FOREST PEST CONDITIONS IN CALIFORNIA–1985

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 animals, insects, diseases, and weeds. Its objective is to establish, maintain, and improve communication among individuals -- managers, administrators, and researchers -- who are concerned with these issues. 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 control recommendations made to forest managing agencies and landowners.

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

The California 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.

This report, **FOREST PEST CONDITIONS IN CALIFORNIA - 1985**, 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 State-wide Cooperative Forest Pest Detection Survey, and from information generated by Forest Pest Management, Pacific Southwest Region, USDA 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: Dead old-growth Jeffrey pine at the Estates, Lake Tahoe Basin Management Unit, South Lake Tahoe (El Dorado County). The tree died after attacks by Jeffrey pine beetle (Dendroctonus jeffreyi), complicated by disease, climatic, and human-use factors. In the forest at large, tree mortality is a common and necessary event, part of the cycle of birth, growth, and decline in a forest ecosystem. In developed recreation sites, however, the loss of even a single tree -- especially an aged monarch like this one -- can seriously affect management.

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HIGHLIGHTS OF PEST CONDITIONS - 1985

STATUS OF INSECTS. Overall, native defoliator activity declined in 1985. A western spruce budworm suppression project using Bacillus thuringiensis was conducted over 89,000 acres in Trinity County. Budworm populations generally declined throughout the infested area and light defoliation was anticipated in 1986. Moderate-to-heavy defoliation by the Modoc budworm and the white fir needleminer occurred over several areas in northeastern California. Douglas-fir tussock moth populations remained low, but with a potential to increase significantly in the next year or two.

The gypsy moth infestation near Eugene, Oregon was reduced following three applications of Bacillus thuringiensis over 227,000 acres. Several other areas in Oregon, including a probable new infestation site northeast of Roseburg, recorded high 1985 moth catches, and there remains the serious potential for the gypsy moth to become established in California. The number of gypsy moths trapped in California was only slightly higher than in 1984 and only two sites were treated for eradication (compared with five in 1984). The number of reports concerning bark, twig, and engraver beetles increased, a possible consequence of the below-normal precipitation in much of California during the first half of 1985; however, damage remained generally low. Regeneration pests, including scarab beetles and the western pineshoot borer, caused problems locally.

STATUS OF DISEASES. Root diseases and dwarf mistletoes were again the major causes of growth loss and mortality in California's forests, while other disease pests caused more limited damage in local areas. Widespread foliage injury that may have been environmental in origin was reported on lodgepole pines in the Sierra Nevada and on Ceanothus species in southern California; no pathogens were found associated with these declines. Oak twig dieback, which has been associated with several fungi and various insects, was again reported from widely-separated parts of the State.

Phoma blight of 2-0 Douglas-fir and true fir seedlings caused extensive damage at Humboldt Nursery in northwestern California from 1981 through 1984. In 1985, however, disease incidence was low and losses were slight. The reduced incidence of this disease may have been related to below-normal winter rainfall, which reduced soil splash and increased the effectiveness of protective fungicide sprays.

STATUS OF ANIMAL PESTS. Deer browsing damage was widespread, with most injury in conifer plantations up to five years old. Pocket gopher damage occurred on 22,000 acres of conifer plantations. Porcupines damaged pines across northern California and southward through the Sierra Nevada; increased damage in Humboldt County may indicate a spreading problem. Rabbit damage to plantations of Douglas-fir and pines occurred in localized areas of 10 to 300 acres. Black bear damage increased in Del Norte and Humboldt Counties.

STATUS AND CONTROL OF INSECTS

WESTERN SPRUCE BUDWORM, Choristoneura carnana californica. The infestation adjacent to Clair Engle (Trinity) Lake in Trinity County remained at 130,000 acres. Only one new infested area appeared -- Bear Creek, near Meter Meadow. On May 11-24, an 89,000-acre core area was treated with 12 B.I.U. (Billion International Units) per acre of Bacillus thuringiensis in a cooperative State, Federal, and private project.

Post-treatment larval counts were significantly different for treated versus untreated areas: seven larvae per 100 flushes of new foliage in treated areas, compared to 12 larvae per 100 flushes in untreated areas. A cold, intense rainstorm 72 hours after treatment appeared to contribute to larval mortality, and may account for the similarity in the drop between pre- and post-treatment larval counts for both treated and untreated areas.

Aerial surveys showed that damage was visibly less than in 1984. Ground checks during egg mass sampling indicated an area-wide average of 33% defoliation (light-to-moderate). Treated areas averaged 29% defoliation (light) versus 45% (moderate) for untreated areas. Damage appraised from mid-crown levels was visibly greater than upper crown damage, which was not sampled. This greening of the upper tree crowns made aerial damage detection difficult.

Egg mass samples indicated a widespread reproductive decline. Only twenty-four new egg masses were recovered from 750 18-inch branches sampled. The outlook for 1986 is for light-to-very light defoliation, with scattered areas of moderate defoliation ranging from a few to 3000 acres, most notably at Jackass Peak, Quartz Spring, Feeny Ridge, Schultz Sheep Camp, and along Highway 3 from Davis Creek To Trinity Center.

DOUGLAS-FIR TUSSOCK MOTH, Orgyia pseudotsugata. Douglas-fir tussock moth activity continued at about the same or slightly higher levels compared with 1984. Larval survey results were variable. Sixteen of 41 plots surveyed showed sub-outbreak early instar population levels, averaging about four larvae per 1,000 square inches of foliage. These areas were in Placer, El Dorado, Calaveras, and Tuolumne Counties. Late instar mid-crown sampling from some of these same areas showed average larval densities of about one larva per 1,000 square inches.

Although not visible from the air, light feeding damage to the current year's foliage was observed on Iron Mountain Ridge, Plummer Ridge, Baltic Ridge, and Armstrong Lookout (El Dorado County); Summit Level Ridge (Calaveras County); Thunder Hill, Strawberry Peak, Hull Meadows, Dodge Ridge, and Twomile (Tuolumne County); Lodgepole Campground, Sequoia National Park (Tulare County); and on the Hume Lake Ranger District, Sequoia National Forest (Fresno County).

The heaviest defoliation, affecting 40-80% of the current year's foliage, occurred over approximately 20 acres on Nevada Point Ridge in Placer County. Fall cocoon and egg mass surveys in these areas

indicated that populations were somewhat higher (i.e., cocoons and egg masses were easier to find) than in 1984. Populations will be monitored closely in 1986.

