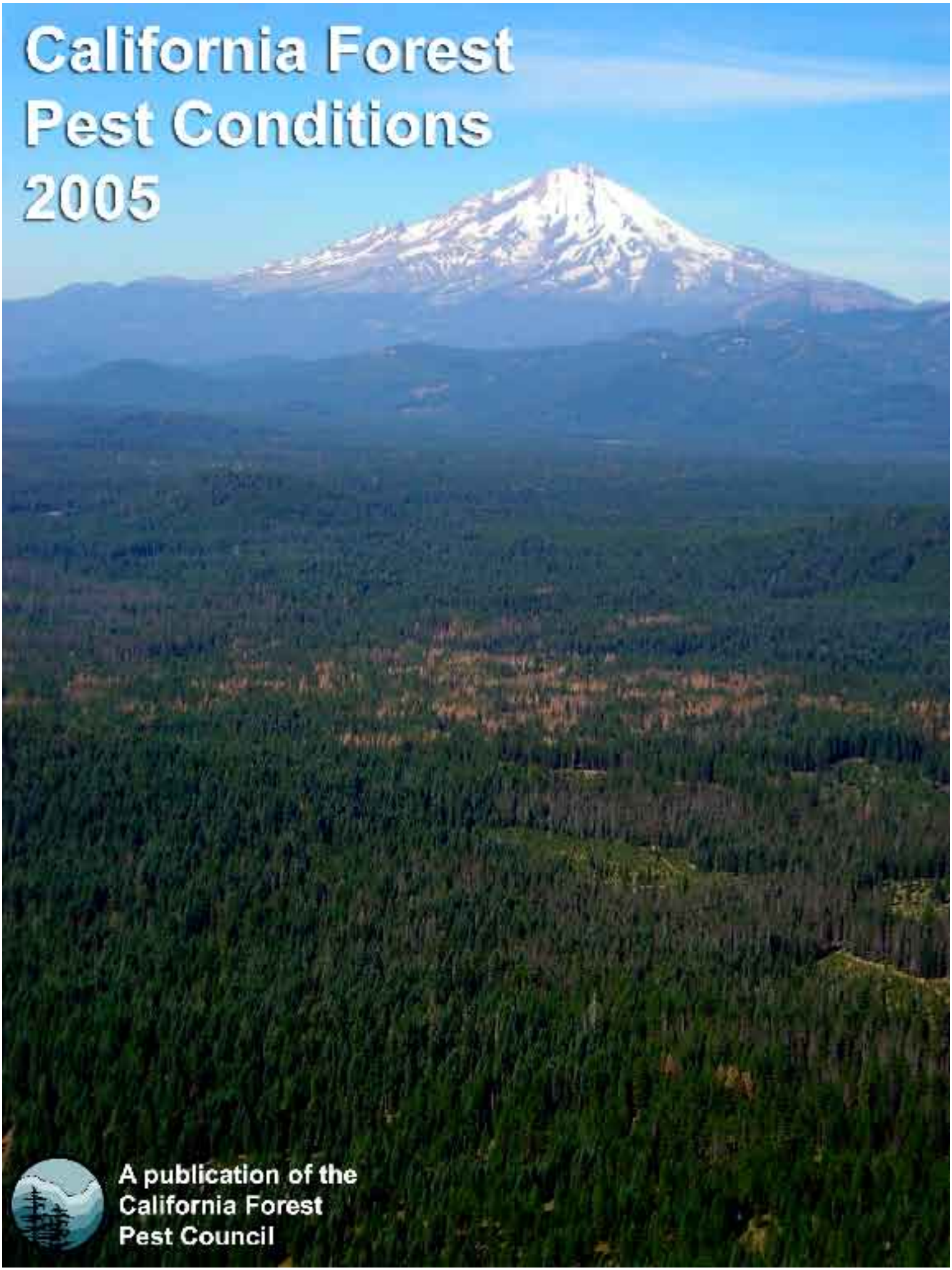
California Forest Pest Conditions 2005



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Cover: Black stain root disease and western pine beetle caused-mortality at McCloud Flats (McCloud Ranger District, Shasta-Trinity National Forests). Photo courtesy Dave Schultz.

THE CALIFORNIA FOREST PEST COUNCIL

The California Forest Pest Council, a 501(3)c non-profit organization, was founded in 1951 as the California Forest Pest Control Action Council. Membership is open to public and private forest managers, foresters, silviculturists, entomologists, pathologists, biologists, and others interested in the protection of forests from damage caused by biotic and abiotic agents. The Council's objective is to establish, maintain, and improve communication among individuals who are concerned with these issues. This objective is accomplished by five actions:

1. Coordinate the detection, reporting and compilation of pest damage, primarily forest insects, diseases and animal damage.

2. Evaluate pest conditions, primarily those of forest insects, diseases and animal damage.

3. Make recommendations on pest control to forest management, protection agencies and forest landowners.

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

5. Foster educational work on forest pests and forest health.

The California Board of Forestry recognizes the Council as an advisory body in forest health protection, maintenance, and enhancement issues. 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 2005***, is compiled for public and private forest land managers and other interested parties to keep them informed of conditions on forested land in California, and as a historical record of forest insect and disease trends and occurrences. The report is based largely on information provided by three sources: (1) information generated by Forest Health Protection, Pacific Southwest Region, USDA Forest Service, while making formal detection surveys and biological evaluations, (2) reports and surveys of conditions on private lands provided by personnel of the California Department of Forestry and Fire Protection, and (3) the statewide Cooperative Forest Insect and Disease Survey, in which federal, state, and private foresters and land managers participate.

This report was prepared by Forest Health Protection, USDA Forest Service, Pacific Southwest Region in cooperation with other member organizations of the Council, published by the California Department of Forestry and Fire Protection and distributed by the two agencies. The report is available in color at the following website:

http://www.fs.fed.us/r5/spf/publications/pestconditions/

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FOREST PEST CONDITIONS IN CALIFORNIA 2005

ABSTRACT

The important forest insect and disease conditions in California in 2005 are given. Included are bark beetles, defoliators, abiotic injury, dwarf mistletoes, declines and root, foliage, rust and canker diseases, animal damage and invasive plants. Sections on surveys and evaluations include summaries of the following:

1. Douglas-fir tussock moth pheromone detection cooperative survey
   high elevation 5-needle pine white pine blister rust survey
2. White pine blister rust screening program
3. Sudden oak death monitoring
4. Intensified Ozone Monitoring and Assessment of Ozone Impacts on Conifers in Southern California
5. Scotch Broom Aerial Survey
6. Detecting vegetation changes in California using satellite imagery
7. 2005 aerial surveys in California

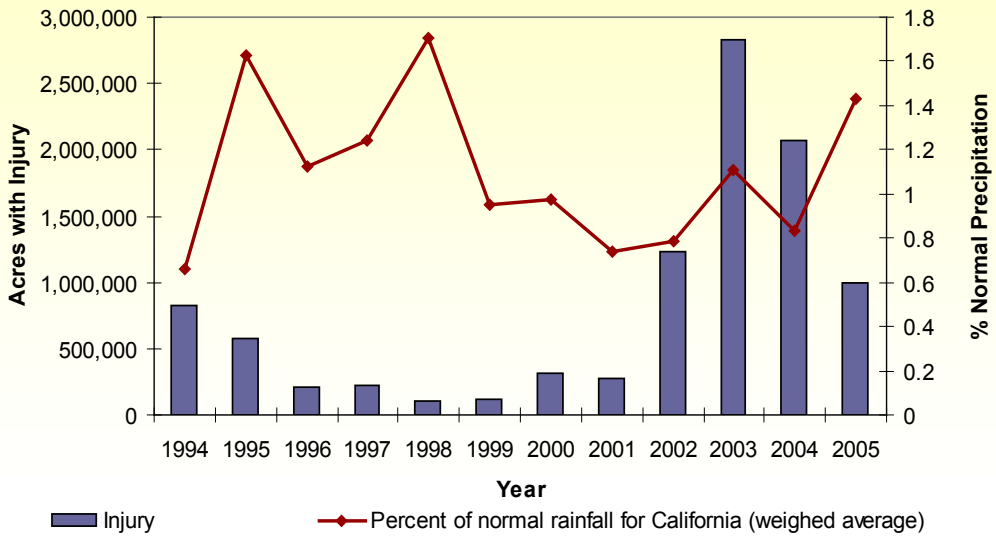
Key words: California, forest diseases, forest insects, surveys, tree mortality

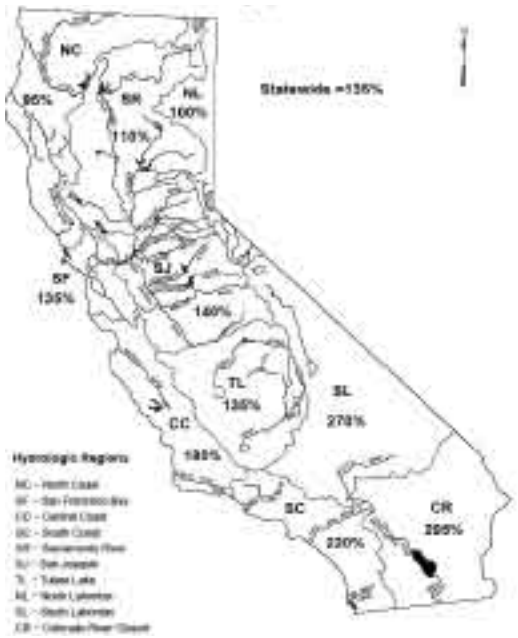
Conditions in Brief

This report summarizes the forest pest activity in California in 2005 by providing information submitted by the aerial survey program, entomologists, pathologists, botanists and other forest health specialists.

During 2005, aerial surveys were completed in California on all National Forests, National and State Parks, Indian Reservations and other Federal, State and Private lands. Approximately 1,000,000 acres of injury from insect, disease and abiotic factors were mapped in 2005, showing a dramatic 52% decrease in the overall injury mapped in 2004 (Figure 1).

Figure 1. Overall rainfall and biotic-caused injury mapped by the Aerial Survey Program from 1994-2005.





Map 1. California cooperative snow surveys seasonal precipitation in percent average to date (October 1, 2004 through April 30, 2005).

Courtesy of the California Cooperative Snow Survey

California emerged from four years of drought conditions with above average springtime precipitation in 2005. Statewide snowpack conditions in April were 135% above average (Map 1). The moist, cool spring contributed to increased tree vigor and was a probable factor in the dramatic decrease in certain pest activity - already decreasing in 2004. However, drought-induced pest activity still occurred on the Warner Ranger District of the Modoc National Forest where precipitation was 13% below the 30-year average.

The long wet spring may have shortened the 2005 fire season. A total of 6,684 fires were reported in 2005, burning 75,540 acres; almost 100,000 acres below the five year average (over 300 acres).

Insects:

Overall **mountain and western pine beetle** activity declined statewide in 2005, with the exception of the Modoc National Forest where mountain and western beetle caused mortality was observed on ponderosa, lodgepole and whitebark pine on the Warner Ranger District. Mountain and Jeffrey pine beetle and drought related mortality in southern California continued to decline from the drastic levels seen in 2003. Activity continued at low levels in the San Bernardino, San Jacinto, and San Gabriel Mountains (Map 2).

The **fir engraver beetle** was a significant pest in California in 2005. Levels of fir engraver beetle caused mortality were high in many areas in 2005. Specifically, scattered fir mortality were found on the Tahoe and Modoc National Forests (Figure 2).

Figure 2. Fir engraver, overstocking and drought conditions resulted in top kill and whole tree mortality of white fir in Cedar Pass, Warner Mountain Ranger District, Modoc National Forest.

Photo by Sheri Smith

The fir engraver in combination with drought, dwarf mistletoe, *Cytospora abietis* canker and the fir roundheaded borer caused considerable branch killing and tree mortality in higher elevation stands in northern California.

Douglas-fir tussock moth trap catches increased in many locations in the Sierras in 2004 but subsequent larval and egg-mass sampling in 2005 indicated that most populations were at least a year away from potential outbreak levels. Areas with larval densities approaching outbreak levels were found:

- Modoc National Forest (3 locations on the Big Valley Ranger District)
- Plumas National Forest (1 location on the Mt. Hough Ranger District)
- Tahoe National Forest (4 locations on the Yuba River Ranger District and 1 location on the American River Ranger District).

Heavy defoliation from Douglas-fir tussock moth was detected from aerial surveys in scattered pockets of variable acreages in Yosemite National Park, Sierra and Stanislaus National Forests for a combined total of 10,462 acres. Larval surveys and trapping information showed that most areas were one year away from reaching outbreak status.

Lodgepole needleminer populations remained high in several areas of Yosemite National Park. A total of 31,030 acres of defoliation were detected in the park. Aerial detection surveys found most of the defoliation to be discontinuous with no mortality observed (Table 1).

Table 1. Acres of lodgepole needleminer activity in Yosemite National Park

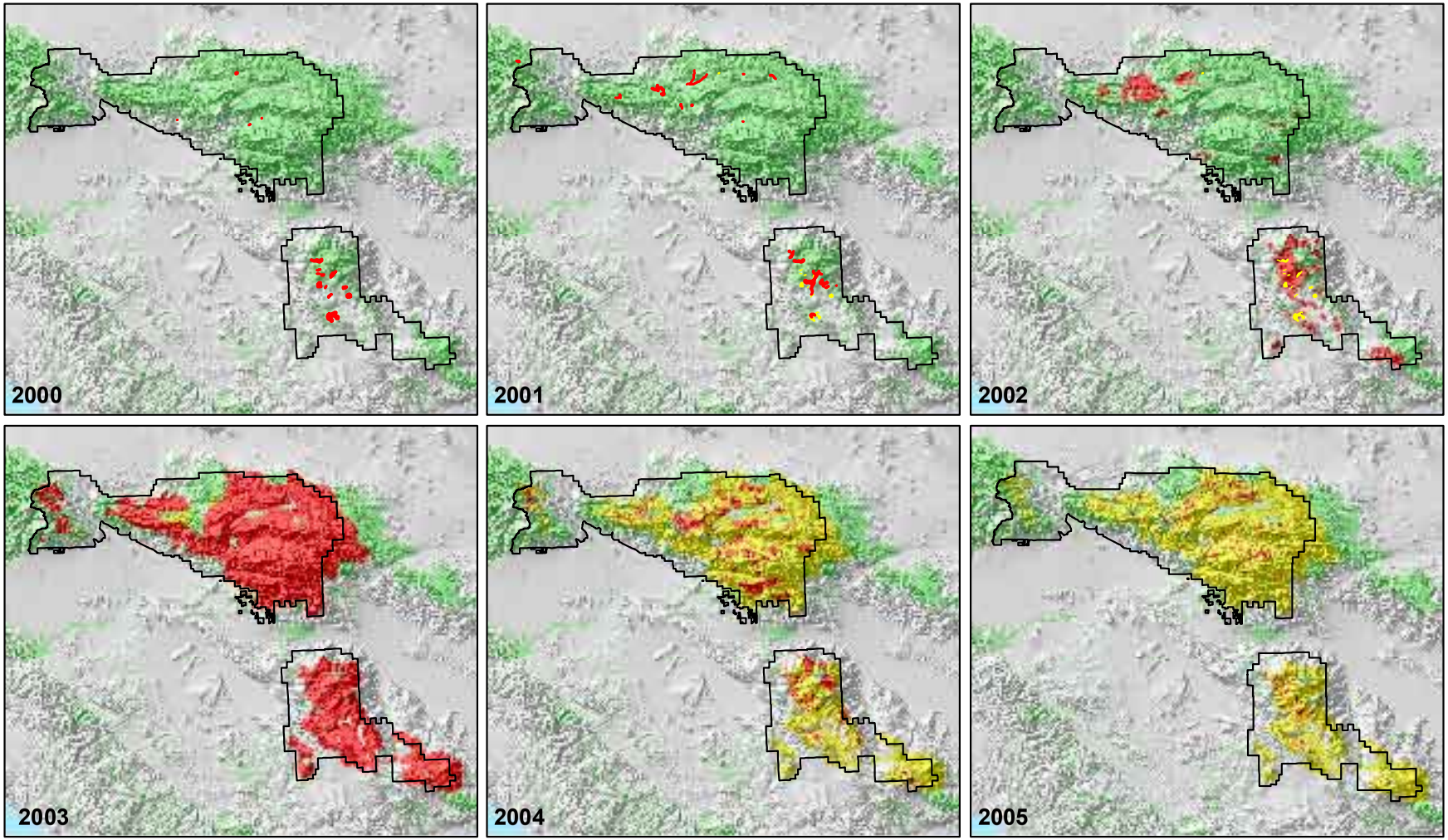
2003	2004	2005
32,019	34,507	31,030

Introduced Insects

Three **Asian longhorned beetles** were discovered on the grounds of a warehouse in Sacramento in June of 2005. Further investigation of the warehouse turned up wooden pallets with larval galleries and exit holes. No additional beetles were found in subsequent surveys of the area or the trace-forward sites (Figure 3).

There were two **Asian Gypsy moth** finds in California during 2005. One moth was found in San Pedro, Los Angeles County and the other in Santa Ana, Orange County.

Map 2. Biotic-caused tree mortality in the San Bernardino National Forest from 2000-2005.

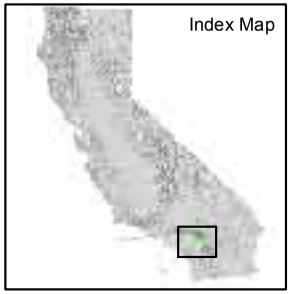


Legend

- BDF Administrative Boundary
- Current Year Mortality
- Previous Mortality
- Forested Areas

San Bernardino Tree Mortality 2000-2005

0 10 20 40 60 80 Miles



Source: 2000-2005 Aerial Survey Data
Acreage mapped does not include areas attributed to abiotic agents

Created by Zachary Heath, 11/28/2005

Several **Mediterranean pine engraver beetles** (first detected in 2004) where found in urban areas of the Central Valley in baited funnel traps. Larvae, pupae, and adults have also been recovered from cut logs of Aleppo pine, Italian stone pine and Monterey pine.

Figure 3. Forest Service smokejumpers climb hardwoods to search for the Asian longhorned beetle around McClellan Air Force Base in Sacramento, CA.

Photo by Michael Bohne

The **banded elm bark beetle** was collected in funnel traps from Inyo, Lassen, Los Angeles, Mono and Nevada Counties In addition, it has been collected beneath the bark of *Ulmus* spp. in Inyo and Yolo Counties.

The **red-haired bark beetle** (first found in Los Angeles County in 2004) beetle was trapped in Newhall and Valencia, CA, Los Angeles County.

Diseases:

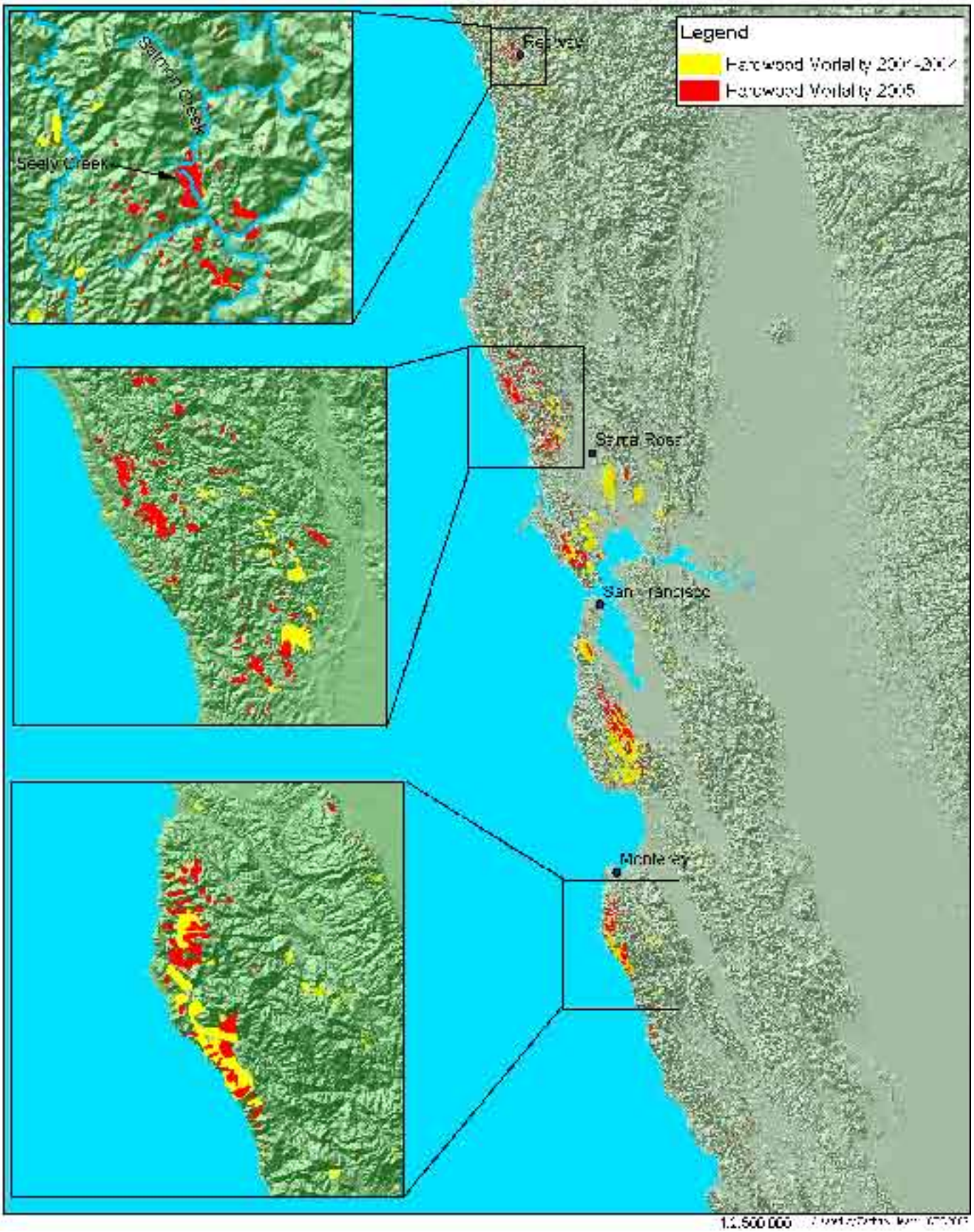
The distribution of **sudden oak death** in California did not change significantly in 2005 (there were no new counties) but a new find in Willow Creek (Monterey County) extended the range of the infestation south to just above the San Luis Obispo County line. Infestations intensified in Southern Humboldt County around Redway expanding north into the Salmon Creek watershed (Map 3). Infestations also intensified in western Sonoma and western Marin Counties and the Big Sur area of Monterey County.

