Green Bulletin

Information for urban pest management professionals

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In this issue:

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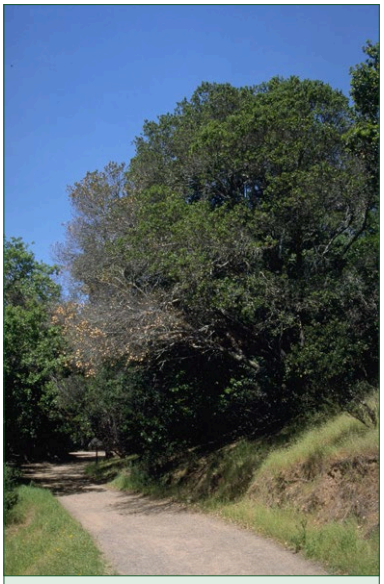
Produced by the Urban and Community IPM Team of the University of California Statewide Integrated Pest Management Program, with partial funding from the USDA NIFA CPPM Extension Implementation Program.

What is Sudden Oak Death?

Sudden oak death (SOD) is a disease syndrome that has killed millions of native oak trees (Figure 1) along the west coast of the United States, from Big Sur in California up to Southern Oregon. The disease may involve several organisms, but its main driver is the fungus-like organism (known as a water mold), *Phytophthora ramorum*. This plant pathogen is spread in the springtime by windy rainstorms. It infects the bark of oak trees, frequently creating bleeding trunk cankers that interfere with water uptake and sugar transport.

Death of SOD-infected trees can be accelerated by attacks from bark and ambrosia beetles. In the absence of beetle attacks, infected oaks may take years to die.

Many common disorders (other than *P. ramorum* infections) can cause damage that resembles SOD, so laboratory testing is needed to confirm the diagnosis.



Jack Kelly Clark, UC IPM

Figure 1. Coast live oaks killed by sudden oak death syndrome.

Sudden Oak Death Host Range

Sudden oak death isn't always sudden, nor does it infect just oaks. The potential host list of *P. ramorum* includes hundreds of plant species, many of which are natives of California's woodlands and forests. In most of these host species, the pathogen simply causes small necrotic spots on the leaves (Figure 2). In a few instances, notably in certain susceptible Rhododendron cultivars, the disease may progress from the leaves down into the stem and kill the plant.

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P Svihra, UCCE

Figure 2. Dark necrotic foliar lesions on California bay laurel infected with *Phytophthora ramorum*.

Sudden Oak Death *continued from p. 1*

Phytophthora ramorum has evolved as a foliar pathogen, primarily spreading from the leaves of infected hosts such as bay laurel (*Umbellularia californica*), tanoak (*Notholithocarpus densiflorus*), and rhododendrons. Therefore, it does not spread easily to other plants from oak trunk cankers. Thus, when oaks become infected, they are referred to as terminal hosts. Tanoak acts as both a foliar host, spreading spores from its leaves in wet and windy weather conditions, and a terminal host, developing cankers that are almost always lethal to the infected plant (Figure 3). Perhaps because infected tanoak leaves rain spores onto their own trunks, their SOD survival rates are among the lowest of all trees that may become afflicted by the disease in North America.

Despite its fearsome reputation, SOD doesn't always kill infected oaks. Valley oak (*Quercus lobata*), blue oak (*Q. douglasii*), and Oregon white oak (*Q. garryana*) are not known to develop cankers in nature, while coast live oak (*Q. agrifolia*), black oak (*Q. kelloggii*), Shreve oak (*Q. parvula* var. *shrevei*), and interior live oak (*Q. wislizeni*) are considered susceptible. Recent studies have demonstrated that there may be considerable variance in some coast live oaks, with measured resistance varying from about 16 to 40%. Many of these resistant or tolerant trees do become infected but are able to defeat the pathogen before trunk cankers enlarge to life-threatening sizes. Casual observations suggest that resistance levels seen in coast live oaks are likely similar to those in Shreve oak and black oak populations. Because interior live oak trees grow in comparatively hotter, dryer, environments than the other susceptible oaks, they almost never become infected, so resistance levels have not been studied. Tree age seems to play a role too. Oak trees under 4 inches in trunk diameter at chest height are not typically susceptible to infection by *P. ramorum*.

P Svihra, UCCE

Figure 3. Dark sap droplets exuding from tanbark oak infested with *Phytophthora ramorum*.

Treatment Approaches

Many different treatment approaches have been trialed, a few of which have shown promise.

