Cooperative Extension University of California Ventura County

Landscape Notes

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Diagnosing your Oak Tree
Part II Insects

Oak Insect problems

More than 800 insects (Swiecki, 2002) are adapted to oaks and their occurrence on oaks is common in California. Native oaks have native insect complexes that come and go and when unregulated, may cause widespread damage symptoms. In some cases, the damage caused by insects mimics that caused by disease pathogens. Close examination of affected foliage and stems will often reveal insect damage symptoms such as chewing, sucking/rasping injury, necrotic tissues, branch dieback, yellowing and/or galls, or insect related products such as frass, webbing, spittle, and fecal material. Hundreds of species of insects can be found on Coast Live Oak, Valley or White Oak, Blue Oak and other exotic or introduced species. In most cases, the damage they cause is superficial. Occasionally, some insects can cause significant damage to stressed or injured oaks. We cover these below. Native oaks and their pests are often under biological control by native insects that regulate pest populations. Thus, we do not often recommend control measures of these pests.

Sometimes when an outbreak occurs, or if a pest is established on a non-native oak tree, control is warranted.

Many oak insects have precise host specificity and only occur on certain groups of oaks. The most fundamental groups are white and black oaks. All native oaks are in the white oak category except for the following which are considered black oaks: *Q. agrifolia*, *Q. kelloggii* and *Q. wislizenii*.

Gall Making Insects

Who has not seen bright red or green oak apple galls on coast live oak or Valley oaks? They are abundant, and when fresh, quite noticeable. Gall tissue is produced by the tree in response to the injection of an egg or other insect fluids into a stem, leaf or plant part. The plant reacts with hyperplasia (increased cell division) and hypertrophic (abnormal cell enlargement) responses. Oak gall-making insects are usually in the order Hymenoptera, the order of bees, wasps and ants. Oak gall-makers are all in the gall-wasp family Cynipidae. These insects affect the leaves, stems, twigs, shoots, flowers and fruit of many oaks growing in landscapes. Most gall-making insects cause little long-term harm to their hosts, however; some gall makers may cause necrosis of leaf tissue thus disfiguring and reducing photosynthetic output of the infested tree. Gall making insects sometimes attack drought stressed trees in preference to well-hydrated or irrigated oaks. Oak gall makers produce a variety of sizes and shapes of galls, some are highly host specific and others have a wide host range. It is typical that the gall made by each wasp species is unique to that species. However, several species have an alternation of generations, i.e. they produce different galls on different oak parts at different times of the year with different sexes of the wasp emerging. You have to be careful when identifying gall-making insects though because not all wasps that emerge from a gall are the ones that caused the gall to form. These hitchhiker gall makers are called inquilines and there are many species of these as well. Presented below are some galls common to Southern California landscapes. There is an excellent reference now on galls of plants by Ron Russo (see bibliography), it is recent, and has many great photos and easily readable descriptions. It is available from University of California Press (www.ucpress.edu).

Two-horned oak gall wasp

Two-horned oak gall is the most common gall-making insect we have on coast live oak. It is often misunderstood or overlooked because the galls are small and form on the undersides (or sometimes upper surfaces) of leaves. The gall has two small

projections or “horns” on its outer surface. These galls are made by *Dryocosmus dubiosus*. This gall-maker has an alternation of generations producing a completely different gall in the catkins of oak flowers during the spring flush. The insects emerging from leaves are all female, while those emerging from catkin galls may be either male or female. Galls often fall from the leaf and emergence occurs from the ground. Galls are associated with leaf veins and cause a loss of function of the vein and browning of part of the leaf fed by that vein. With three or more galls on a leaf, the majority of that leaf may die and the leaf will fall prematurely from the tree. I have seen entire canopies turn brown from the effects of this gall making insect. Trees in drought stress are more susceptible to attack than well-watered trees. Anecdotal observation suggests that supplemental irrigation has “controlled” the insect on coast live oak, however since populations are sporadic, it is hard to attribute increased watering to pest suppression.

Left, damage to leaves; Right is the two-horned oak gall. Below is the adult wasp.

Twig club gall wasp

This gall-making wasp (*Callirhytis suttoni*) affects young twigs and stems of coast live oak. This wasp is only found on black oaks. The irregular twig swellings are abrupt and destructive to the twig or small branch on which they occur. Disruption of water flow is complete, resulting in death of the terminal portion of the branch beyond the gall. The gall is polythalamous, meaning that more than one adult wasp will emerge from a single gall. This gall maker is common, and high populations can easily build up on a single tree resulting in significant amounts of deadwood with the galled twigs. This gall maker should not be confused with the Irregular spindle gall wasp which makes a larger gall found only on white oaks. We suggest pruning out the galls while they are still in the green stage.

