FOREST DISEASE CONDITIONS - 2003

ABIOTIC DAMAGE

Drought

Understory and suppressed incense-cedar faded in many locations during the spring of 2003 in northern California. Specific locations include the Van Duzen River drainage (M261B), the Trinity and Klamath River drainages (M261A), along Hwy 3 near Trinity Center (M261A), and on McCloud Flats (M261D). There were minor amounts of the cedar bark beetle, and the cedar roundheaded borer present, but many trees had no sign of a biotic pest. The trees were very dry and appeared desiccated.

Drought appears to have contributed to the dieback and decline of a number of black oak on a residential property along the McCloud Arm of Lake Shasta, Shasta County (M261A). The site has a southwest exposure and thin soil.

Precipitation in drought-stricken portions of southern California (the San Bernardino Mountains, the Peninsular Ranges, and, at a less severe level, the San Gabriel Mountains and more western portions of the Transverse Ranges) was near average for the 2002-2003 rainfall year. However, extreme mortality continued in the forests of San Bernardino, Riverside, and San Diego Counties. Mortality increased in the San Gabriel Mountains, particularly in overstocked plantations, in stands of Coulter and ponderosa pines (hosts of the western pine beetle), and in the Crystal Lake Recreation Area. In some areas impacted by overstocking, drought, and bark beetles, mortality exceeded 80%. This was particularly true in stands of Coulter and ponderosa pines infested with western pine beetle. In 2003 pine and fir mortality increased dramatically on the north facing slopes south of Lake Arrowhead, in the vicinity of the Rim of the World, and in the forest surrounding Big Bear Lake. There was extreme mortality in portions of the ranges of both species of single-leaf pinyon, *Pinus monophylla* and *P. californiarum*. *P. monophylla* suffered high mortality in the eastern end of the San Bernardino Mountains and the north slope (high desert area) of the San Gabriel Mountains. In the Santa Rosa Mountains, *P. californiarum* stands in the higher altitudinal portions (at least) had 90% mortality. The latter species occurs primarily in southern California, and may have died out in most of its range this year. Drought-associated dieback occurred in other vegetation as well, including chaparral species, incense-cedar, and white fir. Where in 2001 mortality was driven by the extreme drought, in 2003 the outbreak populations of some bark beetle species drove the mortality in their hosts. Dead trees were felled within communities, along highways, around communications sites, and in strategically located stands upwind from communities, with the intent reducing fuels, and providing for safe evacuation in case of fire. The public and various government agencies are extremely concerned about potential loss of property and life should a wildfire occur under the present conditions of excessive fuel loading. Despite these efforts, anthropomorphic fires burned more than 750,000 acres in chaparral and montane forests in southern California in October and November 2003, destroying 3,640 homes.

Mortality in big-cone Douglas-fir was high in many areas of its range in southern California, especially on Yucaipa Ridge in the San Bernardino National Forest. Mortality agents in addition to drought have not been assessed.

Drought and Frost

Incense-cedar throughout northeastern California have exhibited a range of symptoms such as top-kill, branch dieback and whole-tree mortality over the past two years. These symptoms increased significantly this spring, creating great concern among many rural residents. The biggest factor in the

observed dieback is drought. As of last fall, northern California had experienced close to three years of below normal precipitation, including an extremely dry year in 2001. A second factor that may have contributed to the observed incense-cedar dieback is frost injury. On October 31 and November 1, 2002, a sudden cold snap resulted in some record low temperatures throughout northern California. In autumn, many trees are still growing and are therefore susceptible to tissue damage when there is a sudden occurrence of below-freezing temperatures. Cedars suffering from water stress during this time may be even more susceptible, particularly small cedars. Bronzed foliage suggested that many incense-cedars incurred winter damage during this cold spell and the extent of the damage was not revealed until the spring when warmer temperatures dried the needles (Fig. 5a,b,c). These symptoms were reported from many ecological subsections in Northern California, including, but not limited to: M261E – e.g. Foresthill Divide (Placer County) and in the vicinities of Concow (Butte County), Meadow Valley, Cromberg, and Graeagle (Plumas County); M261D – e.g. Burney Basin (Shasta County); M261A – e.g. Weed (Siskiyou County) and Round Mountain (Shasta County); M261B – e.g. Zenia (Trinity County). Incense-cedars in various stages of dieback in the Foresthill area in Placer County have been tagged to monitor their progress in light of the injury.

(a) **(b)** **(c)**

Figure 7. Incense-cedar branch dieback (a), top-kill (b) and whole-tree mortality (c).