Prevention

Potassium phosphite compounds (AgriFos, Reliant, Garden Phos, etc.) work best as preventive treatments. Most of the efficacy achieved by these compounds appears to be the result of stimulating the trees' natural defensive systems, although individual oaks vary widely in their immune responses. Thus, the application of potassium phosphite compounds is a bit of a gamble as to whether it will actually help an individual tree. Trees that are already showing symptoms of infection when treated have a significantly lower survival probability than trees that appear healthy during treatment.

There are two different recommended application methods for potassium phosphites—surface sprays made directly to the bark (using a surfactant such as Pentrabark) and trunk injections. Some applicators have claimed increased efficacy from the trunk injections, albeit at the cost of potential damage to the tree from wounding. Others have claimed equivalent efficacy with repeated bark sprays, when carefully timed. Application of calcium to the root zones of oaks treated with potassium phosphite has been shown to further improve resistance rates.

Potassium phosphite treatments should be made in the spring and fall, regardless of the application method used. This is because the uptake of potassium phosphite by the tree is dependent on high transpiration rates. High transpiration rates in turn depend on both adequate available soil moisture, and warm and sunny weather, preferably with a light breeze.

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Sudden Oak Death *continued from p. 2*

Another preventive treatment option that has proven to be effective is removal of foliar hosts that are near highly valued oak trees (Figure 4). Removing bay laurels that have foliage within about 30 feet of an oak trunk decreases the chances of that oak becoming infected. Removal is especially effective for small, understory foliar hosts, such as young bay laurels, poison oak, and rhododendron. This is not a recommendation for the wholesale removal of bay laurel trees, which are important parts of the California forest ecosystem and should be retained where appropriate. This management approach should only be adopted after careful consideration of the ecological function of the forest or woodland as a whole.

Management of Active Infections

Bark scribing, or cutting away the outer portion of infected bark to let the infection site dry out, was previously touted as an effective treatment for infected oaks. However, rigorous testing has since shown that it does not significantly increase the odds of an oak surviving. Similarly, the application of whitewash to tree trunks has not been shown to make measurable improvements to survival of treated oaks as compared to no treatment at all.

Mefanoxam (Subdue Maxx, Stergo MX, etc.) is a fungicide with a proven record of suppressing *Phytophthora* activity. It has been used to successfully treat infected plants, keeping them alive as long as treatment continues, typically over the span of a year or two. However, in most cases, once treatment stops, *Phytophthora* begins growing again within several months, and the infected plants will eventually succumb to the disease. While mefanoxam fungicides may be effectively used in certain limited situations, they should not be considered effective curative treatments. Resistance to this active ingredient has developed repeatedly, rendering it unacceptable for long-term use.

P Svihra, UCCE

Figure 4. Coast live oak with limbs killed by the sudden oak death pathogen, *Phytophthora ramorum*, possibly spread from nearby infected California bay laurel.

In summary, no silver bullet exists for preventing SOD, and there are no effective tools that will reliably save a tree that is already showing symptoms of infection. This does not mean that any oak that exhibits SOD trunk cankers or bleeding symptoms will die. Bleeding from the bark is a normal response to substantial damage, whether from a pest, pathogen, or, sometimes, even mechanical damage. Even if bleeding is the result of infection by *P. ramorum*, symptomatic trees have recovered with no intervention, usually in association with a few dry years. The most effective tools for managing SOD are preventive, in nature. For more information and best management practices, please see the California Oak Mortality Task Force website at: suddenoakdeath.org.

—Steven Swain,
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Sycamore Anthracnose

Have you been seeing a lot of defoliated sycamore trees recently? Sparse foliage and early leaf drop on sycamore trees might be due to anthracnose. The cool, wet spring in many parts of California provided the perfect conditions for this disease. Anthracnose is a common fungal disease sometimes called leaf, shoot, or twig blight. It can cause twisted, distorted branches in American sycamore, some varieties of London plane trees, and California sycamore trees. Sycamore anthracnose is primarily an aesthetic concern since it usually doesn't kill established trees.

Symptoms

Take a close look at the fallen leaves for the characteristic irregular blotches caused by this disease. Anthracnose can cause leaf spots, cankers, and wilting of young leaves in the spring (Figure 1). Emerging leaves turn brown and die. On older leaves, irregular spots or brown blotches begin on either side of the main leaf vein. The lesions spread, covering much of the leaf surface. Extensive twig or shoot blight occurs when young, growing shoots are killed. New shoots grow back from lower on the branch, eventually causing the branch to look gnarled with a "shepherd's hook" appearance (Figure 2).

