

FOREST PEST CONDITIONS IN CALIFORNIA-1965

**A PUBLICATION OF
THE CALIFORNIA FOREST PEST CONTROL ACTION COUNCIL**

THE CALIFORNIA FOREST PEST CONTROL ACTION COUNCIL was formed in 1951 in recognition of the need for close cooperation among land managers concerned with forest pest problems. Primarily an advisory and coordinating group, the Council sponsors a Statewide cooperative forest pest detection survey; publishes an annual report of forest pest conditions; studies, endorses, and supports desirable pest control actions; reviews control needs and programs; and provides a forum for the exchange of pest control information. The California State Board of Forestry has designated the Council as its official advisory group for forest insect, disease and animal problems. The Council comprises the following organizations:

Boyce Thompson Institute
California Forest Protective Association
California Redwood Association
State of California: Departments of Agriculture,
Conservation, Fish and Game, Parks and
Recreation, and the University of California
U. S. Department of Agriculture, Forest Service
U. S. Department of the Interior, Bureaus of Indian
Affairs, Land Management, Sport Fisheries and
Wildlife, and the National Park Service
Western Wood Products Association

This report, FOREST PEST CONDITIONS IN CALIFORNIA - 1965, was based largely on information provided by the California Cooperative Forest Pest Detection Survey (in 1965, 499 reports were received: 228 for insects, 212 for diseases, and 59 for animal pest damage), and data gathered by the Forest Service Disease Survey. The latter is a systematic inventory of forest diseases on a Statewide basis employing randomly selected, temporary plots on which all trees are examined closely by forest pathologists. To date 734 plots supporting 18,350 trees have been examined.

The report was prepared by the Forest Service and the Bureau of Sport Fisheries and Wildlife in cooperation with other member organizations of the Council; it was printed and distributed by the California Division of Forestry.

THE COVER PHOTO: Fully grown tussock moth larvae. Voracious feeders, these 1-inch insects can quickly strip host trees of all foliage when populations reach epidemic levels.

HIGHLIGHTS OF PEST CONDITIONS-1965

STATUS OF INSECT PESTS. Aerial spraying and natural control factors, particularly a virus disease, ended the worst outbreak of the Douglas-fir tussock moth ever recorded in California.

Two defoliating insects were discovered that had never before occurred at damaging levels in California. Needle miners were active on white fir in parts of the Sierra National Forest and Yosemite and Kings Canyon National Parks. Phantom hemlock loopers defoliated pole-sized Douglas-firs in four infestations south of McCloud, Siskiyou County.

Bark beetle activity increased from the low levels of 1964. Extensive surveys in the north coast area revealed Douglas-fir bark beetles infesting all of the concentrations of down or damaged Douglas-fir remaining after the storms of 1964-1965. Western pine beetle populations also increased in ponderosa pine along streams that were flooded during the preceding winter.

Increasing numbers of Jeffrey pines were killed by the Jeffrey pine beetle at widely separated locations in northern California. Mountain pine beetles killed many lodgepole pines and damaged ponderosa and sugar pine stands. California flatheaded borers killed Jeffrey pines locally in southern California. Losses from the fir engraver beetle and pine engraver beetles remained at a low level in 1965.

The white-fir sawfly and the Douglas-fir gall midge continued to damage high-value Christmas tree plantations in northern California.

STATUS OF DISEASE PESTS. Forest disease conditions did not change greatly in 1965; new locations reported for some diseases indicate better detection and reporting rather than unusual spread.

The root diseases, Armillaria mellea and Fomes annosus, were reported at many new locations. During the year many small groups of recently killed pine and fir trees were examined closely for root diseases. Although most of the trees were infested with bark beetles, and presumably had been killed by those insects, armillaria and annosus root diseases often were present at damaging levels. Repeated observations of this kind in recent years suggest the possibility that root diseases frequently set the stage for subsequent insect outbreaks. University of California scientists are investigating that possibility. Annosus root disease received increased attention as a result of its appearance throughout the State in plantations, in thinned young-growth stands, in campgrounds, in timber-sale areas, in seed production areas, as well as at the Institute of Forest Genetics where it continues to be a problem.

A continuing program of soil fumigation held seedling losses in forest tree nurseries to a low level in 1965. During the year only three instances of these diseases were reported.

Early fall frosts, severe winter weather, late spring frosts, and hail damaged and killed many young trees, particularly in plantations.

STATUS OF ANIMAL PESTS. The 1965 animal damage report was compiled largely from data supplied by private and public landowners who responded to a questionnaire distributed by the Animal Damage Committee.

Deer damage to conifer regeneration, elk depredation along the north coast, and porcupine injury to natural and planted seedlings were the major animal problems in 1965. Tree squirrel damage decreased, while damage by rabbits and pocket gophers remained at the previously reported levels.

FOREST PEST CONTROL IN 1965. During a 10-day period in June and July, landowners in northeastern California cooperated with several state and Federal agencies in suppressing the worst tussock moth epidemic in California's history.

Insect detection and evaluation duties were reassigned when the California Division of Forestry assumed responsibility for this service for a large portion of the State.

The Forest Service, announcing deferment of ribes eradication on the Eldorado and Stanislaus National Forests, called attention to the decreasing threat of blister rust in the central and southern Sierra Nevada.

STATUS OF INSECT PESTS

DOUGLAS-FIR TUSSOCK MOTH, Hemerocampa pseudotsugata. The Douglas-fir tussock moth epidemic, which in 1964 caused severe damage in white fir stands totaling nearly 80,000 acres, declined to a low level in 1965. Applied and natural control factors, including a virus disease, were responsible for the dramatic reduction in the populations of this pest.

