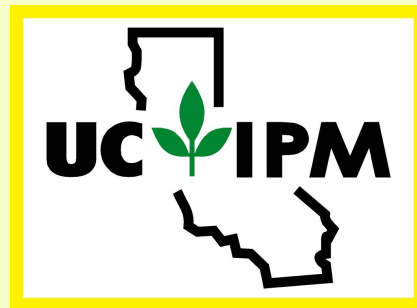


# Recognizing Pest Damage Symptoms on Landscape Plants

Mary Louise Flint  
Extension Entomologist  
UC Statewide IPM Program, UC Davis



# Challenges in diagnosing pest problems



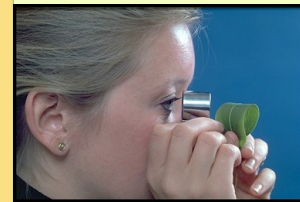
- Many biotic & abiotic agents can cause similar injury symptoms
- Different plant species have different pest problems
- The causal agent (e.g. an insect) may no longer be present when damage is noticed
- Many plant diseases have no external signs that allow you to positively identify the cause
- Damage may be the result of multiple factors

# Diagnosing problems—Ask these questions first, especially if the cause is not apparent:

- Identify the plant
- Identify the symptoms—look for causal agents
- How long as the problem been apparent?
- What parts of the plant are affected (old/new)? Is it moving in the plant? Do symptoms get worse over time?

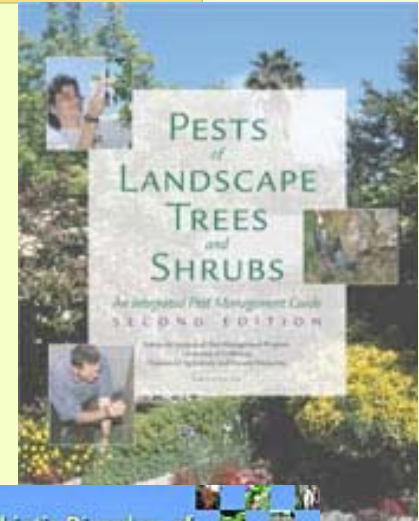


# UC resources to help identify & manage problems



- Diagnostic tables in Pests of Landscape Trees & Shrubs
- Abiotic Disorders of Landscape Plants
- Pest Notes & other info at

<http://www.ipm.ucdavis.edu>





# Landscape Pest ID cards



Provide a quick field reference

- 80 common insects and mites
- 40 diseases
- 20 beneficial insects
- least toxic management options
- 46 pocket-size cards
- 211 color photos



# Organized by Pest Type

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### 30 MISTLETOES



Female broadleaf mistletoe plants form clusters of round, white berries. Seeds are spread in the droppings of birds that feed on the berries.

Mistletoes induce their host trees to form gall-like swellings at the infection site.



Female dwarf mistletoe plants form clusters of green, oval fruit on conifers. Seeds are spread when they are forcibly ejected from fruit.



Broadleaf mistletoes remain green in the winter when their deciduous hosts lose their leaves.



### ROOT, TRUNK, AND BRANCH PESTS

#### Mistletoes

Broadleaf mistletoes infect a wide range of landscape trees, most of them deciduous species. Dwarf mistletoes infect conifers such as pines and firs. A healthy tree can tolerate a few mistletoe plants, but heavy infestations may stunt or kill trees.

- Broadleaf mistletoes form clusters of thick, green leaves and stems easily visible in deciduous trees in the winter.
- Dwarf mistletoes form small, dense clusters of yellow-green stems in conifers, often in a “witch’s broom”—an area of the tree canopy where the foliage is more dense than usual.
- Clusters of round, sticky berries form on broadleaf mistletoes from October to December.

#### What to Do

When planting new trees, choose species believed to be resistant or moderately resistant to mistletoes. These include Bradford pear, Chinese pistache, crape myrtle, eucalyptus, ginkgo, golden rain tree, liquidambar, sycamore, redwood, and cedar.