Springtime Disease

The fungus overwinters on infected sycamore twigs and dead leaves. The disease is most severe during wet years when temperatures during the leafing-out period are below 55°F. The disease is not a problem in hot, dry weather. While the first flush of leaves might be lost to the disease, the canopy will regrow as the second flush of growth matures.

Management

Sycamore anthracnose is best managed by cleaning up fallen infected leaves to prevent the spread of the spores to the following year's new growth. Rake and dispose of fallen leaves and twigs during the growing season and in the fall. Prune and dispose of infected twigs and branches in the fall or winter. Avoid sprinkler irrigation that keeps trees wet. When planting sycamore trees in gardens and landscapes, choose resistant cultivars.

B Messenger-Sikes, UC IPM

Figure 1. Anthracnose symptoms on sycamore leaves.

Jack Kelly Clark, UC IPM

Figure 2. Sycamore limbs distorted into shepherd's hook shapes by anthracnose infection.

Fungicides do not reliably control sycamore anthracnose in California. By the time you see symptoms, it's too late to treat since fungicides effective against the disease are preventive (before the symptoms appear), not eradicative (after the disease symptoms appear). In landscape and residential settings, chemical spray applications are usually not practical due to the size of the trees and the high potential for pesticide drift.

Most sycamore trees will fully recover from defoliation caused by anthracnose so the best option could be to just rake up the fallen leaves to reduce disease inoculum for the following year.

For more information about anthracnose, see the UC IPM *Pest Notes: Anthracnose* at ipm.ucanr.edu/PMG/PESTNOTES/pn7420.html.

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Poisonous Plants: What To Know

Plentiful rainfall in California this spring created an ideal environment for many plants to thrive, including wildflowers, trees, and shrubs that desperately needed the water. However, other potentially harmful species also benefited from the unusually wet weather. Of particular concern are poisonous plants which are growing abundantly in parks and wildlands this year. These plants pose health risks to people, especially children, and pets. Being able to identify poisonous plants and understand available control options is critical for the safety of people who encounter them. While several poisonous plants grow in California, a few of the more common are detailed below along with information on how best to remove or manage them.

P Filler, Flickr

Figure 1. Poison hemlock flowers and leaves.

M Manners, Flickr

Figure 2. Poison oak.

Poison Hemlock

Poison hemlock (*Conium maculatum*) is an invasive weed that thrives in disturbed areas but it can also invade native plant communities. It is commonly found in meadows, pastures, and fields, and may spread quickly after the rainy season. All parts of the plant are toxic to humans and animals when ingested. Touching poison hemlock may cause contact dermatitis for some people.

Poison hemlock can easily be mistaken for its relatives in the family Apiaceae, like carrot, parsley, parsnip, or celery, especially when plants are young. Leaves are triangular shaped, deeply lobed, and have opposite branching (Figure 1). Unlike invasive wild carrot (*Daucus carota*), poison hemlock lacks hairs on its leaves and stems. Poison hemlock has white, umbrella-shaped flowers, similar to those of native cow parsnip (*Heracleum maximum*). However, cow parsnip has much wider leaves that are arranged in threes and can measure up to 16 inches wide. You can also distinguish poison hemlock from similar plants by checking for purple streaks or spots along its hollow stems. Mature plants can reach almost 10 feet tall.

Poison hemlock is best controlled when young, before it sets seed. It releases seeds over several months, and copious amounts of seed can build up in the soil. Small infestations of poison hemlock can be managed by hand removal while wearing gloves or hoeing the area. The taproot must also be removed to prevent regrowth. Repeatedly mowing poison hemlock can deplete its energy and prevent seed production. Be sure to clean mower blades to avoid moving seeds to new areas. Herbicides containing 2,4-D, triclopyr, or imazapyr work best on seedlings. Glyphosate, chlorsulfuron, and metsulfuron are effective on larger, rapidly growing plants. Repeated herbicide applications may be required for several years until the seedbank has been depleted. Never burn poison hemlock as this can release its toxins into the air.

Poison Oak

Poison oak (*Toxicodendron diversilobum*) is a deciduous native plant that is widespread through California's coastlands, woodlands, rangelands, riparian areas, and urban parks and gardens. Poison oak, like its eastern relative poison ivy, contains an oil called urushiol that can cause contact dermatitis and itchy, weeping rashes on the skin of people who are sensitive to urushiol. The allergy-causing oils can persist on tools, clothing, and other objects for months or even years.

The old adage "leaves of three, let it be" often holds true for poison oak, but not always. Plants normally consist of 3 leaflets, but may sometimes contain 5, 7, or 9. Leaves are slightly lobed and occur alternately along the stem (Figure 2). They can vary in color and texture from glossy to dull, and thin to leathery in texture. In open, sunny areas poison oak can grow

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Poisonous Plants *continued from p. 5*

to be a dense shrub. In more shaded areas it grows as a climbing vine. It can easily spread to cover large areas via seeds and rhizomes.