By late fall only one infestation was known to be active in the State; discovered in late October, this 600-acre outbreak along the Corral Creek Road in northern Modoc County was not sprayed. An egg-mass survey was made to determine the virus level in the population, but by the end of the year, laboratory findings were not yet available.

A FIR NEEDLE MINER, Epinotia meritana. A 55,000-acre infestation of this small moth caused local damage in red fir stands in Yosemite and Kings Canyon National Parks and in Sierra National Forest. Since outbreaks of this needle miner on red fir have not been observed in California previously, the Pacific Southwest Forest and Range Experiment Station is studying the biology and habits of the insect.

Death of infested trees is not an immediate threat because the moth does not feed on the current year's foliage; therefore, damage to the affected stands will be determined largely by the persistence of the outbreak.

A PHANTOM HEMLOCK LOOPER, Neptia sp. near phantasmaria. Infestations in Douglas-fir have been discovered at Hawkins Creek, Beartrap Creek, Deadlum Creek, and Trough Creek in Shasta and Siskiyou Counties south of McCloud. Prior to these discoveries, the moth had been collected only once in California. In the current infestation, some Douglas-fir saplings were almost completely defoliated, while others were less severely damaged.

Insect disease specialists at the Forest Insect Disease Laboratory, Corvallis, Oregon, isolated a fungus and virus infection in specimens from the Nepytia sp. populations at Beartrap and Hawkins Creeks. If conditions are favorable, these disease organisms may decimate the population before the stand is severely damaged.

WHITE-FIR SAWFLY, Neodiprion abietis. For the third consecutive year, this sawfly was active in central and northern California, particularly at the following locations: Chalk Mountain, Shasta County; Big Valley Mountain, Ash Creek, Knox Mountain, and Cedar Pass, Modoc County; Diamond Mountain, Lassen County; Smith Peak, Freeman Creek, Crocker Mountain, and Bagley Pass, Plumas County. The greatest economic loss at these locations was in stands managed for Christmas trees.

DOUGLAS-FIR BEETLE, Dendroctonus pseudotsugae. In north-coastal California, populations increased in Douglas-firs damaged or uprooted during the floods of December 1964 and January 1965. Many logs were salvaged, but some Douglas-firs uprooted by slides or wind, still remain to provide breeding material for future infestations. The storm-damaged forests were surveyed in August and September. Results on one-tenth of the sites examined showed a high potential for outbreaks in the summer of 1966; on one-half of the sites, the potential was judged to be moderate.

WESTERN PINE BEETLE, Dendroctonus brevicomis. Losses remained tolerable in most of central and northern California. The most serious infestations were the following: Kelly Cabin on the Mendocino National Forest; Indian Valley near Hayfork, Trinity County; Slate Mountain, Plumas County, and Poso and Calf Creek in Kern County. The infestation in the McCloud Flat area declined in 1965.

Other infestations in Siskiyou and Trinity Counties were associated with flood damage. There, beetles attacked ponderosa pines damaged by thick deposits of silt, and eventually attacked undamaged trees higher on the stream banks. Typical of these infestations were those at Coffee Creek, Boulder Creek and the South Fork of the Salmon River. Snow-breakage contributed to the outbreak on 1,000 acres of the Kelly Cabin infestation.

In southern California, infestations were still active at Lake Arrowhead, San Bernardino County, and at Ranger Peak, Santa Barbara County; and bark beetles continued to kill trees in untreated infestations at Palomar Mountain and at Julian.

JEFFREY PINE BEETLE, Dendroctonus ponderosae (formerly D. jeffreyi). Infestations were detected in the late summer and fall of 1965 at the following locations: Rock Creek, Mud Creek, Benner Creek, High Bridge, and Willow Creek in Plumas County north of Chester; Indian-Pierce-Willow Creek and Hungry Creek, Plumas National Forest, Raker Bench on the north boundary of Lassen Volcanic National Park, Lassen County; near Lake Tahoe at Lookout Mountain and Brockway, Placer County. Older infestations continued active at Hertz Meadow in the Sierra National Forest, Monarch Peak in the Inyo National Forest, and in Yosemite National Park.

In southern California, direct control was begun in infestations at Big Bear Lake, San Bernardino County, and in the Indiana Summit Natural Area, Mono County.

MOUNTAIN PINE BEETLE, Dendroctonus ponderosae (formerly D. mon-
ticolae). Infestations in lodgepole pine were active at the following loca-
tions, several of which are of special importance because they are in
high-use recreation areas: Silver Lake, Lassen County; Warner Valley
and adjacent drainages, Plumas County; Prosser Creek, Nevada County;
Wright's Lake, El Dorado County; Reds Meadow, Mono County. Most
of the infestations were located in creek bottoms or damp meadows, a
factor that may have contributed to the outbreaks, since poor soil drain-
age tends to lower tree vigor, making the trees more susceptible to
insect attack.

Young ponderosa pines continued to be killed at Joseph Creek, Modoc
County. Occasional sugar pines throughout the State were killed by this
insect in 1965.

FIR ENGRAVER BEETLE, Scolytus ventralis. Detection reports and
aerial surveys showed scattered endemic losses in 1965.

PINE ENGRAVER BEETLE, Ips spp. At several locations, buildups
occurred in slash and storm-damaged trees, but these did not seriously
damage standing trees. Outbreaks at McCloud Flat in Siskiyou County
subsided during the summer, and at Kelly Cabin, Lake County, some
damage occurred in connection with that caused by western pine beetles.
Aerial surveys revealed scattered top killing throughout the State, partic-
ularly in the Sierra Nevada foothills north of Placerville at the 4,000-foot
level, and in the southern portion of the Stanislaus National Forest near
Groveland.