- Control infestations in surrounding trees before you plant new trees.
- Prune out infected branches as soon as mistletoe appears. Cut at least 1 foot below the point of mistletoe attachment.
- If the infected branch cannot be removed, remove the mistletoe flush with the bark and wrap the branch in several layers of black polyethylene secured with weather-resistant tape. Removal of mistletoe plants without wrapping will prevent seed production and spread, but the mistletoe is likely to regrow.
- Applications of the growth regulator ethephon in early spring while trees are still dormant will remove mistletoe plants, but there will be regrowth that will have to be treated.

**For More Information** (See “Suggested Reading” on the back card.)

*Pest Notes: Mistletoe*



Each card has management tips, but

See UC IPM Pest Notes for more details on pesticides and other management tools.



## 1 GENERAL PREDATORS



Syrphid fly or hover fly adult.



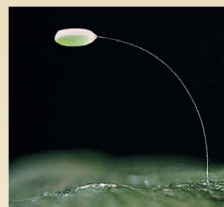
Syrphid fly larva feeding on aphids.



Adult common green lacewing, *Chrysoperla carnea*.



Larva of the common green lacewing feeding on an aphid (above). Lacewing eggs are attached to plant surfaces by long stalks (right).



Adult soldier beetle, *Cantharis* sp.



Adult minute pirate bug, *Orius tristicolor*, feeding on an aphid.

## BENEFICIALS

### General Predators

Many of the insects found in gardens and landscapes are considered beneficial because they feed on pest insects and mites. The term general predator is used for those species that feed on a variety of different pest species. Besides insects such as those shown here, spiders are important general predators in the landscape.

- Syrphid fly larvae are legless maggots that consume aphids and other soft-bodied insects. Adults resemble honey bees or small yellowjackets and are often seen around flowers, where they feed on pollen and nectar.
- Lacewing larvae feed on many different soft-bodied insects and mites. Adults are often seen around light sources at night. Adult food includes insect honeydew and plant nectar. Adults of some species (*Chrysopa* spp.) also feed on small insects.
- Soldier beetle adults, also called leatherwings, feed on aphids and pollen. Larvae live in the soil, where they feed on insects and other arthropods.
- Both immature and adult minute pirate bugs are very small and feed on mites, thrips, and insect eggs. Immatures are pear shaped and yellow or reddish brown.

### What to Do

- To protect beneficial insects, rely on nonchemical pest control methods such as squashing, trapping, washing off, or pruning out pest infestations.
- Avoid using broad-spectrum pesticides such as organophosphates and pyrethroids.
- Include flowering plants in your landscaping to provide pollen, nectar, and shelter for beneficials.
- Control insect-tending ants with baits and use barriers to keep them off landscape plants. Ants drive predators away from aphids and other honeydew-secreting insect pests.

For More Information (See "Suggested Reading" on the back card.)  
*Natural Enemies Handbook*





## 2 PARASITES



Aphid parasites lay their eggs inside aphids.



Some aphid parasites cause their hosts to turn black.



Caterpillar parasites lay their eggs on or inside of host caterpillars.



Tachinid flies resemble house flies but have prominent, stiff bristles on the tip of their abdomen (arrow).



Other aphid parasites cause host to turn beige. The tiny wasps leave circular exit holes in aphid "mummies."



Most adult scale parasites leave round exit holes in their host scales.

## 3 APHID-EATING LADY BEETLES

Adult (right), larva (top) and pupa of the multi-colored Asian lady beetle, *Harmonia axyridis*.



Adult ashy gray lady beetle *abdominalis* (O. v-nigrum)



Lady beetle larvae are black and look like tiny alligators. The larger stages often have orange or yellow markings. A convergent lady beetle larva is shown here.



Eggs of the convergent lady beetle.



Different color forms of the convergent lady beetle, *Hippodamia convergens*.