MODOC BUDWORM, Choristoneura retiniana. The Modoc budworm caused slight to heavy defoliation of white fir in the Warner Mountains and the Manzanita area of Modoc County. In some stands, all of the current year's foliage and many of the buds were damaged. Defoliation occurred at Lily Lake, Mill Creek, Davis Creek, Halls Meadow, south from Deep Creek to Soup Springs, Mahogany Ridge, and Manzanita Mountain.

White fir needleminer, Epinotia meritana, caused moderate to heavy defoliation in these same areas. The cumulative effect of this defoliation was severe in some locations and top dieback was likely in some trees. Sawfly, Neodiprion sp., was abundant here also, and may have contributed to the injury.

GYPSY MOTH, Lymantria dispar. During 1985, 28 male gypsy moth adults were trapped in 10 Counties, and egg masses or pupal cases were found on three properties. This is only slightly higher than the 25 males trapped in nine Counties and egg masses or pupal cases found on two properties in 1984. Only two sites, Fremont (Alameda County) and Felton (Santa Cruz County), were treated to eradicate gypsy moth in 1985, compared to five sites treated in 1984.

The infestation near Eugene, Oregon was significantly reduced after three successive applications of Bacillus thuringiensis to 227,000 acres. Moths caught outside the treatment area in Lane County were generally scattered and were thought to be larval blowouts from the spring. Other Oregon locations with high moth catches included East Portland and Lake Oswego, which had a history of gypsy moth catches, and northeast of Roseburg at Glide, which appeared to be a new infestation.

JEFFREY PINE NEEDLEMINER, Coleotechnites sp. Jeffrey pine needleminer activity in San Bernardino County declined in 1985. Light defoliation was observed over less than 1,000 acres in the Snow Valley, Big Bear City, and Lake Irwin areas. Needleminer defoliation in Plumas County, first noted over about 5,000 acres in 1984, expanded considerably in 1985. Approximately 25,000 acres were reported infested in the Ross Meadows area and in the vicinity of Portola.

LODGEPOLE PINE NEEDLEMINER, Coleotechnites milleri. Essentially no current lodgepole needleminer defoliation was detected in the chronic Tuolumne Meadows outbreak area of Yosemite National Park (Tuolumne County). Larval surveys showed populations to be at the lowest levels recorded in over two decades, with no larvae found in 12 of 28 sample plots. However, extensive mountain pine beetle-related mortality was observed in lodgepole pine stands previously defoliated by lodgepole needleminer.

FRUITTREE LEAFROLLER, Archips argyrospilus. Fruittree leafroller activity near Lake Arrowhead (San Bernardino County) declined noticeably relative to 1984. Light defoliation of California black oak was reported from scattered locations between Silverwood Lake and Running Springs. The only area exhibiting moderate-to-heavy defoliation was near Highway 138 between Camp Seeley and Silverwood Lake, covering approximately 3,000 acres.

TENT CATERPILLAR, Malacosoma sp. Reports of tent caterpillar activity in northern and eastern California declined in 1985. The 20,000-25,000 acre outbreak on the Devil's Garden and Big Valley Ranger Districts (Modoc County) subsided in the spring, but substantial bitterbrush mortality occurred throughout the outbreak area, particularly to 50-70 year-old decadent plants. The infestation in Inyo and Mono Counties continued at about the same level as in 1984, with heavy defoliation occurring over about 1,000 acres on the Mammoth Ranger District near Hot Creek (Mono County).

GRASSHOPPERS. In contrast to the situation in California the past few years -- and in much of the West in 1985 -- grasshopper populations were low and there were no reports of seedling damage.

WESTERN PINESHOOT BORER, Eucosma sonomana. The western pineshoot borer was reported killing the leaders of ponderosa pine in a 60-acre, 15-20 year-old ponderosa pine, Douglas-fir, and Jeffrey pine plantation located near McKinney Creek in Siskiyou County. The unusually high level of about 50% leader mortality may have been related to stress caused by dry spring weather in 1985. The same combination of western pineshoot borer coupled with a dry spring was responsible for occasional dead terminals on 5-10 foot tall ponderosa pine saplings in the McCloud Flat progeny test planation (Siskiyou County). Both leader mortality and stunted growth caused concern about the progeny test results.

SCARAB BEETLES, Serica anthracina. Scarab beetle adults defoliated about one-third of the newly planted Douglas-fir seedlings in a 12-acre progeny test plantation near Foresthill (Placer County). Defoliation occurred during May and was largely confined to the newly emerging needles. Following an application of carbaryl, defoliation ceased, new buds were set, and no trees died. Defoliation apparently occurred because the seedlings were planted in a block that had been cleared of, but was still surrounded by native brush. Foothill vegetation such as manzanita, ceanothus, oak, and lupine provide good habitat for scarab beetles.

For the second year in a row, scarab beetle larvae killed newly planted ponderosa pine seedlings in scattered pockets on McCloud Flat (Siskiyou County). Clearing grass cover and immediately planting seedlings the same spring probably set the stage for root-feeding by the scarab larvae.

WESTERN PINE BEETLE, Dendroctonus brevicomis. The western pine beetle attacked 25-30 pines in an overstocked, mixed stand of oak and Coulter pine near Observatory Campground on Palomar Mountain (San Diego County). At Cedar Grove in Kings Canyon National Park (Fresno County), the beetles attacked ponderosa pine being pruned to remove dwarf mistletoe brooms. Further pruning was postponed and the trees watered in an effort to prevent further mortality.

Western pine beetle killed about 100 ponderosa pine over 20 acres near Angwin (Napa County) in an area logged in 1984. Logging disturbance, mechanical damage to residual trees, and fresh slash were observed over the area. In addition, western pine beetle, in combination with other bark beetles and black stain root disease, was reported causing ponderosa pine mortality in scattered small areas near Timber Mountain (Modoc County).

JEFFREY PINE BEETLE, Dendroctonus jeffreyi. Jeffrey pine beetle attacked 31 Jeffrey pines in the Fallen Leaf-Kiva-Estates suppression project area near South Lake Tahoe (El Dorado County). This compares with 41 pines killed in 1984. Additional Jeffrey pine beetle activity was observed in the vicinity of South Lake Tahoe and other parts of the Lake Tahoe Basin, including Glenbrook and Slaughterhouse Canyon (Douglas County, Nevada). Jeffrey pine beetle-related mortality was also reported near Truckee in Nevada County.

