w&e	w&e		
Berberis L. spp.	Barberry		w&e	w&e		
Chamaecyparis lawsoniana (A. Murr.) Parl.	Port-Orford-cedar		w	w		
Lithocarpus densiflorus (H. & A.) Rehd.	Tanoak (tree)		w	w		
Prunus emarginata (Dougl.) Walp.	Bitter cherry		w&e	w&e		
Rubus leucodermis Dougl.	Raspberry		w&e	w&e	w&e	
Rubus parviflorus Nutt.	Thimbleberry		w&e	w&e	w&e	
Libocedrus decurrens Torr.	Incense-cedar		w&e	w&e	w&e	
Pinus jeffreyi Grev. & Balf.	Jeffrey pine		w&e	w&e	w&e	
Ceanothus velutinus Dougl.	Snowbrush			w&e		
Thuja plicata Donn	Western red cedar			m, w, r		
Abies concolor (Gord. & Glend.) Lindl.	White fir			w&e	w&e	
Ceanothus cordulatus Kell.	Mountain white thorn			w&e	w&e	
Lithocarpus densiflora (H. & A.) Rehd. var. *echinoides* (R.Br.) Abrams.	Shrub tanoak			w	w	
Pachistima myrsinites (Pursh) Raf.	Boxwood			w&e	w&e	
Acer circinatum Pursh	Vine maple			w	w	
Alnus tenuifolia Nutt.	Thinleaf alder			m, w&e	m, w&e	
Arctostaphylos nevadensis Gray	Pinemat manzanita			w&e	w&e	w&e
Castanopsis sempervirens (Kell.) Dudl.	Bush chinquapin			w&e	w&e	w&e
Acer glabrum Torr.	Mountain maple			w&e	w&e	w&e
Pinus contorta Dougl.	Lodgepole pine			w&e	w&e	w&e
Vaccinium L. spp.	Huckleberry				w&e	w&e
Quercus vaccinifolia Kell.	Huckleberry oak				w&e	w&e
Sorbus sitchensis Roem.	Mountain ash				w&e	w&e
Pinus monticola Dougl.	Western white pine				w&e	w&e
Picea breweriana Wats.	Brewer spruce				w, r	w, r
Abies magnifica A. Murr.	California red fir				w&e	w&e
Abies magnifica A. Murr. var. *shastensis* Lemm.	Shasta red fir				w&e	w&e
Tsuga mertensiana (Bong.) Carr.	Mountain hemlock				w&e	w&e
Alnus sinuata (Reg.) Rydb.	Sitka alder				m, w	m, w
Pinus albicaulis Engelm.	Whitebark pine					w&e, r
Pinus balfouriana Grev. & Balf.	Foxtail pine					w, r

Occurrence Codes:

m - Generally restricted to moist sites.
w - Generally found in the western parts of the Northern Interior, i.e., on the western slopes of the Cascades or in the Klamath and Coast Ranges or in the Sacramento Valley.
e - Generally found in the eastern parts of the Northern Interior, i.e., east of the Cascades, or in Siskiyou County east of the Klamath Mountains.
r - Rare, occurs in a few isolated spots.

Names of trees follow Little (1953); other plants follow Munz and Keck (1970).

Inventory Procedures

The summary tables in this report include data for National Forest lands collected by Regions 5 and 6 of the U.S. Forest Service and personnel from the various National Forests; and data for all other lands collected by Renewable Resources Evaluation personnel of the Pacific Northwest Forest and Range Experiment Station. The small parcel of land in Region 4's Toiyabe National Forest in the Northern Interior contains less than 500 acres of commercial forest and is not included in the summary tables. The same general definitions apply to all data, but slightly different data collection procedures were used by Regions 5 and 6 and Forest Survey.

Region 5 National Forests and lands outside National Forests were inventoried using a double sampling design. First, aerial photo sample plots 1 acre in size were distributed systematically across the area and classified into commercial forest, noncommercial forest, and nonforest. Commercial forest plots were further classified into several stand volume classes. Plots outside National Forests were also classified by kind of owner from public records. A random sample of field plots was selected, proportional to the number of aerial photo plots in each land class and volume class on National Forests, and in each land class, volume class, and ownership class on lands outside National Forests. Field plots consisted of 10 sample points distributed over an acre. The variable-radius plot sampling principle was used to select the trees to be tallied. Where no trees were tallied, a ground cover class was recorded. On lands outside National Forests in Lassen, Modoc, Shasta, and Trinity Counties, additional information was recorded, including soil depth by classes, indicator plants used to predict stockability and site index when suitable site trees were not present, and information on past disturbance or treatment. Growth estimates were obtained from measurements of past 10-year growth on increment borings of trees tallied on 3 of the 10 points of each plot. Outside National Forests, mortality was estimated by postdating dead trees over a 5-year period. The National Forests remeasured 2/5-acre plots that had been established several years before the current inventory to estimate mortality and also to reinforce the growth estimates from 10-point plots. On Region 5 National Forests, 27,829 aerial photo plots were examined. The field sample consisted of 2,001 plots, including 1,328 on commercial forest land, 464 on noncommercial forest land, and 209 on nonforest land. On lands outside National Forests, 16,056 aerial photo plots were examined. The field sample consisted of 1,228 plots, including 508 on commercial forest land, 312 on noncommercial forest land, and 408 on nonforest land.