Similar injury was noted in western juniper in northeastern California, particularly on the Modoc National Forest (M261G), the Modoc Plateau in general, and on the Eagle Lake Ranger District, Lassen National Forest. Some of the highest levels of mortality were noted along Hwy 139 north of Canby in the vicinity of the State Quarantine Station.

The Goosenest Ranger District, Klamath National Forest, also reported scattered dieback of western juniper due to drought and the freezing temperatures mentioned above. Similar damage in western juniper was reported in scattered areas as far north as Madras, Oregon — 200 miles from the California border.

Fire

Fire-injured trees continued to die within the boundaries of recent prescribed or wildfire areas. Mortality occurred in all species that sustained excessive injuries to cambium and/or crowns. Areas

with elevated mortality levels associated with fire injury are the Star Fire, Tahoe National Forest (M261E), the Storrie and Cone Fires, Lassen National Forest (M261D), and underburned areas near Poison Lake, Eagle Lake Ranger District, Lassen National Forest (M261D).

Many small diameter blue oaks that received cambial damage in the Jones Valley Fire, Shasta County (M261A) in October 1999 have died in the past couple of years. Recently dead and dying trees are generally <10 inches dbh, appear to have been suppressed and slow growing, and have large basal scars that are typically centered on the south side of the tree. The dead cambium on these trees was not obvious until bark began sloughing in the past couple years. Larger diameter trees exhibit less impact from the fire.

Trees damaged by fire during the fire siege in southern California in October 2003 remain to be evaluated. Most of the fires were in the chaparral vegetation type and only 5-10% of the burn was in timber on the San Bernardino National Forest. Most of the beetle-killed trees on the forest remain unburned.

Hail
Whitebark pine and foxtail pine were partially defoliated by summer hail storms near the summit of Mt. Eddy near Mt. Shasta City (M261A).

Heat
Apparent heat damage occurred on scattered sapling and pole-sized Douglas-fir south of McCloud. Cool, wet weather in May was followed by an abrupt rise in temperature in late May and early June.

Ozone
The ozone survey of the Forest Health Monitoring Program occurs annually between mid-July and mid-August. Results of this survey will be reported about every 4 to 5 years by the Forest Inventory and Analysis group at the Pacific Northwest Station, USDA-Forest Service, Portland.

Wind
Winter windstorms caused breakage of many species of trees in northern California. There was breakage of blue oak limbs around the northern end of the Sacramento Valley (M261C). Many trails in the Trinity Alps, Russian and Marble Mountain Wilderness areas were blocked by windthrow of both living and dead conifers (M261A). Research plots on the Goosenest Adaptive Management Area of the Klamath National Forest had extensive blowdown of both white fir and ponderosa pine (M261D).

Several conifer stands on the Lassen National Forest, particularly on the Almanor and Eagle Lake Ranger Districts, had substantial amounts of blowdown during the 2002-2003 winter (Fig. 8 a, b). The cause was attributed to heavy snow loads and a big wind event in December.

Miscellaneous
Various problems of blue and interior live oaks were investigated in the Redding area, Shasta County (M261C). Summer irrigation of blue oak is a common factor in the decline and death of this tree. Sunscald is a common problem among interior live oak on sites that are being developed. Damage results when stem shading is lost due to the removal of adjacent trees and/or pruning of branches.

Figure 8. (a) Piles of boring dust from *Ips pini* on lodgepole pine blow down. (Eagle Lake District, Lassen National Forest),

(b) Lodgepole and ponderosa pine blowdown. (Eagle Lake District, Lassen National Forest)

BIOTIC DAMAGE

CANKER DISEASES

BLACK KNOT OF CHERRY, caused by *Apiosporina morbosa*
Black knot galls are reducing the numbers of living choke cherry at Grizzly Station and along Indian Dick Road near Little Baldy, Covelo Ranger District, Mendocino National Forest (M261B). The disease is present, but is causing less damage nearby along the Grizzly, Anthony and Summit Roads.

BOTRYOSPHAERIA CANKER, caused by *Botryosphaeria dothidea*
Many planted redwoods, most on drier sites, had increased incidence of this canker in 2003. Sonoma County had many redwoods with branch flagging and top-kill. In Mendocino County near Ukiah, branch flagging was noted on both redwood and giant sequoia, and top-kill was noted on giant sequoia (all ornamental plantings). A planting of young giant sequoia at Turtle Bay in Redding also has Botryosphaeria canker. Raywood ash in both the Central Valley and Bay Area had increased incidence also.

