



Pines, Drought, and Beetles

Although pine trees are comparatively drought tolerant, there comes a point where even hardy trees become stressed by lack of water. Stressed pines frequently exhibit symptoms such as thin, slightly yellowish canopies, or roots that “spider” across lawns (Figure 1). By the time pine trees begin turning brown, they are usually dying, but with some precautions, many trees can be saved before they reach this point.

California has a number of native bark beetle species that individually do only minor damage as they bore through the outer bark to reach the inner bark (phloem) and wood surface. Bark beetles are relatively small insects; most species are smaller than a grain of rice. When their population densities are low, these beetles typically attack only the most stressed pines. However, when their population densities are high, they attack and kill healthier trees (Figure 2). If drought conditions continue and beetle populations grow, the beetles can attack in numbers large enough to overwhelm tree defenses.



S. V. SWAIN, UCCE

Figure 1. Tree roots often grow near the surface when soil is compacted, or when the only water available comes from shallow irrigation.

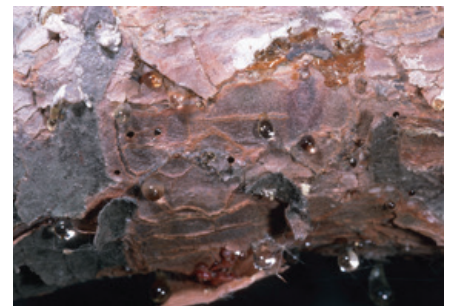
Healthy pines “pitch out” beetles by filling their tunnels with white- to tan-colored sap (Figure 3). Sap production requires water, and if water is scarce, the beetles may succeed. A successful beetle attack is often marked by a small, pinkish, volcano-shaped pitch tube at the entrance or small excreted bits of coarse boring dust, or frass, trapped in bark fissures and piled at the base of the tree (Figure 4). Pines typically do not die if there are only a few successful boring tunnels, and the color of the pitch tube will usually fade with age to a crystalline white.

Deep-red fresh sap around open tunnels typically indicates that a more serious invasion is in progress. Severely stressed trees cannot fight back, and may produce little or no sap at all. Instead, all you may find are piles of frass in the bark fissures or on the ground. Regardless of whether the tree is defending itself or not, little can be done to stop an infestation once the beetles are in the tree.



J. K. CLARK, UC

Figure 2. Monterey pine killed by bark beetles.



J. K. CLARK, UC

Figure 3. Sap exuding from holes created by bark beetles.

Consider removing heavily infested trees while they are still green. Once the trees have turned red, most of the bark beetles will have already emerged. However, if the tree poses a risk to life or property it should still be removed. If the tree is part of a larger forest or is otherwise far away from people or structures, consider retaining it for wildlife value. Animals that need dead trees (“snags”) for homes may find this old dead tree the perfect place to raise a family.

...continued on page 3

WHAT'S INSIDE...

- Foamy Bark Canker | Page 2
- Ask the Expert! | Page 3
- Drought: Water Conservation Q&A | Page 4
- Pest Notes Update | Page 7

Foamy Bark Canker: A New Disease on Coast Live Oak

Declining coast live oak (*Quercus agrifolia*) trees have recently been found throughout urban landscapes in Los Angeles, Orange, Riverside, Santa Barbara, Ventura and Monterey counties. A fungus associated with a specific beetle is causing the decline by spreading what is known as “foamy bark canker disease” (Figures 1 and 2).

The fungal species, *Geosmithia pallida*, was recovered from symptomatic plant tissues in association with the western oak bark beetle (WOBB) *Pseudopityophthorus pubipennis* (Figure 3, inset). WOBB appears to attack trees weakened by drought, disease, injuries, or other factors that may stress the tree. Pathogenicity tests on detached shoots showed that *G. pallida* is capable of causing disease to coast live oak seedlings and produced symptoms of foamy canker.