## 4 SCALE-EATING LADY BEETLES

Adult (top) and larva of *Chilocorus bipustulatus* next to a European fruit lecanium scale (right).



Adult twicestabbed lady beetle, *Chilocorus orbis*, feeding on walnut scale.



Black lady beetle larva feeding on eggs of a lecanium scale.



Adult black lady beetle, *Rhyzobius forestieri*, is about 1/5 inch long.



Adult *Rhyzobius lophanthae* is about 1/10 inch long.

More Beneficials:  
preservation of  
natural enemies  
key to IPM  
programs.



# Chewing Damage

## 5 LEAF-FEEDING BEETLES



Elm leaf beetle adult, eggs, and a newly hatched larva.



Black vine weevils chew irregular notches in the edges of leaves. The larvae of this pest feed on plant roots.



Beetle larvae that feed on foliage resemble caterpillars, but they lack prolegs—leg-like appendages along the abdomen.



Eucalyptus tortoise beetle and characteristic leaf damage.



Foliage damaged by elm leaf beetle larvae and adults.

## 6 LEAF-FEEDING CATERPILLARS



Leafroller caterpillars use silk to roll leaves together or to attach leaves to fruit, and then feed inside the protective shelter.



The California oakworm feeds on oak leaves, especially coast live oak, in coastal areas of California.



Fall webworms feed on foliage in large colonies inside silken tents.



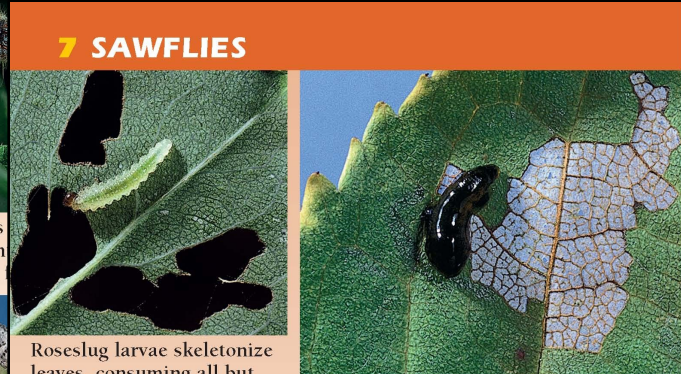
Tent caterpillars inside silken tents to feed on



Redhumped caterpillar larvae feed in groups on foliage.



Roseslug larvae skeletonize leaves, consuming all but the main veins.



The pear slug, larva of the pear sawfly, skeletonizes leaves of pear, cherry, and occasionally other tree species.



Feeding by raspberry horntail larvae kills the stems and leaves above the feeding site.



The larva of the raspberry horntail sawfly feeds inside the stems of roses and caneberries.



Conifer sawfly larvae often feed in groups on pines and other conifers.

## 27 SNAILS AND SLUGS



Brown garden snail feeding on an orange.



Lemon slug feeding on a strawberry.



Snail eggs.



The desiccated snail is a predatory species that feeds on other snails. Although they are present in Southern California, it is illegal to import desiccated snails into other areas. They may feed on desirable herbaceous plants in the garden.

Other common “chewers” not on cards: katydids, earwigs, leafcutter bees. Also see snails & slugs, Card 27.



# Sucking Damage

## 8 THRIPS



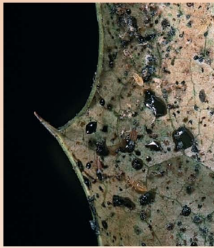
Feeding by some thrips, such as greenhouse thrips, causes pale or silvery mottling of leaves.



Greenhouse thrips, *Heliothrips haemorrhoidalis*, feed in colonies on the underside of leaves.



Myoporum thrips causes galling, distortion, and dieback of myoporum shoots. DAVID ROSEN



Greenhouse thrips leaves unsightly black speckles of excrement on the underside of infested leaves.