White pine blister rust continues to significantly affect sugar pine throughout the known range of the pathogen in California. Specifically, white pine blister rust infestations were noted in Mountain Home State Forest killing young and old sugar pines. Most young trees and seedlings in the forest are affected. This population of the rust pathogen is especially virulent and appears to have overcome genetic resistance in the host population. Results from a two-year survey of high-elevation five-needle pine showed blister rust capable of infesting northern foxtail, western white, and whitebark pine, but it was not found on limber, Great Basin bristlecone or southern foxtail pine.

The branch flagging and mortality of red fir caused by **Cytospora canker** in association with **red fir dwarf mistletoe** (also noted in 2003) continued to be visible in numerous areas in the central Sierra Nevada (Tuolumne, Calaveras and Amador Counties) and on the Stanislaus National Forest (Figure 4). Most of the injury is occurring in areas above 6,500 feet elevation. Trees that survive will have dead branches scattered within their crowns which may lead to hazardous conditions in recreation sites. Significant outbreaks of Cytospora canker have also been noted in Nevada, El Dorado, and Placer Counties. Injury has consisted of dieback of branch tips in affected fir trees and continues to infect red fir branches near Robinson Flat Campground on the Tahoe National Forest. Branch dieback of red fir and, to a lesser degree, white fir continues in Latour State Forest,

Figure 4. Branch flagging and mortality of red fir caused by Cytospora canker in association with red fir dwarf mistletoe.

Photo by John Pronos



Map 3. Harwood mortality mapped during the 2001-2005 sudden oak death aerial surveys.

Shasta County. Affected trees often suffer from dwarf mistletoe and have experienced a higher rate of mortality from the fir engraver beetle.

Annosus root disease continues to be problematic throughout California forests. Specifically, *Annosus* caused mortality of ponderosa pine was noted on McCloud Flats on the Shasta-Trinity National Forest. The pathogen was also found to be infecting an undetermined number of aggregations of white fir south and west of Manzanita Mountain on the Big Valley Ranger District, Modoc National Forest. Annosus root disease in white fir was also found near the headwaters of Thompson Creek on the Mt. Hough Ranger District, Plumas National Forest.

Ponderosa pine mortality due to a combination of drought, high stocking, **black stain root disease** and western pine beetle at McCloud Flats (McCloud Ranger District, Shasta-Trinity National Forest) has decreased compared to previous years. However, conspicuous concentrations of mortality around black stain root disease centers were evident at the Mud Flow Research Natural Area, Elk Flat, Ash Creek Sink, Algoma and Harris Mountain. Scattered pockets of mortality are also present in dense Douglas-fir stands in the Eel River Late Successional Reserve south of the Van Dusen River near Dinsmores (Mad River Ranger District, Six Rivers National Forest). Scattered pockets of Douglas-fir mortality due to black stain root disease was also present between Soda Creek and the northwest shore of Pillsbury Lake, and several centers are present at the Pillsbury Homesite Tract near the northeastern shore of Pillsbury Lake (Upper Lake Ranger District, Mendocino National Forest) Mature ponderosa and Jeffrey pine mortality resulting from black stain root disease continues in the Heart Rock area east of Hwy 139 in northern Lassen County. In southern California, mortality of singleleaf pinyon pine in the San Bernardino Mountains was also associated black stain root disease centers.

An unknown condition was found causing extensive mortality in live oak in southern San Diego County (Figure 5). Mortality occurred over 30 square miles in both young and mature trees, in dry and mesic sites, and in clumped and scattered trees. A few trees were examined closely. No evidence of *Armillaria* infection was found. Tissue was collected from around a bleeding canker but no pathogenic organisms were isolated (tissue was collected in mid summer, when *Phytophthora* is difficult or impossible to isolate). Investigations are continuing.

Figure 5. Oak mortality caused by an unknown pathogen near Descanso, CA.

Photo by Laura Merrill

Invasive Plants:

There are over 1000 documented alien plant species in the state of California, and an estimated 6% of these are considered to be invasive (Hickman, 1993). The California Invasive Plant Council (Cal-IPC), was formed in 1992 by people concerned with the protection, management, and enjoyment of our natural areas, and who were becoming increasingly alarmed about the effects of the introduction and spread of invasive, exotic vegetation into those areas. CAL-IPC provided summaries of 10 high-priority invasive plants of California. This will hopefully initiate future invasive plant reporting to be summarized in this document.

Insect Conditions

Introduced Insects

Asian Longhorned Beetle
Anoplophora glabripennis

Figure 6. Adult Asian longhorned beetle.

Photo by Michael Bohne

The Asian longhorned beetle (ALB) (Figure 6), a voracious pest of hardwood trees, was discovered on the grounds of a warehouse on McClellan Air Force Base, in Sacramento, CA on June 16, 2005. The beetle is native to China and Korea and has forced the removal of thousands of trees in Illinois, New Jersey, New York and Ontario, Canada.

The California Department of Food and Agriculture (CDFA) and Sacramento County Agricultural Commissioner's Office investigated the site and found a total of three Asian longhorned beetles. A live adult beetle was captured outside on the loading dock and two adults were found in the warehouse. Further investigation of the warehouse turned up wooden pallets with beetle damage. ALB has been found in the California warehouses before, however this is the first time that the beetle has been found outdoors. The new outdoor ALB find prompted officials to respond quickly by fumigating the warehouse and inspecting nearby street trees for the tell-tale signs of beetle activity (include tree symptoms). Smokejumpers from Redding, CA climbed trees in search for beetle activity. A scientific advisory panel was convened to help strategize the State's extended response to the potential beetle threat. The panel provided trapping and survey recommendations for the McClellan site and also storage facilities in San Diego and Los Angeles Counties owned by the same company. Survey and eradication procedures will continue for the next few years at these locations to verify that the areas are beetle-free. Over 22,000 trees have been surveyed as of November, 2005, none of which showed any signs of ALB.

Asian Gypsy Moth
Lymantria dispar

The Asian gypsy moth, named for its home continent, is a voracious pest of trees that poses a major threat to forest habitats in North America. It was first identified in North America late in 1991 near the Port of Vancouver in British Columbia, Canada. Moths were discovered in Washington, Oregon, and British Columbia shortly after that.

There were two Asian Gypsy moth finds in California during 2005. One moth was found in San Pedro, Los Angeles County (Asian G.M. Mitotype) and the other in Santa Ana, Orange County (Siberian Mitotype). These two detections and the one moth trapped on July 9, 2003 at Wilmington (Los Angeles County) are considered to be three separate unrelated events. The San Pedro moth is Asian, the one from Santa Ana is Siberian, therefore, these moths represent separate introductions. The Wilmington find has the Asian Mitotype as does the one trapped in San Pedro. The latter find was made 2 miles from the Wilmington detection. The find area has been trapped for two seasons at 25/mi ^{2}. The probability of a viable population of 100 male moths remaining undetected during this time is ~=1.26x10^{-4}. The California Department of Food and Agriculture will continue to trap at a minimum of 100+ traps in the core area and 25 traps/ mi^2 within a 5 mile radius of all three finds. No treatments are currently planned for 2006.

Banded Elm Bark Beetle
Scolytus schevyrewi

The banded elm bark beetle (Figure 7) was collected in funnel traps from Inyo, Lassen, Los Angeles, Mono and Nevada Counties. In addition, *S. schevyrewi* has been collected beneath the bark of *Ulmus* spp. in Inyo and Yolo Counties. It appears to be relatively less abundant than the European elm bark beetle, *Scolytus multistriatus* in California, and concurrently attacks the same host material with the European species. This Siberian species has been slowly widening its range in the United States and was first detected in California in 2003. During 2005 this beetle was recovered in a Mediterranean pine engraver trap located in Bakersfield, CA, Kern County. This is believed to be the first record of this beetle in Kern County.

Figure 7. Adult banded elm bark beetle

Photo by Whitney Cranshaw

Mediterranean Pine Engraver Beetle
Orthotomicus erosus

In May 2004, a new exotic bark beetle for North America was discovered in baited flight traps in Fresno, California during an annual bark beetle and woodborer survey by the California Department of Food and Agriculture. This bark beetle was identified as *Orthotomicus erosus,* the Mediterranean pine engraver beetle. During 2004 the beetle was found in flight traps in five counties in California's southern Central Valley. Furthermore, in Fresno, Tulare and Kern counties, abundant overwintering populations of larvae, pupae, and adults have been found in cut logs of Aleppo pine, Italian stone and Monterey pine. This is the first and only established North American population of the Mediterranean pine engraver in North America. In the Central Valley, beetles overwinter as larvae, pupae and adults, initiate flight in late February and establish their first broods in mid-March. Flight activity increases in June-July and remains high through September, dropping off in October-November. There appear to be 2-3 generations of Mediterranean pine engraver beetle in the Central Valley.

A cooperative effort between Forest Health Protection, USDA. Forest Service, Region 5 and California Department of Food and Agriculture resulted in deploying a total of 111 Lindgren funnel traps at 39 sites during 2005 for further *Orthotomicus erosus* detection work. In general, the 2004 north/south boundaries of the infestations remain the same in 2005, with some significant range extensions to the east (i.e. Porterville). Two Mediterranean pine engraver beetles were recovered from a trap deployed at Santa Margarita Recreation Area in San Luis Obispo County and one beetle from Salinas Golf and Country Club located in Salinas, Monterey County. Follow-up visual surveys need to be completed to determine if there as an infestation present or if this beetle emerged from infested firewood brought in from outside the area. An estimated 150-200 trap samples remain to be processed.

See http://www.fs.fed.us/r5/spf/publications/pest_alerts.shtml for more information and photos.

Phoeosinus armatus

Phloeosinus armatus was discovered infesting firewood at Los Angeles, Los Angeles County, in 1989. In 1990 an additional collection was made from dying branches of Italian Cypress grown at a nursery located in Irwindale. During the 1990's the species was also found to be established in Orange and San Bernardino Counties. Recently, in December

2004, live beetles were recovered from greenstem wood of a cut ornamental Cypress tree at a green waste processing facility in Tulare County. This collection represents the first record of this bark beetles occurrence outside of the Los Angeles Basin. The only recorded California host is Italian Cypress, *C. sempervirens*.

Red-Haired Pine Bark Beetle
Hylurgus ligniperda

Figure 8. Adult red-haired bark beetles.

Photo by William M. Ciesla

The red-haired bark beetle (Figure 8) was detected in 2003 and has been collected in traps baited with ethanol or ethanol and α-pinene in three southern California counties (Los Angeles, Orange, and San Bernardino). The first detections in California at Bear Divide Guard Station, Angeles National Forest, and at the Frank G. Bonelli Regional County Park (both Los Angeles County), were both located near heavily urbanized areas. Later, specimens were also trapped on USDA National Forest lands in more remote locations in Los Angeles, Orange, and San Bernardino Counties. Ground checking for this species on 10 March 2005 at Bonelli Park revealed that the red-haired bark beetle was frequently found in large dimensional (minimum 15-20 cm diameter) cut or broken logs of Aleppo pine, *Pinus halepensis* and Canary Island pine, *P. canariensis.* At this time the beetles were newly colonizing and ovipositing in this fresh host material. Egg galleries were about 6 cm in length. Most of the galleries were on the undersides of the logs that were in contact with soil or, in one case, concrete, and beetles often tunneled into the logs from the cut ends. In the same logs, red-haired bark beetles were frequently found adjacent to more advanced galleries of the California fivespined ips, *I. paraconfusus*, but the *Ips* beetle was generally absent from the undersides of the logs. Mating pairs of *red-haired bark beetle* were also collected from a stump of a *P. halepensis* tree that had broken during a major storm on 27 December 2004.

Adult *H. ligniperda* are attracted to fresh stumps, slash and logging debris for breeding. In unhealthy *Pinus* spp., the beetle usually breeds in thick bark near the base of the stem or in large exposed roots. Newly emerged adults may attack seedlings and stressed pole-sized trees. Adult beetles are efficient vectors of *Leptographium* fungi, which have been implicated in pine root decline diseases.

Yellow Phoracantha
Phoracantha recurva

The Australian insect *Phoracantha recurva* was first detected in southern California in 1995. The beetle, along with another closely related *Eucalyptus* borer *P. semipunctata*, is responsible for widespread *Eucalyptus* mortality in California. *Phoracantha recurva* was discovered in Shasta County in November 2004 attacking Eucalyptus trees in Redding. This is the first report of the insect in the county.

Bark Beetles

M261A

Douglas-fir Beetle
Dendroctonus pseudotsugae

There were about a half-dozen Douglas-fir trees attacked by the Douglas-fir beetle, *Dendrocotnus psuedotsugae*, along Sugar Creek in the Russian Wilderness, Siskiyou County (M261A).

Fir Engraver
Scolytus ventralis

The fir engraver is the most damaging *Scolytus* in California forests, attacking true firs, such as red and white fir throughout the state. Outbreaks can cause severe tree mortality and are usually associated with drought. Fir trees that are suffering from a combination of drought and other stresses have an increased risk of being attacked and killed by the fir engraver. However, even trees that do not show evidence of chronic stress may be killed during periods of drought. Despite the overall wet conditions in 2005, fir engraver continued to be a significant pest throughout the Sierra's and the northern part of the state (attacks in 2004).

Figure 9. Fir mortality near Big Duck Lake in the Russian Wilderness, Klamath National Forest.

Photo by
Dave Schultz

A combination of drought, dwarf mistletoe, *Cytospora abietis* canker, *Tetropium abietis,* and the fir engraver caused considerable branch killing and tree mortality in higher elevation stands in northwest California. Specific locations include the south slope of Mt. Ashland, the Siskiyou Wilderness, Marble Mountain Wilderness, Russian Wilderness (Figure 9), Trinity Alps, South Fork Mountain and the Middle Eel-Yolla Bolla Wilderness (M261A).

Scattered individual trees and small groups of white and red fir killed by the fir engraver beetle were apparent again this year in Latour State Forest, Shasta County. Most mortality occurred in stands with dwarf mistletoe and Cytospora canker. Further east, fir mortality was noted in the CalPines subdivision and west of Goose Lake, Modoc County. Most beetle activity was in the pole-to-intermediate size classes. Overall, fir engraver beetle activity appears to have declined in this area. Fir engraver activity was limited throughout the Lassen and Plumas National Forests. Two areas of elevated activity were Butt Mountain and just north of Philbrook Reservoir, Almanor Ranger District, Lassen National Forest (M261D).

M261D

Fir engraver beetle-caused mortality continued to increase in several areas of northeastern California in conjunction with overstocking, annosus root disease and drought. Elevated mortality levels were found mostly on the Tahoe National Forest and included the Interstate 80 corridor from Cisco Grove to Donner Summit, a large area between Bowman Lake and Jackson Meadow Reservoir, a large area north of French Meadows Reservoir to Royal Gorge on the American River, and a 4 mile wide belt from Cisco Grove south to the "Placer County Grove" of giant sequoias. All of these areas averaged 1 to 3 dead trees per acre (M261E).

M261E

Elevated mortality levels continued on the Big Valley and Warner Mountain Ranger Districts, Modoc National Forest. Some of the highest levels of fir engraver caused mortality in northeastern California were observed in the Warner Mountains near Blue Lake and just west of Sworinger Reservoir. Fir engraver activity was also elevated along the entire

M261G

western front of the Warner Mountain range. The Big Valley Ranger District also had several areas of fir engraver caused mortality. The most notable was east of Adin near Manzanita Mountain along Manzanita Ridge and Hunters Ridge (M261G).

True fir mortality and top-kill associated with the fir engraver remained at background levels (0.5 trees per acre) throughout much of the southern Sierra Nevada. Scattered white fir mortality and top-kill due to fir engraver activity continues in the Stanislaus National Forest – the largest polygon detected around Sherman acres, Big Meadows, and Little Prather Meadow. Fir engraver activity around Breckenridge Mountain and Piutes of Sequoia National Forest significantly dropped compared to 2004. Ground surveys of these areas early this summer show a loss of about 80% of the old-growth white fir. Scattered mortality equaling up to about 10,000 acres due to fir engraver was detected on the Sierra National Forest.

M262B

In southern California, individual and small groups of true firs continue to be killed in the San Bernardino Mountains (M262B). However, the mortality levels are significantly less compared to levels observed in the recent drought period. The epidemic outbreak of the past appears to be over for the time being. In the mountains of southern California, the fir engraver beetle is most commonly found in white fir infected with true mistletoe, annosum and/or Armillaria root diseases and the roundheaded fir borer.

Jeffrey Pine Beetle
Dendroctonus jeffreyi

Jeffrey pine beetle activity was extremely limited in northeastern California in 2005. Mortality was observed south of Adin, CA near Whit Flat on the Big Valley Ranger District, Modoc National Forest. Jeffrey pine beetle mortality continued at low levels in the southern Sierra Nevada. The most significant mortality was located in the Piute Mountains of the Sequoia National Forest.

Jeffrey pine beetles continued to infest and kill their host in southern California, though populations of the beetle were much reduced compared to the previous 3 years. Recent activity was observed in the upper Santa Ana Canyon and Holcomb Valley, San Bernardino National Forest (M262B).

Mountain Pine Beetle
Dendroctonus ponderosae

Figure 10. Groups of ponderosa pine killed by mountain and western pine beetles, Warner Mountains Ranger District, Modoc National Forest.

Photo by Sheri Smith

As with other bark beetle species, mortality caused by mountain pine beetle in most of California declined from the levels seen in previous years. The exception to this trend was on the Modoc National Forest where mountain pine beetle caused mortality of ponderosa pine, lodgepole pine and whitebark pine continued to increase as very little drought relief came to this area during the 2004-2005 winter (Figure 10). Other areas of mountain pine beetle caused mortality in Northeastern California include lodgepole pine along the Susan River from County Road A21 to Silver Lake, lodgepole pine and ponderosa pine from Clover Butte to east of Jennie Mountain, ponderosa pine near Summit Lake (Eagle Lake Ranger District, Lassen National Forest) ponderosa pine near Hobo Camp, Susanville, Lassen County.

Mountain pine beetle activity declined in 2005 in sugar pine that suffered various levels of fire injury during the 2001 Star Fire, American River Ranger District, Tahoe National Forest.

High levels of sugar mortality attributed to fire injury and mountain pine beetle have been observed in the Starr fire since 2002. Similar to previous years lodgepole pine mortality continued along Alder Creek, north of Alder Hill and Soda Springs off of Interstate 80, and Lower Truckee River Campground, Truckee Ranger District (M261E).

Mountain pine beetle, along with lightning strikes, low site and lingering drought in Northwestern California added to the mortality five-needle pines (Figure 11). Sugar pine was killed by mountain pine beetle and white pine blister rust at Buck Lake in the Siskiyou Wilderness, Klamath National Forest. Mountain pine beetle and blister rust killed western white pine at French Hill and Youngs Peak on the Six Rivers National Forest. Mountain pine beetle and blister rust killed western white pine at Russian Lake and Golden Russian Lake in the Russian Wilderness, Klamath National Forest. Mountain pine beetle and blister rust killed western white pine on Mt. Eddy, Shasta-Trinity National Forest. Lightning and mountain pine beetle killed foxtail pine and western white pine in the Trinity Alps (M261A).

Figure 11. Mortality of western white pine near Grouse Ridge (Shasta-Trinity National Forest) caused by a lightning strike and mountain pine beetle.

Photo by Dave Schultz

M261E

M261A

Overstocking and mountain pine beetle killed whitebark pine at Bear Camp Flat, North Emerson Lake, Squaw Peak and Patterson Lake in the South Warner Wilderness (M261G). Western white pine on Lyons Peak near Glass Mountain Geologic Area were also killed on the Modoc National Forest (M261D).