Symptoms

Symptoms occurring on the trunk and primary branches include wet discoloration seeping through entry holes caused by the western oak bark beetle (*P. pubipennis*). Peeling back of the outer bark reveals phloem necrosis surrounding the entry hole, and multiple entry holes may be observed on each tree (Figure 3). At the initial phase of attack, a reddish sap may ooze from the entry hole, followed by a



Figure 1. Die back symptoms on coast live oak.

prolific foamy liquid, which may run as far as 2 feet down the trunk (Figure 4).

The Beetle

Western oak bark beetle is a small beetle (about 2 mm long) that burrows through the bark, excavating shallow tunnels under the bark across the grain of the wood. Female beetles lay their eggs in the tunnels; the developing larvae tunnel at right angles to these, but mostly within the phloem (inner bark) close to the surface.

Landscape professionals and homeowners should note that symptoms may be confused with those caused by fusarium dieback/polyphagous shot hole borer (PSHB). However, the size of the entry hole associated with foamy canker is smaller than that made by the PSHB.

For information about PSHB and fusarium dieback, see <http://eskalenlab.ucr.edu/avocado.html>.

...continued on page 3



Figure 2. Bark canker caused by the fungus *Geosmithia pallida*.

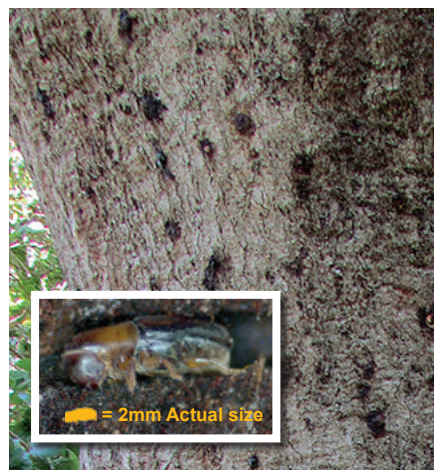


Figure 3. Beetle entry holes. Inset: The western oak bark beetle.



Figure 4 (right). Foamy liquid oozing from an infected tree.

Ask the Expert!

Q: My neighbor has a tree infested with pine bark beetles but isn't doing anything about it. What can I do to protect my pine trees?

A: The best way to protect your trees is to use general cultural practices that improve tree vigor. Healthy trees are less likely to be attacked and are better able to withstand attacks from a few bark beetles. Read the UC IPM Pest Note: [Bark Beetles](#) for help in identifying beetles and for information on damage and management.

Q: Where can I find other drought-related resources from the University of California?

A: The California Institute for Water Resources has a wealth of information about California's current drought, including information on research, events, and expert advice. These pages are being continuously updated as they work to bring the resources of the state's universities and colleges to a broad range of audiences. Visit their Web site at <http://ciwr.ucanr.edu/>.



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Pines, Drought, and Beetles

...continued from page 1

Since little can be done to treat a bark beetle infestation, preventive measures are the best practice. The care a pine receives can have a significant impact on its survival when bark beetle populations are on the rise. If the tree is of high aesthetic value, consider irrigating it in late spring or early summer. Place a soaker hose just inside the dripline, cover it with mulch if possible, and run the hose until the soil is moist to a depth of 12 inches. Wait until the upper 12 inches of soil is dry before irrigating again.

Thinning weak, diseased, deformed, and beetle-infested trees from a stand



Figure 4. Boring dust (frass) at the base of a Monterey pine.

can reduce competition for water among remaining trees. If using this approach, try to retain a variety of tree ages and sizes. Remove downed trees and clean up brush piles that can serve as "ladder" fuels in the event of

a fire. Finally, and only if necessary, prophylactic applications of insecticides to the bark surface can be used to protect high value trees from bark beetle attack.

Learn more about various beetles that attack trees at UC IPM's [Bark Beetles](#) Pest Note <http://www.ipm.ucanr.edu/PMG/PESTNOTES/pn7421.html> or the tree-boring beetles page at <http://www.ipm.ucanr.edu/PMG/invertebrates/links.beetles-treeborers.html>.