At some locations, ips killed lodgepole pines in stands also infested with
mountain pine beetle.

RED TURPENTINE BEETLE, Dendroctonus valens. Infested knobcone
pines were reported in one of the campground units near the Whiskeytown
reservoir, Shasta County. Elsewhere, red turpentine beetles were active
only in conjunction with infestations of the western pine beetle, the
Jeffrey pine beetle, and the mountain pine beetle.

CALIFORNIA FLATHEADED BORER, Melanophila californica. Serious
tree killing took place only in Garner Valley, Riverside County; else-
where in the State the borer killed few trees.

LODGEPOLE NEEDLE MINER, Recurvaria milleri. Populations con-
tinued to decline in Yosemite National Park, but remained at a high level
in Mono County.

INSECTS OF YOUNG TREES. A variety of insects attacked plantations
and young natural stands in 1965. The pine needle-sheath miner,

Zelleria haimbachi, was common in plantations and required suppressive action at the Institute of Forest Genetics, Placerville. Other insects were active in young trees at several locations: in Douglas-fir, the Douglas-fir gall midge, Contarinia pseudotsugae; and, in pine, the reproduction weevil, Cylindrocopturus eatoni, the pine tip moth, Rhyacionia zozana, and the gouty pitch midge, Retinodiplosis inopis.

CONE AND SEED INSECTS. Sugar pine beetles, Conophthorus lambertianae destroyed much of the cone crop on the Klamath National Forest and throughout most of the Sierra Nevada Range; at some locations, 90 percent of the sugar pine cone crop was destroyed.

Serious seed losses in Sierra Nevada forests also were caused by the ponderosa pine cone beetle, Conophthorus ponderosae, and by the pine seed worm, Laspeyresia miscatata, which at some locations destroyed twice as much seed as in 1964.

Widespread damage to the cones of white and red fir caused by Barbara siskiyouana was reported from the Lassen, Plumas, and Eldorado National Forests.

OTHER INSECTS. Tiger moths, Halisidota argentata, were unusually abundant on white fir at Hermit Butte, Modoc County, on Douglas-fir at Titus Ridge, Siskiyou County, and at Elk Mountain, Lake County.

Rare sawflies of the family Xyelidae, and the black-headed budworm, Acleris gloverana, were collected from white fir at Knox Mountain.

Larvae of the sugar pine tortrix, Choristoneura lambertiana, destroyed young cones on rust-resistant sugar pines near Sawyers Bar, Siskiyou County.

The epidemic of the sagebrush defoliator, Aroga websteri, in northern California ended in 1965.

Moderate infestations of tent caterpillars, Malacosoma pluvialis, were reported on bitterbrush near Adin and Fort Bidwell, Modoc County, and near Susanville, Lassen County. Epidemic populations of another species, M. constricta, continued to be found at Richie Creek, San Diego County, and at San Sevine Flats, San Bernardino County.

Fall webworm populations, Hypantia cunea, remained epidemic on madrone along the Klamath River, but were less damaging in this, the fourth year of activity.