MOUNTAIN PINE BEETLE, Dendroctonus ponderosae. The mountain pine beetle was involved, along with other bark beetles, with mortality of ponderosa pine at Timber Mountain (Modoc County) and lodgepole pine in the Sierra Summit Ski Area (Fresno County). The beetle also killed lodgepole pine in campgrounds in the Lake Alpine Basin (Alpine County) and continued to attack overmature and dwarf mistletoe-infected lodgepole pine near Rock Creek (Madera County). In addition, considerable mountain pine beetle-related lodgepole pine mortality occurred over 15,000 to 20,000 acres in the Tuolumne Meadows area of Yosemite National Park in stands previously defoliated by lodgepole needleminer. Affected areas included Rafferty Creek, Lyell Canyon, Dog Lake, and Delaney Creek.

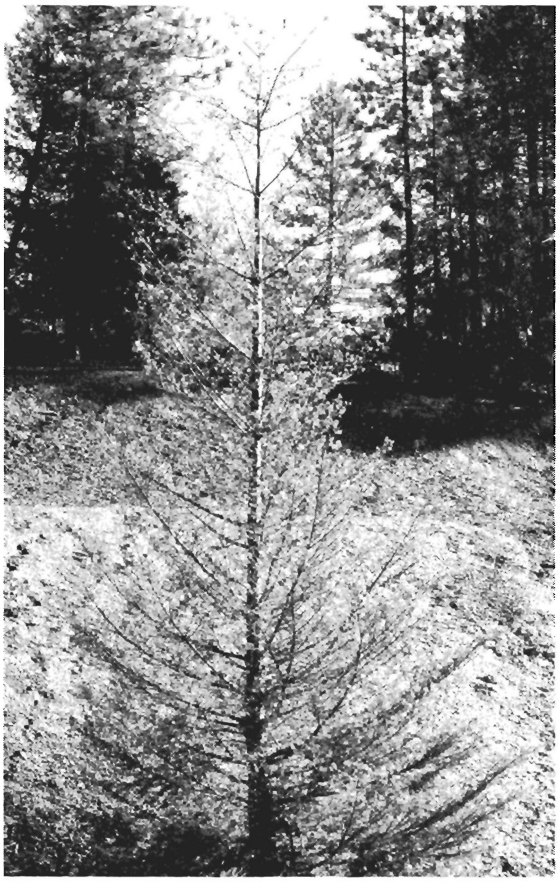
PINE ENGRAVER BEETLES, Ips spp. Pine engravers killed groups of ponderosa pine over two acres in a plantation near Mussock Mountain (Fresno County). Engravers were observed top-killing western pine beetle-infested ponderosa pine at Angwin (Napa County), and were associated with mountain pine beetle-attacked lodgepole pine in the Lake Alpine Basin (Alpine County). They also attacked fire-damaged Jeffrey pine in the Glenbrook Burn on the east side of Lake Tahoe (Douglas County, Nevada).

Several reports were received about Ips sp. attacking ornamental pines. In addition, numerous groups of top-killed ponderosa pine were seen in the vicinity of McCloud Flats (Siskiyou County). Two reports documented Ips sp. activity in Jeffrey pine following stand entries in early summer: beetles bred in early-season logging slash and killed about 50

trees near Ericksons Spring (Lassen County), and 30-50 pines were top-killed or died in a pole-size stand that was thinned in the spring in Shasta County.

FIR ENGRAVER, Scolytus ventralis. Fir engraver activity was reported from several central Sierra locations, including Rock Creek (Madera County), Sierra Summit Ski Area (Fresno County), and campgrounds around Lake Alpine (Alpine County). Increased white fir mortality was also reported from the Fallen Leaf-Taylor Creek-Estates area of Lake Tahoe (El Dorado County).

PACIFIC OAK TWIG GIRDLER, Agrilus angelicus. The twig girdler was associated with extensive branch and twig dieback of live oaks in the valleys and foothills of Santa Barbara and San Luis Obispo Counties. Below-normal precipitation may have been responsible for increased activity of this insect pest.



WESTERN SPRUCE BUDWORM. The infestation near Clair Engle Lake in Trinity County remained at 130,000 acres, with light defoliation predicted for 1986. Some trees defoliated in past years improved markedly in 1985. This Douglas-fir on Bowerman Ridge recovered much of its foliage and color between October 1984 (**left**) and June 1985 (**right**).

TABLE 1. INSECTS OF LESSER IMPORTANCE IN CALIFORNIA FORESTS - 1985

INSECTS Scientific Name	Common Name	HOSTS	WHERE EXAMINED OR REPORTED County	Remarks
Altica ambiens	Alder flea beetle	AL	Humboldt	Localized
Cecidomyia piniinopis	Gouty pitch midge	PP	Trinity	
Chionodes sp.	Cone moth	RW	Humboldt	
Cinara sp.	Giant conifer aphid	WF	Amador	Widespread
Coloradia pandora	Pandora moth	CP	San Diego	< 1 acre
Contarinia pseudotsugae	Douglas-fir needle midge	DF	Nevada, Tehama, & Butte	Widespread
Dendroctonus valens	Red turpentine beetle	PP,JP	San Diego, Riverside, Fresno, Modoc, & Douglas (Nevada)	Widespread
Halisidota argentata	Silverspotted tiger moth	DF,WF, SS	Siskiyou, Humboldt, Del Norte, & Nevada	On 2-0 DF seedlings in Humboldt Nursery
Lithocolletis sp.	Oak leaf miner	WO	Humboldt	Widespread
Mayetiola thujae	Cone midge	WR	Humboldt	Abundant
Melanophila californica	California flatheaded borer	JP	Riverside & Los Angeles	Scattered; campground
Neodiprion sp.	Sawfly	PP	Trinity & Lassen	Localized
Nymphalis californica	California tortoiseshell	WT,SB	Trinity, Tuolumne	Defoliating brush in PP plantations

Table I (Cont.)

