FOREST PEST CONDITIONS IN CALIFORNIA-1983

A PUBLICATION OF
THE CALIFORNIA FOREST PEST CONTROL ACTION COUNCIL

THE CALIFORNIA FOREST PEST CONTROL ACTION COUNCIL was founded in 1951. Its membership is open to public and private forest managers, foresters, silviculturists, entomologists, pathologists, zoologists, and others interested in the protection of forests from damage caused by insects, diseases, animals, and weeds. Its objective is to establish, maintain, and improve communication among individuals -- managers, administrators, and researchers -- who are concerned with these problems. This objective is accomplished by four actions:

1. Coordination of detection, reporting, and compilation of pest damage information.

2. Evaluation of pest conditions.

3. Pest management recommendations made to forest managing agencies and forest owners.

4. Review of policy, legal, and research aspects of forest pest control, and submission of recommendations thereon to appropriate authorities.

The State Board of Forestry recognizes the Council as an advisory body in forest pest protection. The Council is a participating member in the Western Forest Pest Committee of the Western Forestry and Conservation Association. Pest control advisors who attended the November 29-30, 1983 Council meeting are entitled to continuing education credit from the California Department of Food and Agriculture and from the Society of American Foresters (Category 1).

This report, **FOREST PEST CONDITIONS IN CALIFORNIA - 1983**, is compiled for public and private forest land managers to keep them informed of pest conditions on forested land in California, and as an historical record of pest trends and occurrences. The report is based largely on information provided by the Statewide Cooperative Forest Pest Detection Survey; in 1983, 233 reports were received: 46 for insect pests, 130 for diseases, and 57 for animal pests. Additional information was generated by the Forest Pest Management Staff, Pacific Southwest Region, Forest Service, while making formal detection surveys and biological evaluations.

The report was prepared by the Forest Service in cooperation with other member organizations of the Council. It was duplicated and distributed by the California Department of Forestry.

COVER PHOTO: Two-year-old tanoak sprouts at Challenge Experimental Forest, Yuba County. Uncontrolled, tanoak rapidly dominates logged sites and competes aggressively with conifer reproduction. For more information, see Know Your Forest Pests, page 19. (Photo courtesy Pacific Southwest Forest and Range Experiment Station.)

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HIGHLIGHTS OF PEST CONDITIONS - 1983

STATUS OF INSECTS. Defoliators were the most prominent forest insects in the State. Most noteworthy was the California form of the western spruce budworm, which infested Douglas-fir over a large area near Clair Engle (Trinity) Lake in Shasta and Trinity Counties. The infestation expanded in 1983, covering some 90,000 acres, almost three times the area infested in 1982. Less extensive infestations of black pineleaf scale, pine needle sheathminer, grasshoppers, fruittree leafroller, and rangeland tent caterpillars caused concern to land managers in several locales.

Of the principal bark- and cambium-feeding beetles common in California, Jeffrey pine beetle, mountain pine beetle, and pine engravers were associated with the most pronounced damage.

The gypsy moth was trapped in 16 Counties in California. Breeding population on five sites were targeted for eradication in 1984.

STATUS OF DISEASES. Root diseases and mistletoes were major causes of growth loss and mortality in California's commercial and recreational forests. The annual timber volume lost to mortality from root diseases was estimated to be over 19 million cubic feet on commercial forest lands of all ownerships.

Foliage diseases of conifers and hardwoods were reported frequently. True fir needle casts of white fir were common throughout the Sierra Nevada. Powdery mildew was widespread on blue oak in Tulare County and elsewhere in the southern Sierra Nevada. On the Tahoe National Forest ozone injury to ponderosa and Jeffrey pines was slight and scattered across the western two-thirds of the Forest. New white pine blister rust infection centers were found in Tehama, Nevada, Fresno, Tulare, and Kern Counties.

A needle blight of Douglas-fir and a tip blight and canker of red fir and white fir, both of which are associated with a Phoma sp., caused large losses at the Humboldt Nursery, Humboldt County. Fungicide trials indicated that several products were effective for at least a period of time against Phoma on red fir.

STATUS OF ANIMAL PESTS. Deer damage to conifers was widespread except in southern California. Pocket gopher damage was a problem in most timber areas. Porcupine damage occurred in the northern interior forests and in the Sierra Nevada. Rabbits were a problem in the north coast, northern interior, and Sierra Nevada forests. Black bear damage increased on the north coast.

STATUS AND CONTROL OF INSECTS

WESTERN SPRUCE BUDWORM, Choristoneura carnana californica. The infestation of the western spruce budworm in Trinity and Shasta Counties covered approximately 90,000 acres in 1983. New infestations appeared southeast of Trinity Dam, near Wild Cow Mountain, in the vicinity of Trinity Center and Coffee Creek, and at Halls Gulch, Cedar Creek, Squirrel Flat, Hatchet Creek, Eagle Creek, Jackass Peak, and Hayward Flat. Heavy, moderate, and light infestations made up approximately 73%, 4%, and 23% of the area, respectively. Saplings and small pole-sized Douglas-firs were the size classes most seriously affected. The budworm population over much of the area appeared to have stabilized, as the 1983 ratio of new-to-old egg masses was approximately one-to-one.

A cooperative Federal, State, and private effort to decide the most appropriate course of action for 1984 was underway at year's end. It was expected that the pest management alternatives likely to be considered would range from no action except for continued monitoring, to area-wide aerial application of insecticides.

MODOC BUDWORM, Choristoneura viridis. The Modoc budworm caused light defoliation of current year needles and some bud mining on white fir in the northern Warner Mountains (Modoc County). Defoliation was visible along the county road between O'Conners Flat and Snag Lake.

GYPSY MOTH, Lymantria dispar. There was an increase over 1982 in both the number of male moths caught in traps, and in the number of Counties in which captures were made. In 1982, 104 male gypsy moths were caught in 14 Counties; in 1983, 183 male gypsy moths were caught in 16 Counties. About 70 percent of the 1983 captures were made at three locations: San Diego (San Diego County), San Jose (Santa Clara County), and Danville (Contra Costa County). Ten sites were treated with Sevin 80S at the rate of 1-1/4 pounds per 100 gallons of water (two ground applications, 10 to 14 days apart) to eradicate gypsy moth. Five sites met the criteria established by the Gypsy Moth Science Advisory Panel for eradication efforts in 1984: San Diego, San Jose, Danville, Livermore (Alameda County), and Oakland (Alameda County).

CONE AND SEED INSECTS. Collections of Jeffrey pine, sugar pine, and red fir cones shipped to the Placerville Nursery ranged in quality from clean to significantly damaged by insects. The ponderosa cone crop was small and cones were frequently damaged by coneworms and seedworms, Dioryctria and Cydia spp., respectively. A number of sugar pine conelets aborted at Badger Hill Breeding Arboretum. The cause was unknown, but insect damage was a possibility.