CHINKAPIN CANKER, cause unknown
Chinkapins in Calaveras Big Tree State Park are dying from an unknown cankering pathogen. Cankers form on the branches and eventually girdle the stems, killing large numbers in sizeable groups. The affected areas have spread throughout the year. So far no fungus or other potential cause has been isolated from the affected plants.

Figure 9. Willow dieback attributed to *Cytospora chrysosperma*

CYTOSPORA CANKER OF POPLARS AND WILLOWS, caused by *Cytospora chrysosperma*
First detected in both poplar and willow species at lower elevations on the eastside of the Sierra Nevada and southern Cascades in 2002, dieback became more apparent in 2003 with many of willows losing all of the upper branches. Some areas have reported up to 75% mortality within clumps of willows (Fig. 9).

CYTOSPORA CANKER OF TRUE FIR, caused by *Cytospora abietis*
In northern California, many branches were killed on the red fir along Hwy 89 in Lassen Volcanic National Park, Shasta County (M261D), while at Latour State Forest, Shasta County, branch dieback due to Cytospora canker is widespread among red fir. Flagged branches typically are infected by dwarf mistletoe and affected stands tend to have higher levels of mortality caused by the fir engraver.

Branch flagging in mixed true fir stands was reported from several locations in the central Sierra Nevada. Flagging was restricted to red fir that was moderately to severely infected with dwarf mistletoe. This pattern is consistent with branch mortality caused by the canker fungus *Cytospora abietis*, which infects branches at the site of dwarf mistletoe swellings. All sizes of trees were affected, and in some cases more that 50% of the existing crown was recently killed. A few trees up to 20" dbh were completely dead. In general, white fir was not infected with dwarf mistletoe or Cytospora canker.

General locations with branch flagging on red fir included: 1) Hwy 88 corridor (Amador County), from Peddler Hill Maintenance Station to Foster Meadow Road, Silver Lake, and Lake Kirkwood; 2) Hwy 4 corridor (Calaveras and Alpine Counties), Poison Spring, Bear Valley, and Lake Alpine (at Bear Valley true fir mortality not related to Cytospora canker/dwarf mistletoe was present); 3) Hwy 108 corridor (Tuolumne County), Crabtree Trailhead and along Road 4N26 from Hwy 108 to Aspen Meadow.

DERMEA CANKER, caused by *Dermea pseudotsugae* and PHOMOPSIS CANKER, caused by *Phomopsis lokoyae*
Many pole-size and larger Douglas-fir in the interior, dry portions of Mendocino, Humboldt and Lake Counties had branch and stem cankers caused by Dermea pseudotsugae. In addition to Dermea canker, Douglas-firs of all sizes had stem and branch cankers attributed to *Phomopsis lokoyae*. Many of the trees were also attacked and killed or top-killed by the Douglas-fir engraver. Cankers also were found on the main stem of a small number of declining young Douglas-fir in a plantation near Lake Prairie in the upper Redwood Creek drainage, Humboldt County (263A). The pathogens *Dermea pseudotsugae* and/or *Phomopsis lokoyae* were likely causes for these cankers. Drought in previous years is a likely contributing factor.

DIPLODIA BLIGHT OF PINES, caused by *Sphaeropsis sapinea* (*Diplodia pinea*)
Sphaeropsis sapinea continues to kill ponderosa pine branches along the North Yuba River in the Goodyears Bar and Downieville area of Sierra County (M261E). Some of the heavily infected pines have died since this disease was reported in the summer of 2000. The disease is still prevalent in and around Paradise, Butte County (M261D). Paradise is one of the areas where the current outbreak of Diplodia blight first appeared in 1996.

Shoot dieback caused by *Sphaeropsis sapinea* was observed again this year on scattered ponderosa pines in the Sacramento River Canyon in Shasta County. Most affected trees are in the lower, southern end of the canyon. Low levels of disease were also observed in ponderosa pine south of McCloud, Siskiyou County (M261D), in an area where the disease has persisted for several years.

PITCH CANKER, caused by *Fusarium circinatum*
Pitch canker is now confirmed to occur in Ventura County, making a total 19 infested counties, all of which are within the declared Zone of Infestation (ZOI) that extends from San Diego County to

Mendocino County. Within the ZOI, new and expanding infection centers have been observed in many areas, including east bay communities such as Berkeley and Oakland, and in San Mateo County along Hwy 280. There is also increasing activity near the margins of known infestations, such as in Moraga, east of the Oakland Hills. In all these areas the disease can be seen in various stages of development, with some trees exhibiting only limited tip dieback and others having extensive damage to the canopy and, in some cases, top-kill. Many recent infections are evident in Marin County, along Hwy 1 near Muir Beach. In Monterey County, pitch canker continues to intensify in some areas, but has moderated in others. Monitoring plots in the Huckleberry Hill area of Pebble Beach indicate the severity of pitch canker has not increased significantly over the past year. Likewise in Santa Cruz County and many parts of San Luis Obispo County, the impact of pitch canker is now less evident. This reflects the removal of heavily diseased or killed trees and the recovery of others. Monterey pine remains the most commonly infected species, but both bishop and knobcone pines are affected on the Monterey Peninsula and in the Santa Cruz Mountains, respectively.