The beneficial sixspotted thrips, *Scolothrips sexmaculatus*, feeds on mites and mite eggs.



Western flower thrips, *Frankliniella occidentalis*, may cause scarring of flower blossoms but usually does not require control. This species also feeds on pest mites.

These insects have sucking mouthparts, cause stippling and often are associated with black spots of excrement

## 11 LEAFHOPPERS, TREEHOPPERS, SPITTLEBUGS



Leafhoppers have prominent spines on their hind legs.



The adult treehopper has an expanded hood that projects its head.

## 17 TRUE BUGS



Several lace bug species feed on landscape plants. Three adult lace bugs and a nymph are shown here.



Lace bugs cause yellow stippling of leaves and produce unsightly speckles of black excrement.



Stink bugs are shield-shaped and broader than other true bugs. They generally do not cause damage to ornamental plants. Feeding by some stink bug species can damage tree fruits.



Boxelder bugs may become a nuisance when they enter homes. Adults have three red stripes on the segment just behind the head.



False chinch bugs can become a problem when adjacent weedy areas or pastures dry up.



## 12 MEALYBUGS

### 9 APHIDS



A colony of aphids on a leaf. A wingless adult (top) and several nymphs are shown here.



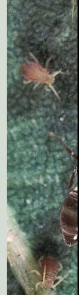
Some aphids cause plants to become tightly curled and distorted.



Oleander aphids, *Aphis nerii*, infesting an oleander flower.



Black sooty mold often develops on the sticky honeydew excreted by aphids.



Ants come from aphids, which are beneficial insects and parasites.

### 10 WOOLY APHIDS, GALLS



Woolly aphids produce copious amounts of white, fluffy wax.



Some aphids can cause galls, which protect the aphids hidden inside. The galls are harmless to host plants.



### 18 WHITEFLIES



Adult whiteflies on the underside of a leaf.



Giant whitefly adults and nymphs. The

### 13 PSYLLIDS



Eucalyptus leaves with covers (lerps) of redgum lerp psyllids.



Eucalyptus redgum lerp psyllid adult (right), lerp cover (upper right), nymph with lerp cover removed (left), and eggs.



Mummy of a lerp psyllid after the adult parasite has emerged through the exit hole in the nymph and its lerp cover.



Adult eugenia psyllids are dark brown with a white band.



Eugenia psyllid nymphs create feeding pits in leaves and can cause distortion and discoloration of foliage.



Bluegum psyllid nymphs produce wavy strands of wax.

These insects are associated with lots of honeydew and sooty mold



## 14 ARMORED SCALES



San Jose scale, *Diaspidiotus perniciosus*, adult female and tiny yellow “crawler” (arrow). This scale usually causes serious damage only on nut trees and stone fruits.

Some armored scales cause discoloration of fruit surfaces.

California red scale, *Aonidiella aurantii*, damages only citrus, sometimes severely.

A colony of greedy scales, *Hemiberlesia rapax*, several with parasite exit holes.



The cover of oystershell scale, *Lepidosaphes ulmi*, looks like a tiny oyster. This scale may cause limb dieback and

stunted growth.

An ivy leaf infested with oleander scale.



## 15 SOFT SCALES



A heavy infestation of black scale, *Saissetia oleae*.



Mature female European fruit lecanium scales, *Parthenolecanium corni*.



In their earlier scales have le around. They susceptible to



The circular hole in this scale covering was made by an emerging adult parasitic wasp.



Ants obtain honeydew from soft scales and protect them from natural enemies.

## 16 OTHER SCALES



Cottony cushion scale infests many woody plants. Females produce prominent, white, fluted egg cases.



Sycamore scale causes tiny yellow spots on leaves, leaf distortion, and premature leaf drop.



Vedalia beetles control cottony cushion scale in inland areas of California.



European elm scales are small and oval with a white fringe. They infest only elms.