TABLE 1
INSECT CONTROL ACTIONS RECOMMENDED BY THE COUNCIL

INFESTATION AREA	ESTIMATED ACREAGE	COUNTY	INSECT	HOST	RECOMMENDED ACTION
BARK BEETLES					
All National Forests, State Forests, Private Timber Land Managers Bureau of Land Management Bureau of Indian Affairs		Statewide	Db,Dm,Dj,Sv,Dp, Dv,Mc	PP,JP,SP,WF, DF,LP	Log infested trees, treat with chemical sprays where warranted, salvage windthrow 1965 storms
Bass Lake	9,000	Madera	Db,Ips,Dm	PP,SP	Maintenance control
Hume Lake-Indian Creek	2,000	Fresno	Db,Dm	PP,SP	Log, fall and spray
Capinero	300	Tulare	Db	PP	Log, fall and spray
Joseph Creek	1,000	Modoc	Dm	PP	Thinning, surveillance
Reds Meadow	1,000	Mono	Dm	LP	Treat or protective spray
South Warners	12,000	Modoc	Db,Dm,Dj	PP,SP,JP	Log infested trees
Willow Cr., Manzanita, Bond Valley	4,600	Plumas	Dm,Dj	LP,JP	Log or spray infested trees
Saddle Camp	1,000	Tehama	Db	PP	Log infested trees
Hoopa	10,000	Humboldt	Dp	DF	Salvage windthrow
Indiana Summit	5,000	Mono	Dj	JP	Fall and spray
DEFOLIATORS					
Diamond Mt. Cooperative	12,300	Lassen, Plumas	Hp	WF	Surveillance
Corral Cr. Road	600	Modoc	Hp	WF	Evaluation
Fredonyer Peak - B.L.M.	1,600	Lassen	Hp	WF	Surveillance
Knox Mt., Cedar Pass	47,000	Modoc	Hp	WF	Surveillance
Roney Flats	2,280	Modoc	Hp	WF	Surveillance
Squaw Valley, Trough Cr.	500	Siskiyou	Np	DF	Surveillance
Deadlum, Hawkins and Beartrap	500	Shasta	Np	DF	Surveillance
Chalk Mt.	5,000	Shasta	Na	WF	Evaluation
Military Pass, Black Fox	13,000	Siskiyou	Na	WF	Surveillance
Warner Mts.	2,000	Modoc	Na	WF	Surveillance
Big Valley Mt.	2,000	Lassen	Na	WF	Evaluation
Taylor Meadows-Bartola	7,500	Tulare, Kern	Cp	JP	Surveillance
Indiana Summit	1,000	Mono	Cp	JP	Surveillance
Crooked Meadow	10	Mono	Rm	LP	Surveillance
Sentinel Meadows	2,200	Mono	Rm	LP	Surveillance
Sierra N.F., Yosemite N.P. and Sequoia and Kings N.P.	55,000	Madera, Mariposa	Em	RF	Surveillance and research
PLANTATIONS AND EXPERIMENTAL AREAS					
Institute of Forest Genetics Plantations Seed Production Areas	2,000	El Dorado Statewide Northern California	Db,Ips Ce,Misc. C&S	PP PP,JP,SP,DF PP	Treat infested trees Detection and evaluation as needed Evaluation, research
STATE AND NATIONAL PARKS					
Cuyamaca Rancho State Park	8,000	San Diego	Mc,Db	JP,PP	Maintenance control
Lassen Volcanic National Park	3,000	Shasta, Lassen	Dj,Db,Dm	JP,PP,SP,LP	Maintenance control
San Jacinto State Park	700	Riverside	Db,Ips,Mc	CP,PP,JP	Maintenance control
Sequoia and Kings Canyon	8,500	Fresno	Db,Dm	PP,SP	Maintenance control
Sequoia and Kings Canyon	400	Tulare	Rm	LP	Surveillance
Yosemite National Park	57,700	Mariposa, Tuolumne	Db,Dm,Dj	PP,SP,JP,LP	Maintenance control
Yosemite National Park	5,000	Tuolumne	Rm	LP	Surveillance
Anza Borrego	500	San Diego	Db,Mc	CP	Maintenance control
SOUTHERN CALIFORNIA FOREST RECREATION AREAS					
Arrowhead-Crestline	47,000	San Bernardino	Dm,Db,Ips,Dj	PP,DF,JP	San.-salvage and maintenance control
Arroyo-Seco	3,000	Los Angeles	Db,Ips,Mc	PP,CP,JP	San.-salvage and maintenance control
Agua Tibia Wild Area	400	San Diego	Db,Ips	CP	Treat infested trees
Big Bear Valley	8,800	San Bernardino	Dj,Ips,Mc,Sv	JP,WF	Log and maint. control according to plan
Corte Madera	1,600	San Diego	Db,Ips,Mc,Dv	CP,JP,PP	Maint. control according to plan
Idyllwild-San Jacinto	37,000	Riverside	Mc,Db,Ips,Dm	PP,CP,JP	San.-salvage and maintenance control
Laguna Mt.	9,700	San Diego	Db,Mc	CP,JP	Maint. control according to plan
Lost Valley	4,000	San Diego	Db,Ips	CP	Maint. control according to plan
Mt. Baldy District	1,500	Los Angeles	Ips,Dj,Dm,Mc,Db	PP,JP,CP	San.-salvage and maintenance control
Mt. Pinos District	7,900	Ventura, Kern	Mc,Ips	JP	San.-salvage and maintenance control
Palomar Mt.	6,600	San Diego	Db,Sv	CP,WF	Maintenance control
San Geronimo District	25,000	San Bernardino	Db,Dj,Ips	PP,JP,CP	San.-salvage and maintenance control
Ranger Peak-Figueroa Mt.	700	Santa Barbara	Db,Ips,Dv	PP,CP	Maintenance control according to plan
Valyermo	14,600	Los Angeles	Mc,Ips	JP,WF	San.-salvage and maintenance control
Wrightwood	2,000	San Bernardino	Mc,Ips	JP	Maintenance control
Julian	5,000	San Diego	Db,Ips	CP	Maintenance control

Abbreviations Used in Tables

INSECTS			HOST	
Ce - Pine reproduction weevil	Dp - Douglas-fir beetle	Na - White-fir sawfly	CP - Coulter pine	RF - Red fir
CP - Pandora moth	Dv - Red turpentine beetle	Np - Phantom hemlock looper	DF - Douglas-fir	SP - Sugar pine
C&S - Cone and seed insects	Em - Fir needle miner	Rm - Lodgepole needle miner	JP - Jeffrey pine	WF - White fir
Db - Western pine beetle	Hp - Douglas-fir tussock moth	Sv - Fir engraver	KP - Knobcone pine	
Dj - Jeffrey pine beetle	Ips - Pine ips		LP - Lodgepole pine	
Dm - Mountain pine beetle	Mc - California flatheaded borer		PP - Ponderosa pine	

California oak moths, Phryganidia californica, defoliated oaks in several Bay Area Counties, and at San Sevaine Flats in southern California in the most damaging outbreak of this insect in many years.

The pandora moth infestation continued at a low level in Tulare and Kern Counties, but increased to an easily detectable level at Indiana Natural Summit Area, Mono County.

