• Affected plants
• Carriers
• Geographic area
• Natural and artificial spread
• Agri-fos and other treatments
• Kashia project
• Current research and management
Susceptible Species
Over 60 Genera; 125+ Species/Varieties

Plant Symptom Photos

- Alleghany viburnum
- Alleghany viburnum flowering
- Alleghany viburnum fruiting
- American cranberry viburnum
- Andrew's clintonia bead
- Andrew's clintonia bead lily
- Andrew's clintonia bead lily
- Ardisia
- Ardisia
- Banana shrub
- Banana shrub
- Photo Needed!
- Photo Needed!
- Photo Needed!
- Photo Needed!
- P. ramorum Micrographs
- Plant Symptom Photos

Symptom Gallery

- Landscape Photos
- Management Photos
**P. ramorum** look-aikes

Other *Phytophthorases*

- *P. nemorosa*
- *P. psuedosyringae*

Other diseases & injuries

- Bacterial wetwood
- *Armillaria* and bark beetles
- Insect borers
- Canker fungi
- Root diseases

Abiotic problems
Quercus species

canyon live oak
CA black oak
Shreve oak
canyon live oak

Canyon live oak
(Quercus chrysolepis)
Tanoak

(Notholithocarpus densiflorus)
Poison oak
Toxicodendron diversiloba
CA bay laurel
*Umbellularia californica*
Leaf infections

Cascara (*Rhamnus purshiana*)
Leaf infections

CA honeysuckle (*Lonicera hispidula*)
Leaf infections

Toyon (*Heteromeles arbutifolia*)
Leaf infections

Wood rose (Rosa gymnocarpa)
Leaf infections

Salmonberry (*Rubus spectabilis*)
Leaf infections

CA buckeye (*Aesculus californica*)
Leaf infections

Big Leaf Maple
(Acer macrophyllum)
Leaf infections

Western starflower
*(Trientalis latifolia)*
Leaf infections

Andrews Clintonia Bead Lily

(Clintonia andrewsiana)
Leaf infections

CA maidenhair fern (*Adiantum jordanii*)
Leaf & twig infections

Evergreen huckleberry (Vaccinium ovatum)
Leaf & twig infections

Madrone (*Arbutus menziesii*)
Leaf & twig infections

Pacific Rhododendron
(Rhododendron macrophyllum)
Leaf & twig infections

Blue blossom
(Ceanothus thyrsiflorus)
Leaf & twig infections

Manzanita (Arctostaphylos spp.)
Leaf & twig infections

CA hazelnut (*Corylus cornuta*)
Conifers

Pacific yew (*Taxus brevifolia*)
Conifers

Coast redwood (*Sequoia sempervirens*)
Conifers

Coast redwood (*Sequoia sempervirens*)
Pacific yew (*Taxus brevifolia*)
CA nutmeg (*Torreya californica*)
Conifers

Douglas-fir (*Pseudotsuga douglasii*) & Grand fir (*Abies grandis*)
Conifers

Western hemlock (*Tsuga heterophylla*) & Japanese larch (*Larix kaempferi*)
Oregon infestation, aerial view, 2013
Aerial Detection Survey – Update, June 13th, 2012

Background: Annual aerial detection surveys for tree injury and mortality have been conducted in California since 1954. This is an update of survey status for the 2012 survey season.

Objective: Detect and map tree mortality and damage in California / USFS Region 5.

Surveyors: Z. Heath, I. Moore, R. Noyes

Dates: June 5, 11, 12, 13th, 2013

Methodology: Recently dead or injured trees (trees still retaining dead foliage) were mapped visually by surveyors using digital aerial skymapping systems flying in a light fixed-wing aircraft approximately 1,000 feet above ground level. Surveyors recorded the number and species of affected trees and type of damage (mortality, defoliation, branch flagging) at each mapped location.

Details:
A short flight to Mount Saint Helena and Mt. Konotski was conducted as a training and conformity flight on June 5th. Douglas fir, gray, knobcone, and ponderosa pine mortality was observed in scattered pockets.

Santa Cruz County and the South and East Bay were surveyed on the 11th. Costa live oak mortality was the main damage mapped in the Oakland Hills, while large areas of tanoak mortality were seen in the Santa Cruz Mountains. Mortality in the gray pines in the Diablo Range was also observed.

A large area of intense live oak mortality was observed east of Watsonville as well, about 9 miles from the closest SDO confirmation. See Figure 2.