California gallfly (Oak Apples)

This is a common gall making insect on oaks, or at least one of the most recognized. It is another Cynipidae (*Andricus californicus*) and is found throughout California wherever oaks grow. Unlike the twig club gall wasp, this gall is sessile (can be removed without harm to the twig) and does not seem to result in harm to the twig or its foliage.

The common name of oak apple is because the gall is green when young but can become quite red, as it grows older. The mature gall is brown at the time when the adult wasps chew their way out. *A. californicus* makes a polythalamous gall that can produce over fifty individual wasps from a single mature gall. It attacks both the Valley and Coast live Oaks in Ventura County.

Photo from UCIPM

Red Cone Gall Wasps

These colorful galls are common on the valley oak and are just turning bright red this time of year (August). They are another kind of gall formed by cynipid wasps (*Andricus kingi*) and will completely infest trees that have been stressed or are suffering from drought. These galls are not known to cause extensive damage and only form on leaves. The bright pink galls are monothalamous and will yield one parthenogenetic female in February. In the spring, male and female generations are formed in small galls at the leaf edge that turn quite dark at maturity.

Jumping Galls

This is a tiny gall caused by the jumping gall wasp (*Neuroterus saltorius*) another cynipid (see photo below). The galls are tiny but will often form in profusion and drop from the tree with an intact larva in each gall. The larvae clicks its body, inside the gall, making it jump up and down. When galls fall on hard surfaces such as sidewalks, decks of street surfaces they are easily noticed. When galls fall in leaf mulch, it is thought that the jumping action helps to work them into the litter and better protect the larvae from parasitization. These galls form on the coast live oak and other species of oak at low levels and very occasionally infest trees abundantly enough to be noticed by their jumping habits.

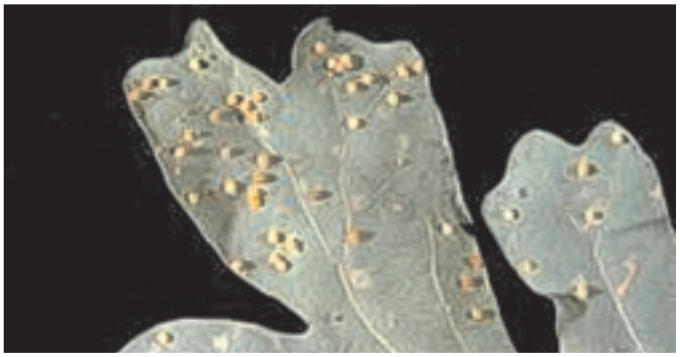


Photo from UCIPM

Boring insects

There are insects that bore every part of the oak tree; bark, twigs, fruit, lower trunk, branches and roots are all attacked by a variety of beetle and moth larvae. These insects range in size from small beetles to some of the largest in California.

Some of the insects are tree killers while others cause little damage to the living tree. As with many insects, the boring insects seem to prefer drought stressed trees, so this year we may see large populations of these insects attacking oaks.

Oak Bark Beetles

The oak bark beetle (*Pseudopityopthorus pubipenis*), is a small insect and is often associated with mass attack beetle deaths of coast live oak in Southern California. Similar in size to the Ambrosia beetle which is more common in Northern California, the Oak Bark Beetle (OBB) is only 1/8 by 3/8” in size. Although tiny, this is a cambium and new xylem feeder which is quite capable of destroying oak trees by girdling them just under the bark. The beetles are attracted to pruned, diseased, or drought stressed oaks. In northern California, these insects have been attracted to sudden oak death affected trees. In urban environments, stressed oaks are trees that have been root pruned to install a wall footing or just victims of the recent drought. Affected trees will often bleed as though they were blasted on all sides with a shotgun. Copious bleeding slows the invasion, so watering affected trees is recommended. Trunk sprays of borer-controlling insecticides in the fall and summer months are also a good preventative measure for high-risk trees.

Pacific Flatheaded Borers

Chrysobothris mali, the pacific flatheaded borer (PFB), is a beetle in the family buprestidae; it has a wide host range and affects many landscape trees including oak (Johnson and Lyon, 1976; Borror, Delong, and Triplehorn, 1975). PFB prefers

hardwoods of various kinds. This year I reared many adults from cut logs of mulberry. Standing trees are also attacked by PFB, and the usual mantra of drought stress or injured trees applies. My observation has been that root pruned oaks are particularly susceptible to this pest. Trees that have been relocated or transplanted may also sustain many challenges from this insect. PFB feed by wandering through the sap and heartwood--they are not strict cambial girdling borers. The larvae feed deep in the older sapwood and heartwood of trees. High populations in the tree are necessary to cause damage or death to affected stems or trunks. The beetle often attacks at the root flare up to breast height on mature trees.