—Steven Swain, Environmental Horticulture Advisor, Marin & Sonoma counties. svswain@ucanr.edu

Foamy Bark Canker

...continued from page 2

What to do if you find the problem

Currently, no control methods are in place to control the fungus or the beetle. When the infection is at an advanced stage, the coast live oak tree dies.

If you suspect that you have found these symptoms of the foamy canker on your coast live oak tree, please contact either your local UCCE Farm

Advisor, pest control adviser, county Ag Commissioner office, or Dr. Akif Eskalen at UC Riverside. For more information visit www.eskalenlab.ucr.edu.

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Drought in the Landscape: Water Conservation Q & A

Q. How much water do landscapes use in California?

A. Landscape irrigation accounts for only about 9% of total statewide developed water use, but the percentage varies widely among communities. Water applied to landscapes is estimated to account for about 50% of residential water consumption statewide, but the amount varies from about 30% in some coastal communities to 60% or more in many inland suburban communities.

Q. What are some easy things I can do to save water in a landscape?

A. Check the irrigation system regularly for leaks as well as physical and operational problems that reduce the efficiency and function of sprinklers, drip emitters, and other water delivery devices. Correcting these problems can reduce water use by 10% or more, improve the uniformity of water application, and likely improve the health of plantings. Check that automatic valves are functioning and repair any leaks at valves, spray heads, and other connections. Walk through an area while the irrigation system is running and repair or replace sprinklers or other types of emitters that are broken, sunken, crooked, or clogged with soil or debris. Also, be certain that plants are not blocking or interfering with a sprinkler's spray pattern, that roots are not clogging drip emitters, and that all sprinklers and emitters are of the same manufacturer and model. For sprinkler systems, ensure the spray or streams completely overlap among the sprinklers by adjusting their output or adding sprinklers.

Q. Does a landscape have to be re-planted with specific drought-resistant, native, or California-Friendly plants to save significant amounts of water?

A. No. Field research studies indicate that traditionally used landscape trees, shrubs, and groundcovers have considerable drought resistance and perform acceptably with about 40% to 60% of the water required to maintain the average lawn in good condition. This is comparable to the water required by so-called drought-resistant, California-Friendly, and native plants to perform acceptably in landscapes. The common perception is that plants traditionally grown in landscapes are not drought-resistant, so they are usually over watered.

Highly drought-resistant plants can survive extended periods with no precipitation or irrigation, but this does not mean they can provide acceptable landscape function and performance with no water. Some California native plants used for landscaping originate in the relatively cool, moist climate of the coast or in foothill and mountain climates, making them susceptible to summer drought and prone to

injury when grown in warmer and drier areas of the state if summer irrigation is not provided.

No native or commonly used landscape plant is drought-resistant until it becomes established. All plants require a steady supply of moisture for about one year or more after they are first planted. Once non-turf landscape plants have well developed root systems, they typically perform well with limited summer water.



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Q. How much water can be saved by removing a lawn?

A. Water savings depends on how effectively the lawn has been irrigated, the type of turfgrass removed, which plants and how many will replace it, and how effectively the water applied to new plants is managed. If a lawn is removed and plant material is changed but the irrigation system and water management practices are not improved, then little water savings will be realized. If the lawn has been over watered and irrigation was poorly managed, then maximum water savings are possible by removing the lawn. However, in such situations keeping the lawn and simply improving irrigation management and improving or replacing an inefficient irrigation system will also generate substantial water savings without the trouble, cost, and the loss of aesthetics and functions that occur when removing the lawn.

Turfgrass water requirements vary by species. Warm-season lawns, such as bermudagrass, zoysiagrass, buffalograss, and St. Augustinegrass, need about 20% less water than widely planted cool-season lawns, such as tall fescue. So, simply replacing a tall fescue lawn with a warm-season one will significantly reduce the water needs of a turf area. Water requirements of warm-season grasses to provide optimum performance are about 10-20% greater than those of trees, shrubs, and groundcovers of any type, but these grasses can remain alive and largely green, though not lush, when

...continued on page 5

Drought: Water Conservation Q & A

...continued from page 4

irrigated at the same level as trees, shrubs, and groundcovers. For optimum performance, cool-season grasses require about 40-50% more water than trees, shrubs, or groundcovers, but they will provide minimum coverage with just 10-20% more water than these woody plants require.