Poison oak can be removed through hand pulling by and digging (including roots) with a shovel; wear protective clothing and gloves and promptly wash or discard them afterwards. Removed plants should be carefully disposed of since the oils remain hazardous even after the plants have dried. Never burn or mow poison oak as it will release its oils into the air, posing an inhalation risk. Herbicides that contain at least 41% glyphosate or 61% triclopyr ester have been shown to provide effective control. Dicamba and imazapyr can also be used. Foliar applications should be made in the late spring or late summer, depending on the chemical used. Cut-stump treatments can be performed in the spring or fall

Burning and Stinging Nettles

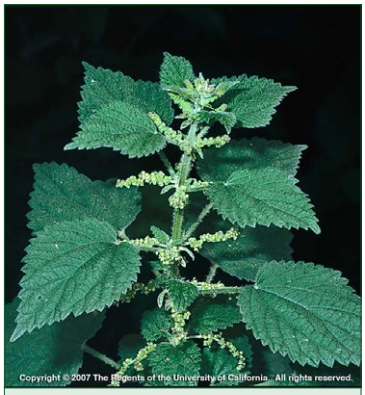
Unlike poison oak and poison hemlock which may only affect some people, burning and stinging nettles (Table 1) cause burning rashes to anyone who touches them. The rashes are caused by a toxin in the prickly hairs on the leaves and stems. Contact with burning and stinging nettles can cause blisters and red patches. Itching, burning, and tingling sensations may persist on the affected skin for several hours (Figures 3 and 4).

Table 1. Characteristics of burning nettle (*Urtica urens*) versus stinging nettle (*U. dioica*).

Burning nettle	Stinging nettle
Found in disturbed sites, roadsides, orchards, and gardens; common along the coast	Found in unmanaged areas, riverbanks, moist wildlands, and roadsides
Summer annual; blooms January to April	Perennial; blooms March to September
Spreads by seed	Spreads by seed and rhizomes
5 inches to 2 feet tall when mature	3½ to 10 feet tall when mature
Opposite leaves with toothed margins; ½ inch to 2 inches long	Opposite leaves with toothed margins; 2½ to 5 inches long

R Vidéki, Bugwood.org

Figure 3. Burning nettle



JM DiTomaso UCD

Figure 4. Stinging nettle.

Burning and stinging nettles can be nuisance plants as well as health hazards. However, they are not considered invasive or noxious weeds. In fact, stinging nettle is native to California so control should only be performed if plants are causing economic or health concerns. Hand pulling while wearing gloves can be effective, but the underground stems (rhizomes) of stinging nettle must also be removed. Mowing close to the ground can prevent seed development and spread, but if done too early in the season the nettles will regrow rapidly from the rhizomes. The active ingredients 2,4-D, aminopyralid, dicamba, glyphosate, and triclopyr provide excellent control for both stinging and burning nettles.

To learn more about controlling these toxic weeds in landscapes and natural areas, see the Weeds page on the UC IPM website at ipm.ucanr.edu/PMG/menu.weeds.html or the Weed Research Information Center wric.ucdavis.edu/. These and other weeds are described in the book *Weed Control in Natural Areas in the Western United States,* available from the UC ANR catalog anrcatalog.ucanr.edu/.

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Upcoming Meetings and Workshops (CEU opportunities)

The Landscape Expo Anaheim!

Come visit the UC IPM table at Booth #769

Our team will be sharing research information on Organic Herbicides as Alternatives to Glyphosate. Use **code TLE-AN-23 Karey Windbiel-Rojas** to get $10 off the seminar.

September 20 & 21, 2023, Anaheim, CA
www.TheLandscapeExpo.com

IPM Training for Retail Nurseries and Garden Centers

UC IPM is offering 3 hands-on, in-person workshops for retail employees, managers, owners, and affiliates.

October 25, 2023, Oakland, CA

November 2, 2023, Sacramento, CA

February 7, 2024, Irvine, CA
ipm.ucanr.edu/home-and-landscape/retail-ipm-training/

UC Riverside Fumigation School

This class for licensed professionals is presented by the UCR Urban Entomology Program and Agri-Turf Distribution.

October 11 & 12, 2023, Pomona, CA
birdease.com/UCRFumeSchool

West Coast Rodent Academy

The University of California Cooperative Extension and the Pest Control Operators of California are hosting a 3-day workshop on urban rodent management.