Mortality caused by mountain pine beetle in southern California declined compared to previous years. Activity continued at low levels in the San Bernardino, San Jacinto, and San Gabriel Mountains (M262B) (Table 2). A small population which has been infesting and killing singleleaf pinyon, *Pinus monophylla*, north of Big Bear Lake, persisted despite apparent poor brood survival in the suboptimal host.

M261D

Red Turpentine Beetle
Dendroctonus valens

The red turpentine beetle is one of the largest and most widely distributed bark beetle in North America. In California, this beetle usually attacks trees of reduced vigor and trees infested with western and mountain pine beetles. It can also attack apparently healthy trees. Red turpentine beetle is often most destructive in areas disturbed by fire, logging, or land clearing. The beetle infests most *Pinus* species in California, but is most commonly found in Jeffrey, lodgepole, Monterey, ponderosa and sugar pine.

M261G

Red turpentine beetle activity was observed in sugar pine, ponderosa pine and Jeffrey pine in nearly every prescribed burn visited in 2005 throughout northeastern California. Numbers and locations of attacks seem to coincide with the degree and location of basal fire injury. The beetle was extremely common after a prescribed burn in a fuelbreak in ponderosa pine near Tennant, CA (M261D). The fuelbreak had been entered twice in recent history to remove small diameter trees with a mechanical harvester and also to remove larger trees by chainsaw thinning. Red turpentine beetle activity was noted on ponderosa pines attacked and killed by primary beetles in Siskiyou, Modoc, and Lassen Counties.

High numbers of red turpentine beetles attacked ponderosa pine in the Wrights Creek

Figure 12. Red turpentine beetle attacks on burned Ponderosa Pine in Wrights Creek, Stanislaus National Forest.

Photo by Beverly Bulaon

plantation following a prescribed fire. Ten trees on were subsequently killed by western pine beetle, after initial attacks by red turpentine beetles (Figure 12).

In the Southern Sierra Nevada red turpentine beetle were present on nearly all sugar, ponderosa and Jeffrey pine that were attacked by primary bark beetles. Notable areas include the Lake Tahoe Basin and Butte County.

M262B

Red turpentine beetle populations on Laguna Mountain, Cleveland NF, plummeted despite the presence of fire-killed and dying trees. However, populations were high in the San Bernardino and San Gabriel Mountains. There was a spectacular flight of *D. valens* in the community of Wrightwood in mid-May during the Community Fire Awareness Day (M262B).

M261G

Western Pine Beetle
Dendroctonus brevicomis

Western pine beetle-caused mortality also leveled off in 2005 throughout California with the exception of the Modoc National Forest. Beetle-caused mortality of ponderosa pine was most prevalent in the Warner Mountains with many large group kills detected (Map 4). These areas include Lassen Creek, Sugar Hill, Plum Valley Campground, South Parker Creek and Blue Lake (Warner Mountain Ranger District). The Lonkey Hill area along Highway 139 and the area surrounding Adin Pass on the Big Valley Ranger District and a large area west of Goose Lake on the Devil's Garden Ranger District also have elevated and increasing levels of western pine beetle caused mortality in ponderosa pine (M261G). One other location of elevated ponderosa pine mortality was observed in Northeastern California on the Eagle Lake Ranger District (Lassen National Forest) on the lower northeast side of Campbell Mountain down towards Martin Creek and the Pine Creek Valley (M261D).

M261D

Individual dead trees, as well as small groups of dead ponderosa pines were noted at various locations in the northeastern part of the state. Inspection of dying trees on Big Valley Mountain, Lassen County, and west of Goose Lake, Modoc County revealed that fewer trees were attacked and killed by western pine beetle this year than in 2004. Outbreaks at these sites appear to be declining.

M261A

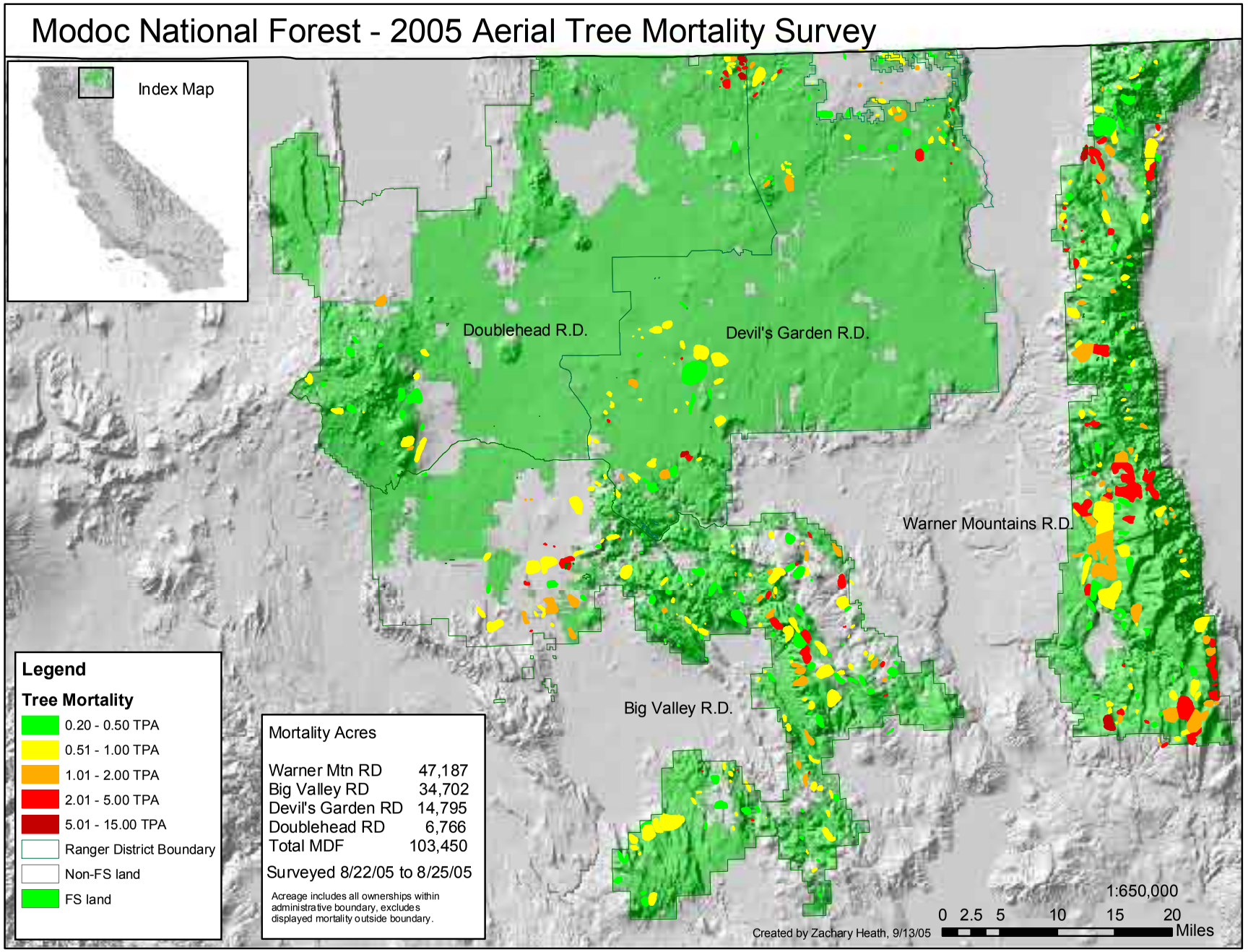
Ponderosa pine mortality due to western pine beetle has decreased in most of northwestern California (M261A, M261D). Precipitation was 95 - 110 percent of normal during the winter of 2004-2005. There were conspicuous concentrations of mortality around black stain root disease centers on the McCloud Flats, Shasta-Trinity National Forest. Mortality associated with the western pine beetle was restricted to scattered individual trees and small groups of ponderosa pine. No specific western pine beetle group kills were reported from the southern part of the Sierra Nevada.

Table 2. Acres of mortality associated with all pest in Southern California Forests (2000-2005), mapped by aerial survey.

National Forest	2000	2001	2002	2003	2004	2005
San Bernardino	4,007	5,390	51,310	521,771	33,436	6,332
Angeles	264	393	891	11,572	18,210	1,211
Cleveland	7,817	401	7,466	58,788	8,324	8,123
Total	**12,088**	**6,184**	**59,667**	**592,131**	**59,970**	**15,666**

Mortality caused by Western pine beetle in southern California declined compared to previous years (Table 2). Western pine beetles killed small numbers of trees in southern California, particularly in the San Bernardino Mountains. A trapping study in the San Bernardinos yielded very low catches except in the vicinity of a log deck on Strawberry Peak. A few mature ponderosa pines were killed at Santa's Village in the Running Springs area. A few Coulter pines in overstocked plantations in the Santa Ana River Canyon were killed by western pine beetle, though most mortality was old (M262B).

M262B



Map 4. 2005 tree mortality mapped by the aerial survey program on the Modoc National Forest.

Engraver Beetles

In most years, engraver beetles do not cause mortality, even though large populations commonly infest slash, cull logs, windthrown trees, and other forest debris. Infestations in standing trees during years of low mortality consist of scattered individuals and small groups of trees which have often been previously damaged by wind, snow, fire or lightning. Outbreaks in healthy, living trees are associated with either warm, dry years, or else large amounts of suitable slash. Larger trees are often top-killed by *Ips* with the lower bole either uninfested or colonized by other species of bark beetles or wood borers.

Several windthrown Engelmann spruce were infested with engraver beetles in the Sugar Creek drainage in the Russian Wilderness on the Klamath National Forest (M261A). *Ips* beetles were again found this year associated with scattered mortality of shore pine and Bishop pine along the Mendocino coast from Albion, CA northward to Cleone, CA. In the Santa Ana Canyon, San Bernardino National Forest, Ips spp. killed Coulter pine tops in overstocked plantations.

M261A

Emarginate Ips
Ips emarginatus

Ips emarginatus was observed attacking ponderosa pine in conjunction with mountain pine beetle in a stand near Summit Lake, Eagle Lake Ranger District, Lassen National Forest (M261D). In southern California *Ips emarginatus* was found in recently killed Jeffrey pine in the Santa Ana Canyon.

M261D

Pine Engraver
Ips pini

Scattered pole-sized ponderosa pine were killed by the pine engraver following a thinning operation on the Dry Creek Rim, west of Goose Lake, Modoc, County. *Ips pini* were seen in Jeffrey pine slash at Heartbar campground (San Bernardino NF) and in weather-broken Jeffrey pine branches a few miles west of Wrightwood (Angeles NF) (all M262B).

M262B

Pinyon Ips
Ips confusus

Single leaf pinyon mortality has continued to decline to near background levels in areas that experienced high mortality from 2001 to 2003 on the Humboldt-Toiyabe National Forest and private lands in Douglas County, south of Minden, Nevada. The pinyon mortality along the eastern side of the Sierra Nevada range in California has also subsided compared to the past few years. Aerial surveys also conducted in these areas revealed none to little new mortality during 2005. In ongoing life cycle investigations using caged slash material, Forest Health Protection personnel from Susanville found that the cold, wet, spring experienced during 2005 delayed *I. confusus* emergence resulting in one less generation in 2005 compared to 2004 (Figure 13).

Figure 13. Emergence cage containing single leaf pinyon logs infested with *Ips confusus* used for studying the life cycle of *I. confusus* Forest Health Protection Entomologists Danny Cluck and Sheri Smith.

Photo by S. Smith

In the mountains of southern California, the rate of pinyon mortality was greatly reduced compared to recent years. Some *P. monophylla* mortality associated with the pinyon ips occurred on the north side of the San Gabriel Mountains. In the San Bernardino Mountains, mortality was associated with blackstain root disease and *I. confusus*. *I. confusus* populations were greatly reduced in the Santa Rosa Mountains, where recently dead *P. californiarum* often did not have *Ips* galleries, but rather those of much smaller scolytids. Also in the Santa

M262B

Rosas, *P. quadrifolia* remain uninfested with beetles. During the height of the drought-*I. confusus* associated mortality in *P. californiarum* occurred while nearby *P. quadrifolia* was unaffected. In June, 2005, *P. californiarum* stands in the Little San Bernardino Mountains, western portion of Joshua Tree National Park were examined. Mortality during the recent drought in this area reached 50% in some of the stands. *Ips* galleries were seen in some of the dead trees (M262B).

M261A

Spruce Engraver
Ips tridens

Several windthrown Engelmann spruce were infested with spruce engraver beetles in the Sugar Creek drainage in the Russian Wilderness on the Klamath National Forest (M261A).

Wood Boring Beetles

California Flatheaded Borer
Melanophila californica

The California flatheaded borer, *Melanophila californica*, can kill seriously weakened pines, often in conjunction with other mortality causing agents. *M. californica* eggs are laid in clusters in bark crevices of host trees. Upon hatching the larvae tunnel into the phloem where they may feed for a few months to 4 years without causing much injury to the tree. If the tree is sufficiently weakened, the larvae pass into a rapidly growing stage and kill the cambium.

Wood boring beetles were found in several prescribed fire areas throughout northeastern California attacking dead and dying trees in 2005. Mortality of Jeffrey pine due to this borer increased in the Piute Mountains on the Sequoia National Forest. Borers have been active in this area for several years, but have not caused significant mortality over any one-year period. Recent drought and water competition with large shrubs appear to have contributed to tree stress, thus attracting wood-boring beetles.

The California flatheaded borer remained active in southern California in 2005 but at a much reduced levels compared to previous years. All major pests continued to be active, including the California flatheaded borer. This insect was active in Jeffrey pine in the mountains of San Diego County, in particular, although attacks occurred in many other areas as well (M262B).

M262B

Fir Roundheaded Borer
Tetropium abietis

Tetropium abietis, was observed causing tree mortality in association with the fir engraver beetle, dwarf mistletoe, and *Cytospora* canker in higher elevation stands in northwest California. Specific locations include the south slope of Mt. Ashland, the Siskiyou Wilderness, Marble Mountain Wilderness, Russian Wilderness, Trinity Alps, South Fork Mountain and the Middle Eel-Yolla Bolla Wilderness (M261A).

M261A

Flatheaded Fir Borer
Melanophila drummondi

Douglas-fir mortality in interior Mendocino County and southern Humboldt County has lessened slightly from the past two years, but flatheaded fir borer incidence remains fairly constant. For the past two years, pockets of Douglas-fir mortality usually yielded both the flatheaded fir borer and the Douglas-fir engraver beetle (*Scolytus unispinosus*). Attacks from the Douglas-fir engraver beetle were not as noticeable this year.

Defoliators

Douglas-Fir Tussock Moth
Orgyia pseudotsugata

During 2005, heavy defoliation from Douglas-fir tussock moth was detected by aerial surveys in Yosemite National Park and on the Sierra and Stanislaus National Forests on over 10,000 acres. There were also an additional 200+ acres of defoliation observed on private land in Mariposa County. Increasing Douglas-fir tussock moth (DFTM) populations were detected over a broad area in the central and southern Sierra Nevada during 2004, with light feeding injury reported from several areas. Based on life stage monitoring in 2004, an increase in defoliation was anticipated during 2005. Ground surveys to rate the level of defoliation were conducted during 2005 in Yosemite National Park and Sierra National Forest. Results showed that tree crowns were 25-30% defoliated, and up to 50% in small pockets within the large areas of defoliation. Defoliation was most severe in understory hosts. Larval feeding on dominate and understory trees was limited to the current years growth. The heaviest defoliated areas were along major highways in Yosemite National Park (Figure 14).

The results of larval surveys conducted during 2005 in recreation areas, and around trap plots with high counts, indicated that most areas were one year away from reaching outbreak status. Based on larval surveys, defoliation ratings, and egg mass counts, DFTM populations in these areas are predicted to peak in 2006. Based on larval sampling, two areas were already at outbreak densities (Chinquapin in Yosemite National Park and 1 plot located on the Sierra National Forest) in 2005 and declines in populations are expected in those areas. If no suppression treatment is implemented in 2006, some tree mortality should be expected in small, localized patches where heavy defoliation occurred in 2005 (Figure 15).

M261E

In northeastern California, Douglas-fir tussock moth trap catches continued to increase in many locations during 2004, but subsequent larval sampling in 2005 indicated that most populations were at least a year away from potential outbreak levels. Areas with larval densities approaching outbreak levels were found on the Modoc National Forest (3 locations on the Big Valley Ranger District), Plumas National Forest (1 location on the Mt. Hough Ranger District) and Tahoe National Forest (4 locations on the Yuba River Ranger District and 1 location on the American River Ranger District). High numbers of larvae were readily observed near the Secret House campground on the Foresthill Divide Road, American River Ranger District, Tahoe National Forest. (M261E). No defoliation was been observed at any of these sites.

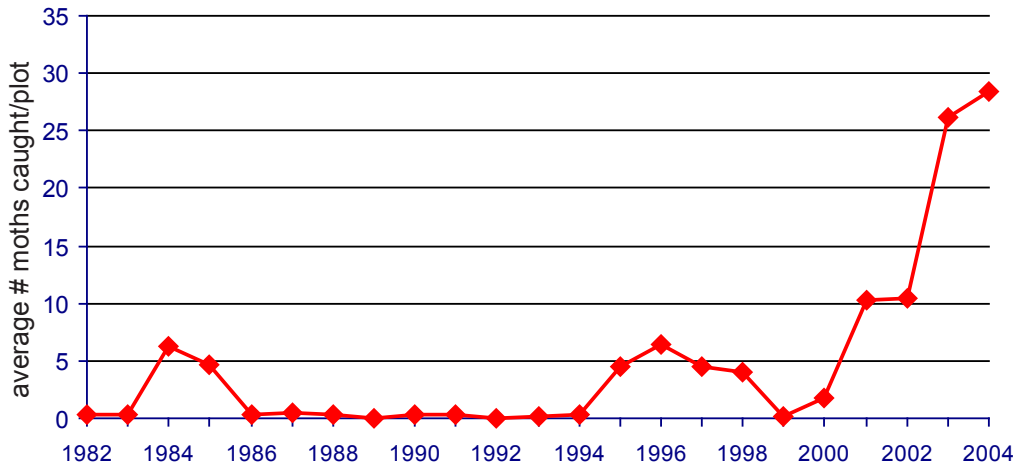


Figure 14. Douglas-fir tussock moth pheromone trap catch summary for the Sierra National Forest and Yosemite National Park

Courtesy
Kathy Sheehan

THE 2005 DOUGLAS-FIR TUSSOCK MOTH PHEROMONE DETECTION COOPERATIVE SURVEY

During 2005, traps were installed in 196 plots (5 traps/plot) with data collected for 187 plots (data for 9 plots were not collected (Table 3). There were 165 (84%) plots with an average of <25 males per trap and 22 plots (11%) that averaged 25 or more moths per trap (Table 3). Twenty-six percent of the plots averaged >25 males moths per trap in 2004 indicating a downward trend in overall trap counts this past year compared to last. Plots that averaged >25 moths per trap for 2005 were located on the following Ranger Districts: Amador and Placerville (Eldorado NF), Big Valley (Modoc NF) and Calaveras, Miwok and Summit (Stanislaus NF). In addition to these plots monitored on National Forest lands there were five plots that exceeded an average of 25 moths/trap on lands of other ownership. Four of these plots were located in Yosemite National Park and 1 was in Shasta County on private land near Burney Mountain, monitored by C.D.F.

An egg mass survey was conducted in the plot near Burney Mountain, Shasta County within a 2 mile radius of the plot in the spring of 2005. No egg masses of the tussock moth were found during the survey. Additional surveys will be completed during 2006 in this area as the trap count remained high for 2005.

Increases and declines in trap counts are very common with DFTM populations. Based on the results of the 2005 trap monitoring, there may be some increases in activity in 2006 in some locations, in addition to the areas where defoliation was detected in 2005. During the field season of this year Forest Health Protection staff will monitor other life stages in the areas where DFTM activity exceeded an average of 25 males/trap and/or where notable larval activity occurred.

Figure 15. Douglas-fir tussock moth defoliation in Yosemite National Park along Highway 120.

Photo by Beverly Bulaon

Year	Total # of Plots	NUMBER OF PLOTS WITH AN AVERAGE MOTH CATCH PER TRAP OF:													
		0<10	10<20	20<25	25<30	30<35	35<40	40<45	45<50	50<55	55<60	60<65	65<70	70<75	75+
1995	158	77	35	13	16	7	7	3	0	0	0	0	0	0	0
	100%	49%	22%	8%	10%	4.5%	4.5%	2%							
1996	149	33	26	16	8	7	12	9	5	8	6	8	5	1	5
	100%	22%	17%	11%	6%	4%	8%	6%	3%	6%	4%	6%	3%	1%	3%
1997	142	88	27	10	9	4	3	0	0	1	0	0	0	0	0
	100%	62%	19%	7%	6%	3%	2%			<1%					
1998	159	81	22	11	9	6	3	10	7	5	2	1	1	1	0
	100%	51%	14%	7%	6%	3%	2%	6%	4%	3%	<1%	<1%	<1%	<1%	
1999	159	126	20	5	3	2	2	0	0	0	1	0	0	0	0
	100%	79%	13%	3%	2%	1%	1%				1%				
2000	185	154	15	4	4	0	1	2	2	2	0	0	1	0	0
	100%	83%	8%	2%	2%		<1%	1%	1%	1%			<1%		
2001	183	95	57	13	10	6	0	1	1	0	0	0	0	0	0
	100%	52%	31%	7%	5%	3%		<1%	<1%						
2002	168	126	31	5	3	3	0	0	0	0	0	0	0	0	0
	100%	75%	18%	3%	2%	2%									
2003	163	53	42	11	11	10	14	13	3	1	4	0	1	0	0
	100%	32%	26%	7%	7%	6%	8%	8%	2%	1%	2%		1%		
2004	174	68	43	6	16	11	6	5	3	0	2	1	1	0	0
	* 93%	39%	25%	3%	9%	6%	3%	3%	2%		1%	<1%	<1%		
2005	195	139	15	11	7	4	3	2	3	1	0	0	0	1	1
	*95%	71%	8%	5%	4%	2%	2%	1%	2%	<1%				<1%	<1%
* Some plots were not collected due to weather.															