Pitch canker, mostly on Monterey pine, increased in the South San Francisco, Colma and Daly City areas. Symptoms are now commonly seen in Monterey pine in San Francisco. In Marin County, Monterey pines are dying on the campus of the Golden Gate Theological Seminary and an increasing number of symptoms occur near Stinson Beach.

An ongoing research project is monitoring the spore population levels of the fungus over time at the Swanton Pacific Ranch in Santa Cruz County and at the Presidio in San Francisco. Permanent plots in the area between Monterey and Santa Cruz also show the continuing loss of trees that have been infected for many years. However, some of the trees are showing potential signs of resistance to the disease after initial branch infections.

SEIRIDIUM CANKER, caused by *Seiridium cardinale*
Seiridium canker was found throughout a stand of incense-cedar in Nevada County near the town of Nevada City. Only younger trees were affected. Some seedlings were killed while saplings only lost some lower branches. Large trees were not affected. The concern was the potential loss of regeneration of the species in the stand.

DECLINES

ASPEN DECLINE, cause unknown
Aspen decline, first noted in 2002 at several locations in and around the Mono Lake and Mammoth Districts, Inyo National Forest, generally remained static in 2003. Aspen affected include stands west of Conway Summit, southwest of McLaughlin Spring, Kelty Canyon and south and west of Sawmill Meadow.

CHAPARRAL DECLINE, cause unknown
Surveys of chapparal dieback have not revealed any associated pathogens and drought continues to be considered the activator. Early winter precipitation in 2003-04 water year is well below normal in southern California and the influence of drought continues.

INCENSE-CEDAR DECLINE, cause unknown
Incense cedar decline and mortality has been reported from northwest of Covelo (Mendocino County), near Kettenpom (Humboldt County) and northern Del Norte County. Many of the affected cedars are in the younger age groups. One theory attributes a severe cold snap in early November 2002 (see Drought,

p.13). Affected trees probably had prior moisture stress. No pathogens were isolated from affected saplings submitted from Covelo and Kettenpom.

MADRONE DECLINE, cause unknown
Scores of madrones in the Brooktrails Township near Willits are off-color and the foliage droops from branches as if affected by a wilt. No pathogens have been recovered, and no specific environmental condition is attributed. Increased exposure from home site development and removal of the forest litter from around these trees may be contributing factors.

PINE DECLINE, cause uncertain
Pine decline continues to occur in Lassen County (M261D) north and south of State Highway 44. Dominant ponderosa, Jeffrey and lodgepole pines in the area have been progressively losing foliage over the last decade and a number of these old growth trees have died. It is suspected that overstocked young conifers surrounding these trees are out-competing the dominant pine trees for the limited available moisture. Drought is also a factor.

SUDDEN OAK DEATH, caused by *Phytophthora ramorum*
***P. ramorum* - general**
Seven new susceptible plant species were identifed in California in 2003, bringing the total of known susceptible species in California to 29. Additional species were also detected in Europe and Oregon; in all, 39 susceptible species have been identified (Tables 1a,b). Newly recognized species include important horticultural plants (*Camellia* and *Pieris*) and species common in the wildland and grown for Christmas trees.

P. ramorum was isolated from grand fir Christmas trees on a plantation in Santa Clara County. The symptoms were limited to branch tip dieback, similar to *P. ramorum* symptoms on Douglas-fir. The infected Christmas trees are growing under *P. ramorum*-infected California bay laurels. The grower reported seeing similar symptoms in this plantation for approximately 10 years. No grand fir trees from the portion of the plantation with symptoms were sold in 2002.

Reports continue to come in on possible sudden oak sites in the Sierras and Central Valley. Numerous black oaks, tanoaks, laurels, madrones and other species have been examined and sampled. Results have been negative. Thus far no incidence of *P. ramorum* has been confirmed outside of the affected coastal counties. Most symptoms have been related to several years of drought, development in previously forested areas, and other pathogens and insects.