PINE NEEDLE SHEATHMINER, Zelleria haimbachi. Defoliation by the pine needle sheathminer was observed at numerous locations throughout

California. Local forest managers reported defoliation at Quartz Valley (Siskiyou County), Dutch Flat (Shasta County), Adin Pass (Modoc County), and Tanbark Flat (Los Angeles County). In Big and Little Humbug plantations, Klamath National Forest (Siskiyou County), the intensity of defoliation decreased. After three years of feeding, some ponderosa pines remained undamaged or lightly damaged, while others had serious top damage and were liable to develop poor form.

BLACK PINELEAF SCALE, Nuculaspis californica. About 1,800 acres of ponderosa pine along the Black Ranch Road near Burney (Shasta County) were infested with black pineleaf scale. Pines on approximately one-half of this area were heavily defoliated, retaining only one or two year's complements of needles. Western pine beetles caused one small group kill in the stand most severely damaged.

GRASSHOPPERS. Forest re-establishment was again impeded by grasshoppers on the Stanislaus National Forest. At McCormick Meadows near Arnold (Tuolumne County), many of the 140 acres of newly planted ponderosa pine plantations were ruined when grasshoppers abandoned heavy stands of dried grass to feed upon the small trees in July. Large grasshopper populations were also present in the Granite Burn -- where 1,500 acres were treated for grasshopper control in 1981 -- but abundant green plant material in mid-summer sustained the grasshoppers and prevented serious defoliation of the larger plantation trees. Land managers were apprehensive about further damage in both areas in 1984.

LODGEPOLE NEEDLEMINER, Coleotechnites milleri. Destructive needleminer outbreaks are almost unique to Yosemite National Park, where they have been documented from 1903 to 1921, 1933 to 1941, 1947 to 1963, and 1973 through 1983. Observations by the Pacific Southwest Forest and Range Experiment Station suggested that the current outbreak might be waning, and that visible defoliation may end by 1985. An aerial reconnaissance in August revealed that 59,740 acres of host type were visibly defoliated, including an isolated 600-acre area that showed feeding injury for the first time.

PINE ENGRAVER BEETLES, Ips spp. Pine engraver activity increased in 1983. Damage was widespread and highly visible from Nevada County south through the Sierra Nevada, and in the mountains of southern California. Most of the reported activity was associated with untreated slash and storm or fire damage. Some reported hot spots were at Mt. Gleason and Devil's Punchbowl (Los Angeles County), Prewitt and Plaskett Ridge and the Ventana Wilderness (Monterey County), and Telephone Ridge (El Dorado County). In some cases, smaller pine engravers (Pityophthorus spp.) substituted for the normally more destructive large pine engravers (Ips spp.), as reported at Hot Springs (Tulare County), and Bald Mountain and Wagontire Flat (Lassen County).

MOUNTAIN PINE BEETLE, Dendroctonus ponderosae. An increase in lodgepole pine mortality associated with mountain pine beetle became apparent by mid-summer. This was most noticeable in Yosemite National Park, where tree killing developed over some 10,000 acres south of Yosemite Valley and along Yosemite Creek north of the Valley. In the Lake Tahoe Basin, mountain pine beetle activity was again reported in the Meeks Bay drainage and Camp Richardson area. Lodgepole pine mortality in the Meeks Bay Campground was associated with severe flooding. Mortality was also reported from Trout Creek north of Truckee and from Donner Memorial Park. Some 250 infested trees were scheduled to be treated with Dursban 4E in the campground at Donner Memorial Park.

JEFFREY PINE BEETLE, Dendroctonus jeffreyi. Jeffrey pine beetle-caused mortality was reported from Big Bear Lake (San Bernardino County), and was frequently associated with building and other construction activities. Concentrated tree killing was also reported near Truckee (Nevada County) and in the vicinity of Markleville (Alpine County). High levels of Jeffrey pine beetle-related damage continued for the fifth year in northeastern California.

High levels of Jeffrey pine beetle-related mortality continued at South Lake Tahoe (El Dorado County), particularly near Camp Richardson. During the winter and spring, 330 beetle-infested Jeffrey pine were felled and peeled over 165 acres on the Lake Tahoe Basin Management Unit at the Tahoe Historic Estates, Kiva Picnic Area, and Fallen Leaf Campground. Another 145 Jeffrey pines that were attacked in the summer were to be cut and peeled in the same areas in the fall and winter. This suppression effort was to be followed in 1984 by silvicultural treatments designed to mitigate conditions predisposing Jeffrey pines to attack.

RED TURPENTINE BEETLE, Dendroctonus valens. In 1982, red turpentine beetle activity occurred in stands that had been underburned for fuels reduction in the Greenhorn area on the Quincy Ranger District (Plumas County). Pines were attacked again in 1983, but at lower rates than in 1982. Little mortality occurred, but trees were to be monitored for several years to evaluate survival.

OTHER BARK BEETLES AND CAMBIUM BORERS. Few other bark beetles were reported active. The western pine beetle (Dendroctonus brevicomis) caused concern at Mt. Gleason (Los Angeles County) and near Caldor (El Dorado County). The Douglas-fir beetle (D. pseudotsugae) was believed to have killed scattered groups of Douglas-fir in Jackson State Forest (Mendocino County). Tetropium abietis larvae were numerous in dead and decadent fir in the Alpine Meadows campground (Alpine County).

DOUGLAS-FIR TUSSOCK MOTH, Orgyia pseudotsugata. No reports of Douglas-fir tussock moth defoliation were received in 1983. Larval sampling in areas near Thunder Hill on the Calaveras Ranger District, Stanislaus National Forest (Calaveras County), which had relatively high pheromone

trap catches in the fall of 1982, showed low to sub-outbreak populations. Pheromone trap monitoring of the 1983 moth flight on 89 plots on State, private, and Federal lands in the Sierra Nevada and Cascade ranges indicated that populations would continue at non-damaging levels in 1984.

FRUITTREE LEAFROLLER, Archips argyrospilus. The fruittree leafroller continued to defoliate California black oak on the Arrowhead Ranger District, San Bernardino National Forest (San Bernardino County). Defoliation was observed over approximately 14,500 acres in areas between Sugarpine Mountain--Silverwood Lake and Running Springs, an increase over the 2,000 acres reported in 1982. Greater than 90% defoliation was observed on scattered individual trees and in localized areas covering an estimated 1,500 to 2,000 acres, mainly near Heaps Peak, Valley of the Moon, and Sugarpine Mountain. Limited egg mass counts indicated that 1984 defoliation levels would be about the same or somewhat higher than in 1983, barring population reduction by natural factors. Fruittree leafroller was also reported on about 500 acres near Sawmill and Liebre Mountains, Saugus Ranger District, Angeles National Forest (Los Angeles County), in the vicinity of Tejon Pass (Kern County), near Mountain Home (Tulare County), and over several hundred acres at lower elevations on the Hot Springs Ranger District, Sequoia National Forest (Tulare County).