Replacing a lawn with a mix of trees, shrubs, groundcovers, vines, and herbaceous perennial plants that creates a nearly complete, well-performing plant canopy over the landscape can be expected to have 50% less water demand than a cool-season lawn or at least 30% less than a warm-season lawn, assuming the lawn was watered to perform well and the new planting is well-designed with a highly efficient and well-managed irrigation system. Larger water savings can be realized if cool-season grass (such as tall fescue) is replaced with mulch and a few widely-spaced, if any, drip irrigated woody plants. However, there are significant functional, aesthetic, and maintenance differences between fully and sparsely planted landscapes that must be considered before choosing a lawn removal and replacement strategy.

Q. Will lawns or landscapes suffer if they are not irrigated every day in the summer?

A. No established lawn or landscape requires daily summer irrigation except in a few extremely hot inland and desert areas that also have sandy or decomposed granite soils. Only newly planted lawns and landscape plants are likely to be damaged by not receiving daily summer irrigation. Tall fescue lawns perform well when irrigated 2 to 4 times per week in the summer, while bermudagrass and other warm-season lawns can be irrigated less frequently. Trees, shrubs, and groundcovers perform well when irrigated every 5 to 10 days, and sometimes less frequently.

Q. What is the best approach for conserving water in a lawn or landscape?

A. After doing the simple things outlined in the first question, increase a lawn's drought resistance by setting the mowing height to at least 3 inches for tall fescue and other cool-season grasses and to at least 1½ inches for bermudagrass and other warm-season grasses. Lightly fertilize lawns but do not fertilize trees and shrubs. Limit pruning of trees and shrubs to remove dead or damaged branches and perform routine hedge trimming less frequently. Check that the majority of plants' root systems are wetted at each irriga-

tion (6-12 inches deep for tall fescue, 12-24 inches deep for woody plants) and adjust runtimes and start times so that enough water is applied to accomplish this.

Next, reduce irrigation from optimum levels by extending the interval between waterings by one day or more rather than reducing the runtime and keeping the same irrigation interval. After extending the interval between irrigations, the water budgeting or seasonal adjust feature found on many controllers can be used to fine tune runtimes and achieve optimum water conservation. If additional water conservation is needed, then further extend the interval between waterings, allow lawn areas to temporarily go dormant or die, or reduce the amount of lawn. If maximum water savings are needed permanently, decrease the area devoted to landscape and garden plants of any kind.

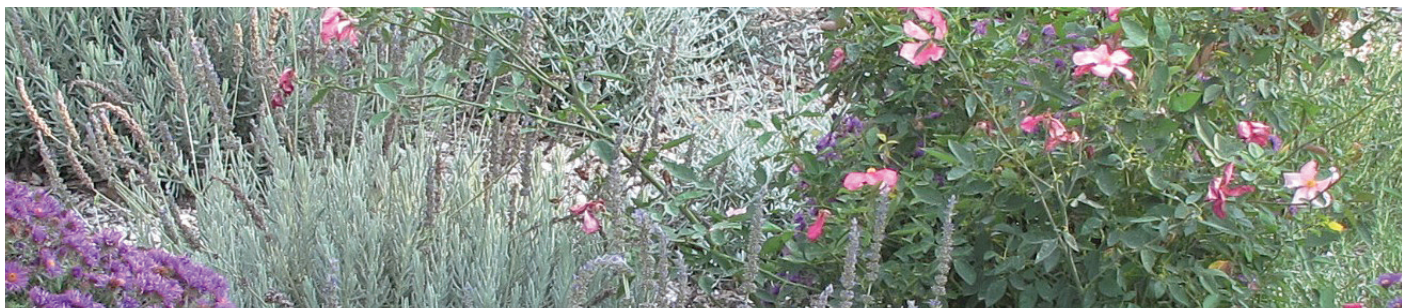
Q. How deeply should I water my lawn and landscape plants?