Oak pit scales cause ring-like depressions in oak twigs and branches. Parasite exit holes can be seen in several of these golden oak scales.

Wide range of scale insects—all lack legs during most of their life. Looks for signs of parasites and other natural enemies.

Soft scales (& cottony-cushion) produce honeydew. Most others do not



# Mites

## 20 SPIDER MITES



Adult spider mites, *Tetranychus* sp., and an egg. Adult spider mites often have dark blotches.



Feeding by spider mites causes yellow stippling on leaves. Heavy infestations may produce webbing.



Chlorotic mottling caused by perseae mite, *Oligonychus perseae*.



European red mite, *Panonychus ulmi*, overwinters as tiny red eggs, often laid in masses around buds.



Predatory mites, such as those shown here feeding on spider mites and mite eggs, often keep spider mite populations under control.

## 19 GALL MITES



Fuchsia gall mites, *Aculops fuschsiae*, cause thickening and distortion of fuchsia flowers and leaves.



Walnut purse gall mites, *Eriophyes brachytarsus*, cause harmless growths on walnut leaves.



Live oak erineum mites, *Eriophyes mackiei*, cause green to brown raised blisters on the leaves of live oaks. The blisters do not harm the oak trees.

Eriophyid mites are very tiny and wedge- or worm-shaped. They are barely visible with a 10× hand lens.





## 21 BARK BEETLES



Bark beetles make small holes when they bore into or out of wood. PAVEL SVIHRA



Larvae of most bark beetles are small, pale grubs that feed under the bark.



A pitch tube may form at the site of a bark beetle infestation. The central opening distinguishes these from resin masses produced by pitch moth larvae.



Tunneling by larvae of some bark beetle species leaves distinctive patterns on the surface of the wood.

## 22 CLEARWING MOTHS



Adult clearwing moths resemble yellowjackets and paper wasps in appearance and flight behavior.



An adult clearwing moth emerged from this pupal case near the opening of the larval tunnel, which is evident as a "chimney" of frass.



Resin infestation removals produce frass.



The clearwing moth larva is a pale caterpillar with a brown head.

## 23 FLATHEADED BORERS, LONGHORNED BORERS



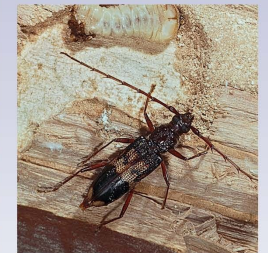
Larvae of flatheaded borers are fairly large, pale grubs with the segment behind the head enlarged and flattened.



Wet spots and dark staining are common characteristics of flatheaded borer damage.



Flatheaded borer adults make a D-shaped emergence hole in bark and wood. Longhorned borer emergence holes are elliptical or football-shaped.

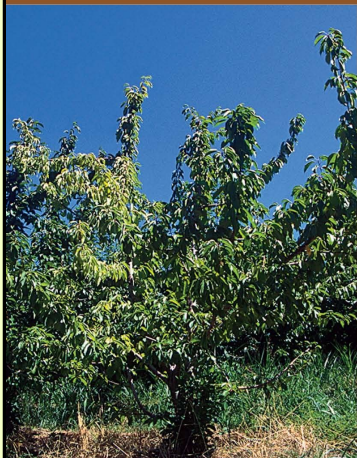


Adult longhorned borers are elongated beetles with very long antennae. Larvae are pale grubs that tunnel in wood underneath bark.

Different-sized holes, frass and gallery patterns distinguish borers. Borers are often secondary invaders on already stressed trees.



## 28 ARMILLARIA ROOT ROT



The first symptom of Armillaria root rot usually is the appearance of pale, stunted foliage on one or more branches.



Following damp weather, *Armillaria mellea* mushrooms may appear at the base of infected trees. Each mushroom has a ring (annulus) around its stalk just underneath the cap.



In trees with Armillaria root rot, white patches or "fans" of fungal tissue develop between bark and wood of the tree crown. The mycelial fans have a mushroom-like odor.