Table 3. Number of Douglas-fir tussock moth pheromone detection survey plots by trap catch for 1995-2005 for California.

Fall Webworm
Hyphantria cunea
Defoliation of madrone by the fall webworm occurred again this year at various locations on the Foresthill Divide, Placer County. Webs and minor defoliation of madrone were also noted in Nevada, Butte, Yuba, Fresno, Mariposa, Tulare, Merced, and Calaveras Counties on the westside of Sierra Nevada (M261E).


M261E

Fruittree Leafroller
Archyps argyrospila
The outbreak of fruittree leafroller (Figure 16) in the San Bernardino Mountains is declining. There was significant defoliation along the Rim of the World, but far less than in recent years. The fruittree leafroller population on Palomar Mountain in San Diego County is in outbreak. Heavily defoliated trees were observed in early summer, though subsequent refoliation obscured the feeding injury by the time the annual aerial survey was conducted (M262B).


Figure 16. Fruittree leafroller.

Photo by Laura Merrill


M262B

Jeffrey Pine Needleminer
Coleotechnites* sp*. near milleri
The Jeffrey pine needleminer continued to infest trees in Truckee, California. Approximately 200 acres were affected in 2005, which is about one third of the area affected in 2004. The area has also shifted and is now entirely to the south of Interstate 80. No tree mortality has been observed (M261E).

Lodgepole Pine Needleminer
Coleotechnites milleri
The lodgepole needle miner is found in the upper Tuolumne and Merced River watersheds of Yosemite National Park and one small drainage of the San Joaquin River on the Sierra National Forest.

Lodgepole needleminer populations remained high in several areas of Yosemite National Park (M261E) (Map 5). A total of 31,030 acres of defoliation were detected in the park. Population density was not surveyed this year, nor were ground surveys conducted. The largest area of defoliation extended from Tuolumne Meadows down to Merced Lake. Other large areas of defoliation were detected in Matterhorn and Virginia Canyons, and along most of Delany Creek watershed. Aerial detection surveys found most of the defoliation to be discontinuous with no mortality observed.

Modoc Budworm
Choristoneura viridis
A small area of defoliated white fir was observed just east of Bald Mountain in the Warner Mountains on the Modoc National Forest (T43N, R15E, Sec.10) (Figure 17). Defoliation was light and has likely occurred here over the past couple of years based on observed crown conditions (M261G). Modoc budworm defoliation is often masked during elevated periods of fir engraver *(Scolytus ventralis*) activity.

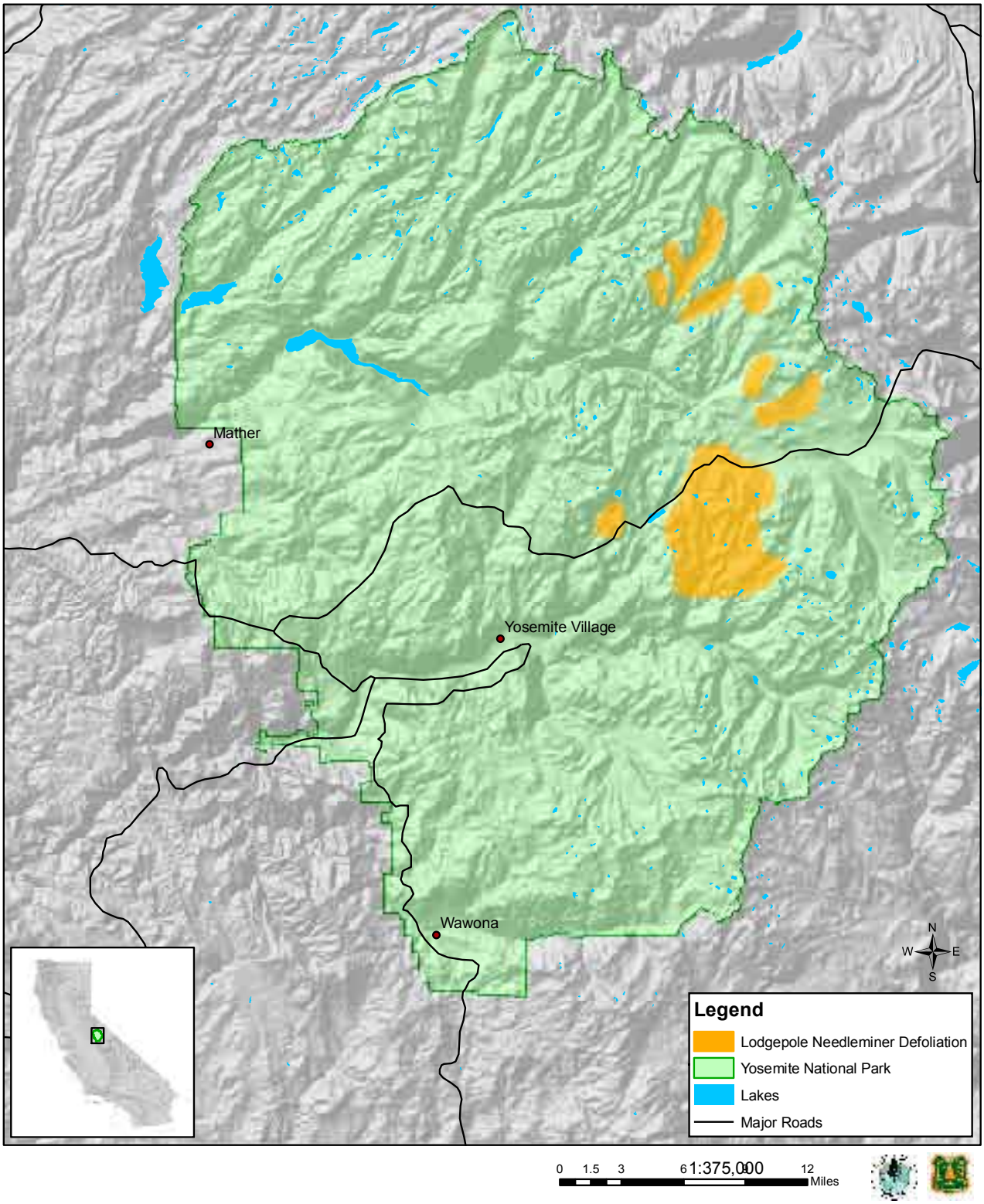

Figure 17. Modoc budworm feeding, Warner Mountain Ranger District, Modoc National Forest.

Photo by Dave Schultz.


M261G

Yosemite National Park, 2005 Lodgepole Needleminer Defoliation

Aerial Survey Sketch Mapping Program



Map 5. Lodgepole needleminer defoliation mapped by aerial survey Yosemite National Park in 2005.

Pandora Moth
Coloradia pandora
Although this insect is widespread in California, outbreaks have only been recorded on the Inyo National Forest and surrounding areas. Adults were abundant in and around the town of Mammoth Lake this year. A small population is still present in this area following an outbreak which started in 2002. Outbreaks of this insect typically only last a few years due to a naturally occurring virus that develops quickly in dense populations and infects nearly 100% of the larvae.

M261A

Adults of the pandora moth were attracted to lights in Yreka, Siskiyou County (M261A). A survey of ponderosa pines in the area did not detect any trees with obvious signs of feeding.

Silver Spotted Tiger Moth
Lophocampha* (=*Halisodota) argentata
Light defoliation of Douglas-fir trees of all sizes was visible in early June near Haylock Gulch, west of Trinity Lake. (M261A).

Other Insects

Alder Bark Beetle
Alniphagus aspercollis,
Alder bark beetles and unidentified flatheaded wood borers were found colonizing dying alders at the edge of an artificial pond near Weed, Siskiyou County. Cankers also appeared to be present, but no pathogens were isolated from dying tissues.

Alder Flea Beetle
Altica ambiens
Severe defoliation of alder by this beetle was noted on the Georgetown Ranger District, Eldorado National Forest. A small group of trees was infested with these beetles around the Ellicot Bridge. Typically these beetles are not known to cause direct mortality, but continuous defoliation will reduce growth and vigor of affected trees.

Black Pineleaf Scale
Nuculaspis californica
An outbreak of black pineleaf scale on sugar pine is occurring north of Dead Horse Summit, Siskiyou County. An affected area of roughly 500 acres was first noticed in the spring of 2005 with symptoms indicating more than one year of infestation. Additional areas of infestation were discovered during the summer, bringing the total infested area to roughly 1,500-2,000 acres. Heavily impacted trees have shortened, chlorotic needles and thin crowns, particularly in the top third of the crown.


M261D

California Tortoise-Shell
Nymphalis californica
California tortoise-shell butterfly larvae were observed on Fredonyer Peak, north of Eagle Lake, Lassen County, defoliating snowbrush (*Ceanothus velutinus*). Large numbers of migrating adults were observed later in the summer on the Eagle Lake Ranger District, Lassen National Forest (M261D). California tortoise-shell larvae were also reported on the Beckwourth Ranger District, Plumas National Forest (M261E).


M261E

Cone Worm
***Dioryctria* sp.**
Cone worm killed terminal and lateral leaders in some otherwise very healthy and vigorous trees in 5 to 12 year old ponderosa pine plantations from the Scarface Burn north to the Long Damon Burn in western Modoc county (M261B). The most concentrated injury is a few hundred acres in Sec 6 of T42N R6E about 3 miles NW of Hollenbeck Butte or about 9 miles south of Tionsesta where greater than 30% of tops are killed. But there is also some damage to the south between the Loveness Logging Rd and the Mud Springs road in several thousand acres of otherwise very healthy plantations.


M261A

Cooley Spruce Gall Aphid
Adelges cooleyi
Galls were visible on Brewers spruce near Buck Lake in the Siskiyou Wilderness on the Klamath National Forest (M261A)

Douglas-fir Twig Weevil
Cylindrocopturus furnissi
Incidence of this pest has decreased in Sonoma and Mendocino Counties from 2004 levels.

Maple leaf scorch

Leaf scorch on bigleaf maple was abundant this year and was either reported or observed from Trinity and Shasta Counties south to El Dorado County and undoubtedly occurred elsewhere. Injury to individual trees varies widely. The injury was consistent with "hopper burn" which is caused by the feeding of leafhoppers. Another theory is that the bacterium *Xylella fastidiosa,* the cause of Pierce's disease, may be involved (Figure 18).

Figure 18. Hopper burn on big leaf maple.

Photo by Dave Schultz

M261E

Indian Creek, Meadow Valley, and the Feather River Canyon in Plumas County, and the North Yuba River in Sierra County had high levels of maple leaf scorch again this year (M261E). Leaf scorch was also detected on maple in the Deer Creek area along Highway 32 (M261E). It appears as though several years of leaf scorch are contributing to branch kill and tree mortality in some areas. Twenty big leaf maple trees along State Highway 49 between Camptonville and Sierra City were tagged and monitored monthly during 2005 to examine multiple year effects of leaf scorch. Maples leaves were tested for the bacterium *Xylella* sp. and *Phytophthora ramorum*, both which were negative. Leaf hoppers, aphids and fruiting bodies of anthracnose fungi were readily observed on the scorched leaves. Monitoring of the individual trees will continue in 2006.

M261D

Mylitta Crescent

Phyciodes mylitta

There was a mass flight of adult Mylitta crescent butterflies over the summit of Mt. Lassen in Lassen Volcanic National Park on August 6 (M261D). The larvae feed on thistles.

M261A

Oystershell Scale

Lepidosaphes ulmi

The oystershell scale contributed to the decline of snowbrush on a ridge above Castle Lake, Siskiyou County (M261A)

Pine Needle Sheathminer

Zelleria haimbachi

Defoliation of current year needles was observed in the terminal and upper lateral shoots of several sapling and pole sized Jeffrey pine in the Lost Fire plantation, Hat Creek Ranger District, Lassen National Forest. Most of the injury appears light, affecting less than 25% of the crown; however, the upper crowns of a few trees have become rounded due to the forking of shoots killed by multiple years of defoliation (M261D). A small amount of pine needle sheathminer defoliation was seen in a ponderosa pine plantation in the old Haystack Burn on the Klamath National Forest (M261A).

Pinyon Needle Scalse

Matsuccocus acalyptus

A pinyon needle scale outbreak was observed in Ventura and Kern County. The affected area (Lockwood Valley, M262B) remains unchanged since 2003/4. Mortality of singleleaf pinyon pine sapplings was observed, particularly in trees invading brush land.

M262B

Redhumped Caterpillar

Schizura cocinna

Colonies of redhumped caterpillar were noted feeding on deer brush, *Ceanothus integerrimus,* at scattered locations east of Lake Oroville, Butte County.

Sugar Pine Scale
Matsucoccus paucicicatrices
This scale was found causing twig- and top-kill of two sugar pine saplings on Boggs Mountain Demonstration State Forest in Lake County. The trees were initially sampled because the excessive pitching of affected branches and stems had the appearance of resinous white pine blister rust cankers.

Unknown Oak Leaf Skeletonizer
Injury was observed in black oak (*Quercus kelloggii*) at a few locations on the Lassen, Plumas and Tahoe National Forests. Areas with the highest injury levels included a 10 acre stand near Monterey Point, southwest of Turner Mountain, Almanor Ranger District, Lassen National Forest (M261D), along the Foresthill Road, Foresthill, Placer County, along the Interstate 80 corridor from Colfax to Emigrant Gap, Tahoe National Forest and along Schneider Creek towards Third Water Creek, Mt. Hough Ranger District, Plumas National Forests (M261E) (Figure 19). Some of this injury may also be caused by anthracnose fungi.

Figure 19. Feeding injury on oaks along the I80 corridor between Emigrant and Colfax.

Photo by Sheri Smith

Western Pineshoot Borer
Eucosma sonomana

M261D

This moth attacked many upper lateral and terminal shoots of sapling and pole size Jeffrey pine and ponderosa pine in the Lost Fire plantation, Hat Creek Ranger District, Lassen National Forest. These attacks are stunting leader growth or killing leaders and lateral shoots. In some cases attacks have occurred over several years resulting in significant growth loss. Many attacked leaders have lost dominance to lateral shoots (M261D).

The western pineshoot borer continues to attack plantation ponderosa pine near Pondosa, CA, in Siskiyou and Shasta Counties and north of Lookout, CA in Modoc County. Western pineshoot borer injury was also noted in ponderosa pine plantations in Lassen County. Injury, in the form of stunted terminals, varies widely across the plantations but exceeds 50% in some areas.

White-Lined Sphinx
Hyles lineata

M261E

Larvae of the white-lined sphinx were reported from several areas on the Lassen National Forest during the summer of 2005 (M261D, M261E). The larval stage feeds on a great diversity of plants including willow weed (*Epilobium*), four o'clock (*Mirabilis*), apple (*Malus*), evening primrose (*Oenothera*), elm (*Ulmus*), grape (*Vitis*), tomato (*Lycopersicon*), purslane (*Portulaca*), and *Fuschia*.

Introduced Diseases

Pitch Canker

Fusarium circinatum

Pitch canker disease was first identified in California at New Brighton State Beach, Santa Cruz County, in 1986. Since then, the disease has been reported from 14 coastal and adjacent inland counties from San Diego to Mendocino. The disease has mainly been problematic in planted Monterey and bishop pine and is a serious threat to the diminishing indigenous populations of Monterey pine and other tree species in California (Table 4).

Table 4. California tree species found infected with the pitch canker fungus in the field

Common name	*Latin name*
Bishop pine	*Pinus muricata*
Coulter pine	*Pinus coulteri*
Gray pine	*Pinus sabiniana*
Knobcone pine	*Pinus attenuata*
Monterey pine	*Pinus radiata*
Monterey x knobcone pine	*Pinus radiata x attenuata*
Ponderosa pine	*Pinus ponderosa*
Shore pine	*Pinus contorta contorta*
Torrey pine	*Pinus torreyana*
Douglas fir	*Pseudotsuga menziesii*
Aleppo pine	*Pinus halepensis*
Canary Island pine	*Pinus canariensis*
Italian stone pine	*Pinus pinea*

Modified from Storer et al. 1995

The fungus causes girdling lesions on branches, exposed roots, and the main stems of pine trees. Multiple branch infections can cause extensive die-back of the crown, and can lead to tree mortality. Large amounts of resin are produced in response to an infection. Numerous insects (mainly bark, twig and cone beetles) have been reported as capable of vectoring the pathogen and starting new infections.

During 2005, new infections were found in large, planted Monterey pines in a private campground in Olema in northwestern Marin County. Most symptoms (flagged branch tips) were in the upper crowns. Pitch canker disease was also found in a mature Monterey pine plantation and adjacent native Bishop pines in the Drakes Estero portion of Point Reyes National Seashore (263A). These infections mark the most northern coastal sites in Marin County wherein symptoms have been reported and sampled.

263A

In San Diego County a large infestation by *F. circinatum* is occurring at the Legoland parking lot. Aleppo pines are infected in the roots and the pathogen girdles the entire tree at root collar without any above ground symptoms.

On November 5, 2003, the New Zealand Ministry of Agriculture and Forestry reported the presence of the pitch canker fungus in one yellowed graft from a consignment of Douglas-fir cuttings imported from the Badger Hill Orchard on the Eldorado National Forest. The confirmed record of pitch canker from Badger Hill is the first report of the pathogen in the Sierra Nevada. Continued surveys in 2005 for pitch canker in El Dorado and surrounding counties (Amador, Placer, and Nevada Counties) have not turned up any positive finds of *F. circinatum*. Surveys have emphasized Christmas tree plantations and urban plantings as well as landowner requests.

Following through on a suggestion by the California Forest Pest Council's Pitch Canker Task Force (PCTF), the USDA Forest Service is developing a prototype database to be used nationwide to record pitch canker incidence. The intent is to pool various pitch canker incidence data into one database, from which incidence maps can be displayed by various layers. In the future there will be available links to incidence mapping on both the Pest Council and PCTF web sites.

Port-Orford-Cedar Root Disease
Phytophthora lateralis

Figure 20. Port-Orford-cedar infestation on French Hill Road, Six Rivers National Forest

Photo by Dave Schultz

Port-Orford-cedar (POC) is found on approximately 35,000 acres in California; primarily on the Six Rivers National Forest and also on the Shasta-Trinity and Klamath National Forests. The species has a narrow geographic range, but a wide ecological amplitude. POC is found at elevations from sea level to 6,400 feet and among a variety of species with differing ecological requirements, from coast redwood to mountain hemlock.

Phytophthora lateralis, an exotic root pathogen, was introduced in the early 1950's to the range of POC. It is almost always fatal to trees it infects. *P. lateralis* spores are spread via infested water or soil. A typical long distance spread scenario involves infested soil being transported into an un-infested area from mud on vehicles or pieces of equipment or in infested water. The infested soil falls off of the vehicle or spores are delivered via water and the pathogen first infects POC near the site of introduction then is washed downhill in surface water infecting additional hosts. This is especially lethal along drainages and creeks where infested water is channeled and flows near concentrations of healthy POC. About 8% of the POC acres in California are infested with the disease.

M261A

Port-Orford-cedar root disease continues to spread and intensify along the main stem of the Sacramento River from Dunsmuir to Shotgun Creek (M261A). Monitoring of the Port-Orford-cedar eradication treatments at Scott Camp Creek in the upper part of the Sacramento River drainage (M261A) revealed no new infestations of *P*. *lateralis*.

A new group of infected Port-Orford-cedar (3-4 trees) was noted in the Mill Creek Addition of Redwood National Park and near the west end of the Hiouchi Bridge along US Highway 199 (263A).

263A

On the Smith River National Recreation Area, Six Rivers National Forest, three active infestation areas were noted along the French Hill Road (Figure 20). One was near Allen's Gulch (T. 17N, R.2E, Sec. 31) and two were near Dry Lake (T.16N., R.3E, Secs 19 and 31). Three more were noted near the Low Divide Road- two along Myrtle Creek at T.17N, R.1E, Secs. 21 and 28, and one on private land adjacent to the Low Divide Road (Del Norte County). Two additional infestations were found along Monkey Creek near US Highway 199 at T.17N, R.3E, Secs. 2 and 10 (M261A).

Ornamental Port-Orford-cedars were killed in Arcata, near the Humboldt State University campus. No other cedars were observed adjacent to the infected trees, and imported, infested soil is reportedly the likely source of pathogen introduction.