TENT CATERPILLAR, Malacosoma sp. Activity of tent caterpillars -- probably the Great Basin tent caterpillar, Malacosoma californicum fragile -- was reported for the first time since 1978 near Mammoth Lakes (Mono County). Defoliation of antelope bitterbrush occurred on approximately 1,000 to 1,500 acres over two grazing allotments on the Mammoth Lake Ranger District, and on 4,000-5,000 acres in six different areas on the White Mountain Ranger District, Inyo National Forest. New egg masses were found at several points between Mono Lake and Lake Crowley, and a larval survey was to be conducted in the spring of 1984.

PANDORA MOTH, Coloradia pandora. No reports of pandora moth activity were received in 1983. Very few late-instar larvae were found during the June larval collections in areas defoliated during the recent outbreak on the Mammoth Ranger District, Inyo National Forest (Mono County). In contrast to the November 1982 larval collection, in which a large proportion of the larvae were infected with a virus, none of the larvae collected in June 1983 were infected. The reduced numbers of larvae and the lack of virus indicated that the outbreak first reported in 1979 had subsided.

JEFFREY PINE NEEDLEMINER, Coleotechnites sp. Jeffrey pine needleminer defoliation in San Bernardino County continued at about the same levels as in 1981 and 1982 (approximately 2,000 to 3,000 acres). No new areas were reported infested in 1983, with the heaviest damage essentially confined to private, unmanaged stands in the Big Bear City--Lake Irwin area.

TABLE I. INSECTS OF LESSER IMPORTANCE IN CALIFORNIA FORESTS - 1983

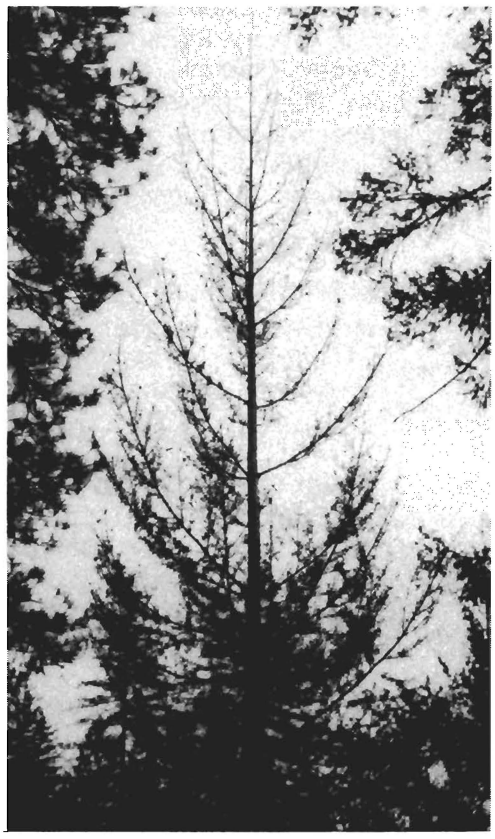
INSECTS		HOSTS	WHERE EXAMINED OR REPORTED	
Scientific Name	Common Name	Names	County	Remarks
------	Bud mite	CP,KxM	San Bernardino	Plantation, 3-6" dbh
------	Scale	RF	Siskiyou	Plantation
Altica sp.	Alder flea beetle	Garden perennials	Kern	Residential forest area
		Al	Los Angeles	
Asterolecanium sp.	Oak pit scale	VO	Fresno	Riparian oaks
Cecidomyia piniinopis	Gouty pitch midge	PP	Nevada	Plantation
Contarinia pseudotsugata	Needle gall maker	DF	Sonoma, Mendocino	Xmas tree plantations & in natural stands
Dioryctria sp.	------	DP,CP	Los Angeles	Plantations, terminal leaders attacked
Halisidota argentata	Silver-spotted tiger moth	DF	Placer	Saplings in mixed conifer stands
		JP,SP	Tulare	Saplings in mixed conifer stands
Leucoma salicis	Satin moth	Cw	Shasta	Urban forest area
Neodiprion sp.	Sawfly	PP	Siskiyou	Mixed conifer-oak stand
Neophasia menapia	Pine butterfly	JP	Mono	Adult flight conspicuous
Orgyia vetusta	Western tussock moth	Pe	Sonoma	Residential

TABLE I (Cont.)

INSECTS Scientific Name	Common Name	HOSTS Names	WHERE EXAMINED OR REPORTED County	Remarks
Otiorhynchus sp.	Root weevil	PP	Butte	Chico Tree Improvement Center
Xyela sp.	Xyelid sawfly	PP	Siskiyou	Summer home area

HOST ABBREVIATIONS

Al = Alder	KxM = Knobcone x Monterey pine
CP = Coulter pine	Pe = Persimmon
Cw = Cottonwood	PP = Ponderosa pine
DF = Douglas-fir	RF = Red fir
DP = Digger pine	SP = Sugar pine
JP = Jeffrey pine	VO = Valley oak



WESTERN SPRUCE BUDWORM, Choristoneura carnana californica. This insect defoliated Douglas-fir on 90,000 acres of forest land in Trinity and Shasta Counties. Sapling and small pole-sized Douglas-fir were most seriously affected.

STATUS AND CONTROL OF DISEASES

ABIOTIC DISEASES. Diseases caused by abiotic or non-living agents were reported from several locations, but most were unimportant, involving only one to a few trees. Two exceptions occurred in nurseries: excess soil moisture damaged eucalyptus, coast redwood, and giant sequoia seedlings at a nursery in Yolo County, while a combination of hot weather followed by heavy rains led to excessive damping off of Jeffrey pine and sugar pine seedlings at the Placerville Nursery (El Dorado County).

AIR POLLUTION. The Forest Service surveyed ozone injury to ponderosa and Jeffrey pines on the Tahoe National Forest during the fall of 1983. Preliminary results indicated that injury was slight and scattered across the western two-thirds of the Forest.

Twenty-six ozone injury plots were re-evaluated for chlorotic mottle symptoms on pine foliage on the Sierra and Sequoia National Forests (Mariposa, Madera, Fresno, Tulare, and Kern Counties). Each plot was first rated in 1977 and, in the six years that these plots were monitored, 22 showed increased injury, one showed less injury, and three remained unchanged. In 1977, nine of these plots had no visible signs of injury, but in 1983 only two were without injury.

Ozone was monitored at two locations in the central Sierra Nevada -- White Cloud Fire Station (Nevada County) and Foresthill Ranger Station (Placer County) -- and at one location in the southern Sierra -- Mountain Home Demonstration State Forest (Tulare County). The California ozone standard [10 parts per hundred million (pphm)] was equalled or exceeded at Foresthill and Mountain Home, but no values over the Federal Standard (12 pphm) were recorded.

CANKER DISEASES. A *Fusicoccum* sp. was identified as the likely cause of a widespread canker disease of Pacific madrone throughout its range in California. *Cytospora abietis* was found on white fir in Butte County, and Dermea canker (caused by *Dermea pseudotsugae*) was reported on Douglas-fir in Shasta, Siskiyou, Tehama, and Trinity Counties.