*Armillaria mellea* forms dark, root-like structures called rhizomorphs, which can infect healthy tree roots. A healthy root is shown below the rhizomorph.

## 31 PHYTOPHTHORA ROOT AND CROWN ROT



Yellow foliage and branch dieback due to Phytophthora root rot. Excessive moisture from watering the turfgrass favored infection of the roots by *Phytophthora*.



Wilted foliage and dark roots (right) are symptoms of Phytophthora root rot.



Phytophthora crown rot cankers have distinct margins that often have alternating light- and dark-colored zones.

## 34 WOOD DECAY FUNGI



Fruiting bodies (conks) of the white rot fungus *Ganoderma applanatum*. This fungus will attack trees through wounds.



Fruiting bodies of the white rot fungus *Schizophyllum commune* are small with feathery edges. This fungus attacks stressed trees or cut and fallen wood.



Fruiting bodies of the white rot fungus *Trametes versicolor*, which infects wounded areas of living trees.



Fruiting bodies of *Laetiporus gilbertsonii*, which attacks living or dead trees, causing a brown rot. EDWARD J. PERRY, GARY W. HICKMAN

Crown and root rots and mushrooms. Proper irrigation key. Seriously decayed trees should be removed.



## 29 CANKERS



Blackened twig killed by *Botryosphaeria dothidea*.



The sunken lesion is a Cytospora canker, the cause of a wilt.



Pitch cankers appear on limbs as swellings that exude dark pitch. Needles on affected branches die.



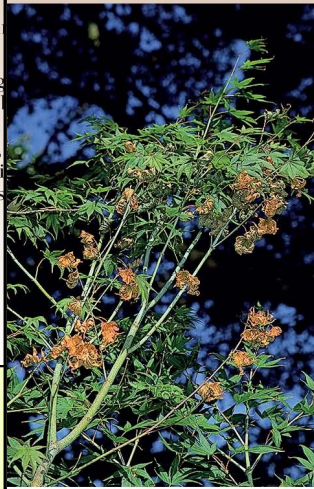
Cypress foliage killed by cypress canker, which is severe on susceptible cypress varieties in hot, inland areas.



Bacterial canker kills buds and causes a reddish brown discoloration of phloem.



The margin between cankered and pale, healthy tissue is usually sharply defined.



By peeling branches of *Verticillium*, you can see the pathogen.

Brown, dead foliage scattered on a Japanese maple by *Verticillium*.

## 33 VERTICILLIUM WILT



## 37 FIRE BLIGHT



Fire blight has caused these flowers to wilt and turn black.

Leaves remain attached to shoots that are killed quickly by fire blight.



Bacterial ooze on a shoot infected with fire blight.

Sudden shriveling of leaves can be associated with several different types of diseases.



### 35 ANTHRACNOSE

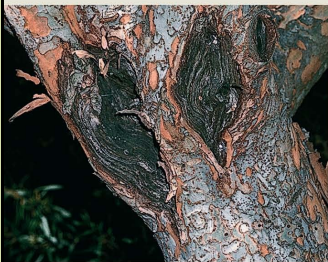


Black spots caused by Chinese elm anthracnose.



Brown leaves, distorted leaves, and dead shoot tip on Modesto ash caused by anthracnose.

Sycamore anthracnose kills shoots and causes brown lesions along major leaf veins.

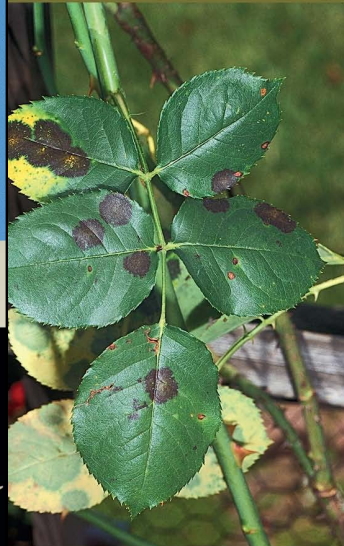


Chinese elm anthracnose cankers.