Sudden Oak Death

Phytophthora ramorum

Over the past ten years significant mortality of oaks has occurred in the coastal areas of central California. Commonly called Sudden Oak Death (SOD), this epidemic is viewed as a serious threat. Tree losses are occurring in both wildland and urban-wildland interface areas. Up to 80 percent of trees may be affected within some stands. This oak loss is unprecedented in recent California history, and there are concerns that the mortality is affecting ecosystems, increasing fire and safety hazards, and reducing land values. Federal, state, and local agencies and organizations formed the California Oak Mortality Task Force to better coordinate efforts to learn more about the disease and attack the problem.

In June 2000 the cause of SOD was discovered to be a previously unknown pathogen *Phytophthora ramorum*. In addition to oaks, *P. ramorum* has been determined to infect a range of other plants including rhododendron and camellia, popular ornamental plants, and coastal redwood and Douglas-fir. The impact of the disease varies, ranging from significant mortality in oaks to minor spots on the leaves of camellia. The effects of the disease in redwood and Douglas-fir remain unclear, although no mortality from the disease in either species has been observed.

The distribution of *Phytophthora ramorum* in California did not change significantly in 2005 (there were no new counties) but a new find in Willow Creek (Monterey County) extended the infestation south to just above the San Luis Obispo County line. Infestations intensified in Southern Humboldt County around Redway expanding north into the Salmon Creek watershed. Thousands of trees (mostly tanoak) were killed in western Sonoma (Map 6) and western Marin Counties and the Big Sur area of Monterey County.

New hosts. 16 new hosts were identified in 2005. The total number of known susceptible species stands at 84, across more than 40 genera. For a complete list, see:

www.suddenoakdeath.org

Of note are more native Californian species, including *Abies concolor* (white fir), *Adiantum jordanii* (California maidenhair fern), *Torreya californica* (California nutmeg), and *Vancouveria planipetala* (Redwood ivy). The first canker infection on a conifer, Taxus brevifolia (pacific yew), was also detected this year.

***P. ramorum* in nurseries.** The USDA Animal and Plant Health Inspection Service (APHIS) issued an emergency federal order for all California, Oregon and Washington nurseries which regulates the interstate movement of all host and associated host plants. Nurseries must be inspected and certified as *P. ramorum*-free before transporting plants across state lines, with inspections repeated annually.

In 2004, there were 177 USDA APHIS confirmed positive *P. ramorum* sites in 22 states from trace-forward, national, and other surveys. So far in 2005, 99 sites in seven states (California, Oregon, Washington, Georgia, Louisiana, South Carolina, and Tennessee) have had *P. ramorum* detections. In 2005, the California Department of Food and Agriculture (CDFA) has identified 55 *P. ramorum*-positive nurseries in California.

In addition to wholesale nurseries the pathogen was recovered from a retail nursery in Sacramento County. Genetic analysis of the Sacramento retail nursery isolate determined that it is a new strain of the pathogen not previous found in the US or Europe. In addition, the pathogen was isolated from roots of infected rhododendron plants for the first time.

The pathogen was also detected in a residential landscape in El Dorado County. Following USDA-APHIS protocols, the infestation was eradicated.

2005 Sudden Oak Death Surveys

Since 2000, the USDA Forest Service and California Department of Forestry and Fire Protection have been collaborating on a comprehensive program to address sudden oak death, caused by *Phytophthora ramorum*, in California. Early detection and some delimitation monitoring was carried out via aerial survey, watershed, and ground-based vegetation survey. Five projects were implemented in 2005; the results of which are summarized below:

Aerial Survey (Jeff Mai, USDA Forest Service, and Walter Mark, Cal Poly San Luis Obispo). This 2005 aerial and ground-check survey covered 23 counties in the state and mapped approximately 81,000 acres of hardwood mortality. 13.5 million acres were surveyed in 2005; approximately 75% of the surveyed area was on private land. Ground surveys, following aerial surveys, covered seven California counties and identified four new findings in Humboldt County, expanding the known infested area for the county to include two additional watersheds. Hardwood mortality was mapped over the Los Padres National Forest and along the Big Sur coast and noted in the southern-most known *P. ramorum*-infested areas (Willow and Plaskett Creeks), just north of the San Luis Obispo County border. However, several canyons between Julia Pfeiffer Burns State Park and Plaskett Creek along the southern Big Sur Coast appear to remain uninfested. Flyovers and ground surveys concluded that *P. ramorum* remains undetected in Del Norte and San Luis Obispo Counties. Additionally, the flyovers made note that vegetation types containing coast live oak have less mortality and fewer confirmations of *P. ramorum*, while those with a tanoak component appear to be increasing both in terms of mortality area and new confirmations. For detail results of aerial and ground surveys, see accomplishment report, maps and other publications at http://www.fs.fed.us/r5/spf/fhp/fhm/sod/index.shtml.

Figure 21. *Phytophthora ramorum*- caused mortality in Sonoma County as seen by the 2005 Aerial Survey.

Photo by Jeff Mai.

Watershed Monitoring (David Rizzo, University of California, Davis) Eighty-eight locations were established in perennial watercourses in 2004 and 2005 to monitor for the presence of *Phytophthora* ramorum throughout coastal central and northern California as well as portions of the Sierra Nevada mountains. Most of the monitored areas have limited or no *P. ramorum* at this time, but are near the epidemic range of *P. ramorum* and considered high-risk for invasion by *P. ramorum*. Two currently infested sites in Sonoma County were included as a baseline for successful recovery of *P. ramorum*. Rhododendron leaves were placed in mesh bags and secured in watercourses for 1 to 3 week intervals year-round to bait for *Phytophthora* species. Recovered symptomatic leaves were plated on *Phytophthora* -selective media (PARP-H). Twenty-one stream courses were infested with *P. ramorum*. *P. ramorum* was detected at all sites with a priori knowledge of forest infestation. *P. ramorum* was found at six sites without prior knowledge of forest infestation in Humboldt, Contra Costa, and Monterey counties. Forest infestations have been confirmed at all six sites, with the exception of Willow Creek in Monterey County, where symptomatic trees have been identified but not confirmed for *P. ramorum* presence. Another six sites downstream of known forest infestations had *P. ramorum* recovered, including three sites at least 4km away from known forest

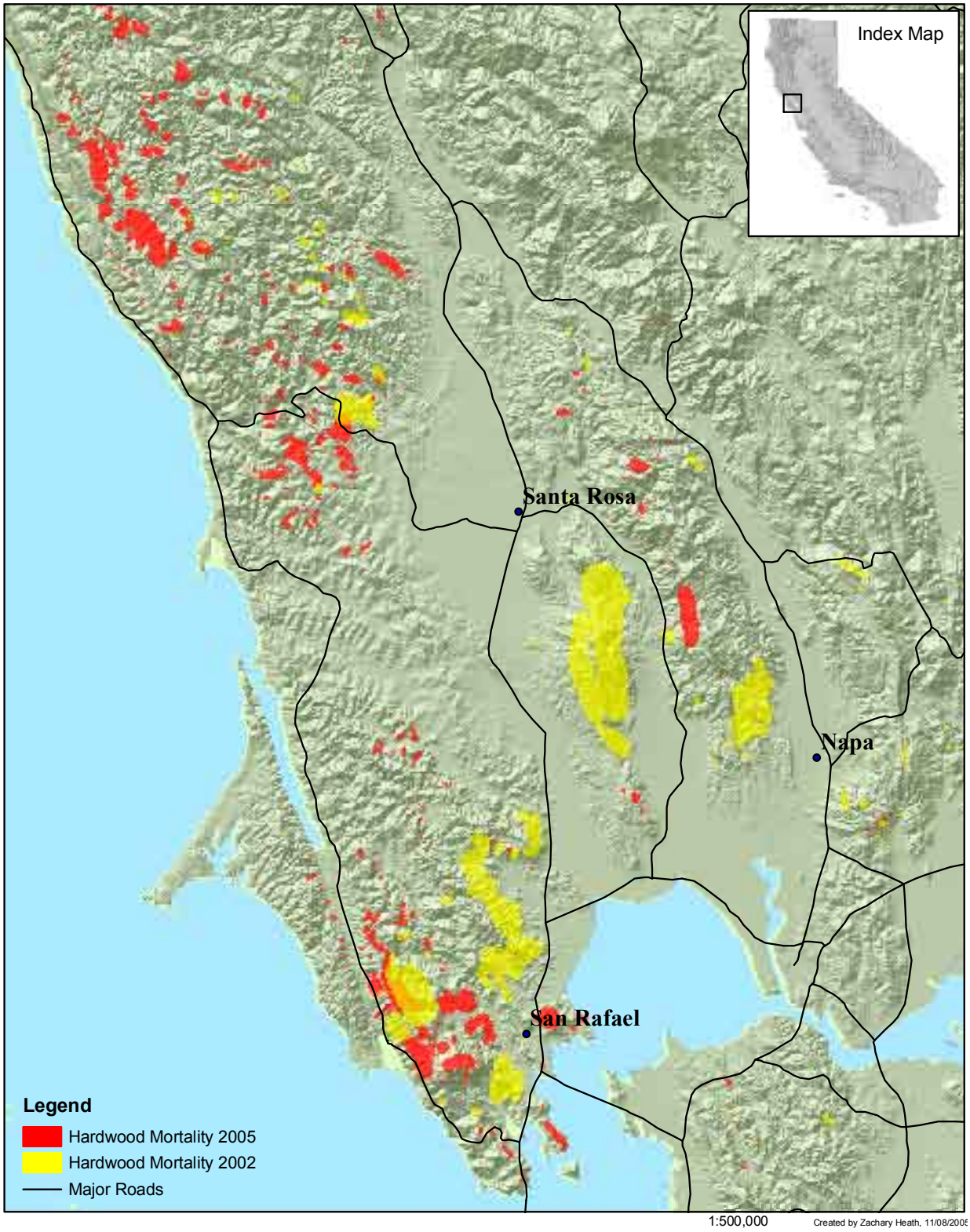
infestation. This monitoring has extended the southern range of *P. ramorum* to Willow Creek, 3km further south in Monterey County. Stream monitoring provides a useful method of early detection for *P. ramorum* infestation in watersheds. This project involves many collaborators including UC Davis, UC Cooperative Extension for Humboldt and Del Norte Counties, Cal Poly State University, California Department of Forestry and Fire Protection, UC Angelo Coast Reserve, Landels-Hill Big Creek Reserve, Fairfield Osborn Preserve, UC Berkeley Blodgett Forest Research Station, Hoopa Indian Tribe, Yurok Indian Tribe, East Bay Regional Parks, California State Parks, and Sonoma State.

Ground-Based Targeted Risk Survey (Ross Meentemeyer, Sonoma State University) Funded by USDA Forest Service Pacific Southwest Region State and Private Forestry and the CSU Agricultural Research Initiative, Meentemeyer and Mark assessed 392 high-risk locations across California based on the disease risk model developed by Meentemeyer et al (2004). Leaf samples were collected from hosts with *P. ramorum* symptoms along two transects per site. The pathogen was detected at 45 of the 392 (12%) locations assessed across the state. Of the 45 sites that *P. ramorum* was detected, 16 occurred in Marin County, 3 in Alameda, 1 in Contra Costa, 1 in Mendocino, 1 in Solano, 6 in Santa Cruz, 7 in Sonoma, 3 in Monterey, 3 in San Mateo, and 4 in Santa Clara. The pathogen was not discovered in any currently uninfested counties, but *P. ramorum* DNA was detected at one site nearly 30 miles from the nearest known infection in Humboldt County. However, it has not been possible to replicate this result through subsequent sampling and culture analysis. Distance-decay analysis of the 392 locations indicates that the probability of *P. ramorum* occurrence decreases exponentially with increasing distance from known centers of infection and its probability of presence decreases substantially beyond 20 km.

California National ***P. ramorum*** **Survey** (Don Owen, CDF, Redding). Detection surveys in eastern Butte and Yuba Counties, including a road survey combined with vegetation transects to record hosts of *P. ramorum* and sample symptomatic host tissue, and a stream survey that utilized rhododendron leaves as bait for *Phytophthora* spp. in stream water were conducted. A total of 35 vegetation transects were surveyed and 11 streams baited. Roughly 170 miles of roadside vegetation was scanned while driving through areas identified as moderate to high risk for sudden oak death. Eight vegetation samples were collected for lab diagnosis. *P. ramorum* was not detected by any of the survey methods. The only confirmed *Phytophthora* infection was from symptomatic bay leaves collected near Pulga, Butte County, which yielded P. pseudosyringae. This *Phytophthora* was also recovered during last year's survey from symptomatic bay leaves collected in San Luis Obispo County.

The complete survey report (2005 California National *Phytophthora ramorum* Wildland Survey) can be found on the California Oak Mortality Task Force website: www.suddenoakdeath.org.

Survey of Southern Humboldt County (Valachovic, Lee and others). A new *P. ramorum*-infested site in Humboldt County has been confirmed 6 miles north of the Garberville/Redway area on Humboldt Redwoods State Park property along the Avenue of the Giants. The site features a moderately steep hillside dissected by ephemeral drainages running directly into the South Fork Eel River. Old-growth redwood, in places with an understory of nearly pure California bay laurel, grows on the site's lower slopes; the stand grades into a Douglas-fir/tanoak and madrone mix on upper slopes. Symptoms are found in both forest types. Tanoak shoots and bark, as well as California bay laurel leaves from the site all yielded *P. ramorum*. Numerous symptomatic hosts, including California black oak, madrone, and Douglas-fir, have since been observed on the site and sampled; results are pending.



Map 6. 2002 and 2005 oak mortality mapped by aerial survey in Sonoma and Marin Counties.

White Pine Blister Rust

Cronartium ribicola

White pine blister rust (WPBR) is the most destructive disease on five-needle pines (such as sugar pine, western white pine, and whitebark pine) in California. The pathogen is native to Asia, although it was actually introduced on pine seedlings from Europe in the early 1900's.

White pine blister rust causes cankers on branches and eventually the main stem of infected pines. Cankers on smooth-barked trees will often have a rough center surrounded by a diamond-shaped orange lesion of infected bark. On older trees with rough bark, the leading edge of infection is not apparent. Older cankers are rough and blistered in appearance. WPBR requires *Ribes spp.* as an alternate host.

White pine blister rust continues to be a significant problem of sugar pine throughout the known range of the pathogen in California. Specifically, WPBR infestations were noted in Mountain Home State Forest, killing young and old sugar pines. Most young trees and seedlings in the forest are affected. The disease continues to spread out within the area. This population of the rust pathogen is especially virulent and appears to have overcome genetic resistance in the host population.

High Elevation 5-needle Pine Survey

The effects of white pine blister rust on sugar pine and western white pine are well known, damage is widespread and common in California. Other tree hosts, or potential hosts, are great basin bristlecone, foxtail, limber and whitebark pines. Less is known about disease's impacts on these other white pines. In 2004, a two-year field project was initiated by the USDA Forest Service to learn more about impacts to California's other white pines. Others working on the project include Death Valley National Park and a consulting pathologist. Thus far, great basin bristlecone pine is the only white pine species not affected. Preliminary data indicate that the incidence of rust in northern populations of foxtail pine is between 18-30%. The study did not observe blister rust on any limber pine plots. Rust incidence varied widely in whitebark pine (8-71% in the infected plots) and tended toward the northern portion of the reconnaissance area which extends from Lake Tahoe to Yosemite National Park.

Results from second-year field work on evaluating the incidence of blister rust continued with the focus on whitebark, foxtail, and western white pine stands. A total of 113 longterm monitoring plots were established over two years. Rust was found on northern foxtail, western white, and whitebark pine, but not on limber, Great Basin bristlecone or southern foxtail pine. A GIS-based database has been developed to merge information on the distribution of white pine and blister rust locations in California.

M261D

M261A

M261B

In 2005 USDA Forest Service Forest Health Protection Northern California Services Area personnel preformed an incident survey of 5-needle pines in many high elevation pine sites in Northern California. Rust was present in scattered locations on western white pine, whitebark pine and foxtail pine. Occurrences of WPBR in these pines were as follows:

Western White Pine

Low levels of rust were found in several locations on the Shasta-Trinity National Forest (on Black Butte (M261D), near the top of Grouse Ridge near the Dorleska mine (M261A), near Upper Deadfall Lake (M261A), and along the trail to north Yolla Bolly Summit (M261B). On the Klamath National Forest, low levels of WPBR are present on western white pine along the trail to Big Duck Lake (M261A) (Figure 21), near Buck Lake (M261A), around Eaton Lake (M261A), at Russian Lake, Water Dog Lake and Russian Creek (M261A), near Statue Lake (M261A), and along Sugar creek, above and below Sugar Lake (M261A). Higher levels of

Figure 22. White pine blister rust on western white pine near Big Duck Lake, Russian Wilderness, Klamath National Forest.

Photo by Dave Schultz.

M261A

rust are present in western white pine on the Klamath National Forest along the Pacific Crest Trail from Carter Meadows to South Fork Lake (M261A), in the drainage around Golden Russian Lake (Russian Wilderness, M261A). On the Six Rivers National Forest, higher levels of white pine blister rust are present along the French Hill Road near Camp Six and along the Youngs Creek trail within the first two miles from the trailhead (both Smith River National Recreation Area, M261A).

Whitebark Pine

White pine blister rust is present in low levels in whitebark pine in the Russian Wilderness (Klamath National Forest) on the ridgeline above Big Duck Lake and near Statue Lake (M261A), in the Warner Mountains near North Emerson Lake (Modoc National Forest, M261G), at Lassen National Park, a few hundred yards north of the Summit Trail parking lot (M261D), and on private land near Little Crater Lake (in Siskiyou County at T. 40N., R.9W, Sec. 19, M261A) (Figure 22).

Figure 23. White Pine Blister Rust on whitebark pine near Big Duck Lake, Russian Wilderness, Klamath National Forest

Photo by Dave Schultz.

Foxtail Pine

White pine blister rust is present in low levels in foxtail pine at the Lake Mountain Lookout (Oak Knoll Ranger District, Klamath National Forest, M261A), and in the saddle on the west side of South Yolla Bolly Mountain (Yolla Bolly-Middle Eel Wilderness, Grindstone Ranger District, Mendocino National Forest, M261B).

M261D

M261G

M261B

2005 White Pine Blister Rust Resistance Screening

During FY2005 the program screened about 580 sugar pine families from new candidate trees suspected of carrying major gene resistance (MGR) to blister rust; 43 families proved to be from MGR seed-parent trees. This brings the total number of live, proven resistant trees in the Pacific Southwest Region to about 1,580 families. In addition, 263 families had one or more MGR seedlings due to an unknown MGR pollen parent (MGR-PR). Screening 23 families of western white pine from Region 4 also revealed one MGR family and seven families with MGR-PR seedlings.

Spring 2005 sowing included 810 sugar pine and a few western white and limber pine families. Rust inoculations take place in Fall and resistance screening in Winter 2005/2006. Additional seedlings were grown by the Institute of Forest Genetics to establish a field test in 2006 for evaluating the expression and inheritance of partial rust resistance in sugar pine from selected families.

In September 2005 the Program received about 1,400 new sugar pine candidate trees, 942 from the southern California forests and 278 from the North Zone forests. Cone collections from the south are part of recent expanded efforts to identify rust-resistant sugar pine there. Collections from the north are part of the North Zone strategy (developed in 2004) for finding rust resistant trees in that region, i.e., a strategy focused on identifying trees with partial resistance (also called slow rust resistance), and thereby increase the speed with which rust resistant individuals are found, in light of a very low MGR frequency in the North Zone.

Two sets of sugar pine seedlings were planted at Happy Camp in Spring 2005: the first set of 1,541 MGR seedlings from 234 families were planted at the Happy Camp Outplant Site and the second set of 8,363 seedlings, not tested for MGR, were planted at a nearby site. As part of the North Zone strategy, the second set will augment the first as both will be evaluated for partial rust resistance. Additional activities included the selection and scion collection of 107 saplings with partial resistance from 85 sugar pine families, scion collection from 184 MGR pollen receptor saplings for clone banking, and planting of 143 Great Basin bristlecone pine seedlings from 30 families.

Canker Diseases

Chinkapin Canker

Cause unknown

Branch dieback and mortality of chinkapin was observed along a 2-mile segment at the summit of the Bald Hills Road (between Orick and Weitchpec, near Schoolhouse Peak, (263A). The disease was widespread and affected all ages of chinkapin.

263A

Cytospora Canker of True Fir

Cytospora abietis

Figure 24. Heavy infestation of cytospora canker of true fir.

Photo by Dave Schultz.

Branch flagging and associated injury to red fir first reported in 2003, continued to be visible in numerous areas in the central Sierra Nevada (M261E; Tuolumne, Calaveras and Amador Counties). Cytospora canker (caused by *Cytospora abietis*) in association with red fir dwarf mistletoe (*Arceuthobium abietinum* f. sp. *magnificae*) were the primary causes of branch and whole tree mortality (Figure 23) The continued loss of additional branches over time has resulted in more tree mortality than was observed in 2003. In affected stands there is a mixture of recent and old mortality plus top kill. Most of the injury is occurring in areas above 6,500 feet elevation. Trees that survive will have dead branches scattered within their crowns which may lead to hazardous conditions in recreation sites. Locations with observed injury on the Stanislaus National Forest include: Bourland Mountain, Dodge Ridge, Aspen Meadow, Crabtree Trailhead, Bear Valley and Lake Alpine.