A. Apply enough water at each irrigation to wet the soil to the depth of plants' root systems. Tall fescue lawns normally have roots 6 to 12 inches deep while roots of bermudagrass and other warm-season grasses are normally at least 12 inches deep. The majority of roots of trees, shrubs, and groundcovers are normally found within 12 to 24 inches of the soil surface. Ideally the soil is wetted to these depths each time irrigation occurs. Using sprinklers to fully wet the soil to these depths without creating runoff or puddling of water will usually require scheduling multiple, relatively short irrigation cycles of 5 to 10 minutes or so on each irrigation day, depending on slope, soil type, output of the irrigation system, and how much water is needed. Be certain the irrigation system is functioning well and water is applied uniformly over the area. Using low-output precision sprinklers can reduce runoff but runtimes need to nearly double in order to deliver the same volume of water as standard sprinklers. For non-turf plants, a drip irrigation system set to irrigate two or more cycles per irrigation day can be used to slowly apply water deeply without runoff.

Q. How much can irrigation be reduced without hurting a lawn?

A. It depends on the species of grass that dominates the lawn and the amount of water currently being applied to it. Always gradually reduce the amount of water applied by

...continued on page 6



Drought: Water Conservation Q & A

...continued from page 5

extending the interval between thorough irrigations as described above. If the lawn is primarily tall fescue or another cool-season grass and it is being well watered with no obvious drought symptoms or brown areas, then the amount of water can probably be reduced by 10-20% without seriously injuring it. If the lawn is predominantly bermudagrass or another warm-season grass and you are keeping it well watered, you can probably reduce the amount of water up to 30% without seriously hurting it. You may see brown areas develop over time after reducing water by the amounts suggested. Limited brown areas that develop when water is reduced are often a sign that the irrigation system distributes water unevenly, rather than because the amount of water isn't enough to meet the lawn's needs. See the answer to the first question to address this problem.

If the lawn already has brown areas from too little water, then reducing the amount of water further may permanently damage it. Further water reductions will cause the grass to be largely brown and simply surviving in a mostly dormant state producing minimal growth and soil cover.

Q. How much can irrigation be reduced without hurting trees, shrubs, and other landscape plants?

A. As with lawns, it depends on the amount of water currently being applied. Plantings that have been maintained with high soil moisture content can usually maintain acceptable performance with a 20-40% reduction in irrigation by extending the interval between thorough irrigations as described above. Additional 10- 20% irrigation reductions to these plantings or to plantings that have already been irrigated below optimum will usually allow plants to remain functional, but they will grow less, possibly wilt and drop some leaves. It is important to gradually reduce water over a few to several week period by extending the interval between irrigations and applying enough water to wet most of the root system at each watering.

A few deep, root-zone wetting irrigations spaced 3 to 6 weeks apart from spring through fall can be enough to keep most trees and shrubs alive when water is in short supply. Many tree and shrub species will drop leaves, wilt, or suffer dieback of some branches under severe water shortage, but will survive.

Q. When is the best time of day to irrigate?

A. Irrigating during the very early morning hours is best with spray and similar overhead irrigation systems, gener-

ally between 12:00 A.M. and 6:00 A.M. Evaporation is lower and usually there is little or no wind to disrupt the pattern of sprinklers during these hours. In addition, water pressure is more favorable for irrigation systems in many areas during this period. Drip irrigation can be scheduled any time of day since evaporation and wind are not concerns with this type of system. Nighttime watering in California does not normally cause greater incidence of plant disease because the humidity is relatively low. Contrary to common belief, midday irrigation does not harm plants.

Q. If water becomes severely restricted, how should priorities be set to save landscape plants?

A. Cease irrigating low-priority plant beds and lawn areas, and direct available water to higher priority and more valuable plantings, especially trees and shrubs. When water is limited, most people choose to water fruit trees, landscape trees, groundcovers, shrubs, and herbaceous perennials. Lawns and bedding plants can be re-established relatively quickly and inexpensively, but trees, shrubs and other plants need years to mature and are less easily replaced. Underwatered fruit trees probably will produce less if any fruit, but will survive.