TABLE 2 - FOREST DISEASE SURVEY DATA 1958 - 1965

TREES / SPECIES	TOTAL SAMPLE		DISEASE BY NUMBER OF PLOTS AND NUMBER OF TREES																
			INWARMISTLE	TREE MISTLETOES	ELYPHOTOPIA DEFORMANS	OTHER NEEDLE CASTS	UNCLASSIFIED POLIAGE	CECONIUM RITIDIA	CECONIOPHORIUM LIPICEDRI	MELAMPSCOEELLA CARY.	PERIDERMIUM HARNESII	PERIDERMIUM STALACTIFORME	GYMOSPORA ABETIS	UNCLASSIFIED LIMB CANER	ECHINOCANTHUM TINCTORIUM	PORES PINI	POLYPORUS SCHWEINITZII	X-DISEASE	UNCLASSIFIED HEART ROT
	UNIT	NO.																	
Ponderosa Pine	Plot	409	92		90	143	11				10					15		4	96
	Trees	4394	439		332	484	34				17					23		27	166
Jeffrey Pine	Plot	168	25		41	45	4				4	1							28
	Trees	1578	109		176	129	5				10	1							55
Sugar Pine	Plot	274	59			19	11	11								4	1		50
	Trees	968	99			24	17	17								4	1		63
Lodgepole Pine	Plot	71	20		1	4	3				23			20			1		25
	Trees	834	218		1	17	9				69			57			1		65
Incense-Cedar	Plot	295		65		2			255										113
	Trees	1570		129		3			1103										461
White Fir	Plot	376	108	25		42	36			6			143	17	24	3	1		235
	Trees	3868	650	63		90	123			10			517	28	37	4	1		722
Red Fir	Plot	103	47			2	5			14			90	6	5				59
	Trees	1136	412			2	5			34			205	18	7				190
Douglas-Fir	Plot	276	12			7	13							67		105	26		132
	Trees	3075	45			25	24							284		266	34		341
Juniper	Plot	46		3		1	5												12
	Trees	195		6		3	15												19
Redwood	Plot	22																	12
	Trees	386																	171
Knobcone Pine	Plot	10	8		1	2					1								1
	Trees	57	33		1	5					7								1
Western Hemlock	Plot	5	1																4
	Trees	33	5																6
Western White Pine	Plot	25				3		2											8
	Trees	87				8		3											8
Digger Pine	Plot	6	1			1					1								
	Trees	13	1			4					1								

1/ Other tree species, apparently free of disease, occurred on the plots in the following numbers: big cone Douglas-fir (18), big tree (19), Coulter pine (54), white bark pine (2), grand fir (1), Sitka spruce (7), mountain hemlock (20), Port Orford Cedar (19), piñon pine (13), and Pacific Yew (3).

STATUS OF DISEASES

ROOT DISEASES. In 1965, new centers of Fomes annosus and Armillaria mellea were found throughout the State.

Fomes annosus. Many new infection centers were reported where light to heavy cutting had occurred three or more years before. Insect attacks were linked with the disease in many of these centers, while in others, trees had been killed by the disease alone. New infection centers were found as follows: 21 appeared since the last logging on Alamo Mountain, Ventura County; seven appeared during the spring at the Cal Mountain Seed Production Area, Lassen County; one was found at Table Mountain Campground on the Angeles National Forest, Los Angeles County; and a single-leaf pinyon pine, growing near an infected Jeffrey pine stump, was killed on Tecuya Ridge in western Kern County.

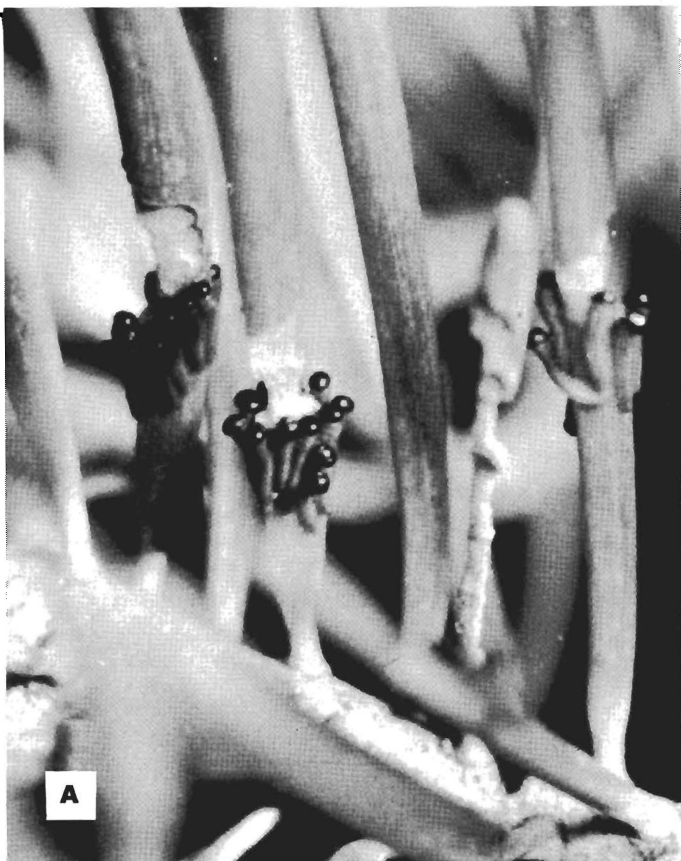
The disease was first reported on common sagebrush, Artemisia tridentata, when dying bushes were found growing near an infected ponderosa pine stump at Blacks Mountain. At another location, young trees surrounding infected white fir stumps were also killed by the disease.

Armillaria mellea. Armillaria root disease is common throughout the State, and plays a particularly important role in killing true firs. In 1965 groups of dead firs throughout the State were examined; most were found to be infected with the disease. Near Eagle Lake in Lassen County many groups of young white firs growing in overstocked stands were killed or severely weakened by the disease.

Although less of a problem in pines, armillaria root disease on two occasions was found to be present in recently killed groups of Jeffrey pines. In one such group, a 36-inch tree had thick felts of mycelium under the bark and abundant rhizomorphs, indicating that the disease was present long before the insect attack. A Sierra redwood growing in Inaja Memorial Park also was killed by the disease.