INSECTS Scientific Name	Common Name	HOSTS	WHERE EXAMINED OR REPORTED County	Remarks
Oligonychus sp.	Spider mite	MP	Humboldt	Landscape trees
Otiorhynchus sp.	Weevil	DF	Siskiyou	2-year old plantation
Phloeosinus punctatus	Western cedar bark beetle	IC	San Bernardino	Landscape trees
Phloeosinus cristatus	Cypress bark beetle	CC	Santa Barbara	Decommissioned research plantation
Pissodes radiatae	Monterey pine weevil	BP	Mendocino	Landscape trees on pygmy soils
Pityogenes sp.	Twig beetle	JP	Mono	In winter-damaged trees along Hwy. 395 and on edges of open areas
Pityophthorus sp.	Twig beetle	SH,MP, PP	Marin, Santa Cruz, Trinity, & Yuba	Low site, poor vigor trees
Scythropus sp.	Weevil	PP	Yuba	Progeny test plantation

HOST ABBREVIATIONS

AL =	Alder	RW =	Redwood
BP =	Bishop pine	SB =	Snowbrush
CC =	Cuyama cypress	SH =	Shore pine
CP =	Coulter pine	SS =	Sitka spruce
DF =	Douglas-fir	WF =	White fir
IC =	Incense-cedar	WO =	White oak
JP =	Jeffrey pine	WR =	Western redcedar
MP =	Monterey pine	WT =	Whitethorn
PP =	Ponderosa pine		

STATUS AND CONTROL OF DISEASES

ABIOTIC DISEASES. Two reports described a dieback of the brush species Ceanothus crassifolius across the entire southern portion of the Angeles National Forest (Los Angeles County). No pests were identified, and the cause was assumed to be environmental. Four reports dealt with an unusually heavy needle loss of lodgepole pine over a 300-mile range from the Lassen (Shasta and Lassen Counties) south through the Sierra National Forest (Fresno County). Again, no pests were found that could explain this phenomenon. The condition did not occur where lodgepole pine occupied dry sites or above 7000 feet elevation.

AIR POLLUTION. In 1985, the Forest Service re-evaluated 27 long-term ozone injury trend plots on the Sierra National Forest (Mariposa, Madera, and Fresno Counties). Since they were last visited in 1983 or 1984, eight plots had more injury symptoms, 10 had fewer symptoms, and nine were unchanged. In general, the changes were small, and ozone injury apparently remained at about the same level on the Forest over the last two years.

Acid deposition generated considerable public interest during 1985. Active research was conducted in Sequoia and Kings Canyon National Parks (Fresno and Tulare Counties) and on the San Dimas Experimental Forest (Los Angeles County). California forest lands were part of a Nationwide Environmental Protection Agency (EPA) program that included a one-time sample of Sierra Nevada lakes and continuous sampling of acidic deposition at permanent sites. The California Air Resources Board also carried out an intensive research and monitoring effort.

CANKER DISEASES. Phytophthora drechsleri was isolated from a twig dieback and canker disease of red fir in a Christmas tree plantation near Laytonville (Mendocino County). Dermea canker, caused by Dermea pseudotsugae, was found in an 18-year-old Douglas-fir plantation on South Fork Mountain, Trinity County.

Reports of other canker diseases included Botryosphaeria canker (Botryosphaeria ribis) on giant sequoia at the Chico Tree Improvement Center (Butte County), redwood canker (Coryneum sp.) on a few redwoods in Sonoma County, and Atropellis canker (Atropellis sp.) on lodgepole pines on the Tahoe National Forest (Placer County).

DWARF MISTLETOES, Arceuthobium spp.. No new State-wide dwarf mistletoe surveys were conducted in 1985. However, suppression projects to control this pest continued in Forest Service recreation areas, plantations, and timber stands. Pruning and tree removal were conducted at Sentinel Campground in Kings Canyon National Park (Fresno County), and at Nevada Beach Campground in the Lake Tahoe Basin Management Unit near South Lake Tahoe (Nevada, Douglas County). Suppression projects continued in a plantation on the Cannell Meadow Ranger District of the

Sequoia National Forest (Tulare County), and in a 2600-acre stand of Jeffrey and ponderosa pine on the Milford Ranger District, Plumas National Forest (Plumas County).

FOLIAGE DISEASES. Foliage diseases were at a low level of occurrence in 1985. A short, dry spring did not provide the moisture needed for infection by leaf diseases like anthracnose and red band needle blight. Elytroderma disease was found on ponderosa pine on the Sequoia National Forest (Tulare County) and on Jeffrey and ponderosa pine on the Lassen National Forest (Shasta County). A Lophodermium sp. was reported on shore pine at several locations in Humboldt County.

True fir needle cast caused by Lirula abietis-concoloris was reported from white fir near Lake Britton in Shasta County. Rhabdocline pseudotsugae was found on Douglas-fir in Christmas tree plantations near Pollock Pines (El Dorado County), and Phaeocryptopus gaumanni was noted on Douglas-fir in a plantation on the Six Rivers National Forest (Del Norte County). A powdery mildew caused by Sphaerotheca lanestris was found on valley oaks in Santa Clara County.

NURSERY DISEASES. Phoma blight of 2-0 Douglas-fir and true fir seedlings, caused by Phoma eupyrena, occurred at very low levels in the Humboldt Nursery (Humboldt County). The low incidence of disease was thought to be due to lower than normal amounts of winter rainfall, which limited soil splash and allowed successful application of protective fungicides.

Sirococcus tip blight, caused by Sirococcus strobilinus, caused minor losses of 1-0 Sitka spruce and 2-0 Jeffrey and ponderosa pines at the Humboldt Nursery. Hypocotyl rot, caused by Fusarium oxysporum, resulted in about 6 to 8% loss of 1-0 sugar pine at the Placerville Nursery (El Dorado County). Septoria leaf spot, caused by Septoria alnifolia, was common on 1-0 red alder at Humboldt Nursery, but caused no losses.

Minor diseases reported included Phomopsis canker, caused by Phomopsis occulta, on 2-1 and 2-0 Douglas-fir and on 2-0 red fir at Humboldt Nursery; Botrytis blight, caused by Botrytis cinerea, on 1-0 and 2-1 Douglas-fir at Humboldt Nursery; Fusarium hypocotyl rot followed by Sirococcus tip blight on 1-0 sugar pine at Humboldt Nursery; and charcoal root disease, caused by Macrophomina phaseolina, on true fir at the Placerville Nursery.

ROOT DISEASES. Root disease fungi continued to be damaging disease agents in California forests. Estimates of root disease-related tree mortality were similar to previous years at about 19.6 million cubic feet State-wide. The principal root diseases in California included annosus root disease, caused by Fomes annosus; Armillaria root disease, caused by Armillaria sp.; and black stain root disease, caused by Ceratocystis wageneri.