Q. How long will it take a lawn to die from lack of water?

A. If you stop watering a lawn, it will gradually turn brown signifying it has died or become dormant. Depending on weather conditions, this may take from 1 to 4 weeks for most lawn grasses, but it might take longer for deep-rooted grasses like bermudagrass. The first signs of inadequate water will be wilting of grass blades and a bluish-gray appearance. Next, leaf blades will yellow and eventually become brown and the grass will thin out. The lawn will probably not turn from a uniform green to a uniform brown, but will instead have a mix of green, yellowish, and brown areas. A lawn that recently turned brown from drought can often be revived with regular, thorough watering.

Q. When should trees, shrubs, and other landscape plants be planted in a dry year or if drought is expected?

A. Hold off planting until fall or winter to take advantage of cool weather as well as fall and winter rains. The planting site may be prepared in spring or summer, however.

...continued on page 7

WHAT IS IPM? Integrated Pest Management (IPM) programs focus on long-term prevention of pests or their damage through a combination of techniques including resistant plant varieties, biological control, physical or mechanical control, and modification of gardening and home maintenance practices to reduce conditions favorable for pests. Pesticides are part of IPM programs but are used only when needed. Products are selected and applied in a manner that minimizes risks to human health, beneficial and nontarget organisms, and the environment.

Water Conservation Q & A

...continued from page 6

Q. How often should newly planted trees and shrubs be watered?

A. The root balls of newly planted trees and shrubs need to be kept moist until a network of roots grows out into native soil. Newly planted container plants may need watering every day for several weeks during warm weather. Adding a 2 to 4 inch thick layer of mulch reduces water loss and weed problems. Delaying planting until the fall or winter can reduce the frequency of irrigation required to maintain moisture in the root balls of new transplants and takes advantage of seasonal rain.

Q. If a lawn dies, or is damaged due to drought, when should it be replanted?

A. Do not replant a lawn until there is enough water available from rainfall, irrigation, or a combination of the two. Assuming water is available, the best time of year to plant lawns is in the fall or spring for cool-season turfgrasses (tall fescue, rye, etc.) and late-spring or summer for warm-season turfgrasses (bermuda, zoysia, St. Augustine).

Q. Will adding soil amendments like polymers or similar "water conserving" products really conserve water?

A. Polymers and similarly promoted soil amendment products do not by themselves save water. They often can increase the amount of water a soil can hold, but plants still require the same amount of water. Adding these types of amendments to a soil can extend the length of time required between irrigations but will not alter significantly the amount of water used by plants. Field research studies with polymers suggest that they can extend the time between waterings, but effectiveness varies with the product, the concentration added to soil, and site conditions. Some lose their ef-

Pest Note Updates

UC IPM recently released two revised titles in its Pest Notes series of publications covering home, garden, landscape, and wildlife pests.

Skunks:

<http://www.ipm.ucanr.edu/PMG/PESTNOTES/pn74118.html>

Flies:

<http://www.ipm.ucanr.edu/PMG/PESTNOTES/pn7457.html>

To access these and 163 other titles, visit UC IPM's Pest Notes Web page: <http://www.ipm.ucanr.edu/PMG/PESTNOTES>.



fectiveness when fertilizers and other natural salts are present in the soil. When using a polymer or other soil amendment product, add enough to effectively amend the soil to the depth where most of the plants' roots are and mix it evenly into the soil. A large volume of product may be required to increase significantly the soil's water holding ability especially where relatively deep-rooted plants like trees

and shrubs are grown. These products provide little benefit in soils with high clay or high organic matter content.

To access this article and other useful information online, visit the UC Center for Landscape and Urban Horticulture at http://ucanr.edu/sites/UrbanHort/Water_Use_of_Turfgrass_and_Landscape_Plant_Materials/

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For more information about managing pests, contact your University of California Cooperative Extension office listed under the county government pages of your phone book, or visit the UC IPM Web site at www.ipm.ucanr.edu.

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