Verticicladiella wagenerii. Two of the known centers, when carefully examined, proved to be more extensive than previously reported; no new centers were found in 1965.

NURSERY DISEASES. Seedling loss in forest-tree nurseries was negligible in 1965: at the Humboldt Nursery a Phomopsis killed a few trees, and Rosellinia herpotrichioides, attacking needles, and to a lesser extent stems, killed and damaged a few more; at the Parlin Fork Nursery an unidentified disease produced cankers on the lower stems of Douglas-fir seedlings; and at the Ben Lomond Nursery some tip die-back was reported on Coulter pine.



INSECT PESTS

Defoliators injure trees by reducing the food-producing capacity of host trees. Illustrated are (A) white-fir sawfly larvae destroying the needles of a white fir tree--note the shiny, black heads of the early-instar larvae and the partially consumed needle in the foreground; and (B) a pandora moth larvae feeding on Jeffrey pine foliage. As with other defoliators, trees attacked by these insects often recover unless the attack is repeated for several years.



ANIMAL DAMAGE

The damage done by deer browsing is illustrated dramatically by these close-cropped white firs. Except for the continuing destruction of new growth these trees would be as large as some of those in the background.



DISEASE PESTS

An airborne disease, *Rosselinia herpotrichioides*, attacked Douglas-fir seedlings at the Humboldt Nursery in the first recorded occurrence of this fungus in California. The shiny, spherical objects are fruiting structures. The seedling in photo A is enlarged about three times; in photo B the enlargement is about ten times actual size.



INSECT SUPPRESSION

All major insect-suppression projects now include monitoring systems to discover undesirable effects on associated wildlife. Here a State biologist collects trout to measure the DDT residue attributable to the 1965 tussock moth suppression project. The fish are stunned by an electric shocking device he carries, and caught with the net attached to the pole in his right hand. Such collections were only a part of the elaborate monitoring system that involved many State and Federal scientists.



NEEDLE DISEASES. Many needle diseases were reported but none caused much damage; Rhabdocline pseudotsugae on Douglas-fir needles was reported from the Middle Fork of the Tuolumne River north to western Siskiyou County; Elytroderma deformans was reported on ponderosa and Jeffrey pine, but no new areas of severe damage were discovered; Hypodermella arcuata damaged some sugar pines on the Klamath National Forest, and was also reported on sugar pine near Bartle on the Shasta-Trinity National Forest and near Strawberry in Tuolumne County. Other needle diseases were reported on pines: Coryneum cinereum, Lophodermium pinicolum, Lophodermina nitens, Hypodermella medusa, H. montana, and Hypoderma pini. Brown-felt blight, a snow mold caused by Neopeckia coulteri, was common on small lodgepole pine at higher elevations.

Many needle diseases, all at endemic levels, were reported on red and white fir. One of the most common was brown-felt blight caused by Herpotrichia nigra; others were Hypoderma robustum, Stegopezizella balsameae, Hypodermella abietis-concoloris, and an undetermined species of Cenangium. At higher elevations, snow mold caused by Phacidium infestans var. abietis was widespread but at low intensities.

DWARFMISTLETOE. The known southern range of Douglas-fir dwarfmistletoe in California was extended when this species of the parasite was discovered for the first time in the southern part of the Trinity National Forest. The dwarfmistletoe of foxtail pine, Pinus balfouriana, that was reported in 1964 was identified as Arceuthobium campylopodium forma cyanocarpum. Overall, the dwarfmistletoe situation as summarized in Table 3 has not changed in recent years.

RUSTS ON CONIFERS. Weather conditions during the spring and summer of 1965 were not favorable for the spread and intensification of most rusts. White pine blister rust spread to ribes only within a few hundred feet from infected pines. Pinyon rust on ribes was not abundant, although it was more common than in 1964. No new cankers on pine were found in the Comandra rust infection center at the Long Valley Plantation; the alternate host, bastard toad flax, at Long Valley was heavily infected when examined in early October. Chickweed (Stellaria sp.), the alternate host of the rust known as yellow witches'-broom, Melampsorella caryophyllacearum, was lightly infected at several locations in Fresno and Shasta Counties.

Although a minor pest with regard to timber production, western gall rust, Peridermium harknessii, can be severely damaging where recreational or aesthetic values are involved. Several infection centers in young-growth stands on the Plumas National Forest were studied in 1965. In all, 4,435 ponderosa pines ranging in height from six inches to

15 feet were examined; 36 percent were infected with the disease.

Three other rusts were reported: Pucciniastrum goeppertianum on needles of white fir; Coleosporium madae on needles of Monterey pine; and Uredinopsis pteridis, a needle rust of true firs, which was common along Concow Creek, Butte County, on both white fir and on the alternate host, bracken fern.

CYTOSPORA CANCKER. The status of Cytospora canker disease has changed little since 1964. A common pest in most true fir stands of the State, the disease again showed its greatest activity in the central Sierra Nevada and near Callahan in southwest Siskiyou County. As a result of average and above average precipitation that has returned trees to normal vigor in most parts of the State, activity of this weak parasite should subside.