Annosus root disease and bark beetles were involved in widespread mortality of Jeffrey pine in Garner and May Valleys on the San Jacinto Ranger District, San Bernardino National Forest (Riverside County). In a knobcone X Monterey pine plantation on the Cajon Ranger District, San Bernardino National Forest (San Bernardino County), four pole-size trees were killed by Macrophomina phaseolina, which causes charcoal root disease. The fungus was probably introduced on nursery stock, remained inactive in the roots for years without causing symptoms, and finally became aggressive when the trees were stressed by lack of moisture.

Black stain root disease was involved in ponderosa pine mortality in overstocked stands on Timber Mountain on the Doublehead Ranger District, Modoc National Forest (Modoc County). Black stain was also reported on sapling and pole-size Douglas-firs in at least four disease centers at MacArthur-Burney Falls State Park (Shasta County).

Two instances of annosus root disease on Pacific madrone were reported: one at Boggs Mountain State Forest (Lake County) and the second near Georgetown (El Dorado County). This is the first report of this disease on madrone in the State Forest. The trees infected at Georgetown were all greater than 30 inches in diameter. In both situations, surrounding conifers did not show any above-ground symptoms of disease.

RUSTS. Needle rust of Douglas-fir, caused by Melampsora occidentalis, was reported from several hundred Christmas trees near San Leandro Reservoir (Alameda County); the disease was controlled with a single application of triadimefon in the spring. Pinyon needle rust, caused by a Coleosporium sp., was reported on singleleaf pinyon pine near Holcomb Valley in the San Bernardino National Forest (San Bernardino County).

Significant damage by blister rust, caused by Cronartium ribicola, was reported from several areas in California. Four sugar pine saplings were infected near Zumwalt Meadows, Kings Canyon National Park (Fresno County); infections were dated to 1980. This was only the second report of blister rust in the Cedar Grove area of the Park. Rust was also found at two new locations on the Sierra National Forest in Fresno County. However, general observations of the disease on Ribes spp. indicated a relatively low incidence in the central and southern Sierra.

Sugar pine regeneration was extensively damaged in several localities. Dramatic increases in damage were reported from Bald Mountain, Snow Creek, and Sugarloaf Mountain on the Downieville Ranger District, Tahoe National Forest (Sierra County). Similarly, damage was extensive on Louisiana-Pacific Corporation lands around Big and Little Signal Peaks (Mendocino County). In Latour State Forest (Shasta County) many seedling and pole-size western white pines were top-killed or died from the disease. At the University of California's Blodgett Experimental Forest (El Dorado County), blister rust became increasingly severe in many 10-20 year-old plantations in which sugar pine had been planted.

The California Department of Forestry (CDF) outplanted sugar pine seedlings from 18 blister rust-resistant parents at Mountain Home Demonstration State Forest (Tulare County). Three test sites with resistant and

non-resistant seedlings were established on the Forest. Seedlings from an additional 55 trees were to undergo a cotyledon test in early 1986 to provide additional parents and a broader genetic base for outplanting.

Some three-thousand blister rust-resistant sugar pine seedlings were started at Magalia State Nursery (Butte County) for outplanting in various parts of the State in 1987. These seedlings will be used to test their susceptibility to blister rust in various locations in California. They will be removed before they begin to interact with the local gene pool.

TRUE MISTLETOES. A true or leafy mistletoe, Phoradendron villosum, was found scattered throughout the chaparral on branches of red shank (Adenostoma sparcifolium) on the San Bernardino National Forest (Riverside County).

WESTERN GALL RUST. This rust fungus infects many hard pines in California, including lodgepole pine, shown here. This pine has survived a girdling stem canker, but many die from such extensive infection.

TABLE II. FOREST DISEASES REPORTED - 1985

AGENT	HOST	COUNTY
ABIOTIC INJURIES		
Frost	PP,Mz	Modoc
Moisture Stress	CR	Ventura
	PP	Plumas
	RF	Sierra
Ozone	PP	Tuolumne
Weather	DF	Nevada
	PP	Siskiyou
Unknown	AP,As	Siskiyou
	CP,KxM	San Bernardino
	Mz	Tuolumne
CANKER DISEASES		
Botryosphaeria ribis	GS	Butte
Coryneum sp.	CR	Sonoma
Dermea pseudotsugae	DF	Trinity
DECAYS		
Lenzites sp.	PP	Plumas
Polyporus dryophilus	LO	Tulare
Unknown	CP	San Diego
	GS	Tulare
FOLIAGE DISEASES		
Elytroderma deformans	JP,PP	Shasta
	PP	Tulare
Gloeosporium sp.	BM	Mariposa

Table II (Cont.)

AGENT	HOST	COUNTY
FOLIAGE DISEASES (Cont.)		
Leaf Scorch	BM	Plumas
	BM	Tulare
Lirula abietis-concoloris	WF	Amador
	WF	Shasta
Lophodermium sp.	ShP	Humboldt
Phacidium abietis	WF	El Dorado
Phaeocryptopus gaumanni	DF	Del Norte
Rhabdocline pseudotsugae	DF	El Dorado
Rhabdocline sp.	DF	Del Norte
Rhytisma punctatum	BM	Marin
Sphaerotheca lanestris	VO	Santa Clara
Unknown	LP	Amador
	LP	El Dorado
	LP	Lassen
	LP	Mariposa
	LP	Placer
	LP	Tuolumne
	MP	Mendocino
	Ta	Yuba
NURSERY DISEASES		
Botrytis cinerea	DF	Humboldt
Fusarium sp.	DF	Humboldt
	SP	El Dorado
	SP	Humboldt
Macrophomina phaseolina	SP	El Dorado
Phoma eupyrena	DF	Humboldt
Phomopsis sp.	DF	Humboldt
	RF	Humboldt

Table II (Cont.)

AGENT	HOST	COUNTY
NURSERY DISEASES (Cont.)		
Septoria alnifolia	RA	Humboldt
Sirococcus strobilinus	JP	Humboldt
	SP	Humboldt
	SS	Humboldt
Unknown	DF	Humboldt
PARASITIC PLANTS		
Phoradendron sp.	RS	Riverside
ROOT DISEASES		
Ceratocystis wageneri	DF	Humboldt
	DF	Plumas
	DF	Sonoma
	PP	Modoc
Macrophomina phaseolina	KxM	San Bernardino
Unknown	GS	Tulare
RUST DISEASES		
Coleosporium sp.	SPP	San Bernardino
Cronartium ribicola	SP	Fresno (2)
	SP	Madera
	SP	Mendocino
	SP	Sierra
	SP	Siskiyou
	WWP	Shasta
Endocronartium harknessii	MP	Sonoma
Melampsora occidentalis	DF	Alameda
Melampsorella caryophyllacearum	RF	Sierra

Table II (Cont.)