A shoot blight, twig dieback, and canker disease of red and white fir was found in Christmas tree plantations at Pollock Pines (El Dorado County) and near Auburn (Placer County). A *Phytophthora* sp. was isolated from the twigs and cankers. It was not known whether the disease would cause damage in natural stands.

DWARF MISTLETOES, *Arceuthobium* spp. No new State-wide surveys of dwarf mistletoe incidence were conducted in 1983. However, suppression projects to control this pest continued in Forest Service recreation areas, and a control project was begun in Table Mountain Campground, Angeles National Forest (Los Angeles County).

FOLIAGE DISEASES. More than one-quarter of the disease detection reports in 1983 involved injury to either hardwood or conifer foliage. The abundance of leaf and needle fungi was attributed to two successive years of ample winter precipitation followed by cool, wet spring weather.

The most commonly reported needle diseases were the true fir needle casts caused by Lirula abietis-concoloris and Virgella robusta; they were reported on white fir from throughout the Sierra Nevada. The pines had their share of foliage diseases also. Elytroderma disease was reported on lodgepole pine in Calaveras and Tuolumne Counties, Lophodermium nitens affected sugar pine in Lassen County, and Davisomycella medusa was found on Jeffrey pine near Stampede Reservoir (Sierra County). In all cases the injury reported was minor.

Foliage diseases of hardwoods were also widespread, though they caused little damage. Reports included Cylindrosporium kelloggii on black oak in San Diego County; a powdery mildew (Sphaerotheca lanestris) on black oak and blue oak in San Diego and Tulare Counties; and leaf blister (caused by Taphrina caerulescens) on several oak species in Sacramento County. Laurel leaf blight, caused by two fungi and a bacterium, was common for the second straight year on California laurel in Humboldt, Santa Cruz, and Tulare Counties. A Mycosphaerella sp. caused leaf-spotting of tanoak on the Plumas National Forest in Butte, Sierra, and Yuba Counties.

NURSERY DISEASES. A tip blight and canker disease caused by a Phoma sp. was the major disease at the Forest Service's Humboldt Nursery (Humboldt County). The disease caused a 75% loss of 1-0 red fir and a 15% loss of 1-0 white fir at Humboldt Nursery, and moderate losses of white fir at Ben Lomond Nursery (Santa Cruz County). Fungicide evaluations at Humboldt Nursery indicated that several fungicides were efficacious for at least a period of time against Phoma on red fir.

A Phoma sp., which may be the same species causing tip blight and canker of true firs, caused a needle blight of Douglas-fir at the Humboldt Nursery. This disease killed or severely damaged 23% of the 1-0 Douglas-fir, causing a loss of 2.8 million seedlings.

Fusarium root rot, caused by Fusarium oxysporum, was the major disease at Magalia Nursery (Butte County); the disease was reported on Douglas-fir, red fir, white fir, and ponderosa pine. A Phomopsis sp. was reported on Douglas-fir and western hemlock at Humboldt Nursery. The Placerville Nursery (El Dorado County) reported Phytophthora cinnamomi affecting 2-0 sugar pine, and Macrophomina phaseoli causing a tip dieback on 2-0 red fir.

ROOT DISEASES. The principal root diseases in California are annosus, Armillaria, and black stain, which are caused by the fungi Fomes annosus, Armillaria mellea, and Ceratocystis wageneri, respectively.

During 1983 the Forest Service calculated the annual volume losses from root disease-caused tree mortality on commercial forest lands in California. The estimated losses in cubic feet were as follows:

National Forest System lands	12,282,100
Other Federal lands	395,500
State and Private lands	6,695,400

Laminated root rot, caused by Phellinus weirii, was reported for the second time in California. Both Douglas-fir and white fir were windthrown and killed in a several-acre center near Willow Creek (Humboldt County). It is suspected that more laminated root rot centers will eventually be discovered in northwestern California.

Numerous trees were windthrown during the severe storms of the 1982-83 winter season. Observations indicated that many had significant root decay that contributed to their failure.

A survey of Port-Orford-cedar in northwestern California revealed several new locations of root rot caused by Phytophthora lateralis. However, these infection centers were limited to the Smith River watershed (Del Norte County), where the disease was already known to occur.

RUSTS. White pine blister rust, caused by Cronartium ribicola, was reported on sugar pine from several new locations in northern and central California: the Corning Ranger District, Mendocino National Forest (Tehama County); Big Tunnel Plantation, Nevada City Ranger District, Tahoe National Forest (Nevada County); and Bonta Creek, Sierraville Ranger District, Tahoe National Forest (Sierra County). Western white pine was reported to be infected at Keystone Gap, Downieville Ranger District, Tahoe National Forest (Sierra County).

The Forest Service conducted a white pine blister rust incidence survey on the Sequoia National Forest, and confirmed that the rust has reached the southern limits of sugar pine in the Sierra Nevada. Infection is now widespread on the Tule and Hot Springs Ranger Districts, but still uncommon on the Hume Lake and Greenhorn Ranger Districts. Previously unreported blister rust centers were found at Bacon Meadow and Tenmile Creek on the Hume Lake District (Tulare County); at Peppermint, Bear, and Boulder Creeks on the Tule District (Tulare County); at nine locations on the Hot Springs District (Tulare County); and at Bear Creek, Slick Rock Creek, and Greenhorn Summit on the Greenhorn District (Kern County). On the Sierra National Forest, rust was reported at Big Creek, Pineridge Ranger District (Fresno County); this was the first report of the disease on this District.

Pinyon pine blister rust, caused by Cronartium occidentale, was reported on pinyon pines on Bureau of Land Management forest lands in the Chimney Peak area (Inyo County).

TABLE II. FOREST DISEASES REPORTED - 1983

AGENT	HOST	COUNTY
ABIOTIC DISEASES:		
Drought	PP	Nevada
Excess Soil Moisture	MG,Rw,GS	Yolo
Mechanical Damage	DF	Humboldt
	WF	El Dorado
Weather	BM	Trinity
	DF	Humboldt
	JP	San Bernardino
	JP,SP	El Dorado
Unknown	IC	Kern
	JBP	El Dorado
CANKER DISEASES:		
Botryosphaeria ribis	GS	Tulare
Cytospora abietis	WF	Butte
Dermea pseudotsugae	DF	Shasta
	DF	Siskiyou
	DF	Tehama
	DF	Trinity
Diplodia sp.	WR	Mendocino
Dothichiza pythiophila	LP	Tulare
	WWP	Tulare
Fusicoccum sp.	Ma	Lake
DECAYS:		
Fomes igniarius	Oa	Marin
Pholiota adiposa	WF	Tulare
Polyporus dryophilus	BO	Tulare

TABLE II (Cont.)