***P. ramorum* - nurseries**
P. ramorum was detected in seven California nurseries in Stanislaus, Marin, Santa Cruz, Sacramento, Alameda and Placer Counties. *P. ramorum* was also recovered in nurseries in British Columbia, Washington, Oregon and Europe.

In May, two composite samples of *Camellia sasanqua* cult. “Bonanza” from a wholesale nursery located in Stanislaus County tested positive for *P. ramorum*. The nursery is approximately 10 miles east of Modesto and 100 miles from the coast. The *P. ramorum* detection on 1-gallon and 5-galleon varieties of *Camellia sasanqua* was the result of a trace-back survey initiated by the detection of *P. ramorum* at a Santa Cruz County nursery in April. The origin of the pathogen at the Stanislaus nursery has not been determined.

In Marin County, *Camellia japonica* and *Viburnum tinus* were detected positive in April in a nursery in Fairfax, the first U.S. report of *P. ramorum* confirmed on these species. The portion of the holding area where the symptomatic material was detected is adjacent to a stand of California laurels infected with *P. ramorum*.

In Santa Cruz County in April, a 5-gallon "Bonanza" at a nursery in Soquel tested positive of *P. ramorum*. The symptomatic plant material was detected by county inspectors during the nursery's annual inspection. A subsequent investigation revealed that the infected camellia was shipped from a nursery in Stanislaus County, three days prior to their annual inspection. The Santa Cruz nursery is a wholesale nursery with sales inside the regulated area. Host material at the nursery had been inspected extensively in 2002 with no detections of *P. ramorum*.

The nursery interceptions in Placer, Alameda and Sacramento Counties were stock traced from nurseries in coastal counties. All known *P. ramorum*-infected plants were destroyed.

Monitoring.

P. ramorum has been found approximately 10 miles north of the San Luis Obispo County line near Plaskett Creek, extending the most southern known infested area about 15 miles. Julia Pfeiffer Burns State Park previously contained the most southern infestation. About a dozen dead and dying tanoaks (Fig. 10) were detected via aerial survey, then ground-checked and confirmed by the Rizzo laboratory at UC-Davis. On the ground adjacent, infected California bay laurels were also observed, sampled and also tested positive. The aerial survey is part of the on-going aerial survey conducted by Forest Service and Cal Poly-San Luis Obispo. Investigations by the Rizzo (UC-Davis) and Garbelotto (UC-Berkeley) labs and surveys by the USDA Forest Service did not detect *P. ramorum* in the foothills of the Sierra Nevada.

Figure 10. Tan oak mortality on the Big Sur Coast of California.

Management.

The systemic fungicide AGRI-FOS® and Pentra-Bark surfactant were approved by the California Department of Pesticide Regulation to treat individual oaks and tanoaks at high-risk of contracting *P. ramorum*. Agrichem's AGRI-FOS® (EPA Reg. No. 71962-1) and Pentra-Bark were granted a Special Local Needs (Section 24c registration, SLN CA-030011). This newly approved treatment will prevent infection of oaks and tanoaks at risk of

contracting *P. ramorum*, but will not cure trees already infected by the pathogen.

Sudden Oak Death collection yards under the SOD Busters Program opened in Marin and Santa Cruz Counties. The yards accept *P. ramorum*-infested plant debris and treat and utilize it. The project's objectives are to evaluate the utilization potential of host tree species, identify best and most appropriate uses, and develop protocols for handling materials infested with *P. ramorum*. For more information on the program, visit the SOD Busters website at: http://groups.ucanr.org/sodbusters/.

Regulations.
The California Department of Food and Agriculture revised its enforcement guideline policy for *P. ramorum*. The revisions, which apply only to intrastate movement of host material, harmonize California's enforcement guideline policy with the requirements of the federal *P. ramorum* regulation and the anticipated amendments to the forthcoming revised federal regulation.

Under the revised enforcement guidelines, green waste, compost, wreaths, garland, greenery, wood products and Christmas trees are no longer regulated for movement within the 12 known infested counties (regulated area). However, host plant shipments from wholesale nurseries, both within and beyond the regulated area, will continue to be inspected.

Intrastate movement of green waste originating within the regulated area to an area outside the 12 infested counties will be permitted under compliance agreement with the originating local county agricultural commissioner. Movement will be from an origin facility to a specified facility under state permit outside the regulated area. For additional specifics, visit the Internet site http://www.suddenoakdeath.org.

Phytophthora nemorosa.
Phytophthora nemarosa (formerly referred to as *Phytophthora* ilicis-like) caused leaf spots in California bay laurel along the Avenue of the Giants between Pepperwood and Redcrest in Mendocino County and behind the Hiouchi Hamlet campground in Hiouchi, Del Norte County (263A).