HOST ABBREVIATIONS

AP = Austrian pine	Oa = Oaks
As = Aspen	PP = Ponderosa pine
BM = Bigleaf maple	RA = Red alder
CP = Coulter pine	RF = Red fir
CR = Coast redwood	RS = Red shanks (Adenostoma sp.)
DF = Douglas-fir	ShP = Shore pine (lodgepole pine)
GS = Giant sequoia	SP = Sugar pine
JP = Jeffrey pine	SPP = Singleleaf pinyon pine
KxM = Knobcone X Monterey pine	SS = Sitka spruce
LO = Live oak	Ta = Tanoak
LP = Lodgepole pine	VO = Valley oak
Mz = Manzanita	WF = White fir
MP = Monterey pine	WWP = Western white pine

ANIMAL DAMAGE CONTROL. In 1985, pocket gophers damaged seedlings and young trees on at least 20,000 acres of conifer plantations in California. To help stem this loss, a Forest Service wildlife biologist demonstrates trapping and baiting techniques for gopher control.

STATUS AND CONTROL OF ANIMAL PESTS

DEER. Deer browsing damage to pines, true firs, Douglas-fir, and redwood was widespread. Most damage occurred in plantations up to five years old, with some damage in plantations up to fifteen years of age. Major damage to natural regeneration occurred on Douglas-fir and redwood in the north coast Counties. The extent of damage was most frequently less than 100 trees per acre, but there were numerous reports of injury to 200 to 600 trees per acre. The overall damage trend was static with localized increases outnumbering decreases by six to four. Seedling protectors and repellants were used as control measures.

POCKET GOPHER. Pocket gopher damage was reported on a minimum of 22,000 acres of conifer plantations. Most damage was in one-to-ten year old plantations of pines and true firs in the northern interior forests and the Sierra Nevada. Plantations of Douglas-fir and redwood were damaged in Humboldt County. Damage magnitude was commonly 10 to 50 trees per acre and often 150 to 500 trees per acre. Reports of increased damage outnumbered those of decreased damage by five to one. Over fifty percent of the incidents of increased damage were at locations along the entire length of the Sierra Nevada Mountains. Baiting with strychnine-treated grain was the major control method employed. Vegetation control with herbicides was used on a few areas in the Sierra Nevada.

PORCUPINE. Porcupines gnawed pines in plantations and natural stands across northern California and southward through the Sierra Nevada. Douglas-fir, redwood, and pines were injured in the north coast Counties. The largest acreages affected were in Siskiyou, Shasta, Lassen, and Modoc Counties, as in past years, and in Humboldt County. The overall damage trend was static. Four reports of increased damage in Humboldt County may indicate a spreading problem. Injury rates were mainly 10 to 20 trees per acre, ranging up to 200 to 300 trees per acre in Tuolumne County and 500 trees per acre in Humboldt County. Limited control was undertaken with trapping, hunting, and strychnine-salt blocks.

RABBITS. Rabbit damage, primarily in plantations of Douglas-fir and pines, occurred from north to south in localized areas of 10 to 300 acres. The injury rate on seedlings up to five years of age was often severe, 200 to 600 trees per acre. The overall damage trend was static. Seedling protectors and repellents were used for control in a few plantations.

BLACK BEAR. Black bear damage to redwood and Douglas-fir continued in Del Norte and Humboldt Counties. Bark stripping and sapwood consumption occurred in second growth timber 10 to 100 years old. The injury rate ranged from three to 50 trees per acre. Six of the ten bear damage re-

ports from the north coast noted an increase in damage. Bears also damaged pines in the northern Sierra Nevada and injured some true firs in the southern Sierra.

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

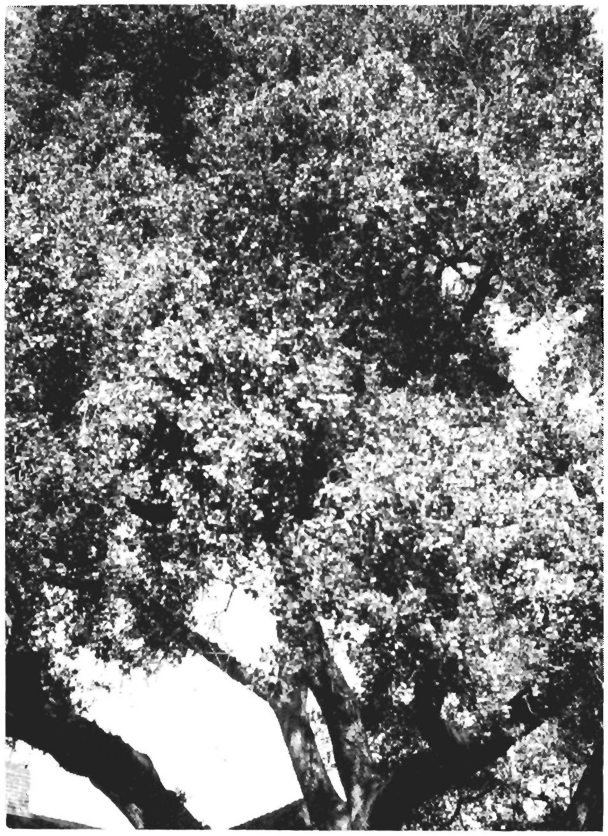
SPECIES	COUNTY OR REGION
Antelope	Modoc
Beaver	Humboldt, San Bernardino, Riverside, San Diego; northern and southern Sierra Nevada
Birds	Humboldt (dark-eyed junco, nursery); northern interior (blue grouse)
Domestic stock	All major timber areas
Dusky-footed woodrat	Del Norte, Humboldt, Mendocino, Tuolumne, San Mateo, Santa Cruz
Elk	Del Norte, Humboldt
Ground Squirrel	Shasta, Lassen, San Bernardino, Riverside, Los Angeles
Meadow Mouse	Humboldt, Siskiyou, Shasta, Lassen, Modoc, Tehama, Plumas, El Dorado
Mountain Beaver	Del Norte, Humboldt
Small Seed-eating Mammals	Humboldt, Glenn, Colusa, Lake, Siskiyou, Fresno, Tulare, Kern
Tree Squirrels	Humboldt, Mendocino, Glenn, Colusa, Lake, Sonoma, Lassen, Butte, Plumas, Fresno, Tulare, Kern, San Bernardino, Riverside

Know Your Forest Pests

BRANCH AND TWIG DIEBACK OF OAKS

Oaks in California are valued as urban and park trees, as scenic adornment of Coast range and Sierra foothills, as food and cover for wildlife, and as shade on cattle ranges. In 1977, dieback of branches up to six inches in diameter was first noted. This dieback became increasingly severe through 1981, when it began to decrease; in 1985, however, the disease reappeared. In 1981, extensive dieback of oak twigs was observed also. Twig dieback continued unabated through 1985, and affected large numbers of oaks. Recent investigations by researchers at the University of California in Berkeley have begun to illuminate the causes, pathology, and control of these diseases.