AGENT	HOST	COUNTY
DECAYS (Cont.):		
Polyporus pargamenus	BO	Tehama
Stereum sp.	Oa	Marin
	GS	Mendocino
Unknown	BO	Tehama (2)
	SP	Tulare
FOLIAGE DISEASES:		
Colletotrichum gloeosporioides/*Kabatiella phoradendri*/*Pseudomonas lauracearum*	CL	Humboldt
	CL	Santa Cruz
	CL	Tulare
Cylindrosporium kelloggii	CBO	San Diego
Davisomycella medusa	JP	Sierra
Dothistroma pini	BP	Humboldt
	BP	Mendocino
	MP	Humboldt
Elytroderma deformans	JP	San Bernardino
	LP	Calaveras
	LP	Tuolumne
Keithia thujina	WRc	Humboldt
Leptostroma decipiens	PP	Lassen
Lirula abietis-concoloris	WF	El Dorado
	WF	Plumas (2)
	WF	Tuolumne
	WF	Sierra Nevada-wide
Lophodermium nitens	SP	Lassen
Lophodermium sp.	SP	Shasta
	WF	Plumas
Macrophoma sp.	MP	Mendocino

TABLE II (Cont.)

AGENT	HOST	COUNTY
FOLIAGE DISEASES (Cont.):		
Mycosphaerella sp.	Ta	Butte
	Ta	Sierra
	Ta	Yuba
Rhabdocline pseudotsugae	DF	El Dorado
Sphaerotheca lanestris	BO	Tulare
	CBO	San Diego
Taphrina caerulescens	Oa	Sacramento
Virgella robusta	WF	Plumas
	WF	Siskiyou
Unknown	DF	Mendocino
	DP	Sacramento
	WF	Tulare
NURSERY DISEASES:		
Botrytis cinerea	Rw	Humboldt
Fusarium oxysporum	DF	Butte (2)
	PP	Butte
	RF	Butte (2)
	WF	Butte
Fusarium roseum	DF	Butte
	WF	Santa Cruz
Fusarium sp.	JP,SP	El Dorado
	WF	Santa Cruz
Macrophomina phaseoli	RF	El Dorado
Phoma sp.	DF	Butte
	RF,WF	Humboldt
	WF	Butte
Phomopsis sp.	DF	Humboldt
	WH	Humboldt
Phytophthora cinnamomi	SP	El Dorado

TABLE II (Cont.)

AGENT	HOST	COUNTY
NURSERY DISEASES (Cont.):		
Phytophthora sp.	WF	Santa Cruz
Pythium sp.	DF	Placer
	DF	Santa Cruz (2)
	Eu	Yolo
	GS	Butte
	IC	Placer
	JP	Butte
	ScP	Butte
	WF	Butte (2)
	WF	Placer
	WF	Santa Cruz
Unknown	DF	Eldorado
	PP	Butte
PARASITIC SEED PLANTS:		
Arceuthobium americanum	LP	Siskiyou
A. campylopodum	PP,JP	Ventura
Cuscuta sp.	WCc	Nevada
ROOT DISEASES:		
Armillaria mellea	JP	Kern
	Ma	Nevada
	WF	Tulare
Ceratocystis wageneri	DF	Calaveras
	DF	Humboldt
	DF	Marin
	DF	Shasta
	DF	Siskiyou
	PP	Siskiyou (3)
	PP,JP	Lassen
	SPP	Tulare
Fomes annosus	Ma	Placer
	PP,JP	Ventura
	RF	Alpine

TABLE II (Cont.)

AGENT	HOST	COUNTY
ROOT DISEASES (Cont.):		
F. annosus	RF	Nevada
	SP	Nevada
Phellinus weirii	DF	Humboldt
Phytophthora sp.	POC	Del Norte
Unknown	Bi	Mono
	JP	El Dorado
	WF	Nevada
	Wi	San Bernardino
RUST DISEASES:		
Cronartium occidentale	SPP	Tulare
Cronartium ribicola	SP	Fresno (2)
	SP	Kern
	SP	Nevada
	SP	Sierra
	SP	Tehama
	SP	Tulare (3)
	WWP	Sierra
Endocronartium harknessii	LP	Siskiyou
Melampsorella caryophyllacearum	RF	El Dorado
Peridermium stalactiforme	JP	San Bernardino
MISCELLANEOUS FUNGI:		
Arthrobotryum spongiosum	IC	Plumas

TABLE II (Cont.)

HOST ABBREVIATIONS

Bi	= Bitterbrush	MP	= Monterey pine
BM	= Bigleaf maple	Oa	= Oak
BO	= Blue oak	POC	= Port-Orford-cedar
BP	= Bishop pine	PP	= Ponderosa pine
CBO	= California black oak	RF	= Red fir
CL	= California laurel	Rw	= Coast redwood
DF	= Douglas-fir	ScP	= Scots pine
DP	= Digger pine	SP	= Sugar pine
Eu	= Eucalyptus	SPP	= Singleleaf pinyon pine
GC	= Giant chinquapin	Ta	= Tanoak
GS	= Giant sequoia	WCc	= Western choke-cherry
IC	= Incense-cedar	WF	= White fir
JBP	= Japanese black pine	WH	= Western hemlock
JP	= Jeffrey pine	Wi	= Willow
LP	= Lodgepole pine	WR	= Western redbud
Ma	= Madrone	WRc	= Western redcedar
MG	= Manna gum	WWP	= Western white pine

LAMINATED ROOT ROT, Phellinus weirii. White fir snags are surrounded by declining white fir and Douglas-fir in an infection center near Willow Creek, Humboldt County.

STATUS AND CONTROL OF ANIMAL PESTS

DEER. Deer browsing was widespread except in southern California. Most damage was in plantations of pines, Douglas-fir, and true firs. Much of the damage involved 100 to 400 trees per acre. Increased injury occurred at sites in the north coast region, the northern interior forests, and the northern and southern Sierra Nevada. A few localized decreases in damage were noted, primarily in Modoc and Mendocino Counties and in the northern Sierra Nevada. The use of seedling protectors continued as the most common control measure.

POCKET GOPHER. Pocket gopher damage was a problem in most timber areas. Plantations of pines and true firs sustained the greatest injury. Damage intensity was frequently 10 to 50 and often 100 to 300 trees per acre. Increases in damage were reported for thousands of acres in Modoc, Siskiyou, and Shasta Counties and from numerous locations along the length of the Sierra Nevada. Baiting with strychnine-treated oats, trapping, vegetation management, and some seedling protectors were used for control.

PORCUPINE. Porcupines damaged plantations and natural stands of pines in the northern interior forests and in the Sierra Nevada south to Kern County. Douglas-fir was injured in Humboldt and Trinity Counties. Increased damage to pines was noted at several sites in southern Humboldt, western Trinity, and Mendocino Counties and at a few locations in the northern and southern Sierra Nevada. Strychnine-salt blocks, hunting, and trapping were used as control measures in a few areas.

RABBITS. Rabbit damage was primarily to one-to-five year old Douglas-fir and pines in plantations in the north coast, northern interior, and Sierra Nevada forests. The overall damage trend was static. Seedling protectors, fencing, and slash burning were used for control.

BLACK BEAR. Black bear damage occurred in Del Norte, Humboldt, Siskiyou, and Trinity Counties. Redwood and Douglas-fir up to 65 years of age were injured by bark stripping and sapwood feeding. Six of the eleven reports of bear damage noted an increase in injury, primarily in Del Norte and Humboldt Counties. Hunting and trapping were used for control.