Western Sycamore Borer

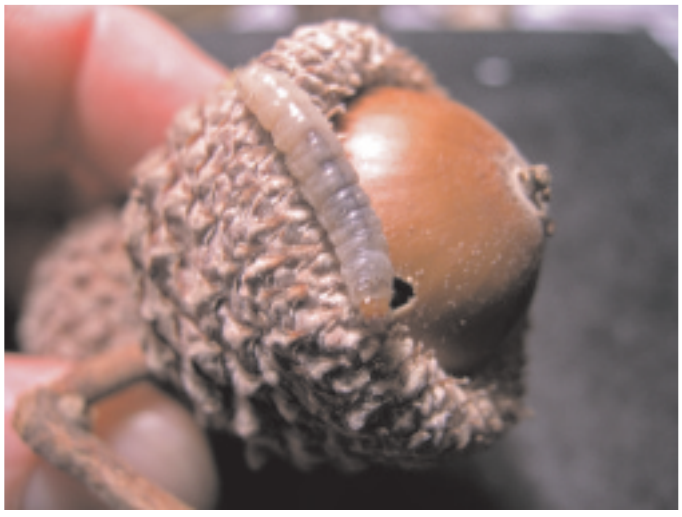
As the name implies, this insect is a pest of California Sycamore (*Platanus racemosa*); however, it is also a pest of mature coast live oaks. You will notice Western sycamore borer as it causes roughened bark on mature oaks or sycamores. If you look carefully, you may also see the cast skins left behind after the moths pupate and leave the tree as adults. The feeding of larvae and exudation of resin stains the bark a dark color. There is usually abundant frass that collects in bark crevices around the base of the tree. Damage is typically at breast height on the main stem down to the root flare. Young trees are somewhat immune to the insect. *Synanthedon resplendens* is a phloem-feeding insect and does not appear to harm the vascular cambium of affected trees. Long-term health affects due to heavy attack by Sycamore borers is unknown. Adults resemble yellow jackets and also display wasp-like movements and behavior adding to their convincing mimicry (see below).

Oak Twig Girdler

Agrilus angelicus is the Latin name for the Oak Twig Girdler. Many will rapidly recognize this insect as a member of the Buprestidae or metallic wood borers or flatheaded borer group. Oak twig girdler larvae spend their lives in pencil-sized twigs of coast live oak, where they burrow spiral “barber pole” galleries in the young stem. Although the damage caused by oak twig girdler is ugly, the insect is not thought to harm the tree. Instead, the insect may be saving the tree water by cutting down on evapotranspirational water loss. The insect has a two-year life history and will emerge from twigs in May or June as an adult beetle. This beetle is especially attracted to drought stressed, aged, or diseased trees.

Filbert weevil

The filbert weevil (*Curculio* spp.) is a pest of oak acorns (next page top, left). The beetle can be so successful at parasitizing acorns that up to 90% of the annual acorn crop is lost. The larvae chew out of the acorn and fall to the ground where they pupate into adult weevils. There is no control for this insect. Sometimes it is also responsible for initiating drippy nut disorder. Young acorns (last picture in this series) will bleed and drip a sticky exudate that covers patios, cars or anything under the oak tree. This can be a tremendous nuisance as nothing can be done to stop it when weevil populations are high. Filbertworms also infest acorns and these are the larvae of moths (below).



Photos: courtesy of Bruce Hagen and UCIPM (drippy nut)

Sucking insects

Pit Scale

Unlike many of the previously mentioned insects, Oak Pit Scale is a damaging insect that debilitates oaks. The insect gets its name from the pitting of stem tissue that the insect causes to grow around developing crawlers, nymphs and adult female scales (see above right). It is especially damaging to the valley oak (*Q. lobata*). The pest in Ventura County is worst in our hot inland valley communities such as Thousand Oaks, Simi Valley, Oak Park etc. Pit scales inject toxic saliva into twigs causing their premature death. Heavily infested trees display a twiggy dieback that detracts from the overall health and appearance of the tree. Older oaks are extensively damaged by pit scale which some experts think can cause their ultimate demise as other insects or plant pathogens come in to finish off a pit-scale-affected oak. Drought intensifies the affects of pit scale. Monitoring with double sticky tape followed by sprays of superfine oil can control this insect while it is in the crawler stage in the spring.