Significant outbreaks of Cytospora canker have been noted in Nevada, El Dorado, and Placer Counties (M261E). Injury has consisted of dieback of branch tips in affected fir trees and continues to infect red fir branches near Robinson Flat Campground on the Tahoe National Forest. Branch dieback of red fir and, to a lesser degree, white fir has been quite noticeable the past two years on Latour State Forest, Shasta County. Affected trees often suffer from dwarf mistletoe and have experienced a higher rate of mortality from the fir engraver beetle.

M261E

Diplodia Blight of Pines

Sphaeropsis sapinea (***Diplodia pinea***)

Scattered Diplodia blight was identified in ponderosa pine at the Sheep Camp campground in Whiskeytown National Recreation Area (M261A).

M261A

Shoot dieback caused by Diplodia blight was observed again this year on ponderosa pines in the Sacramento River Canyon, Shasta County. Repeated infections on some trees are leading to crown dieback and occasionally mortality. Diplodia blight was also reported on ponderosa pine from various locations in Nevada and Placer Counties, including Grass Valley, Nevada City, Auburn, and Meadow Vista. Shoot dieback was also observed on ponderosa pines in the foothills of the Sacramento Valley. Most of the injury was along sections of Highway 49 in Placer and Nevada Counties. The most severe injury was in the upper reaches of the South Yuba River Canyon and infestations continue to kill ponderosa pine branches along the North Yuba River in the Goodyears Bar and Downieville areas of Sierra County (M261E).

M261E

Incense Cedar Canker

Cause unknown

A new disease concern has developed of young incense-cedars, *Calocedrus decurrens*. A canker disease of unknown cause is killing young trees and branches. Cankers have formed in the smooth bark and spread until the tree or branch is girdled. The infection does not penetrate the wood of the host. Affected cankers tend to ooze slightly. Most of the disease is found in understory trees growing in extremely dense thickets beneath the overstory vegetation. Surrounding green incense cedars are also often infected but have yet to show dieback or death of the host. Affected trees have been found from approximately 2,000 to 4,000 feet in elevation. The area reporting the problem extends from El Dorado County just south of Highway 50 in the north to the community of Shaver Lake in Fresno County in the south (M261E). The area was affected by years of drought followed by an average rainfall year but with rain extending into late June. The winter was very mild, but there were severe late spring frosts that may have contributed to the disease.

M261A

Fusicoccum Canker

Fusicoccum sp.

Fusicoccum canker was common in madrone at the Oak Bottom campground at Whiskeytown National Recreation Area (M261A). *Fusicoccum quercus* was isolated from heavily declining tanoaks in Eldorado CO and may be involved with tanoak mortality.

262A

Seiridium Canker

Seiridium cardinale

Seiridium canker was identified on a Palestine cypress (*Cupressus sempervirens pyramidalis*) near the main greenhouse at the Genetic Resource and Conservation Center in Chico, Mendocino National Forest (262A).

Foliage Diseases

Needle Cast Diseases

Various fungi


M261D

Various needle cast fungi are causing injury to the foliage of various conifer species. Late spring rains are likely to blame for the severity of the problem. True firs and Douglas fir are the major hosts although some pines are also affected this year. Old needles are often completely killed with only current year needles remaining on the trees. Primary concern has been for the Christmas tree industry with major outbreaks in Placer, El Dorado, and Marin Counties. *Lophodermium* spp. is killing lodgepole pine needles in the Lost Creek drainage in Lassen National Forest, near the northern boundary of Lassen Volcanic National Park (M261D).

Elytroderma Disease continues to be widespread on Jeffrey pines in the Laguna Mt. Area, Descanso Ranger District, Cleveland National Forest.

Oak Anthracnose

Apiognomonia quercina

Late spring rains resulted in significant defoliation and leaf scorch of various oak species due to anthracnose diseases. Entire trees were defoliated early in the growing season only to re-foliate later in the year. No significant injury appears to have occurred although the trees are undoubtedly under stress from the defoliation. All sizes of trees appear to have been affected. Notable areas included Placer and El Dorado Counties and in the community of Oakhurst (M261E).

Oak Leaf Blister

Taphrina caerulescens

Oak leaf blister was observed on huckleberry oak (*Quercus vaccinifolia*) in a landscape setting in the town of Portola, Plumas County. (M261E)

Oak Leaf Pathogens

Various species

Wet spring weather contributed to the widespread occurrence of oak leaf spotting throughout much of the Sacramento Valley and surrounding areas. Injury was very similar to that which occurred in 1993. In Shasta and Tehama Counties, black, blue, and valley oaks were affected. Affected trees exhibited brown splotches on their leaves and were subject to early defoliation. Many trees produced some new foliage. Blue oaks lost leaves all summer long and by September many trees had thin crowns. More than one type of fungus can cause these leaf spots, including *Discula quercina* (oak anthracnose) and *Septoria quercicola* (oak Septoria leaf spot). A *Septoria* sp. was identified as the cause of leaf spots on one valley oak sample.

Powdery Mildew, caused by ***Uncinula adunca***

Leaf and Twig Blight, caused by ***Venturia macularis***

The combination of powdery mildew and leaf and twig blight were both observed on young quaking aspen (*Populus tremuloides*) stems growing under dense conifer canopies along Pine Creek, west of Bogard Campground, Eagle Lake Ranger District, Lassen National Forest (M261D).

Sugar Pine Needle Cast

Lophodermella arcuata

Sugar pine needle cast was observed on several sugar pine near the intersection of Highways 32 and 36, Almanor Ranger District, Lassen National Forest (M261D).

Root Diseases

Annosus Root Disease

Heterobasidion annosum

Figure 25. Forest Pathologist John Kliejunas treats stump with annosum inoculum. Hat Creek Ranger District, Lassen National Forest.

Photo by S. Smith

Root diseases are of a growing concern in California after the cutting of numerous trees for bark beetle control and safety issues (Figure 24). The potential for spread of annosus root disease (caused by *H. annosum*) will be a possibility for decades to come where freshly cut stumps were not properly treated. Permanent plots are to be established to monitor the development of the disease over time. In particular, fresh, untreated stumps of recently killed large diameter pines were seen in the San Bernardino Mountains, e.g., at Heartbar and Council Campgrounds.

M261D

Several madrones and one knobcone pine were found dead and dying within the Bonny Doon Ecological Reserve in Santa Cruz County. Annosus conks were found at the bases of the madrones, and the pathogen was reared from the root flare of the adjacent knobcone pine. An area void of pines of approximately 2 acres is adjacent to the dying trees, and annosus root disease may have played a role in killing knobcones in this area. Not too far away are declining chinkapins, but the crowns were riddled with small branch cankers, with no evidence of *H. annosum* near the root collar.

M261G

Annosus root disease continues to cause scattered pockets of mortality in ponderosa pine on McCloud Flats on the Shasta-Trinity National Forest (M261D).

The pathogen was found to be infecting an several groups of white fir south and west of Manzanita Mountain on the Big Valley Ranger District, Modoc National Forest (M261G). The disease appears to be interspersed throughout pure white fir stands as well as fir stands with a minor ponderosa pine component. Annosus root disease in white fir was also found near the headwaters of Thompson Creek on the Mt. Hough Ranger District, Plumas National Forest (M261E).

M261E

Armillaria Root Disease

***Armillaria* sp**.

Armillaria root disease has become a concern on medium pole sized incense-cedar in the central Sierra. Trees have been killed in small groups in Butte, Placer, and Fresno Counties. Most areas affected are severely overstocked.

Black Stain Root Disease

Leptographium wageneri

Due to near normal precipitation in most of northwestern California during the winter of 2004-2005, ponderosa pine mortality caused by a combination of drought, high stocking, black stain root disease and western pine beetle at McCloud Flats (McCloud Ranger District, Shasta-Trinity National Forest, see cover photo) has decreased (M261D). However, conspicuous concentrations of mortality around black stain root disease centers were evident at the Mud Flow Research Natural Area, Elk Flat, Ash Creek Sink, Algoma and Harris Mountain (Figure 25). Scattered pockets of mortality were also present in dense Douglas-fir stands in the Eel River Late Successional Reserve south of the Van Dusen River

near Dinsmores (Mad River Ranger District, Six Rivers National Forest, 263A). Scattered pockets of Douglas-fir mortality due to black stain root disease are also present between Soda Creek and the northwest shore of Pillsbury Lake, and several centers are present at the Pillsbury Homesite Tract near the northeastern shore of Pillsbury Lake (Upper Lake Ranger District, Mendocino National Forest, M261B).

Figure 26. Black stain root disease center near Algoma mountain.

Photo by Dave Schultz

263A

M261B

M261D

M261G

Leptographium wageneri is killing ponderosa pine along Forest Road 35N21 one mile west of Schroder Lake on the Hat Creek Ranger District, Lassen National Forest. (M261D) The disease was confirmed in two 0.05 acre mortality centers. Several other mortality centers were nearby.

Mature ponderosa and Jeffrey pine mortality resulting from black stain root disease continues in the Heart Rock area east of Hwy 139 in northern Lassen County (M261G). Two dead (32" dbh and 36" dbh, each 110 feet tall) Jeffrey pine had black staining in the xylem tissue at the base. The trees are 2.1 mile east of Hwy 139 on Modoc National Forest Road #38N04. Black stain could not be detected in two nearby Jeffrey pine (32" dbh and 38" dbh) which died from Jeffrey pine beetle attacks.

During 2005, the only *P. monophylla* mortality that occurred in the San Bernardino Mountains was in *L. wagneri* root disease centers.

Brown Cubical Butt Rot

Phaeolus schweinitzii

Brown cubical butt rot was observed affecting small groups of Douglas-fir at the Mud Flow Research Natural Area at McCloud Flats (M261D). The disease is also affecting management of the Eel River Late Successional Reserve south of the Van Dusen River near Dinsmore (Mad River Ranger District, Six Rivers National Forest, 263A).

Phytophthora Root Rot

Phytophthora cinnamomi

Phytophthora root rot is problematic in Amador County where it is wiping out the endangered ione manzanita and killing many white manzanita. It is also widespread on coast live oak in San Diego County where it causes mortality in concert with drought.

Rust Diseases

Cedar Apple Rust

***Gymnosporangia juniperi-virginianae*.**

A severe outbreak of cedar apple rust occurred on primarily young incense-cedar in Calaveras County. Trees were stunted and deformed. A few small trees appear to have been killed by the deformed growth. The stand occurred within close proximity of an apple orchard.

342B

Gymnosporangium Rust (possibly ***G. clavariiforme***) was found on roughly 200 acres of serviceberry (*Amelanchier utahensis*) west of the town of Madeline, Lassen County. (342B)

Western Gall Rust

Peridermium harknessii

M261E

Western gall rust was found infecting a large number of 27 year-old and younger ponderosa pine trees in the USDA Forest Service Meadow Valley progeny evaluation site east of the UC Berkley Forester Camp on the Plumas National Forest (M261E). An evaluation to correlate the level of infection with known progeny is being conducted by the Forest Service Pacific Southwest Research Station's Institute of Forest Genetics.

Miscellaneous Diseases

An unknown condition is causing the tops of planted giant sequoia to thin and sometimes die at the Lake Almanor Country Club. All the affected trees are in irrigated landscapes.

Sunscald was a commonly encountered problem in the Redding area, Shasta County, on thin-barked trees that are pruned or exposed to sun through the removal of adjacent vegetation. Two incidences of sunscald were investigated – one caused by the pruning of a mature interior live oak, *Quercus wislizenii,* and the other caused by pruning of a group of pole-sized black oaks, *Quercus kelloggii*

Oak Mortality – Southern California

Cause unknown

An unknown condition is causing extensive mortality in live oak in southern San Diego County. Mortality has been mapped on roughly 7,500 acres of coast live and Engelmann oaks. The mortality is centered in Merrigan's Ranch near Descanso, but is also occurring around Descanso, Pine Valley, and in areas south of Interstate 8, including Horsethief Canyon, along Campo Road near Dutchman Canyon, and Lake Morena County Park. Mortality is occurring in both young and mature trees, in dry and mesic sites, and in clumped and scattered trees. A few trees were examined closely. No evidence of *Armillaria* infection was found. Tissue was collected from around a bleeding canker (with zone lines; Figure 26). There has been a single isolation of *Phytophthora cinimomi*, downslope from an avacodo orchard. However, the injury agent responsible for the widespread mortality is as yet undetermined, investigations are continuing. . Ambrosia beetles were found in one tree. Investigations are continuing. Typically affected trees develop thin crowns which then die in part or total. The extent of the mortality, over 30 square miles, is of great concern.

Figure 27. An unknown pathogen causing extensive mortality in live oak in southern San Diego County.

Photo by Laura Merrill

Mistletoe

True Mistletoe of White Fir
Phoradendron pauciflorum
True Mistletoe is severely impacting thousands of acres of white fir stands throughout portions of the central Sierra Nevada. True mistletoe is infecting the upper crowns of white fir stands over hundreds of thousands of acres of National Forest and private forest lands. In many locations, this infection shows up as a decline in upper crown health, making the trees susceptible to other attacking agents. In some cases, the mistletoe on individual trees may be killing the trees directly. Seeds from the true mistletoe can be spread over large areas by birds, which find the berries of the mistletoe highly palatable. Generally, the upper portion of the crowns are initially infected, but the infection can spread to lower portions of the trees. Usually the tallest trees in a given stand are infected, but the mistletoe can infect trees of any height.


M261D

Juniper Mistletoe
Phoradendron juniperinum
Juniper mistletoe is present in small amounts in some of the in the juniper in Lassen Community College Forest. The college is located 2 miles west of the Lassen National Forest Eagle Lake District Ranger Office in Lassen County (M261D).


M262B

***Phoradendron* spp.**
Leafy or true mistletoes are continuing to cause dieback and decline in both hardwood species such as oaks as well as in conifer species such as white fir in Developed Recreation Areas on all National Forests in So. California. Technical assistance was provided to the B.I.A for Projects on the Los Coyotes, Ramona, and Pauma Reservations in San Diego County and to Applewhite CG, Front Country RD., San Bernardino National Forest (M262B).

Limber Pine Dwarf Mistletoe
Arceuthobium cyanocarpum
Dwarf mistletoe is present on whitebark pine on Black Butte, which is a plug dome between Mount Shasta and US Interstate 5. Dwarf mistletoe on whitebark pine in the area has been previously reported by Hawksworth as *A. cyanocarpum* (Hawksworth and Weins, USDA Ag. Handbook #709, 1996; pers. comm. Bob Mathiasen, 2005).


M261B

Red Fir Dwarf Mistletoe
Arceuthobium abietinum* f.sp. *magnificae
Incidence and impact of red fir dwarf mistletoe continues to be heavy at South Fork Mountain on the Hayfork Ranger District, Shasta-Trinity National Forest (M261B).


M261E

Western Dwarf Mistletoe
Arceuthobium campylopodum
Scattered infected ponderosa pines were noted on the 40-acre Enterprise Rancheria near Lake Oroville in eastern Butte County (M261E). The dwarf mistletoe is also widespread in ponderosa pine at Hayward Flat campground on the Trinity Unit of the Whiskeytown-Shasta-Trinity National Recreation Area, Shasta-Trinity National Forest (M261A) and Sunset Campground on Pillsbury Lake, Upper Lake Ranger District, Mendocino National Forest (M261B), and is present on one side of the Sheep Camp campground in Whiskeytown National Recreation Area (M261A).


M261A

Western dwarf mistletoe is severely impacting the 30 year-old ponderosa pine on approximately 10 acres of the Cottonwood plantation which was planted after the 1974 Cottonwood Fire. Infected overstory pine that survived the fire were retained in the 150 acre plantation and provided the seed source for this current outbreak. The plantation

is located 1 mile NE of Cottonwood Campground on the Sierraville Ranger District, Tahoe National Forest (M261E). Western dwarf mistletoe continues to infest many of the overstory ponderosa pine on the 160 acre Lassen Community College forest following a recent thinning from below. The infection in the overstory trees is generally limited to the lower 33% of the crowns.

M261E

White Fir Dwarf Mistletoe
Arceuthobium abietinum* f.sp. *concoloris

Incidence and impact of white fir dwarf mistletoe continues to be heavy at South Fork Mountain on the Hayfork Ranger District, Shasta-Trinity National Forest (M261B).

M261B

Five-Year Dwarf Mistletoe Suppression Program

Dwarf mistletoes continue to be a serious problem in Developed Recreation Areas throughout Southern California. Five-Year Dwarf Mistletoe Suppression Programs are continuing on the Angeles National Forest and the Los Padres National Forest. The results from the Five-Year Dwarf Mistletoe Suppression Program on the Angeles National Forest are summarized in Table 6. Results from the Los Padres National Forest (Mount Pinos and Ojai Ranger Districts) are as follows:

- 140 Trees climbed
- 80 Trees pruned under 12” dbh
- 30 Trees removed under 12” dbh
- 6 Climbers trained

Table 6. Dwarf mistletoe suppression projects on the Angeles National Forest
(Los Angeles River, Santa Clara and Mojave Rivers Ranger Districts)

Project Area	Acres Treated	Trees Pruned	Trees Removed	Total Trees Treated
Highway 2	120	14	2	16
High Country	399	53	10	63
Buckhorn	40	6	0	6
Total	**599**	**72**	**12**	**85**

Abiotic Conditions

Drought

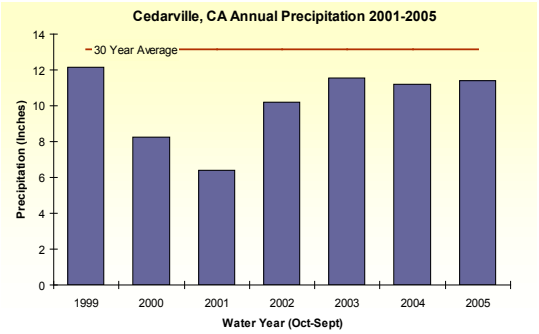


Figure 28. Annual precipitation from 2001-2005 of Cedarville, CA (near Modoc National Forest), compared to the 30-year average

California emerged from a four-year drought with above average springtime precipitation in 2005. Statewide snowpack conditions in April were 135% above average. Conditions remained slightly to extremely wet throughout the year (Figure 28) The moist, cool spring contributed to increased tree vigor and was a probable factor in the dramatic decrease in overall pest activity. However, drought-induced pest activity still occurred on the Warner Ranger District of the Modoc National Forest where precipitation was 13% below the 30-year average (Figure 27).

Palmer Classifications
4.0 or more extremely wet
3.0 to 3.99 very wet
2.0 to 2.99 moderately wet
1.0 to 1.99 slightly wet
0.5 to 0.99 incipient wet spell
0.49 to - 0.49 near normal
- 0.5 to - 0.99 incipient dry spell
- 1.0 to - 1.99 mild drought
- 2.0 to - 2.99 moderate drought
- 3.0 to - 3.99 severe drought
- 4.0 or less extreme drought

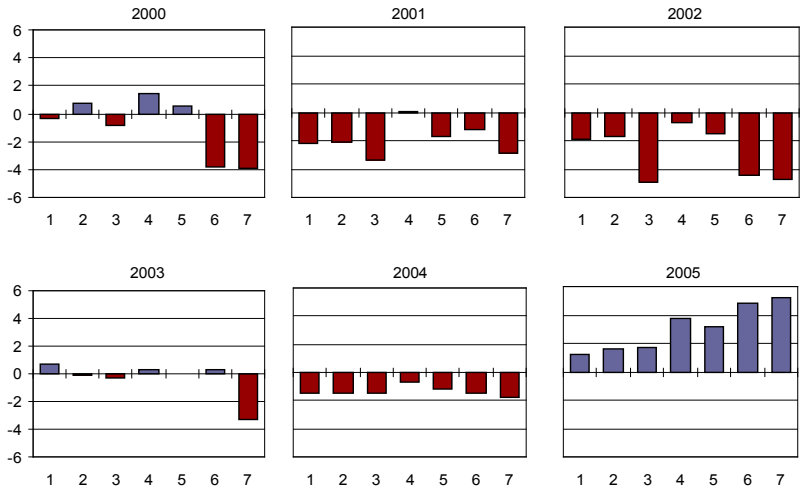


Figure 29. Palmer Drought Indices through September 2005.

Fire

There were 6,143 fires reported by California Department of Forestry and Fire Protection, burning 74,408 acres.

Ozone

Map 7. 2005 FIA plots with ozone injury.

Ground level ozone is an air pollutant in the lower atmosphere formed from the reactions of hydrocarbons and nitrous oxides in the presence of sunlight. Automobile engines and industrial processes produce most of the compounds that result in ozone. It is a major element of urban smog. The airborne transport of ozone to remote forested areas has led to increasing concern about how this pollutant is influencing the health of our national forests. Possible impacts of ozone on forested species include reduced growth and seed production and increased susceptibility to insects and disease. Long-term ozone stress may lead to changes in species composition and biodiversity.