OTHER ANIMALS. The animals listed in Table III caused damage in the Counties or regions shown. Damage was serious in some sites but it was generally not widespread.

TABLE III. MISCELLANEOUS ANIMAL PESTS - 1983

SPECIES	COUNTY OR REGION
Beaver	Del Norte, Humboldt, Shasta, Siskiyou, Plumas, Sierra, Placer, Lassen; southern Sierra Nevada
Birds	Shasta, Siskiyou, Tulare, Kern
Domestic Stock	All major timber areas
Dusky-footed Woodrat	Del Norte, Humboldt, Mendocino, Lake, Trinity, Siskiyou, Shasta
Elk	Del Norte, Humboldt, Shasta
Ground Squirrels	Mendocino, Lake; northern Sierra Nevada
Meadow Mouse	Shasta, Siskiyou, Plumas, Sierra
Mountain Beaver	Del Norte, Humboldt
Small Seed-eating Mammals	Mendocino, Lake, Colusa, Glenn, Shasta, Siskiyou, Tulare, Kern, Los Angeles
Tree Squirrels	Humboldt, Mendocino, Sierra, Placer, El Dorado, Alpine, Tulare, Kern, San Bernardino

Know Your Forest Pests

TANOAK

Tanoak (Lithocarpus densiflorus) is a major woody plant pest among northern California's coniferous forest types. According to forest survey data, the species' range extends to over a million acres of commercial forest land in the State. Volume estimates indicate over a billion cubic feet or 2 billion board feet of sawtimber in California.

Tanoak grows in humid climates where annual precipitation may vary from 40 to 100 inches. Average mean daily temperatures range from 36 to 42 degrees F. during January and 60 to 74 degrees F. in July.

Tanoak grows well on a variety of soils developed from igneous, metamorphic, or sedimentary rocks. The soil types may range from poor serpentines where the tree's form is shrubby, to high-quality timber sites where tanoak can attain heights in excess of 100 feet.

Tanoak will form pure stands in the inland portion of the Redwood Forest Type, but more often it associates as an understory component with Douglas-fir, or as a component of hardwood stands or of mixed hardwood and conifer forests. The most common hardwood component is Pacific madrone, but there are at least a dozen other hardwood species that are associates. In addition to Douglas-fir, the major coniferous forest species that associate with tanoak include Port-Orford-cedar, coast redwood, grand fir, Sitka spruce, Pacific yew, California nutmeg, western hemlock, white fir, Jeffrey pine, ponderosa pine, western white pine, and knobcone pine.

Tanoak is well-recognized as a prolific seeder, producing abundant acorn crops after 30-40 years. A significant number of acorns are infested by insect larvae prior to seedfall and thus are unable to germinate. Newly developing seedlings need ample light and a seedbed of loose, mineral soil. First-year seedling growth is considered vigorous, with germinants ranging from two to eight inches by July. A taproot develops quickly and may reach two feet during the first year. Seedlings respond best to partial shade in the early years and become more shade-tolerant with age.

Because tanoak is an extremely vigorous sprouter and an aggressive invader of timber sites following logging and fire disturbance, it has been labelled an undesirable weed when forest management objectives require maximum stocking and yield of commercial conifers.

Studies measuring sprout development have indicated that, in clear cuts, first-year growth can reach five to six feet, and by the fifth year heights greater than 13 feet have been recorded. In another study area, unthinned sprout clumps were over 10 feet wide after 10 growing seasons.

CONTROL METHODS. Tanoak has some unique features that make it resistant to traditional control measures. It has an extremely thick sapwood area that allows the tree to remain living for several years following complete removal of the bark. This phenomenon may also be explained through active root grafting of the peeled tree to healthy trees.

Mature tanoak leaves are covered with dense, pubescent structures called stellate trichomes that may act as physical barriers to the uptake of herbicides. The leaves also become thicker and waxier with age and appaprently are considered unpalatable as browse for livestock and deer. The heavy, slowly-decaying leaf litter beneath older tanoak can seriously impede the germination of conifer seedlings.

Mechanical methods of control such as hand cutting, crushing, or chipping generally result in vigorous resprouting from the stump. Burning the aerial parts of the plant will also stimulate sprouting from the woody buds that originate beneath the bark and below the ground.

When planning control programs for tanoak, land managers should consider tanoak's survival mechanisms and develop a strategy that recognizes its vulnerability to chemicals prior to the sprouting stage and leaf maturation. Highest priority should be placed on using herbicides that are effective on freshly-cut stumps. Timing the application for the dormant period increases effectiveness of chemicals such as triclopyr (the amine form) and picloram.

If treating stumps is not a viable option, land managers should attempt control when sprouts are less than a few years old and not more than six inches in diameter. Basal spraying of young sprouts during the late summer with the ester form of triclopyr has proven successful and is an alternative to complete foliar applications. As sprouts gain in size and age, the hack-and-squirt method may be necessary for effective control. Using a small hatchet, make slanting cuts or frills well into the cambium, being careful to completely encircle the tree's trunk.

All of these methods are extremely labor-intensive and may not be feasible over large acreages or in rough terrain. Aerial applications of selective herbicides for conifer release or site preparation may be the only effective method to achieve desired results.

OTHER VALUES. We have focused primarily on the serious problems associated with tanoak as an aggressive competitor with California's major conifers. As with many biological agents that are considered pests, there is another perspective that recognizes the value the organism provides to the environment. Tanoak is no exception. Its acorns are a major food source for many wildlife species. Its presence on very steep slopes may enhance soil stability and reduce soil erosion. The wood fiber has been successfully used for pulp. Because the wood is strong, tough, and hard, it has been used for pallets, flooring, decking, and even baseball bats. Its relatively high heat content (26.1 million BTU per dry cord) makes it an excellent candidate for a home heating fuel.

SUMMARY. Tanoak's range overlaps many of the State's most important commercial timber species. Tanoak's aggressive sprouting ability, coupled with its natural resistance to normal control measures, has given it a reputation as an important plant pest in California's forests. Decisions to control its growth should be based on sound forest management information coupled with an understanding of its inherent values. Tanoak control strategies should take into account its vulnerability at the early stages of development rather than waiting to deal with large, mature trees.