San Benito County and the North Bay area were surveyed on June 12th and 13th. Mortality from sudden oak death, primarily affecting tanoak, was mapped throughout the area. Coastal San Mateo County, especially areas around Half Moon Bay and Greenfield, had some of the highest levels of tanoak mortality. Point Reyes and coastal Marin County also had large areas of both coastal live oak and tanoak mortality. The total number of acres and trees killed by SOD in the surveyed area appear to be similar to last year's levels. 31,476 trees killed across 28,700 acres.

Pitch canker continues to cause damage on Point Reyes, killing branches and often entire trees in dance bishop pine stands. See Figure 3.

A large area of low-intensity Douglas-fir mortality was mapped near Mount Saint Helena.

Figure 1. Flown area and mapped oak mortality

Summary:

- Acres surveyed: 1.2 million acres
- Acres with mortality: 31,476
- Acres with other damage: 28,700

Aerial Detection Survey – Update, June 28, 2013

Background: Annual aerial detection surveys for tree injury and mortality have been conducted in California since 1954. This is an update of survey status for the 2013 season.

Objective: Detect and map tree mortality and damage in California / USFS Region 5.

Surveyors: Z. Heath, R. Noyes, E. Wahl

Dates: June 27 and 28, 2013

Methodology: Recently dead or injured trees (trees still retaining dead foliage) were mapped visually by surveyors using digital aerial skymapping systems flying in a light fixed-wing aircraft approximately 1,000 feet above ground level. Surveyors recorded the number and species of affected trees and type of damage (mortality, defoliation, branch flagging) at each mapped location.

Details:
- Coastal Mendocino, Humboldt and Del Norte Counties were flown, including Jackson Demonstration State Forest and Redwood State and National Park. See Figure 1.
- Bear damage to Douglas fir and redwood comprised the bulk of the damage mapped in coastal Humboldt and Del Norte Counties. Continuing damage was also mapped at a localized area of the Mendocino Coast.
- Tanoak mortality from sudden oak death was seen in southwest Mendocino, mostly in the Anderson Valley and near the Sonoma County line. The majority of the damage was much lower in intensity than the mortality observed in Sonoma County this year.
- Tanoak mortality was also observed in isolated pockets on the central Mendocino Coast, near Jackson State Forest.

Figure 2. Dead tanoak in the North Fork of the South Fork Noyo River in Jackson State Forest.

Summary:

- Acres surveyed: 1.5 million acres
- Acres with mortality: 25,942
- Acres with other damage: 24,210

Figure 3. Dead tanoak and bear-damaged Douglas-fir in Redwood Creek in Humboldt County.

Direct questions pertaining to this report to Zachary Heath (email: zheath@fs.fed.us; phone: 510-756-1751). Report Date June 13th, 2013.
Spread

- Mild temps: 61-72 °F
- Extended rain: 12+ hrs wetness
- Optimal weather 2+ years
Foliar host removal & pruning

• Won’t halt SOD in tanoak stand
• Used alone or with phosphonate
• May result in no mature trees

2.5 – 5 m of clearance
• Storm wind direction
• Focus on leaves on the ground, on nearby understory trees, and on lower branches of inner canopy
• Monitor for sprouts & remove
Pesticide treatments

- Preventative, not a cure!
- Specimen trees
- Apply 4-6 weeks ahead of pathogen activity
- Every year in the fall (2x the first year)

- Phosphonate (Agri-Fos® and others)
  - Injection
  - Surface application
Basal Bark Application
Mix solution of 21 parts Agri-Fos® Fungicide with 21 parts water solution with 1 part Pentra-Bark, CA DPR # 71962-50001-AA.
Apply this uniformly to the circumference of the trunk of the tree. Spray from top down to ground level from either first branch or from as high as possible without exposing applicator to drift. Spray to just prior to runoff.

Treatment is generally effective if applied uniformly to 6 to 9 feet of trunk circumference, or from first branch to ground level, depending upon age and infection level of tree. Can be used as a preventative or curative application for trees listed.
Thinning understory tanoak:
- remove stems <2 inches DBH;
- for stems 2-3.25 inches DBH, retain if good form and well spaced; eliminate highly suppressed or strongly leaning stems where possible.
Acorns collected from pairs of tanoaks prior to treatment
Kashia Band of Pomo Indians

- Targeted use of pesticides in high-value areas with research to study effects of pesticides on food sources
- Selected removal of trees to reduce spread (i.e., habitat modification)
- Surveys to assess the extent of the problem
- Internal education to reduce spread via cultural practices (i.e., sanitation and exclusion)
- External education and leadership to reduce spread
Aggressive eradication efforts haven’t stopped the disease