Anthrachnose lesion on a coast live oak leaf.

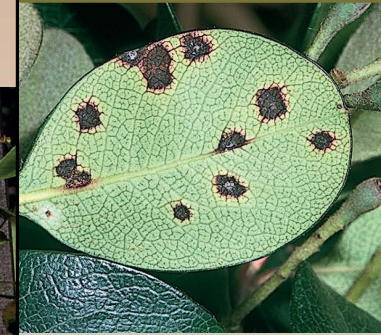
### 36 BLACK SPOT OF ROSE



Black spot appears as black spots or patches with feathery margins on the upper surface of leaves and on the stem.

Black spot may cause leaves to drop, leaving bare canes.

### 39 LEAF SPOTS



*Entomosporium* leaf spot on *Raphiolepis*. *Phyllosticta* leaf spot on maple.



*Septoria* leaf spot on poplar.



Shot hole symptoms on a plum leaf.



Mite damage (shown here) or insect damage may be confused with disease symptoms.

Distinctive spots or blotches are associated with certain diseases. Some can be confused with insect damage.



## 40 POWDERY MILDEW



Powdery mildew on rose foliage and flowers.



This coast live oak has been distorted, dwarfed, and discolored by a powdery mildew infection.



Powdery mildew may cause russetting on the fruit of some host species.



Powdery mildew appears as white patches on upper and lower surfaces of leaves.

## 41 RUST DISEASES



Rust symptoms on the upper (top) and lower surfaces of rose leaflets.



When rust pustules are viewed through a magnifying lens, reddish orange spores are visible.



Western pine gall rust causes the formation of galls or swellings on 2-needle and 3-needle pines. Galls become covered with orange spores in the spring.



Rust on bluegrass turf.  
ARTHUR H. MCCAIN



Pustules of daylily rust on the underside of a leaf.  
MARGERY L. DAUGHTREY

Powdery spores are associated with these diseases. They are the primary ones fungicides are applied against in the landscape.



## 42 HERBICIDE INJURY



Leaves of susceptible plants exposed to 2,4-D or other growth regulator herbicides become twisted and distorted (right). Stems may also curve or twist.



Glyphosate can cause new foliage to appear distorted and needle-like and may cause flower blossoms to be discolored and distorted.



Herbicides can kill desirable plants if label precautions are ignored. This patch of lawn was killed by misapplication of glyphosate.



If glyphosate contacts tree buds in the fall, leaves that emerge the following spring are stunted and puckered and form compact rosettes.

## 43 MINERAL DISORDERS



Iron deficiency is characterized by bright yellow young foliage with distinctly green leaf veins. Iron deficiency usually is more common when soils have a high pH or when drainage is poor.



Foliage on zinc-deficient trees may be stunted and yellow, and may develop as compact tufts at shoot tips. Similar symptoms may be caused by some herbicide applications.



Excess levels of boron may cause yellow and brown patches to develop along leaf edges, with a sharp margin between yellow and brown. ROBERT G. PLATT



Excess levels of salt causes a yellowing and burning of leaf edges.

Abiotic disorders are common in the landscape and often confused with damage caused by pathogens or insects.



Didn't  
have time  
to cover!

## 24 EXOTIC PESTS



Diaprepes root weevil adults. This weevil is a serious pest of citrus and many ornamental plants.  
ELIZABETH E. GRAFTON-CARDWELL



Japanese beetle adults. The larvae are serious turf pests, and the adults feed on many plant species.



Light brown apple moth larva. This pest feeds on a wide range of crops and woody ornamentals.