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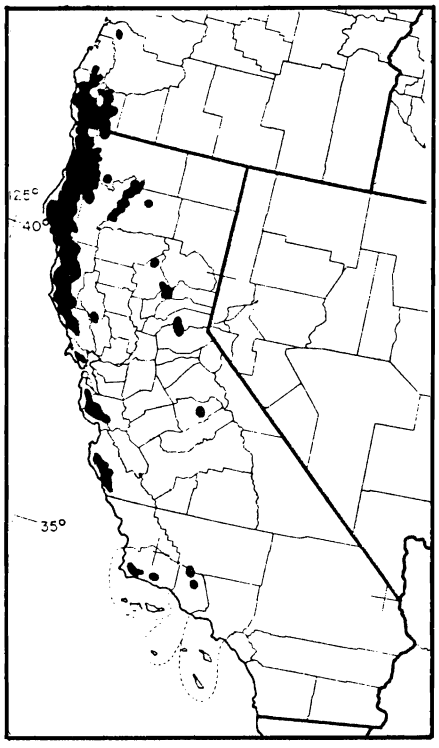

THE RANGE OF TANOAK ON THE PACIFIC COAST. Tanoak ranges from slightly north of the Umpqua River in southwestern Oregon southward through the Coast Ranges to the Santa Ynez Mountains. The range also extends from near Humboldt Bay to the lower slopes of Mount Shasta, then intermittently southward along the west slope of the Sierra as far as Mariposa County. In the Sierra, tanoak is most common between the Feather and American Rivers.

SURVEYS AND EVALUATIONS

PEST DAMAGE INVENTORY ON THE SAN BERNARDINO NATIONAL FOREST. The Forest Service estimated the volume and number of dead trees on the commercial forest land of the San Bernardino National Forest from May 1981 to May 1982. Precipitation from July 1980 through June 1981 was below normal, and it was expected that tree mortality would increase over that reported for 1976-1978.

The estimated total for 1981-1982 was 15,907 dead trees with a volume of 8,148,400 board feet, compared to an estimated 6,910 trees or 3,500,000 board feet lost annually in 1976-1978. Two-thirds of the dead trees and one-half of the volume were white fir. Jeffrey pine constituted over one-fourth of the dead trees and over one-third of the volume, with Coulter pine, sugar pine, and singleleaf pinyon pine making up the remainder.

On average, 0.13 trees or 68 board feet were killed per acre. Beetles alone accounted for 34% of the total mortality, while beetles interacting with pathogens accounted for 59%. Fir engraver, fir mistletoe, and annosus root disease accounted for more than 90% of the white fir mortality. Over three-fourths of the Jeffrey pine mortality involved at least one of three pests: Jeffrey pine beetle, California flatheaded borer, and annosus root disease. Ninety-five percent of the Coulter pine mortality was attributed to one or more of these pests: western pine beetle, western dwarf mistletoe, and red turpentine beetle. Nearly all of the dead trees showed evidence of beetle attack.

BIOLOGICAL EVALUATIONS. During 1983 the Forest Service conducted the evaluations listed in Table IV (next page). The evaluation reports included brief descriptions of specific pest problems that were important to forest land managers, and presented current management alternatives. Copies are available upon request from the Forest Service, Forest Pest Management, 630 Sansome Street, San Francisco, California 94111.

TABLE IV. BIOLOGICAL EVALUATIONS PERFORMED BY THE FOREST SERVICE - 1983

EVALUATION NUMBER	EVALUATION LOCATION	ACRES EVALUATED	HOST SPECIES	PEST OR PESTS INVOLVED
83-1	Weaverville R.D., Shasta-Trinity N.F.	33,100	DF	Cc
83-2	Taylor Cr.--Greenhorn Area, Quincy R.D., Plumas N.F.	383	PP,WF,DF, SP,IC	Dv,Db,Dp,Sv, Fi
83-3	Stuart Fk. & Big Bar, Weaverville & Big Bar R.D.s, Shasta-Trinity N.F.	23,800	DF,PP,WF	Wt,Dps,Db,Sv, Ips,Os
83-4	Jackass Insect Salvage, Truckee R.D., Tahoe N.F.	5	JP,LP	Dj,Dm,Fa,Os
83-5	Eldorado N.F.	500 M	JP,PP	Oz
83-6	Kiva-Taylor Cr. Rec. Areas, Lake Tahoe Basin Mgmt. Unit	250	JP,LP,WF	Dj,Fa,Os,Dp, Pg,Ed,Ar,Ap, Pst,Eh
83-7	Fir Crags Home Tract, Meeks Bay Rec. Area, & Nevada Beach C.G., Lake Tahoe Basin Mgmt. Unit	130	RF,WF,JP LP	Et,Fa,Sv,Ar, Os,Fl,Dp
83-8	Upper Lake Ranger Sta. & Round Burn, Upper Lake R.D., Mendocino N.F.	10	HA,MA,DF, PP,CBO	Phr,Cs,Ce, Ips,Am
83-9	Four Cedar Grove C.G.s, Kings Canyon Natl. Park	116	PP,JP,WF, IC,SP	Fa,Ar,Db,Dj, Dp,Sv,Ta,Ips, Dv,Mc,Pjl,Phl, Me
83-10	Hazard Tree Removal, Yosemite Valley, Yosemite Natl. Park	4,480	PP	Fa
83-11	Yosemite Natl. Park	15	LP	Cm

TABLE IV (Cont.)

EVALUATION NUMBER	EVALUATION LOCATION	ACRES EVALUATED	HOST SPECIES	PEST OR PESTS INVOLVED
83-12	Starkey Forest, Blue Jay, & Banning Sta., Cajon, Arrowhead, & San Gorgonio R.D.s, San Bernardino N.F.	45	CP,KP,WF, PP,GS	Dr,Os,Db,Ips, Ar,Fa,Oz,Am
83-13	Devil's Punchbowl Co. Park, Little Rock Sta., Mt. Gleason, & Big Tujunga Dam, Valyermo & Tujunga R.D.s, Angeles N.F.	1,240	SPP,IC,CP, PP,HA	Psp,Ips,Ar, Phl,Db,Phr
83-14	Black Ranch Rd. Area, Hat Cr. R.D., Lassen N.F.	1,850	PP	Nc,Ar
83-15	Crane Valley, Denver Church, and Little Denver Church C.G.s, Bass Lake R.D., Sierra N.F.	28	PP,IC,WF, CBO	Ar,Phr,Fa,Am, Ed,Eh,Db,Pg, Gs,Sb
83-16	Nacimiento Sta., & Northcoast & South-coast Areas, Monterey R.D., Los Padres N.F.	200	HA,PP,CP	Fa,Db,Ips,Am, Ar,Dr
83-17	Kirch Flat C.G., Kings River R.D., Sierra N.F.	4	HA	Phr,Gp,Gs,Pg, Cg
83-18	Rock Cr. & Mammoth Pool C.G.s, Minarets R.D., Sierra N.F.	15	PP,SP,IC	Ed,Fa,Ar,Pjl, Pg,Db
83-19	Muir Woods Natl. Monument	300	DF	Cw
83-20	McKenzie, Verplank, & Hoist Ridges, & Phillips Ranch Progeny Test Site, Hume Lake R.D., Sequoia N.F.	95	WF,SP,PP, IC	Sv,Fa,Dp,Db, Ar,Psp,We,Gr, Pg

TABLE IV (Cont.)