BRANCH DIEBACK. Dieback of oak branches is caused by Diplodia quercina, a fungus that attacks and kills the sapwood, cambium, and phloem of branches. Infection occurs mainly through wounds, although uninjured petioles can be infected also. Once established, the fungus girdles branches, resulting in the death of distal portions. The final result is branch flagging and eventual stag-heading in tree crowns. The disease is sometimes so severe that it kills entire trees.



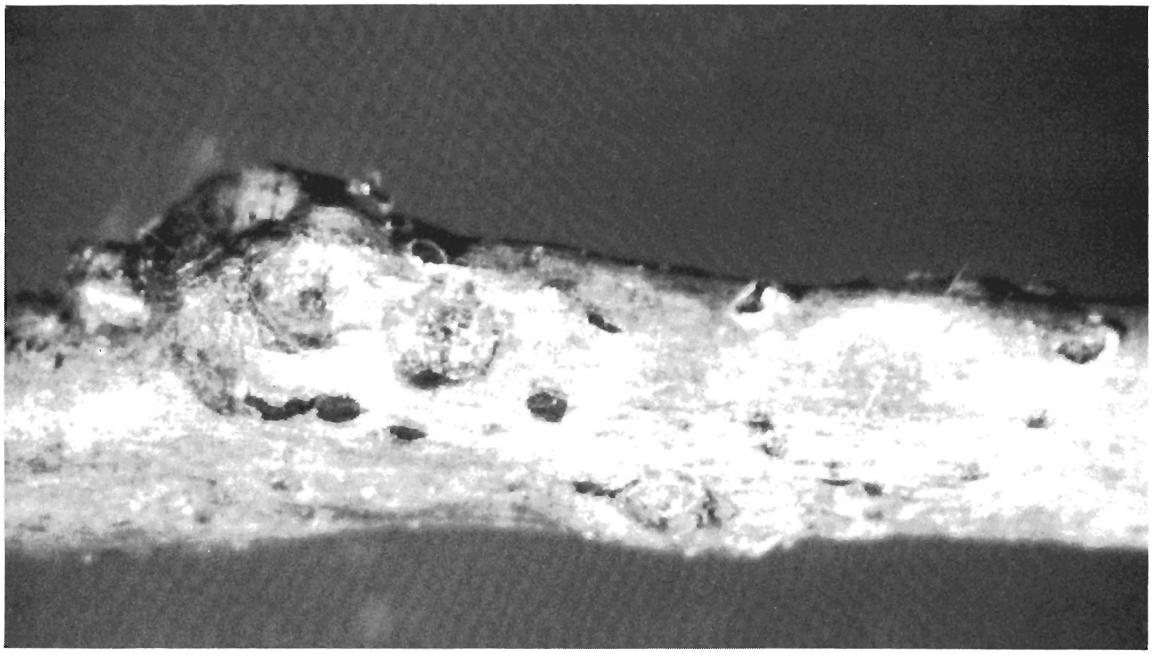
OAK BRANCH DIEBACK. Diplodia quercina infects and girdles branches up to six inches in diameter, causing flagging in the crown and occasionally death of whole trees.

Fungus fruiting bodies are produced on dead tissues. These produce spores that can be spread by rain splash, and probably by insects. Sporulation occurs within 24 hours after branches are wetted, indicating that the fungus responds quickly to rain. In nature, infection apparently occurs mainly in early spring, but symptoms are often most pronounced during hot periods in late summer.

In California, this disease has been observed in Quercus agrifolia, Q. kellogii, and Q. lobata, but inoculations show that Q. douglasii and Q. robur are also susceptible. The result of a survey conducted by the San Mateo County Farm Advisor and the University of California showed that dieback occurs in at least twenty Counties in California and throughout most of the range of Q. agrifolia. Reasons for the sudden appearance of widespread dieback have not been determined. Since many such diebacks are associated with stress, it may be that the severe drought of 1976-1977 was instrumental in disease buildup. It is worth noting that the disease had declined dramatically until the recent dry spell in 1985, when an apparent increase in disease was observed. It appears likely that Diplodia will flare up periodically in response to variations in rainfall.

TWIG DIEBACK. Twig dieback is associated with two fungi, Cryptocline cinerescens and an undetermined species of Gloeosporium. Both fungi behave similarly and can be discussed together under the general designation of twig dieback. Dieback of small twigs results from girdling and may involve a few to many twigs up to a diameter of 0.75 inches. Often the disease is more severe in the lower crown or on one side of a tree. In extreme cases, repeated twig dieback can result in death of the tree.

OAK TWIG DIEBACK. This disease is often most severe in the lower crown.



OAK PIT SCALE AND TWIG DIEBACK. Severity of twig dieback is associated with pit scale infestations. In the photo, acervuli (fungus fruiting bodies) are visible as black mats breaking through the bark in a ring around the pitted tissues where the scale insects are attached.

Infection by water-borne spores occurs mainly during tree growth stages when twigs and leaves are immature and succulent, mainly in early spring. Wounding does not increase the amount of disease and is apparently unnecessary for infection. Acervuli (fruiting bodies) form readily on infected branches, but mature spores are found only in late October or early November, just as the first rains occur. Spores germinate within 24 hours and acervuli continue to produce viable spores until March or April.

Generally, only Quercus agrifolia is affected severely, but Q. lobata and Q. wislizenii, the interior or Sierra live oak, can be infected also. Disease distribution has not been systematically determined, but the disease has been observed from Ukiah to Santa Barbara in the Coast range and over most of the foothills of the westside Sierra Nevada. The conditions that triggered the current outbreak are unknown. Studies have shown, however, that the amount of twig dieback is correlated with the amount of oak pit scale (Asterolecanium minus).