Gypsy moth larvae. Gypsy moth is a potential threat to many deciduous tree species.  
ROGER ZERILLO



Asian citrus psyllid adults and nymphs spread the tree-killing citrus greening disease.  
MICHAEL E. ROGERS

## 25 GALL MAKERS



Larvae of oak cynipid gall wasps induce the formation of small, colorful, harmless galls on oak leaves.

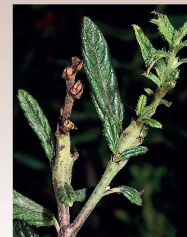


Galls induced by larvae of the twohorned oak gall wasp cause parts of live oak leaves to turn brown.

Willow gall sawfly larvae cause the formation of harmless galls such as these on leaves or twigs of various willows.



Swellings induced by ceanothus stem gall moth larvae cause dieback and stunted terminal growth on some ceanothus species.



Gall makers are among the many causes of leaf or twig dieback. Damage from twohorned oak gall wasp is shown here.

## 32 SUDDEN OAK DEATH



Oak trees killed by sudden oak death. Infected trees often occur close together. PAVEL SVIHRA



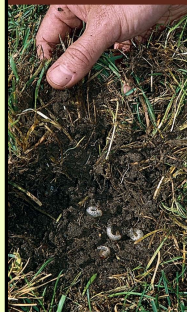
Infection by *Phytophthora ramorum* causes brown lesions on the leaves of California bay laurel. PAVEL SVIHRA

True oaks with naturally reddish cambium often develop black discoloration with sharply defined margins when infected with *Phytophthora ramorum*. PAVEL SVIHRA



Dark sap exuding from the lower trunk of a coast live oak infected with *Phytophthora ramorum*. PAVEL SVIHRA

## 26 LAWN GRUBS AND CATERPILLARS



Lawn grubs are the larvae of scarab beetles such as the masked chafer (shown here), black turfgrass ataenius, and June bug.



Larvae of a lawn moth, *Tehama bonifatella*. A. D. ALI



Billbug larvae lack legs. The larva of the Phoenix or Phoenician billbug, *Sphenophorus phoeniciensis*, is shown here.



Cutworms roll up into a C shape when disturbed.

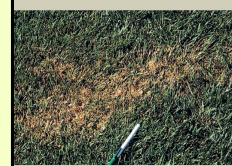
## 38 LAWN DISEASES



Decaying (left) and healthy mushrooms of a common lawn fungus. Though mushrooms may be unsightly, they rarely indicate disease.



Pythium blight (grease spot) in a turf of ryegrass and bluegrass. ALI HARIVANDI



Rhizoctonia blight in a tall fescue turf.

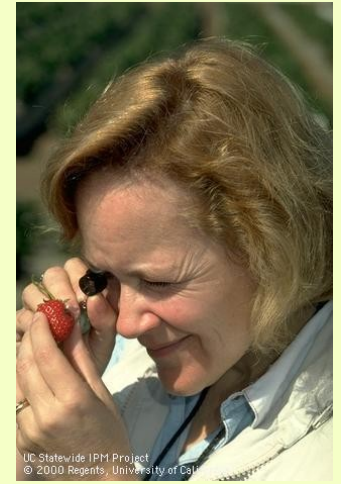
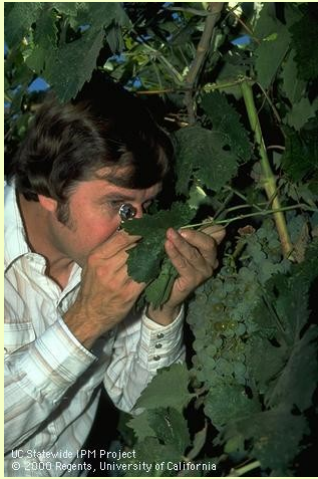


Dollar spot, caused by the fungus *Sclerotium homoeocarpa*, affects Kentucky bluegrass and tall fescue. ALI HARIVANDI



Patches of grass killed by dog urine may be confused with some lawn disease symptoms. EDWARD J. PERRY





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