EVALUATION NUMBER	EVALUATION LOCATION	ACRES EVALUATED	HOST SPECIES	PEST OR PESTS INVOLVED
83-21	French Mdws. Rec. Area, Foresthill R.D., Tahoe N.F.	250	WF,RF,SP, IC,PP,DF	Wt,Fa,Sv,Ips
83-22	Fungicide Trials, Humboldt Nursery, Six Rivers N.F.	10	RF,JP	Pho,Ss
83-23	Heart Rock & Big John Timber Sales, Big Valley R.D., Modoc N.F.	17,000	PP,JP	Dp,Db,Dv,Mc, Psp,Ips,Cw
83-24	Priority Fuelwood Sale, Arrowhead R.D., San Bernardino N.F.	450	PP,CP,SP, WF,CBO	Ar,Db,Am,Phr, Sv,Fa,Oz
83-25	Chimney Peak Area, Bureau of Land Mgmt.	2,000	SPP	Cw
83-26	Deadwood, Coats Cr., Middle Cr., & Doggett Progeny Test Sites, Klamath N.F.	60	PP,SP,DF	Cw,Cr,Ar,Fp
83-28	Benton Mdws. Area, Warner Mtn. R.D., Modoc N.F.	500	WF	Fa,Lo,Pg,Wd
83-29	Hunters Ridge Sale, Big Valley R.D. Modoc N.F.	700	WF,JP	Fa,Ar,Pg,Sv
83-30	Progeny Test Sites, Covelo & Stonyford R.D.s, Mendocino N.F.	380	PP,DF,SP, IC,WF	Db,Dv,Am,Ar, Fa,Ed
83-31	Round Valley & Little Cleghorn Res., Bureau of Land Mgmt.	100	JP	Ar,Fa
83-32	Marmot Picnic Area, Calaveras R.D., Stanislaus N.F.	5	RF,LP	Fa,Sv,Ta,We, Mca,Ar,Ap

TABLE IV (Cont.)

EVALUATION NUMBER	EVALUATION LOCATION	ACRES EVALUATED	HOST SPECIES	PEST OR PESTS INVOLVED
83-33	Sugarpine Mtn. & Silverwood Lake, Arrowhead R. D., San Bernardino N.F.	14,500	OA	Aar
83-34	Hemlock, Medicine Lake, & Headquarters C.G.s, Doublehead R.D., Modoc N.F.	50	LP	Ar,Dp,Eh,Dc
83-35	San Bernardino N.F.	120 M	JP,WF, CP,SP, SPP	Db,Dv,Mc,Dj, Sv,Fa,Ar,Cw
83-36	Mammoth, Mono Lake, & White Mtn. R.D.s, Inyo N.F.	6,000	AB	Mcf

HOST ABBREVIATIONS

AB = Antelope bitterbrush
BO = Blue oak
CBO = California black oak
CL = California laurel
CP = Coulter pine
DF = Douglas-fir
GS = Giant sequoia
HA = Hardwoods
IC = Incense-cedar
JP = Jeffrey pine
KxM = Knobcone x Monterey pine
KP = Knobcone pine
LP = Lodgepole pine
MA = Pacific madrone
MC = Monterey cypress
OA = Oaks
PP = Ponderosa pine
RD = Coastal redwood
RF = Red fir
SP = Sugar pine
SPP = Singleleaf pinyon pine
SRF = Shasta red fir
TO = Tanoak
WF = White fir

PEST ABBREVIATIONS

Aa = Alder flea beetle
Aar = Fruittree leafroller
Ac = Cooley spruce gall aphid
Am = Armillaria root disease
Ap = Atropellis canker
Ar = Dwarf mistletoes
Bc = Douglas-fir cone moth
Ca = Cytospora canker
Cc = Western spruce budworm
Ce = Pine resin midge
Cf = Douglas-fir twig beetle
Cg = Cattle grazing
Cm = Lodgepole needle miner
Co = Cone gall midge
Cp = Pandora moth
Cr = White pine blister rust
Cs = Douglas-fir needle midges
Cw = Black stain root disease
Da = fir coneworm
Db = Western pine beetle
Dc = Dasyscyphus canker
De = Dermea canker
Dj = Jeffrey pine beetle
Dp = Mountain pine beetle

TABLE IV (Cont.)

PEST ABBREVIATIONS

Dps = Douglas-fir beetle	Nc = Black pineleaf scale
Dr = Drought	Nm = Pine butterfly
Dv = Red turpentine beetle	Os = Overstocking
Eh = Western gall rust	Oz = Ozone injury
Es = Pine shoot borer	Pa = Yellow cap fungus
Et = Indian paint fungus	Pe = Pesticide
Fa = Annosus root disease	Pg = Pocket gopher
Fc = True fir canker	Phl = Cedar bark beetle
Fi = Fire injury	Pho = Phoma blight and canker
Fl = Flooding	Phr = True (leafy) mistletoe
Fo = Fusarium root disease	Pjl = Incense-cedar mistletoe
Fp = White pocket rot	Ps = Velvet top fungus
Gp = Sycamore anthracnose	Psp = Twig beetles
Gr = Grasshoppers	Pst = Stalactiform rust
Gs = Ground squirrels	Ra = Rabbits
He = Herbicide	Ro = Rodents
Ips = Pine engravers	Rz = Ponderosa pine tip moth
Llb = Laurel leaf blight	Sb = Scotch broom
Lo = Logging injury	Sc = Cypress canker
Lv = True fir needle casts	Sq = Squirrels
Ma = Pinyon needle scale	Ss = Sirococcus tip blight
Mc = California flatheaded borer	Sv = Fir engraver
Mca = Yellow witch's broom	Ta = Fir roundheaded borer
Mcf = Great Basin tent caterpillar	Wd = Weeds
Md = Fir flatheaded borer	We = Weather
Me = Mechanical damage	Wt = Windthrow
Ms = Douglas-fir seed chalcid	Zh = Pine needle sheathminer

RESOLUTION ADOPTED BY THE COUNCIL, NOVEMBER 30, 1983

RESOLUTION -- Presented for information and support to the Director, California Department of Food and Agriculture; Director, University of California Cooperative Extension; Director, University of California Experiment Station; Director, California Department of Forestry; Secretary, U. S. Department of Agriculture; Regional Forester, Pacific Southwest Region, Forest Service; and Director, Pacific Southwest Forest and Range Experiment Station.

Whereas California's forest resources contribute substantially to the economy of the State, and

Whereas forest weeds present a substantial reduction in forest growth and yield, and

Whereas artificial regeneration of the forest is a relatively new facet of California's forest management, which offers many unknowns relative to controlling unwanted vegetation,

Be it resolved that the California Forest Pest Control Action Council promotes and encourages continued and expanded research efforts in the cost-effective management and control of major California forest weeds in the following categories:

- **Major Forest Weeds by Region:**
  - Coastal Redwood and Douglas-fir (Tanoak, Pacific Madrone, and Red Alder)
  - Coastal Range Douglas-fir (Tanoak, Pacific Madrone, and California Black Oak)
  - Sierra Mixed Conifer (Bear Clover, California Black Oak, Tanoak, Pacific Madrone)
  - Eastside Pine (Mules Ear)
- **Major Forest Weeds in Most Commercial Forest Types:**
  - Manzanita, Ceanothus, and Chinkapin

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