The Rogue River National Forest (Region 6) was inventoried using a sample of plots located 1.7 miles apart in a grid pattern. The standard 10-point plot design was used, as described above, for all forest resource information except mortality which was estimated from remeasured 1/5-acre plots. The 25 plots examined included 23 on commercial forest land and 2 on nonforest land.

Fieldwork on commercial forest land was completed as follows:

	National Forests	Year
Region 5:	Klamath	1967
	Lassen	1970
	Mendocino	1971
	Modoc	1970
	Plumas	1969
	Shasta	1968
	Trinity	1969
	Six Rivers	1966
Region 6:	Rogue River	1967
	Outside National Forests	
	Lassen County	1971
	Modoc County	1971
	Siskiyou County	1968
	Shasta County	1970
	Trinity County	1970

No attempt was made to adjust the information from the various dates of collection to a common date. Such adjustment would result in very insignificant differences in the resource data from those published here. For all ownerships, the annual change in volume indicated by growth and cut is currently about 0.4 percent per year.

The information on both productive and unproductive forests in reserved areas, including National, State, and County Parks, and National Forest Wilderness and Natural Areas, was obtained by aerial photo sampling and type-mapping procedures and by collecting existing data from agency records. The estimate of total productive forest land area in reservations is probably high. Newer procedures used on nonreserved lands which showed previous estimates of commercial forest area to be too high were not used in reserved areas; and a subsample of ground plots was not established to adjust the aerial photo estimates. Spot checking in parts of the Salmon-Trinity Alps area revealed that many areas, though heavily timbered, were too steep and rocky to be managed. Almost without exception the reserved areas are in the higher elevations where soils are shallow, growing seasons are short, timber growth potential is low, and regeneration following disturbance is slow.

The timber cut information used in this report came from three sources: the State Forest Notes of the Office of the State Forester, "Production of California Timber Operators": the National Forest "Timber Cut and Sold" reports; and timber industry production reports prepared by the Pacific Southest and the Pacific Northwest Forest and Range Experiment Stations.

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 having such tree cover, and 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 areas 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

Adverse location areas are productive forest land, often having merchantable stands of timber, but which, because of physical location, are impossible or difficult to harvest. This category of land was used only on National Forests.

Commercial forest land is capable of producing 20 cubic feet per acre per year of industrial wood and not withdrawn from timber utilization.

Critical watersheds are areas well within the forest zone and sites above the 20 cubic feet per acre per year productivity level; but because of unstable soil and other conditions,

cannot be logged without seriously affecting the watershed. This category of land was used only on National Forests.

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 commercial forest land. In the Northern Interior all reserved forest land is in public ownership.

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, considering both size and spacing.

Tree Classes

Growing Stock

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

Sawtimber trees are 9.0-inch d.b.h. and larger (11.0-inch 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 a tree must be free of defect for either softwoods or hardwoods.

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 with no disease, defects, or deformities which are likely to prevent their becoming growing-stock sawtimber trees.

Sapling and seedling trees are less than 5.0-inch d.b.h., live, of commercial species, and have no disease, defects, or deformities which are 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, containing 25 percent or more of sound volume, and at least one merchantable 16-foot log if a softwood or one merchantable 8-foot log if a hardwood.

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 inches 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 commercial forest land are less than 10 percent stocked with growing-stock trees.

Stocking

Stocking is an expression of the extent to which growing space is effectively utilized by present or potential growing-stock trees of commercial species. "Percent of stocking" is synonymous with "percentage of growing space occupied" and means the ratio of actual stocking to full stocking for comparable sites and stands. Basal area is used as a basis for measuring stocking.

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 of 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[14] for trees 11.0-inch d.b.h. and larger.

International 1/4-inch rule is the standard board-foot log rule adopted nationally by the Forest Service for the presentation of Forest Survey 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 inches breast high, with a minimum log length of 8 feet and a small 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 is measured. Net volume equals gross volume less deduction for rot and missing bole sections.

Industrial Wood

All roundwood products, except fuelwood, are included.

Net Annual Growth

The net increase in volume of trees during a specified year is included. (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 become culls during the year.)

[14] Utilization study data are on file at the Pacific Southwest Forest and Range Experiment Station, Berkeley, California.

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.

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.

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2. Developing and evaluating alternative methods and levels of resource management.
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