A roadside survey by the California Department of Forestry in the Brooktrails Township northwest of Willits, Mendocino County detected 60 tanoaks with bleeding stem cankers. One of the sites has been sampled several times and was negative for *P. ramorum*. To date, only *P. nemorosa* has been isolated from the area. Of the cankered trees, 23 were dead (red), 16 were thinning or declining and 21 were still green.

***Phytophthora pseudosyringae*.**
Along with *P. ramorum* and *P. nemorosa*, a third *Phytophthora* species has been repeatedly isolated from trees showing similar symptoms — leaf necrosis on California bay laurel and stem cankers on coastal live oak. Colony and microscopic morphological characters of the California isolates were consistent with *P. pseudosyringae*, a recently described species recovered from rhizosphere soil of oak species and necrotic fine roots and stem necrosis on European beech and European alder in Germany and France (Jung et al. Mycological Res. 107:772-789, 2003).

P. pseudosyringae has been found in coastal California counties from San Luis Obispo to Humboldt. It has also been isolated from one location in Mariposa County in the Sierra Nevada. Disease symptoms on California bay laurel and coastal live oak are similar to *P. ramorum*, although *P. pseudosyringae* does not appear to cause wide-spread mortality in oaks. This is the first report of *P. pseudosyringae* in

North America. The relationship between European and California isolates is not clear at this time. It is unknown whether *P. pseudosyringae* is native to California or an introduction.

Phytophthora cinnamomi.
This pathogen has been found in various locations around the state. *P. cinnamomi* is a serious problem to true fir Christmas tree production in El Dorado County. It has caused the death of various oak species in the central valley that have experienced sporadic flooding or irrigation (Glenn, Tehama, Sacramento, Yolo Counties). The pathogen is also a problem in irrigated landscape trees and has caused death and decline of sycamores, oaks and camphor trees in Sacramento, Yolo, and San Joaquin Counties.

Tables 1a, b. California Plant Species Known To Be Susceptible (a) to *Phytophthora ramorum* and Associated Plant Species (b)*

a. Recognized hosts.

Scientific Name	**Common Name**
Acer macrophyllum	Big leaf maple
Aesculus californica	California buckeye
Aesculus hippocastanum +	Horse chestnut
Arbutus menziesii	Madrone
Arctostaphylos manzanita	Manzanita
Camellia japonica #	Camellia
Fagus sylvatica +	European beech
Heteromeles arbutifolia	Camellia
Lithocarpus densiflora	Tanoak
Lonicera hispidula	California Honeysuckle
Pieris formosa #	Andromeda
Pseudotsuga menziesii v. *menziesii*	Douglas-fir
Quercus agrifolia	Coast live oak
Quercus chrysolepis	Canyon live oak
Quercus kelloggii	California black oak
Quercus parvula v. *shrevei*	Shreve oak
Rhamnus californica	California coffeeberry

b. Associated Plant Species

Scientific Name	Common Name
Abies grandis #	Grand fir
Arbutus unedo #	Strawberry tree
Camellia sasanqua #	Camellia
Corylus cornuta	California hazelnut
Hamamelis virginiana +	Witch-hazel
Kalmia latifolia +	Mountain laurel
Pieris formosa x japonica #	Forest Flame Andromeda
Pieris floribunda x japonica #	Brouwer's Beauty Andromeda
Pieris japonica #	Variegated and Flaming Silver Andromeda
Pittosporum undulatum #	Victorian box
Rhamnus purshiana	Cascara
Rubus spectabilis	Salmonberry
Syringa sp. +	Lilac
Taxus baccata +	European Yew
Toxicodendron diversiloba	Poison oak
Vaccinium vitis-idaea	Lingonberry
Viburnum plicatum tomentosum #	Mariesii - Doublefile Viburnum

* The species recognized as hosts have had the pathogen isolated from plants growing under natural conditions and have been confirmed using Koch's postulates. For the plants classified as associated plants, the pathogen has been isolated under natural conditions, but Koch's postulates have not been completed. Artificially inoculated species are not included in either category.
\# Reported in 2003; + Reported in 2003, only in Europe.

DWARF MISTLETOES

GRAY PINE DWARF MISTLETOE, *Arceuthobium occidentale*.
Heavily infested gray pines have been killed in Madera and Fresno Counties and around Lake Berryessa in Napa County. Dry conditions, poor sites and old age are contributing factors to the mortality of large trees.