Ehrhorn's oak Scale

Unlike pit scale, Ehrhorn's scale does not seem to cause harm to affected trees. Although some believe that Ehrhorn's scale increases the amount of dead twigs in an oak canopy, there has been little research on this insect. The insect relies on a mutual relationship with an associated fungus which covers its body. Affected limbs are usually larger, 2-6 inches in diameter, and are covered with a felt like, white matt of fungal growth (see image below). The scale larvae live under this protective mat and feed on the branch bark. The insect is usually seen on dense canopied oaks. These are usually by definition healthy. Since twigs and small limbs die quickly in dense shade there is a natural accumulation of dead wood within the canopy of an Ehrhorn's scale affected tree. The need to control this insect is still a matter of debate.

Oak Tree hoppers

If you are fortunate, you will sometime observe the oak tree hopper (*Platycotis vittata*). The adults are ¼-inch long, olive green to brown with red dots and have a thick horn on their heads. Nymphs and adults are found on twigs, feeding in groups. These insects are sapsuckers and as such could pose a problem if found in high numbers (which is rare). Some twigs may die from feeding and sooty mold

can also accumulate as with any sucking insect. It is perhaps the most striking insect found on coast live oaks. Treehoppers have gradual metamorphosis and the nymphs are even more striking than the adults.

Photo courtesy of Bruce Hagen

Leaf-Consuming Insects

Oak Moth, Oakworm

Oak moth (*Phryganidia californica*) is perhaps the most voracious oak consuming caterpillar pest we have in the landscape. It attacks both the native *Q. agrifolia* and the landscape Holly Oak. Eggs are laid on leaves or shoots and hatch to form caterpillars which grow and then pupate hanging from the trunk or branches. Pupae hatch to form more of the small grey adults (see figures below male on left female on right). In Ventura, there can be up to five moth generations per year. However, many of the pupae are parasitized by a native complex of wasp hyperparasites. Sometimes up to 99% of all pupae can be killed by these wasp parasitoids. Still, the populations of biocontrol wasp and moth can fluctuate and this leads to outbreak population increases of the moth. When moth populations build to this level, we see defoliations of entire trees or streets of trees or sections of native forest. Such damaging levels usually lead to a "crash" in the moth population when larvae run out of food (leaves). This gives the trees time to refoliate and they may not see another defoliation event for several years. However, in some urban settings, defoliation occurs on a routine basis. This seems to be the case in Ventura where trees defoliate several times a year.

Because oakworms are serious defoliators, some tree owners may choose to use pesticides to gain control of the problem. Control is possible with a wide variety of caterpillar controlling pesticides. These may be a necessity for the pest on Holly Oak which does not recover as well from oak moth populations as does the native *Q. agrifolia*. The biological pesticide *Bacillus thuringensis* has been used effectively. Permethrin and carbaryl can both provide knockdown control of larvae and adults but not pupae.

Photos: UCIPM

Leaf Rollers and Leaf Cutters

These insects manipulate the leaves of oaks to their reproductive advantage. The fruit tree leafroller (*Archips argyrospilus*) have green larvae with a black head, chew leaves, then tie the edges together in order to pupate in the protective leaf fold (see below). The larvae are about ¾ inch long and wriggle vigorously when touched. Large populations may defoliate sections of the tree or the entire tree. These insects are usually not damaging and control is only rarely necessary.

Photo: Jim Downer

Wooly Oak Aphid

Wooly oak aphids are occasionally seen on coast live oak. They look like someone stuck cotton balls in the tree. The insect (*Stegophylla quercicola*) is greenish to bluish less than 1/8 inch long and covered with cottony wax fibers. It is most commonly found within rolled leaf margins. It is responsible for sucking sap and can cause the resultant buildup of sooty mold that accompanies most sucking insects. Unless populations are very large, usually no control is necessary.

Crown Whitefly

The Crown whitefly (*Aleuroplatus coronata*) is commonly found on coast live oak but usually not at damaging levels. This sucking insect occurs here and there and is seen on undersides of leaves. They are not mobile and are conspicuous because of their dark color surrounded by a fringe of white wax. Since these insects suck plant sap, they excrete honeydew which can lead to a build up of sooty mold if the populations of whiteflies are high enough. Usually the oaks change leaves and the pests are shed in the leaf drop before the insects build to significant levels. The adults are white colored and rarely seen.

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