NONINFECTIOUS DISEASES. Reports of weather-damaged trees were received from as far south as San Bernardino County, and it is probable that damage from this source occurred throughout the State. The unusual sequence of conditions causing this condition is as follows: first, hot dry weather in the summer of 1964 terminated tree growth prematurely, then an inch or more of rainfall during late August produced a second flush of growth in many areas, especially in pine plantations. As a result, some trees were still growing and succulent at the time of a late-October frost. At that time, the temperature at one location dropped from a high of 75 degrees to a low of 28 degrees and then rose to 86 degrees the following day. Where temperature variations were the greatest, new leaders and much of the new growth on the limbs were damaged or killed, and much of the older foliage, then in a turgid condition after the second-growth period, was damaged also. Subsequently, some of these same damaged trees were subjected to extremely low temperatures during the winter of 1964-1965, and to a late frost after growth had started in the spring of 1965. Many trees that could have withstood any one of these conditions succumbed to the combination of them.

Hail damaged young trees in parts of Lassen County.

Many reports of chemical damage were received in 1965: some concerned chemicals used along highways in snow regions; some involved fertilizers and weedkillers used near homes; and some resulted from brush suppression projects in forest plantations. One plantation that was sprayed for brush control in mid-September suffered severe damage from a combination of causes, any one of which would have had little effect on the trees: first, the herbicide that was used was strong enough to kill the brush, but was also strong enough to shock young trees; next, spraying was followed by a strong, drying wind that lasted two days; finally,

there was a drop in temperature to 16 degrees. Together, these chemical and weather conditions caused severe defoliation in the plantation.

The chlorotic decline of ponderosa pine in southern California, attributed largely to air pollution, continued with no apparent change. Air pollution is suspected as a possible cause of foliage damage to some Monterey pines growing in the San Francisco Bay Area.

MISCELLANEOUS DISEASES. Most of the leaf and twig diseases of quaking aspen were comparatively inactive in 1965. Atropellis pinicola was reported on sugar pine limbs at many locations. Schleroderris abieticola killed limbs and young stems of white fir on Kinsey Ridge, Humboldt County. Douglas-fir phomopsis canker, Phomopsis lokoyae, was reported from western Shasta and Siskiyou Counties. A fungus, Cenangium furruginosum (C. abietis), found at several locations on dead and dying twigs of sugar pine, white fir, and ponderosa pine, showed evidence of being a weak parasite.

Diplodia pinea killed twigs of Monterey pine at the Jackson State Forest. At the Ramshorn Public Camp near Downieville, an estimated 150 ponderosa pines and 25 Douglas-firs bore sporophores of the heart rot caused by Fomes pini. All common heart rots were reported again in 1965.

UNKNOWN DISEASES. The unidentified disease prevalent on big leaf maple in 1964 was found less frequently in 1965, and at less damaging levels.

TABLE 3
DWARFMISTLETOE INFECTION, 1958 - 1965

Species	Total Plots	Infected Plots	Percent	Total Trees	Infected Trees	Percent
			Plots Infected			Trees Infected
PP	405	92	22.7	4,380	439	10.0
JP	168	25	14.9	1,578	109	6.9
SP	273	59	21.6	967	99	10.2
LP	71	20	28.2	834	218	26.1
WF	376	108	28.7	3,918	650	16.6
RF	103	47	45.6	1,136	412	36.3
DF	262	12	4.6	2,785	45	1.6

STATUS OF ANIMAL PESTS

Although animal-caused damage is a serious problem in parts of the State, comparatively few instances of animal damage have been reported through the channels of the Cooperative Pest Detection Survey.

In 1965, the Animal Damage Committee, in an attempt to augment the information available through the Cooperative Survey, instituted a program of mailing animal damage questionnaires to forest land managers throughout the State. The first year response was encouraging, and the information provided by the questionnaires is the primary source of this summary of animal damage conditions.

DEER. Damage to conifer regeneration by deer was the worst and most widespread animal-caused reforestation problem in 1965. Nearly every private or public forest reported some loss. Most reports indicated the damage was increasing or remaining at a high level.

ELK. Elk damaged young Douglas-firs and redwoods along the north coast in Humboldt County. Special elk hunts conducted by the Department of Fish and Game in 1963 and 1964 reduced the amount of damage.

PORCUPINE. Reports indicated that damage to natural stands, as well as to planted trees, increased slightly in 1965. Porcupines commonly attacked ponderosa, Jeffrey and sugar pines, and occasionally injured other tree species also.

RABBITS. The amount of damage appeared to be the same as in 1964. Rabbit damage was most severe along the Mendocino Mountain Range, but was of minor importance in Shasta and Siskiyou Counties and on the Cleveland and San Bernardino National Forests. Species most frequently damaged were ponderosa pine, Monterey pine, and Douglas-fir.

POCKET GOPHERS. Damage to plantations, primarily ponderosa pine, remained constant. The Shasta-Trinity National Forest and the northeastern part of the State were the locations of most severe damage.

TREE SQUIRRELS. Damage prevalent in the coastal redwood areas in past years appeared to have decreased in 1965. However, bark stripping by squirrels was more common in the southern Sierra. Ponderosa, Jeffrey, Coulter, lodgepole and sugar pines were the principal trees attacked.

BLACK BEAR. Damage occurred to redwood, Douglas-fir, bishop pine, and hemlock of the 15- to 45-year-age class in Humboldt and Del Norte Counties. Of the three reports of bear damage received, one indicated an increase, one no change, and one a decrease in bear damage.

BEAVER. Six reports from various parts of the State indicated attacks of low-grade hardwoods, lodgepole pines, Douglas-fir, white fir, and redwoods; damage remained constant and usually was insignificant.

CATTLE AND SHEEP. Range stock damaged ponderosa pine plantations on the Klamath and Shasta-Trinity National Forests. Construction of drift fences reduced cow damage significantly on the Klamath National Forest.