LIMBER PINE DWARF MISTLETOE, *Arceuthobium cyanocarpum*.
Limber pine dwarf mistletoe was found infecting western white pine and whitebark pine between the Deadfall Lakes and Mount Eddy on the Mount Shasta Ranger District, Shasta-Trinity National Forest (M261 A).

MOUNTAIN HEMLOCK DWARF MISTLETOE, *Arceuthobium tsugense subsp. mertensianae*.
Abundant mountain hemlock dwarf mistletoe was observed on mountain hemlock growing near Shadow Lake on the east slope of Lassen Peak in Lassen Volcanic National Park (M261D).

FOLIAGE DISEASES

POWDERY MILDEW ON OAKS, caused by *Microsphaera alni* and *Sphaerotheca lanestris*.
A report of whitish discoloration of oak foliage in the Placerville area was submitted in the spring of 2003. The discoloration turned out to be powdery mildew and was observed from the southern edge of Placerville for over 6 miles south along Hwy 49. Another area of infestation was seen along Hwy 193 north of Placerville and a few miles past the South Fork of the American River. Both of these areas are within El Dorado County. The primary host affected was blue oak and the mildew was confined to 2003 tissue. Two species of powdery mildew affect blue oaks in California, *Microsphaera alni* and *Sphaerotheca lanestris*. The morphology of mildew found in the Placerville area corresponds to *M. alni*. All powdery mildews are obligate parasites and do not kill their host. Their spores are unique among pathogenic fungi in that most do not require free moisture or high humidity for germination and infection.

Powdery mildew caused by *Sphaerotheca lanestris* was prevalent on coast live oak in southern California coastal counties, with many reports from Ventura County and in Los Osos (about 500 trees), San Luis Obispo County.

ROOT DISEASES

ANNOSUS ROOT DISEASE, caused by *Heterobasidion annosum*.
Annosus root disease was involved in blowdown of commercial white fir stands during winter storms on the Goosenest District, Klamath National Forest (M261D) and near the headwaters of Red Cap Creek on the Six Rivers National Forest (M261A). It was associated with white fir windthrow in Crags and Lost Creek Campgrounds in Lassen Volcanic National Park in the winter of 2002 /2003 and was present in many areas in both campgrounds. Annosus root disease is also responsible for thin crowns and reduced height growth in a stand of white fir west of Goose Lake in the vicinity of Black Reservoir, Modoc County (M261G).

The pathogen continues to cause scattered pockets of mortality in ponderosa pine in several locations on McCloud Flats on the Shasta-Trinity National Forest (M261D). Mortality is particularly heavy on Forest Service land adjacent to the Shasta Forest subdivision, 6 miles northeast of McCloud. Several living ponderosa pines that were uprooted by winter storms on McCloud Flats were found to have *H. annosum* decay. Annosus root disease was also confirmed in a stand of white fir south of McCloud (M261D).

The pathogen caused the death of trees in stump culture Christmas tree plantations in Santa Cruz County near the town of Bonny Doone, and was present in dead sugar pine saplings killed on private property near Deer Valley Campground, Mendocino National Forest.

ARMILLARIA ROOT DISEASE, caused by *Armillaria* sp.
Numerous tanoaks were killed by *Armillaria mellea* in Sonoma, Mendocino and Humboldt Counties. Mortality commonly occurred down slope of rural roads where berm or fill was placed over much of the root systems, or within clumps of tanoak where previously a single stem was killed by *P. ramorum* or

another pathogen. *Armillaria mellea* was also associated with white fir windthrow in Crags and Lost Creek Campgrounds in Lassen Volcanic National Park in the winter of 2002 /2003 and was present in many areas in both campgrounds.

In a more urban area, significant damage due to "shoestring root rot" was found in Sacramento County in valley oaks along the American River Parkway.

BLACK STAIN ROOT DISEASE, caused by *Leptographium wageneri*.
This pathogen continues to kill ponderosa pine in a large area two miles east of Willow Creek Campground in Modoc National Forest, Lassen County (M261D). The disease was first reported in the area in the early 1940s and various cultural treatments have been completed in the last two decades in an attempt to limit the mortality caused by this disease. Currently, a study is being prepared to evaluate the effect stand density has on black stain root disease and the ponderosa pine in this area.

Approximately 130 Douglas-fir, ponderosa pine, white fir and sugar pine were windthrown in Tannery Campground and Fawn Group Camp in the Trinity National Recreation Area, Shasta-Trinity National Forest (M261A). Most of the blowdown occurred in Douglas-fir that was infected with black stain root disease. Black stain root disease also is causing continued scattered pockets of mortality in ponderosa pine in the Mudflow Research Natural Area northeast of McCloud and pockets of black stain root disease are present in mature ponderosa pine stands south of McCloud between Huckleberry and Mud Creeks, Siskiyou County (M261D).