The USDA Forest Service's Forest Inventory and Analysis (FIA) uses biomonitoring to monitor the potential impact of tropospheric ozone (smog) on forests. Bioindicators (Table 5) are plants that exhibit a visible response to ozone pollution. 65 plots were visited in 2005; ozone injury was present on 31 plots (Map 7). Indicator species with validated injury were ponderosa pine, Jeffrey pine, blue elderberry and skunkbush. Additional analysis of ozone injury detected by the FIA program will be reported in the upcoming FIA 5-Year Report for California as well as a Pacific Northwest General Technical Report

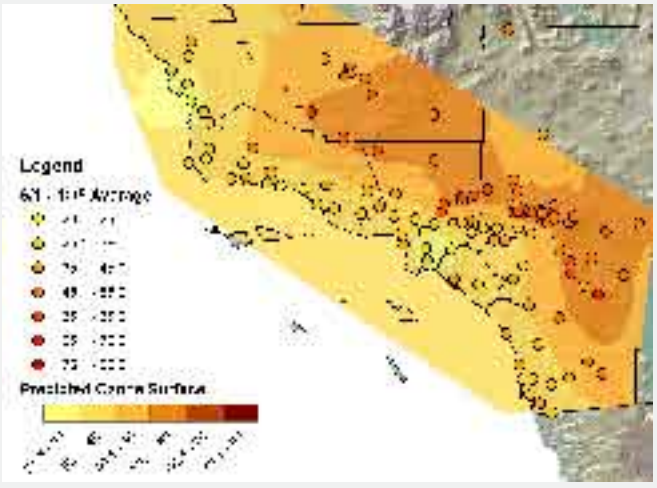
Table 6. Western ozone bioindicator species.

Native Plants	**Tree Species**
Thimbleberry	Ponderosa Pine
Huckleberry	Jeffrey Pine
Evening Primrose	Quaking Aspen
Mountain Snowberry	Scouter's Willow
	California Black Oak
	Choke Cherry
	Ninebark
	Pacific Ninebank
	Western Wormwood
	Blue Elderberry
	Red Elderberry
	Red Alder

Intensified Ozone Monitoring and Assessment of Ozone Impacts on Conifers in Southern California

Michael Arbaugh, Andrzej Bytnerowicz, Pacific Southwest Research Station,
and James Allison, Forest Health Protection

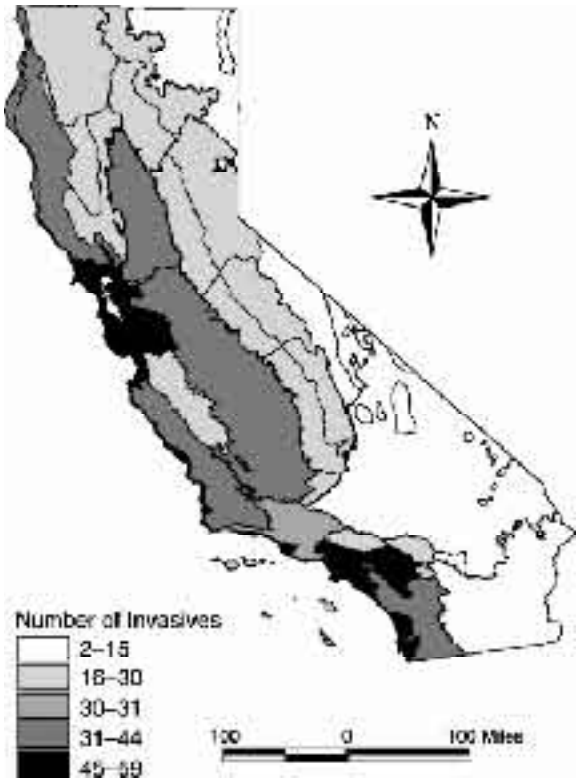
Tropospheric ozone is a phytotoxic gaseous air pollutant formed by photolysis from air pollution generated by large metropolitan areas, during transport over long distances to rural areas. Ozone, together with drought and bark beetles, is one of the key stressors affecting forest trees adjacent to urban areas. Recently passive samplers have been used to measure ambient ozone concentrations. Passive samplers allow O_3 distribution to be characterized at forest stand and landscape scales. Because they are inexpensive, easy to use and do not require electricity to operate, passive samplers are especially suited to remote areas. Large-scale evaluations have already been performed for the Sierra Nevada. In this study several sources of funding were utilized to establish an extensive network of 37 passive ozone samplers southern California mountains, foothills and desert. Samplers were changed every 2-weeks during between May and September 2005. Several active ozone monitors were installed to provide calibration of passive samplers on-site. Passive and active ozone sampler data were then used to develop spatial estimates of ozone distribution in the mountains of Southern California for the summer of 2005 (Map 8).



Map 8. Average 2005 summer ozone season for Southern California.

Courtesy
Mike Arbaugh, PSW

Invasive Plant Conditions



Map 9. The distribution of invasive plants by bioregion. Invasive plants include those rated A and B by the California Invasive Plant Council. (Dark 2004)

The California Exotic Pest Plant Council was formed in 1992 by people concerned with the protection, management, and enjoyment of our natural areas, and who were becoming increasingly alarmed about the effects of the introduction and spread of invasive, exotic vegetation into those areas. Since then, the California Invasive Plant Council (Cal-IPC), a 510(c)3 nonprofit, has been dedicated to finding solutions to problems caused by non-native pest plant invasions of the State's wildlands through research, restoration, and education. The organization provides a forum for all concerned parties: land managers of local, State and Federal agencies, land owners/stakeholders, professional managers from land trusts and preserves, stewardship volunteers, consultants, agency and university researchers, professional and amateur gardeners, and concerned citizens to share information and unite behind a common goal.

California's National Forests play a key role in the California landscape, with their valuable habitat and resources. Like other parts of the State, invasive weeds degrade the quality of natural resources (Map 9).

The forests of California are subject to infestation from a variety of plant pests due to the variations in vectors, climate, topography, and the nature of disturbances that have occurred there (i.e. logging, fire, drought, insect pathogens, etc.). Public agencies, landowners, and natural area managers have formed working partnerships to address the problem through outreach, inventory, prevention, treatment, and monitoring of priority weeds. Typically parties work together through Weed Management Areas. These cooperative efforts have demonstrated great success by increasing efficiency of control efforts across ownerships, and raising awareness about the problems caused by invasive weeds.

Table 6 on the following page illustrates a selected group of high priority species that are invading the forests of California. The rating systems and species descriptions are explained below.

Table 7. High priority invasive plant species of California forests.

Common Name	Scientific Name	Family	State Rating	CAL-IPC Rating
Scotch Broom	*Cytisus scoparius* (L.) Link	Fabaceae	C	High
Spotted knapweed	*Centaurea maculosa* Lam	Asteraceae	A	High
Squarrose knapweed	*Centaurea squarrosa* Willd.	Asteraceae	A	Moderate
Scotch thistle	*Onopordum acanthium* L.	Asteraceae	A	High
Musk thistle	*Carduus nutans* L.	Asteraceae	A	Moderate
Yellow star thistle	*Centaurea solstitialis* L.	Asteraceae	C	High
Dyer's woad	*Isatis tinctoria* L.	Brassicaceae	B	Moderate
Arundo, giant reed	*Arundo donax*	Poaceae	No rating	High
Leafy Spurge	*Euphorbia esula*	Euphorbiaceae	A	High
Rush skeletonweed	*Chondrilla juncea L.*	Asteraceae	A	Moderate

Pest Ratings:
California Dept. of Food and Agriculture (CDFA):

A: Eradication, containment, or entry refusal at State level
B: Species more widespread. County Ag. Commissioner discretion on eradication, containment or control.
C: Species very widespread. County Ag. Commissioner discretion on eradication, containment or control.

California Invasive Plant Council (Cal-IPC)

High: These species have severe ecological impacts on ecosystems, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal and establishment. Most are widely distributed ecologically, both among and within ecosystems.

Moderate: These species have substantial and apparent – but generally not severe - ecological impacts on ecosystems, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal, though establishment is generally dependent upon ecological disturbance. Ecological amplitude and distribution may range from limited to widespread.

Low: The ecological impacts of these species are minor. Their reproductive biology and invasiveness attributes result in low to moderate rates of invasion. Ecological amplitude and distribution are generally limited (these species may be locally persistent and problematic). None listed in this report.

References:

California Department of Food and Ag; Pest Ratings of Noxious Weed Species, 2004. www.cdfa.ca.gov/phpps/ipc/encycloweedia
Cal-IPC, Public Review Draft, California Invasive Plant Inventory, October 2005. www.cal-ipc.org

Scotch Broom
Cytisus scoparius
Introduced into California through the horticultural trade, this species is wrecking havoc in California forests. Highly flammable, with large seed longevity, and unfortunately pretty in bloom with bright yellow flowers, this species is especially problematic in the wildland/urban interface of the Central Sierras. It can form large, dense infestations, and is a barrier to successful reforestation.

Scotch Broom Aerial Survey of the Eldorado National Forest

A pilot survey was completed in coordination with the Eldorado National Forest (ENF) and Forest Health Protection to aerially map Scotch broom occurrences within a portion of the forest, primarily the western portion of Georgetown Ranger District. The survey was completed in May, 2005 during peak flowering to map areas where Scotch broom had greater than 50% cover (Map 10).

Of all the weeds documented on the ENF, Scotch broom has the greatest presence. During the aerial survey, 51 discrete areas were mapped with >50 % Scotch broom cover. These areas averaged 64 acres in size with a total area mapped of approximately 3,300 acres. When clipped with the ENF administrative boundary 34 polygons totaling 1,700 acres were documented. Approximately 25 new areas were mapped, when compared to previous GIS point data. This point data documents an additional 179 smaller infestations elsewhere on the district/forest. It is important to note that each point can represent one individual or several dozen broom plants.

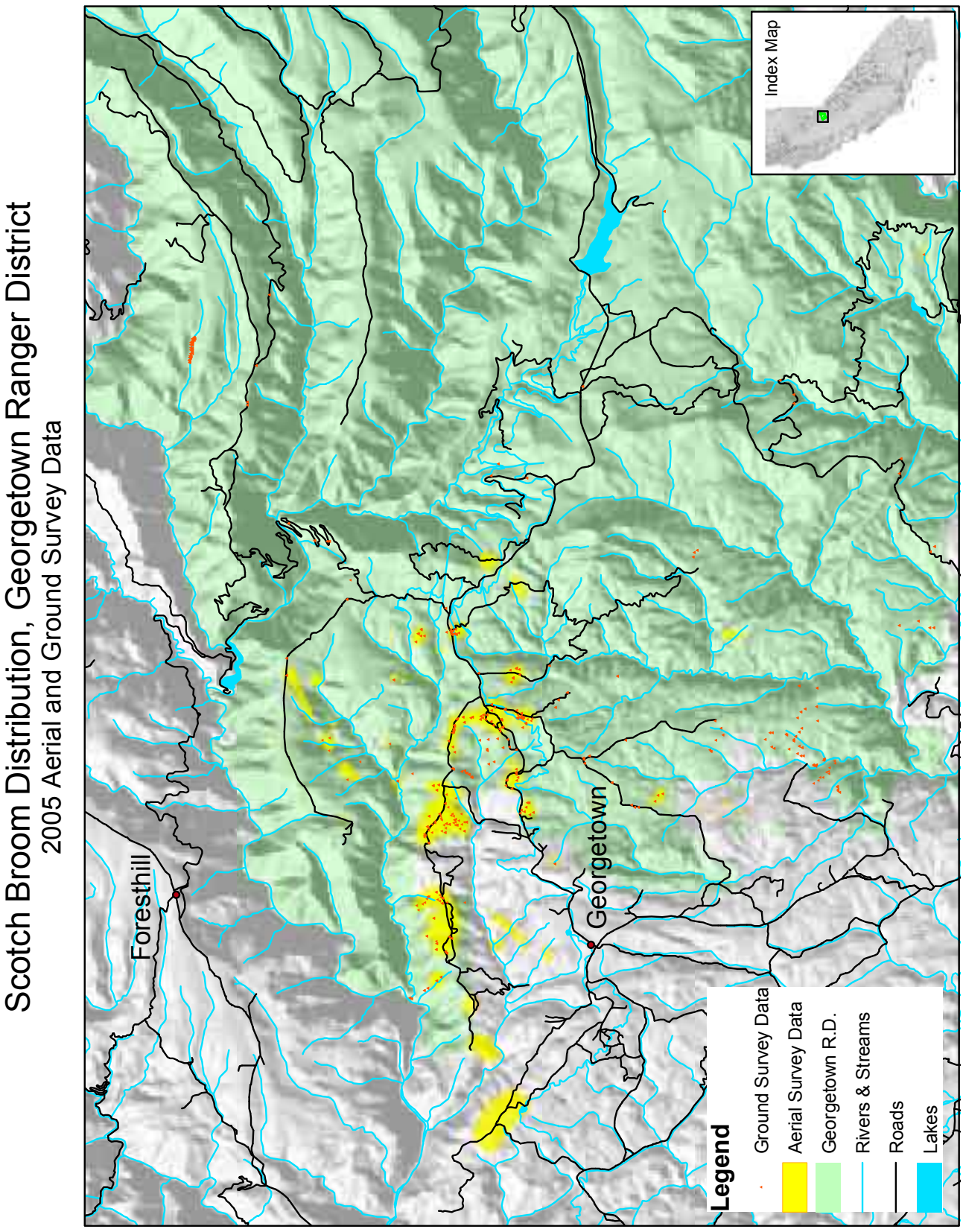
This was the first attempt to map invasive plants aerially in California and was very successful. Future aerial surveys for Scotch broom and other invasive native/nonnative plants are being considered elsewhere in the region.

Spotted knapweed
Centaurea maculosa

Figure 30. Spotted knapweed seedheads.

A tap rooted perennial, this species has been shown to be extremely invasive wherever it occurs. The largest, most robust plants are found in open, disturbed areas, but it has also been found in shaded, forested environments, where plants tend to be a little weaker. In California forests, eradication efforts are mandatory, and progress is being made, although there are still many thousands of acres to inventory. Seed viability of this species has been observed to be anywhere from eight to fifteen years. The roots of this plant exude chemicals into the soil that inhibit growth of other species (allellopathy), thus providing for monotypic stands. This species occupies millions of acres in Montana and Idaho, at elevations above 8,000 feet. Similar growing conditions exist in California's mountain areas.

Squarrose knapweed
Centaurea squarrosa
This species of knapweed is concentrated in the north part of the State. It insipidly continues to creep and spread into surrounding pine/shrub communities near and around the town of Hawkinsville, CA. Most populations in forested areas are still small and easily controllable provided annual visits continue. Research on insects for biological control of this species continues to yield promising results.



Map 10. Scotch broom distribution mapped by aerial survey on the Georgetown Ranger District, Eldorado National Forest

Scotch thistle
Onopordum acanthium
Native to Europe, this species was once used in Scotland as a barrier around castles. In California, it mostly infests open rangeland, but in the pine forests of eastern Siskiyou County it infests berms left after tractor logging. It is most easily controlled in the early rosette stage, but control is very difficult once this plant reaches mature size.

Musk thistle
Carduus nutans
Another thistle native to Europe, this species was introduced in the early part of the twentieth century and is now relatively widespread in the United States. Seeds are long lived, air borne, and this species can form dense stands given the right conditions. In the photo, right, musk thistle individuals are evident in the foreground and form a thicket in the background.

Yellow star thistle
Centaurea solstitialis

Figure 31. Close-up of the yellow star thistle.

Joe DiTomaso

Probably the most common and well known Noxious weed in California, Yellow star thistle (YST) infests between 15 and 20 million acres in the State. The goal of forest managers in California at this point is to set containment lines, beyond which the strategy is early detection and rapid response, along with control, as possible, in more densely infested areas. The biology of YST makes it easier to control, provided seed set is prevented, and perseverance is instituted. However, once vast monocultures take hold, the sheer number and density of plants overcomes resource managers. Most forested landscapes see YST encroachment on roads first, then openings, and often explosively spreading in areas that have burned recently.

Dyer's woad
Isatis tinctoria

Figure 32. Dyer's woad.

Steve Orloff

Introduced from Europe, this species is highly invasive and has shown exponential growth in density of infestations in the last few years. In the northern part of the State, it is already beyond eradication. Forest managers have a strategy that sets containment lines at certain points in the watersheds, at which treatment of this species is initiated. It is a short lived perennial plant with a deep taproot that resprouts if only partially re-moved. The first appearance of this species is usually along roads, or in areas where contaminated hay has been used.

Giant reed
Arundo donax

Figure 33. Giant reed.

Joe DiTomaso

Giant reed (arundo) is spreading along waterways of southern California National Forests, with devastating results for wildlife and watersheds. Giant reed reduces habitat and food supply for several special status species. It does not provide good shade to stream channels, which causes water temperatures to rise, and thus threatens aquatic species. The plant is able to retain sediment, which may change the shape of the stream channel. Dense stands are a fire hazard. Giant reed spreads vegetatively.

Plant parts can be carried downstream and establish beyond the original infestation. Giant reed grows from 9 to 30 feet in height, and forms dense, broad, many-stemmed clumps. Giant reed colonizes streamsides, but may spread from there both into the channel, and out beyond the riparian corridor. It occurs on many different soil types, though it seems to do best on well-drained, well-watered soils. It does not grow in deserts, or in areas that freeze regularly.

Leafy Spurge
Euphorbia esula

This species is currently only a problem in the north part of the State in Siskiyou County, but there is potential for explosive spread. The danger this species poses to forested lands is the fact that once established, the deep rhizomatous root system makes it impossible to get rid of. Currently, infestations are limited to the riparian corridors of the Scott and Klamath Rivers, and rangelands east if Interstate 5 in Siskiyou County, but populations are showing signs of expansion above of the river channel to the forested slopes above. This species is closely related to Poinsettia.

Figure 34.
Leafy spurge.

Barbara Williams

Rush skeletonweed
Chondrilla juncea

Introduced from Eurasia, this species currently infests several million acres in the States of Idaho, Washington, Oregon, and California. It is a perennial, with a deep, extensive root system, making it difficult to control with all methods. This species can be seen gaining a stronghold in the central Sierra Nevada on the Eldorado National Forest, around Auburn and the American River corridor (where it is taking over Yellow starthistle infested lands); in Shasta County around Shasta Lake; and just over the California-Oregon border in Oregon south of the town of Ashland. In Fresno County, rush skeletonweed is spreading toward the national forests of the Sierra Nevada despite several years of eradication efforts by the county. The danger this species poses to forested lands is that it can take over in the event of disturbances that create suitable habitat for it, mainly fire. Even though this species currently infests roadsides, the proximity of the wind borne seed source to other areas poses a great risk. This species has illustrated its ability to quickly out-compete native vegetation in other parts of the west.

Figure 35.
Leafy spurge.

Joe DiTomaso

Animal Damage Conditions

Black Bear
Ursa americanus
Bear damage continues to be the most common plight of conifers on industrial and small private lands from the Klamath River northward to the Smith River in Northern California. 20 to 40 year old Douglas Fir commonly injured, but where redwood also exists, it is equally damaged or killed.

Porcupine
Erethizon dorsatum
Feeding by porcupines noticed on sugar pines infested with white pine blister rust in Fresno County on the west side of the Sierras.

DETECTING VEGETATION COVER CHANGES IN CALIFORNIA USING SATELLITE IMAGERY

The California Land Cover Mapping and Monitoring Program (LCMMP) uses Landsat Thematic Mapper (TM) satellite imagery to map vegetation and derive land cover change (losses and gains) within five-year time periods. TM satellite imagery has a spatial resolution of 900 square meters (each pixel within a TM image is 30 meters on each side), or about 1/5 of an acre. The purpose of this program is to monitor vegetation changes over time and to provide information about trends. This data can inform managers as to whether landscape management plans and policies are accomplishing their intended purposes. Land cover monitoring information is a key source of information for consultation when starting land management plan revision, preparing wildlife conservation assessments, and developing fire and vegetation policies. Figure 10 shows the project areas in the state.

During FY 2005 the cooperative LCMMP saw the completion of the Southern Sierra Project Area (SSCDP) and the Southern California Project Area (SCCDP). The Northern Coast Project Area (NCCDP) is near completion with just cause attribution remaining. Currently, the program is in its second cycle of the long-term monitoring, and has approximately 10 years worth of data and information for each project area complete to date. Results from the SSCDP analysis showed that:

- Decreases in conifer accounted for about 58,800 acres of the total decrease in vegetation within the project area.
- Hardwood and shrub/chaparral showed a decrease on about 12,600 acres and 15,000 acres, respectively.
- Fire was the primary cause of change in both the conifer and the hardwood vegetation types, affecting about 54,350 acres and 10,370 acres, respectively.
- Harvest accounted for approximately 2,900 acres of the total decrease.
- Increases in conifer accounted for approximately 5,500 acres of the total increase in vegetation in the project area.
- Shrub/chaparral showed an increase on about 2,400 acres.
- Regrowth was the primary cause for increase in both conifer and shrub/chaparral types, affecting about 4,800 acres and 2,000 acres, respectively.