MICE, MOUNTAIN BEAVER, WOODRATS AND BIRDS. Reports indicated no unusual damage.

PEST CONTROL IN CALIFORNIA

Forest pest control in California involves detection, evaluation, and prevention as well as suppression. In 1965 there were important developments in each category.

DETECTION AND EVALUATION. The State of California and the Forest Service entered a cooperative agreement under which the California Division of Forestry assumed responsibility for insect detection and evaluation in all of the State fire-pay area except for southern California. The new State program, which is jointly financed by the State and the Federal Government, is directed by a full-time forest entomologist whose headquarters is in Sacramento. The Forest Service remains responsible for insect detection and evaluation on all lands not covered by the State, as well as for disease detection and evaluation on lands of all ownership. At the same time, the Forest Service and the California Division of Forestry entered a working agreement with the California Department of Agriculture to promote greater coordination in detecting insect and disease pests which would attack both agriculture and forest crops.

Detection reports for lands serviced by the State will be sent to the State Forester, Department of Conservation, Division of Forestry, Sacramento, California 95814, and all others, as in the past, will be sent to the Regional Forester, 630 Sansome Street, San Francisco, California 94111.

The Cooperative Forest Pest Detection Survey is the backbone of successful detection and evaluation activities in California; a summary of reports received is given on the inside of the front cover.

Animal Damage Survey. Results of a special survey of animal damage sponsored by the Council was published in 1965. The survey, in which private, State and Federal foresters cooperated, showed that several animals are responsible for significant amounts of damage to forest trees. Also published by the Council in 1965 was Deer Enclosures - An Aid to Measure Forest Damage, a pamphlet giving instructions for constructing deer-proof fencing on forest lands.

PREVENTION. Prevention of root-disease outbreaks in thinned young-growth pine stands was the subject of an administrative study begun in 1965 by the Pacific Southwest Forest and Range Experiment Station and the California Region of the Forest Service. Several hundred stumps such as might result from thinning or dwarfmistletoe suppression were treated with various fungicides, and later were inoculated with Fomes annosus. Samples will be taken in the spring of 1966 to determine the merits of the different treatments.

SUPPRESSION. Industrial foresters and private landowners, together with representatives of several State and Federal agencies, cooperated in a large-scale tussock moth suppression project. The insect outbreak, which was reported in some detail in "Forest Pest Conditions in California, 1964," damaged white fir stands on 78,000 acres of forest land in 1964 and threatened major losses in the summer of 1965. An aerial spray, consisting of 3/4 pound of DDT in one gallon of diesel oil per acre, was applied to control units totaling 56,000 acres during a 10-day period in late June and early July.

An important feature of the project was an extensive monitoring system planned to extend over 18 months and designed to reveal undesirable side effects on the water, forage, wildlife and livestock of the control units. In addition, State and Federal scientists studied the effect of broadcast spraying on insect predator and parasite populations. Results of the monitoring and insect studies were not yet available in 1965.

Post-treatment surveys in sprayed and unsprayed portions of the infestation showed that the chemical treatment destroyed the insect population immediately, preventing severe damage that would otherwise have taken place during the summer. It was thus evident that serious tree killing, top killing, and growth loss were averted by the suppression project. Stands of Christmas trees, in particular, benefited greatly. A late-season buildup of a virus disease controlled the outbreak in unsprayed areas.

Bark Beetle Suppression. With bark beetle populations increasing at several locations in the State, sanitation logging continued to be the principal suppression measure for these insects, with chemical treatment reserved for unmerchantable material only. Salvage of uprooted and storm-damaged trees, begun in early 1965 to suppress the Douglas-fir beetles, will continue in 1966. Sanitation logging operations were undertaken to combat western pine and Jeffrey pine beetles; these will be accelerated in 1966.

During 1965, State and Federal agencies demonstrated the suitability of lindane as a year-round treatment for flatheaded borers; results of the Forest Service tests will be published as a Research Note by the Pacific Southwest Forest and Range Experiment Station.

Blister Rust Control. Ribes eradication was deferred on the Stanislaus and Eldorado National Forests and on adjacent privately owned lands in another of several recent program adjustments aimed at maintaining a satisfactory balance between expensive protective action and the threat of this introduced disease. Scientists of the Pacific Southwest Forest and Range Experiment Station now feel that blister rust may have

reached a climatic barrier in the central Sierra Nevada, and that further overall protection of young-growth sugar pine stands is no longer needed. Earlier, ribes eradication was deferred in the southern Sierra Nevada and in the Coast Ranges. The blister rust control program in these areas now will stress the detection and suppression of individual infection centers as they occur.

RESOLUTIONS ADOPTED BY THE CALIFORNIA FOREST
PEST CONTROL ACTION COUNCIL - 1965

At its annual November meeting the Council took the following actions:

1. Suggested that agencies responsible for biological evaluation augment their capacities for such work.
2. Recommended that stumps not be treated for the control of bark beetles, except where Dendroctonus valens is a problem.
3. Urged the Forest Service and the Divisions of Forestry in all western states to augment the culture, stockpiling, and ancillary investigations necessary to make virus available for the future control of Douglas-fir tussock moth outbreaks.
4. Declared its interest in and support of a Forest Service survey to determine the distribution and present level of intensity of Fomes annosus in California forests.
5. Urged the Western Forestry and Conservation Association to support increased research in the biology and control of fungi causing root diseases of conifers.
6. Recommended distribution of the Animal Damage Survey Report to Council members.
7. Encouraged the extension of the Animal Damage Survey to the Pine Region of California, and offered its services in organizing the project.