PORT-ORFORD-CEDAR ROOT DISEASE, caused by *Phytophthora lateralis*.
Individual trees have been observed dying throughout the north half of Del Norte County. Most have been detected from Hiouchi eastward and up to the South Fork of the Smith River.

Port-Orford-cedar root disease continues to expand and cause tree mortality in the upper Sacramento River Canyon, Siskiyou and Shasta Counties (M261A). This condition is expected to continue for years to come along the mainstem of the Sacramento River, where the disease is well established from Dunsmuir to the mouth of Shotgun Creek. Management efforts are aimed at preventing new infestations elsewhere in the Sacramento and Trinity River drainages. When two additional infected Port-Orford-cedars were found within 50 feet of an isolated infestation found in 2001 along Scott Camp Creek, all Port-Orford-cedars were girdled or removed in September 2003. A second eradication treatment was performed in the Riverside Campground at Castle Crags State Park in September 2003 in which all Port-Orford-cedar within reach of the Sacramento River were girdled or removed.

RUST DISEASES

INCENSE-CEDAR RUST, caused by *Gymnosporangium libocedri*.
Incense-cedar rust was reported from the Scott Valley, Siskiyou County (M261A).

WHITE PINE BLISTER RUST, caused by *Cronartium ribicola*.
White pine blister rust appears to be increasing in severity in the Lake Tahoe Basin. Larger trees are showing infection of upper branches more frequently than in the past. Little regeneration is surviving due to the pathogen and the overstocked conditions of the Basin.

WESTERN GALL RUST, caused by *Peridermium harknessii*.
Western gall rust has been intensifying in ponderosa pine plantations north of Camptonville in Sierra and Yuba Counties (M261E). The disease is endemic in the old pine growing in the surrounding mixed

conifer stands. Growing almost a monoculture of ponderosa pine has favored the development of this disease.

Western gall rust was seen as severe in isolated locations in Santa Cruz, Yolo, Placer and Nevada Counties. Smaller individual trees have died; however, most severely infected trees are just showing a lack of vigor.

WILLOW-CONIFER RUST, a species complex referred to as *Melampsora epitea*.
A group of willow rust species was found on several willows in drainages in the Susanville area.

MISCELLANEOUS

BIG LEAF MAPLE ANTHRACNOSE, caused by *Discula* sp.
Several large maples were affected west of Willits in Mendocino County.

NEEDLE CAST ON MONTEREY PINE, caused by *Lophodermium* sp.
Dozens of planted Monterey pines along Hwy 101 in the vicinity of Piercy (Mendocino County) were severely affected. Many of the trees had less than 10% green crowns remaining, usually the tops only.

OAK ANTHRACNOSE, caused by *Apiognomonia quercina*.
Black oaks and Oregon white oaks were severely affected several miles west of Brooktrails in Mendocino County.

OAK LEAF BLISTER, caused by *Taphrina caerulescens*.
Severe infections were observed on Oregon white oaks in central Mendocino County. Many of the trees also had oak anthracnose.

REDWOOD DECLINE, cause unknown.
A suspected viral infection has caused branches on a few planted coastal redwood in Tulare County to turn bright yellow in color. Other than some landowner concern, the symptoms do not appear to be causing any serious damage.

SYCAMORE ANTHRACNOSE, caused by *Apiognomonia veneta*.
Effects were serious on California sycamore in many northern California locations.

ANIMAL DAMAGE

Black bear, *Ursus americanus*
Branch flagging, top-kill and tree mortality from black bear damage is by far the most visible damage to second-growth conifers in Humboldt and Del Norte Counties. Redwood is the most affected, but Douglas-fir has sustained major damage also. Significant areas of damage include Smith River, Cal-Barrel (AhPah and Surpur Creeks), and the lower Bald Hills area of Tectah, Johnson and Roach Creeks.

Douglas squirrels, *Tamiasciurus douglasii*
A few lodgepole pines were stripped of their bark throughout their upper boles by Douglas squirrels within and adjacent to the Crater Lake Campground, Lassen National Forest. Patches of stripped bark varied in size and were located mostly in the upper boles and branches. Squirrels also are suspected of

causing damage on mid-size giant sequoias and coastal redwoods planted in the Placer, Amador and El Dorado County foothills. Strips of bark are removed for nesting material.

Elk, *Cervus elaphus*

Observations are that elk populations may have increased along the north coast, but damage remains light to seedlings growing along trails. Most damage was noted in the Smith River and Bald Hills areas.