Acervuli are often produced in a ring around individual scale insects. Emerging crawlers may pick up spores as they emerge and disperse, but emergence generally occurs in May, when sporulation is unlikely. Attempted isolations from surface-sterilized scales failed to yield either twig pathogen. It is more likely that either the scale insects or the twig pathogens weaken and predispose the tree to further attack by one or the other organism. It is therefore possible that factors affecting pit scale prevalence may influence disease outbreaks.

IMPACT AND CONTROL. It is still too early to evaluate the long-term impact of these diseases. Locally, some mortality has occurred, and homeowners and park managers in many parts of the State have expressed alarm over the appearance of many oaks. Observations suggest that severely affected trees may continue to decline until they die. Additionally, the disease may reduce acorn crops and lower the usefulness of trees for shade and cover. While the Diplodia branch dieback appears to respond mainly to degrees of drought, the twig dieback outbreak has continued without abatement and is distinctly more severe in wet years.

With increasing emphasis on urban forestry, range management, and wildlife conservation, the need to understand, anticipate, and control disease outbreaks in native oaks becomes increasingly important. Presently, no adequately-tested controls are available, but preliminary data suggest that properly timed application of fungicides, combined with removal of dead branches and control of pit scales, can reduce damage. Control tests have not been evaluated sufficiently to permit specific recommendations.

IMPACT OF TWIG AND BRANCH DIEBACK. So far, few oaks have died from these diseases, but the unsightly appearance of patches of brown leaves in the crowns of normally green oaks has alarmed many Californians. Although no controls are now available, fungicide sprays -- combined with dead branch pruning, scale insect control, and overall good tree care -- may prove effective.

SURVEYS AND EVALUATIONS

DEMONSTRATION THINNING PLOTS IN THE EASTSIDE PINE TYPE ON THE LASSEN NATIONAL FOREST. In 1978-79 the Forest Servive established plots in the eastside pine type to show the effects of thinning on pest-caused tree losses in areas of high tree mortality. The stands chosen were mostly pole-size ponderosa pine mixed with some white fir and incense-cedar, growing on medium to low sites, and ranging in age from 70 to 90 years. Within the demonstration plots, four levels of stocking density -- 40, 55, 70, and 100 percent of normal basal area -- were established to demonstrate the biological and economic alternatives available for management planning. (Normal basal area is the basal area that a stand should have when fully stocked with trees, which, in the demonstration areas, ranges from 185 to 215 sq.ft./ac. depending on site quality.) Six years after thinning, the treatments had reduced mortality from 88 to 100 percent of the level in unthinned stands (see table below).

COMMERICAL TREE MORTALITY (IN TREES/ACRE) BY STOCKING LEVEL (IN % OF NORMAL BASAL AREA) FOR SIX YEARS AFTER THINNING. Commercial trees are 8 inches dbh and larger, with straight boles, yielding a 10-foot log with a 6-inch top. Mountain pine beetle killed most trees.

	RESIDUAL STOCKING AFTER THINNING			
YEAR	**40%**	**55%**	**70%**	**100%**
1980	0.0	0.2	0.2	2.4
1981	0.0	0.0	0.7	2.4
1982	0.0	0.5	0.3	3.6
1983	0.0	0.1	0.8	4.1
1984	0.0	0.0	0.0	1.0
1985	0.0	0.2	0.0	0.6
MEAN	0.0	0.2	0.3	2.4
Range (by year)	0	0-0.5	0-0.8	0.6-4.1
(by treatment)	0	0-1.0	0-4.0	0-8.8
% Mortality Reduction Compared With Normal Basal Area	100.0	91.7	87.5	---

UNITED STATES DEPARTMENT OF AGRICULTURE - FOREST SERVICE — CALIFORNIA FOREST PEST CONTROL ACTION COUNCIL

FOREST PEST DETECTION REPORT

I. FIELD INFORMATION (*See instructions on reverse*)

1. COUNTY:	2. FOREST (FS ONLY):	3. DISTRICT (FS ONLY):
4. LEGAL DESCRIPTION: T._____ R._____ S._____ 5. DATE:	6. LOCATION:	7. LAND OWNERSHIP: 1. FOREST SERVICE ☐ 2. OTHER FEDERAL ☐ 3. STATE ☐ 4. PRIVATE ☐
8. SUSPECTED CAUSE(S) OF INJURY: 1. INSECT ☐ 5. CHEMICAL ☐ 2. DISEASE ☐ 6. MECHANICAL ☐ 3. ANIMAL ☐ 7. WEED ☐ 4. WEATHER ☐ 8. UNKNOWN ☐	9. SIZE(S) OF TREE(S) AFFECTED: 1. SEEDLING ☐ 4. SAWTIMBER ☐ 2. SAPLING ☐ 3. POLE ☐ 5. OVERMATURE ☐	10. PART(S) OF TREE(S) AFFECTED: 1. ROOT ☐ 5. TWIG ☐ 2. BRANCH ☐ 6. FOLIAGE ☐ 3. LEADER ☐ 7. BUD ☐ 4. BOLE ☐ 8. CONE ☐
11. SPECIES AFFECTED:	12. NUMBER AFFECTED:	13. ACRES AFFECTED:

14. INJURY DISTRIBUTION:	15. STATUS OF INJURY:
1. SCATTERED ☐ 2. GROUPED ☐	1. DECREASING ☐ 2. STATIC ☐ 3. INCREASING ☐

16. PLANTATION ? 1. YES ☐ 2. NO ☐	17. STAND COMPOSITION (SPECIES):	18. STAND AGE AND SIZE CLASS:
	19. STAND DENSITY (BASAL AREA):	20. SITE QUALITY:

21. PEST NAMES (IF KNOWN), AND REMARKS (SYMPTOMS AND CONTRIBUTING FACTORS):

22. SAMPLE FORWARDED ? 1. YES ☐ 2. NO ☐	23. ACTION REQUESTED: 1. YOUR INFORMATION ONLY ☐ 2. LAB IDENTIFICATION ☐ 3. FIELD EVALUATION ☐	24. REPORTER'S NAME:	25. REPORTER'S AGENCY:
		26. REPORTER'S ADDRESS, ZIP CODE, & PHONE NO.:	

II. REPLY (*Pest Management Use*)

27. RESPONSE:	31. FILE NO.

28. REPORT NUMBER:	29. DATE:	30. EXAMINER'S SIGNATURE:

R5-3400-1 (Rev. 2/82)

FOREST PEST DETECTION REPORT FORM. The Conditions Report was compiled from information provided by Federal, State, and private forest land managers and individuals. Copies of this form are available at local offices of the Forest Service or the California Department of Forestry.

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