November 1-3, 2023, Irvine CA
https://ucanr.edu/sites/WCRA/

Ask the Expert!

Q: How can I tell if an oak tree has Sudden Oak Death?

A: It's not possible to visually determine whether an oak tree is infected with Sudden Oak Death.
According to the California Oak Mortality Task Force website:

"The only way to be certain that a plant has *Phytophthora ramorum* is to have a tissue sample laboratory-tested. This is necessary because other organisms and injuries can produce similar symptoms. However, there are some steps that can help you determine if Sudden Oak Death is likely. First, determine if your oak tree is a susceptible species by checking the full USDA-APHIS list of current host & associated plants. Second, compare the symptoms of Sudden Oak Death with those on your oak tree. Symptoms are described in the Diagnostic Guide. Third, check other susceptible tree and shrub species nearby. Do they have symptoms of *P. ramorum* infection? Finally, determine if you are in an infested area. Check maps available on the SODMAP website, contact the local UC Cooperative Extension office, your county Agricultural Commissioner, or CA Department of Forestry and Fire Protection office. If you are outside of an infested area, your tree could still have Sudden Oak Death, but it would be less likely. Follow these links for more information: hosts, symptoms, and contacts."

P Svihra, UCCE

Reddish brown discolored tissue under bark of coast live oak infected with *Phytophthora ramorum.*

New and Revised *Pest Notes*

Visit UC IPM's Pest Notes web page for these and many more titles:
ipm.ucanr.edu/PMG/PESTNOTES/index.html

Invasive Shothole Borers

Invasive shothole borers (ISHB) are responsible for the deaths of tens of thousands of trees in Southern California. These beetles bore into trees and infect them with Fusarium dieback, a fungal disease that kills the trees. Many native California like California sycamore, valley oak, and arroyo willow can be killed when invasive shothole borers attack them.

Management of these beetles includes regular monitoring of trees to quickly identify sources of beetles, disposing of infesting cut wood, and appropriate pesticide treatments. For details, see the new publication *Pest Notes: Invasive Shothole Borers*, authored by leading UC experts in the research into this pest.

Online at
ipm.ucanr.edu/PMG/PESTNOTES/pn74179.html

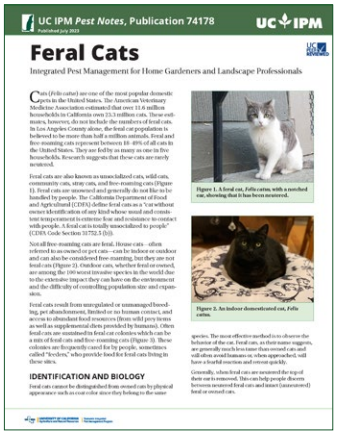

UC IPM *Pest Notes*, Publication 74179
Invasive Shothole Borers
Integrated Pest Management for Home Gardeners and Landscape Professionals

Feral Cats

While cats are popular household pets, feral cats can spread diseases and parasites and kill songbirds and other wildlife.

A new *Pest Notes*, *Feral Cats*, covers the impacts and management of feral cats in urban settings. Academics associated with the UC Statewide IPM Program wrote the publication to address the concerns associated with rising populations of feral cats in California's urban areas.

Online at
ipm.ucanr.edu/home-and-landscape/feral-cats/pest-notes/

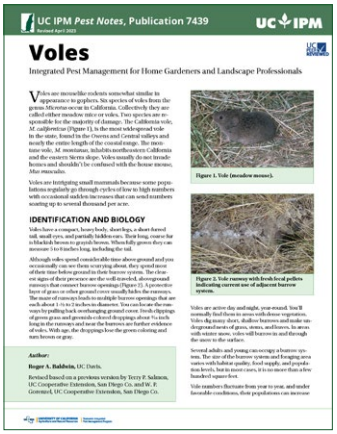

UC IPM *Pest Notes*, Publication 74178
Feral Cats
Integrated Pest Management for Home Gardeners and Landscape Professionals

Voles

Voles, also known as meadow mice, are small, mouselike rodents that can be pests in gardens and landscapes. They gnaw on many types of plants, damaging and sometimes killing them.

UC Davis Wildlife Specialist Roger Baldwin has revised the *Pest Notes: Voles* with added information such as range maps, distinguishing vole damage from gopher damage, and improving trapping success.

Online at
ipm.ucanr.edu/home-and-landscape/voles/pest-notes/


UC IPM *Pest Notes*, Publication 7439
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For more information about managing pests, contact your University of California Cooperative Extension office, or visit the UC IPM website at ipm.ucanr.edu.