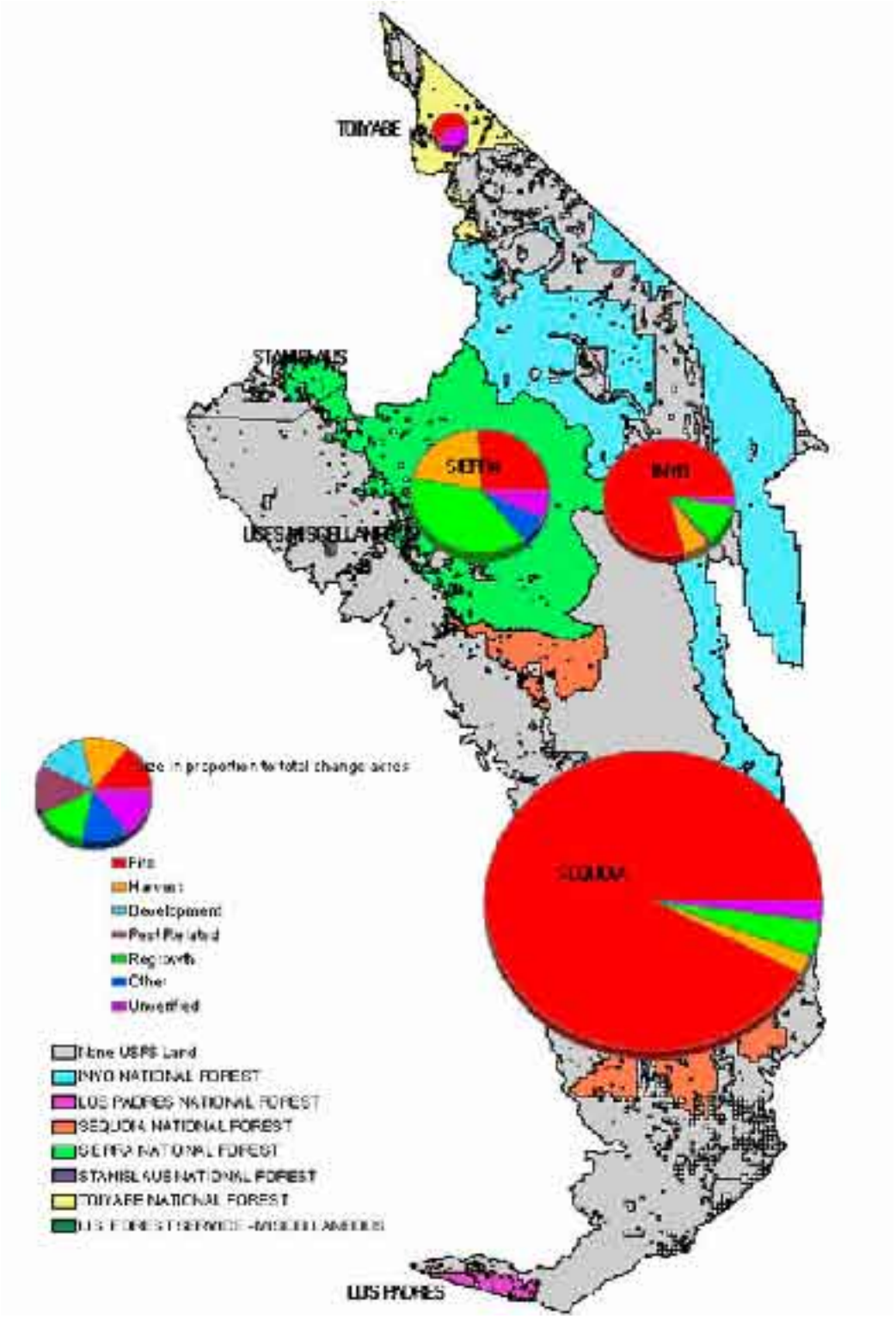
Another cooperative effort is being conducted to map the changes due to drought-induced mortality during the 2002-2003 timeframe. The two projects will have a combined report available in early FY 2005.

Final reports for Southern Sierra project area are available and the Southern California and North Coast project area will be available by the end of FY 2006.

For more information please go to http://www.fs.fed.us/r5/spf/about/fhp.shtml.

Figure 36. Cause of Change between 1995/1997 through 2001 by National Forest *

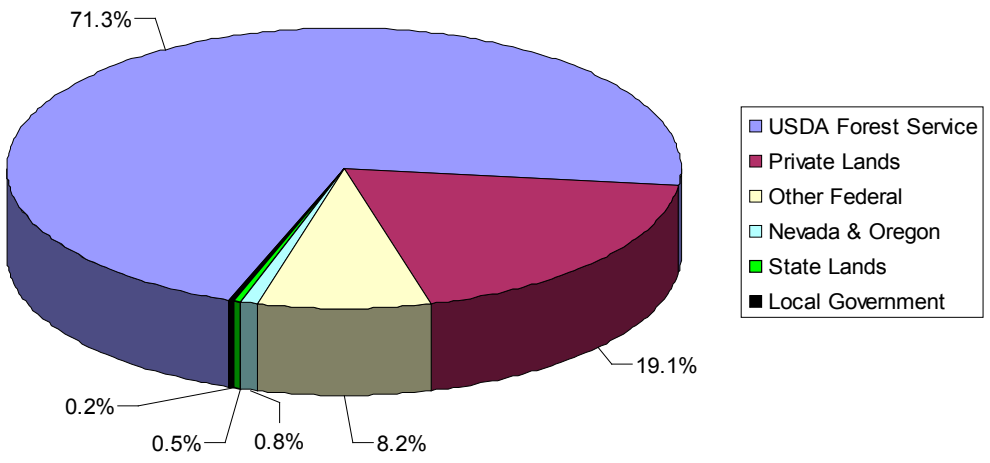
** size of pie charts are in proportion to the amount of change on each forest*



2005 Annual Aerial Surveys

Annual Forest Health Protection Surveys have been completed for Sequoia Kings Canyon, Lassen, and Yosemite National Parks, and all Pacific Southwest Region forests. Approximately 28 million acres were covered during the 2005 annual aerial surveys. The area flown also includes other federal, state and private lands.

Figure 37. Area flown by ownership, 2005 aerial survey



Whenever possible, surveys are conducted with other USDA Forest Service personnel on the forests, USDI Park Service, BIA and CDF. Acres with damage by damage type for both biotic and abiotic causes are displayed below. Biotic damage-causing agents include bark beetles, defoliators, fungi and bear. Abiotic damage-causing agents include fires, mudslides and flooding. Fire damage may not be all-inclusive. For complete fire history, go to http://www.fs.fed.us/r5/fire/ and http://www.fire.ca.gov/cdf/incidents/

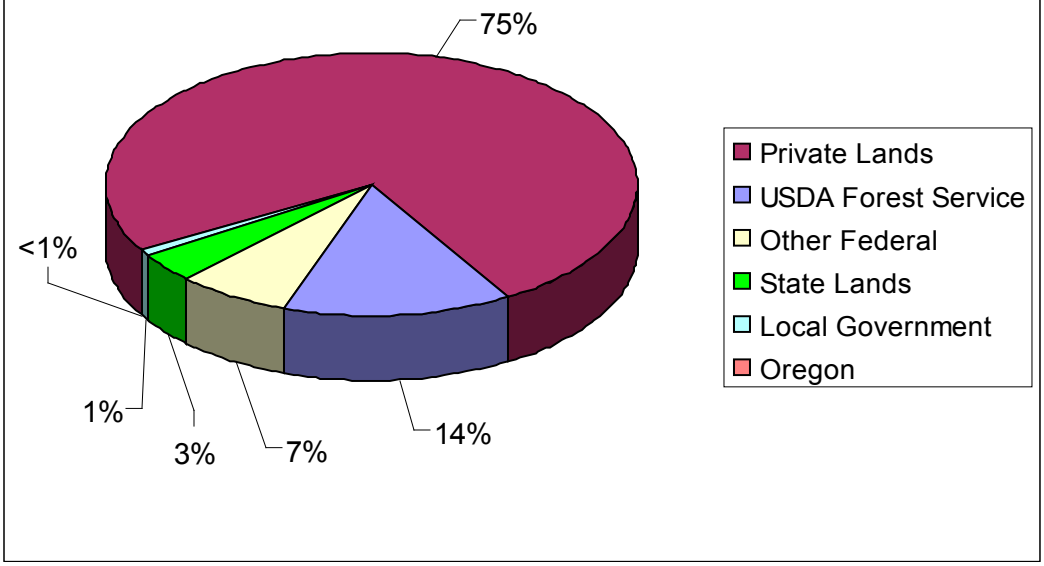
Table 8. Acres mapped with injury in 2005.

Biotic	Pine	Fir	Mixed Conifer	Hardwood	TOTAL
Mortality	217737	449010	257128	29517	953392
Defoliation	31457	12711	8		44176
Other Damage	53	1829	33	58	1973
TOTAL	**249247**	**463550**	**257169**	**29575**	**999541**
Abiotic	**Pine**	**Fir**	**Mixed Conifer**	**Hardwood**	**TOTAL**
Mortality	19131	4299	90774	15565	129769
TOTAL	**19131**	**4299**	**90774**	**15565**	**129769**

2005 Special Aerial Surveys

Historically, Forest Health Protection Surveys have been completed to supplement the annual survey program. These are conducted in response to emerging forest health issues or to survey areas of concern not regularly flown as part of the annual program such as the 2003 Pinyon Survey, 2004 Southern California Quarterly Surveys, and Sudden Oak Death (SOD) Surveys which have been conducted every year since 2001. A special survey for Sudden Oak Death was again completed in 2005 and, with the exception of a small-scale invasive plant survey, was the only special survey completed in 2005. Host forest habitat surveyed was approximately 13.5 million acres with the largest proportion of the area surveyed occurring on private lands. Ground surveys, following aerial surveys, resulted in *P. ramorum* detections in new watersheds within previously infested counties and no new detections in uninfested counties.

Figure 38. Area Flown By Ownership, SOD Special Survey



Additional results for Annual and Special Aerial Surveys are referenced elsewhere in this report and available on line http://www.fs.fed.us/r5/spf/fhp/fhm/aerial/index.shtml.

LIST OF COMMON AND SCIENTIFIC NAMES

INSECTS

Common Name	Scientific Name
Bark Beetles and Wood Borers	
Ambrosia beetles	*Monarthrum* spp.
Asian Longhorned Beetle	*Anoplophora glabripennis*
California fivespined ips	*Ips paraconfusus*
California flatheaded borer	*Melanophila californica*
Cedar bark beetle	*Phloeosinus* sp.
Douglas-fir beetle	*Dendroctonus pseudotsugae*
Fir engraver	*Scolytus ventralis*
Fir roundheaded borer	*Tetropium abietis*
Flatheaded fir borer	*Melanophila drummondi*
Jeffrey pine beetle	*Dendroctonus jeffreyi*
Monterey pine ips	*Ips mexicanus*
Mountain pine beetle	*Dendroctonus ponderosae*
Oak bark beetles	*Pseudopityophthorus* spp.
Pine engraver	*Ips pini*
Pine engravers	*Ips* spp.
Pinyon ips	*Ips confusus*
Red turpentine beetle	*Dendroctonus valens*
Western oak bark beetle	*Pseudopityophthorus pubipennis*
Western pine beetle	*Dendroctonus brevicomis*
Wood borers	*Semanotus* sp.
Yellow Phoracantha	*Phoracantha recurva*
Defoliators	
California oakworm	*Phryganidia californica*
Douglas-fir tussock moth	*Orgyia pseudotsugata*
Fall webworm	*Hyphantria cunea*
Fruittree leafroller	*Archyps argyrosphila*
Gypsy moth	*Lymantria dispar*
Lodgepole pine needleminer	*Coleotechnites milleri*
Pandora moth	*Coloradia pandora*
Pine catkin sawflies	*Xyela* spp.
Other Insects	
Aspen gall wasp	unknown
Cooley spruce gall aphid	*Adelges cooleyi*
Douglas-fir twig weevil	*Cylindrocopturus furniss*
Jeffrey pine needleminer	*Coleotechnites* sp. near *milleri*
Needleminers	*Coleotechnites* spp.
Pine reproduction weevil	*Cylindrocopturus eatoni*
Ponderosa pine twig scale	*Matsucoccus bisetosus*
Red gum lerp psyllid	*Glycaspis brimblecombei*
Scales	*Physokermes* sp.
Sequoia pitch moth	*Vespamima sequoiae*
Spruce aphid	*Elatobium abietinum*
The obtuse sawyer	*Monochamus obtusus*
Tip moth	*Rhyacionia zosana*
Western pineshoot borer	*Eucosma sonomana*

Recent Introductions

Asian gypsy moth	*Lymantria dispar*
Asian longhorned beetle	*Anoplophora glabripennis*
Banded elm bark beetle	*Scolytus schevyrewi*
Mediterranean pine engraver	*Orthotomicus erosus*
Red-haired pine bark beetle	*Hylurgus ligniperda*

DISEASES AND THEIR CAUSAL PATHOGENS

Common Name of the Disease	Scientific Name of the Pathogen
Cankers	
Chinkapin canker	Unknown
Cytospora canker of true fir	*Cytospora abietis*
Diplodia blight of pines	*Sphaeropsis sapinea*
Douglas-fir canker	Unknown
Madrone canker	*Nattrassia mangiferae* and *Botryosphaeria dothidea*
Phomopsis canker	*Phomopsis lokoyae*
Pitch canker	*Fusarium circinatum*
Declines	
Incense-cedar decline	Unknown
Sudden oak death	*Phytophthora ramorum*
Dwarf Mistletoes	
Douglas-fir dwarf mistletoe	*Arceuthobium douglasii*
Gray pine dwarf mistletoe	*Arceuthobium occidentale*
Mountain hemlock dwarf mistletoe	*Arceuthobium tsugense* subsp. *mertensianae*
Pinyon pine dwarf mistletoe	*Arceuthobium divaricatum*
Red fir dwarf mistletoe	*Arceuthobium abietinum* f. sp. *magnificae*
Sugar pine dwarf mistletoe	*Arceuthobium californicum*
Western dwarf mistletoe	*Arceuthobium campylopodum*
White fir dwarf mistletoe	*Arceuthobium abietinum* f. sp. *concoloris*
Foliage Diseases	
Elytroderma disease	*Elytroderma deformans*
Sugar pine needle cast	*Lophodermella arcuata*
Root Diseases	
Annosus root disease	*Heterobasidion annosum*
Armillaria root disease	*Armillaria mellea*, *Armillaria* sp.
Black stain root disease	*Leptographium wageneri*
Port-Orford-cedar root disease	*Phytophthora lateralis*
Phytophthora root rot	*Phytophthora cinnamomi*
Schweinitzii root disease	*Phaeolus schweinitzii*
Rusts	
Western gall rust	*Endocronartium harknessii*
White pine blister rust	*Cronartium ribicola*

True Mistletoes

True mistletoe	*Phoradendron* spp.

TREES

Common Name	Scientific Name

Conifers

Pines

Aleppo pine	*Pinus halepensis*
Bishop pine	*Pinus muricata*
Coulter pine	*Pinus coulteri*
Foxtail pine	*Pinus balfouriana*
Gray pine	*Pinus sabiniana*
Italian stone pine	*Pinus pinea*
Jeffrey pine	*Pinus jeffreyi*
Knobcone pine	*Pinus attenuata*
Lodgepole pine	*Pinus contorta* var. m*urrayana*
Monterey pine	*Pinus radiata*
Ponderosa pine	*Pinus ponderosa*
Singleleaf pinyon	*Pinus monophylla*
Sugar pine	*Pinus lambertiana*
Torrey pine	*Pinus torreyana*
Western white pine	*Pinus monticola*
Whitebark pine	*Pinus albicaulis*

True firs

Red fir	*Abies magnifica*
White fir	*Abies concolor*

Others

Brewer spruce	*Picea breweriana*
Douglas-fir	*Pseudotsuga menziesii*
Engelmann spruce	*Picea engelmannii*
Giant sequoia	*Sequoia giganteum*
Incense-cedar	*Calocedrus decurrens*
Mountain hemlock	*Tsuga mertensiana*
Port-Orford-cedar	*Chamaecyparis lawsoniana*
Coast redwood	*Sequoia sempervirens*
Sitka spruce	*Picea sitchensis*

Hardwoods

Oaks

Oaks	*Quercus* spp.
California black oak	*Quercus kelloggii*
Coast live oak	*Quercus agrifolia*

Other

Aspen	*Populus tremuloides*
Big-leaf maple	*Acer macrophyllum*
California bay laurel	*Umbellularia californica*
California sycamore	*Platanus racemosa*
Camphor	*Cinnamomum camphora*
Chinkapin	*Castanopsis chrysophylla*
Eucalyptus	*Eucalyptus* spp.
Mountain mahogany	*Cercocarpus* sp.

Pacific madrone	*Arbutus menziesii*
Poison oak	*Toxicodendron diversilobum*
Poplars	*Populus* spp.
Tanoak	*Lithocarpus densiflorus*
Willow	*Salix* spp.

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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.**
Section (s)

5. Date:

6. Location:

UTM:

7. Landownership:
- National Forest ☐
- Other Federal ☐
- State ☐
- Private ☐

8. Suspected Cause of Injury:
- 1. Insect ☐
- 2. Disease ☐
- 3. Animal ☐
- 4. Weather ☐
- 5. Chemical ☐
- 6. Mechanical ☐
- 7. Weed ☐
- 8. Unknown ☐

9. Size of Trees Affected:
- 1. Seedling ☐
- 2. Sapling ☐
- 3. Pole ☐
- 4. Sawtimber ☐
- 5. Overmature ☐

10. Part(s) of Tree Affected:
- 1. Root ☐
- 2. Branch ☐
- 3. Leader ☐
- 4. Bole ☐
- 5. Twig ☐
- 6. Foliage ☐
- 7. Bud ☐
- 8. Cone ☐

11. Species Affected:

12. Number Affected:

13. Acres Affected:

14. Injury Distribution:
1. Scattered ◯ 2. Grouped ◯

15. Status of Injury:
1. Decreasing ◯ 2. Static ◯ 3. Increasing ◯

16. Elevation:

17. Plantation?
1. Yes ◯ 2. No ◯

18. Stand Composition (species):

19. Stand Age and Site Class:
Age: Class:

20. Stand Density:

21. Site Quality:

22. Pest Names (if known) and Remarks (symptoms and contributing factors):

23. Sample Forwarded:
1. Yes ◯ 2. No ◯

24. Action Requested:
- 1. Information only ☐
- 2. Lab Identification ☐
- 3. Field Evaluation ☐

25. Reporter's Name:

26. Reporter's Agency:

27. Reporter's Address, email and Phone Number:
email: _____ phone: _____
Address 1: _____
Address 2: _____
City: _____ State: _____ Zip: _____

II. Reply (Pest Management Use)

28. Response:

29. Report Number:

30. Date:

31. Examiner's Signature:

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Completing the Detection Report Form

Heading (Blocks 1-7): Enter all information requested. In Block 6, **LOCATION**, provide sufficient information for the injury center to be relocated. If possible, attach a location map to this form.
Injury Description (Blocks 8-15): Check as many boxes as are applicable, and fill in the requested information as completely as possible.
Stand Description (Blocks 16-21): This information will aid the examiner in determining how the stand conditions contributed to the pest situation. In Block 18 indicate the major tree species in the overstory and understory. In Block 19, indicate the stand age in years and/or the size class (seedling-sapling; pole; young sawtimber; mature sawtimber; overmature or decadent).
Pest Names (Block 22): Write a detailed description of the pest or pests, the injury symptoms, and any contributing factors.
Action Requested (Block 24): Mark “Field Evaluation” only if you consider the injury serious enough to warrant a professional site evaluation. Mark “Information Only” if you a reporting a condition that does not require further attention. All reports will be acknowledged and questions answered on the lower part of this form.
Reply (Section II): Make no entries in this block; for examining personnel only. A copy of this report will be returned to you with the information requested.
Handling Samples: Please submit injury samples with each detection report. If possible, send several specimens illustrating the stages of injury and decline. Keep samples cool and ship them immediately after collection. Send them in a sturdy container, and enclose a completed copy of the detection report.

Your participation in the Cooperative Forest Pest Detection Survey is greatly appreciated. Additional copies of this form are available from the Forest Service - Forest Health Protection, and from the California Department of Forestry and Fire Protection.

The Cooperative Forest Pest Detection Survey is sponsored by the California Forest Pest Council. The Council encourages federal, state, and private land managers and individuals to contribute to the Survey by submitting pest injury reports and samples in the following manner:

Federal Personnel: Send all detection reports through appropriate channels. Mail injury samples with a copy of this report to one of the following offices:

USDA Forest Service
State and Private Forestry
Forest Health Protection
1323 Club Drive
Vallejo, CA 94592

Forest Health Protection
Shasta-Trinity National Forests
2400 Washington Avenue
Redding, CA 96001

Forest Health Protection
Stanislaus National Forest
19777 Greenley Road
Sonora, CA 95370

Forest Health Protection
Lassen National Forest
2550 Riverside Drive
Susanville, CA 96130

Forest Health Protection
San Bernadino National Forest
1824 Commercenter Circle
San Bernadino, CA 92408-3430

State Personnel: Send all detection reports through channels. Mail injury samples with a copy of this report to one of the following appropriate offices:

Forest Pest Management
CA Dept. of Forestry & Fire Protection
P.O. Box 944246
Sacramento, CA 94244-2460

Forest Pest Management
CA Dept. of Forestry & Fire Protection
6105 Airport Road
Redding, CA 96002

Forest Pest Management
CA Dept. of Forestry & Fire Protection
17501 N. Highway 101
Willits, CA 95490

Private Land Managers and Individuals: Send all detection reports and samples to the closest California Department of Forestry and Fire Protection office listed above.

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