

Oak Diseases & Insect Pests

Although oak trees (*Quercus* species) are well adapted to South Carolina, they can be commonly affected by many pests and diseases. Maintaining healthy oak trees, by following recommended cultural practices, is the first line of defense in preventing most of these problems. For more information see [HGIC 1017, Oak](#).

Diseases

Oak Leaf Blister: Oak leaf blister is a disease caused by the fungus *Taphrina caerulescens*. Most oak species are susceptible, but the red and black oak group are especially so. Minor infections cause little harm, but midsummer defoliation can occur when infections are severe. Blister-like patches appear on the leaves. They are often lighter green than the surrounding tissue and later turn brown. The blister-like patches result from overgrowth of infected leaf tissue, which is caused by substances secreted by the fungus.



Oak leaf blister on water oak.
Andrew J. Boone, South Carolina Forestry Commission,
www.forestryimages.org

The fungus survives the winter as spores in buds. The spores germinate in the spring to infect the leaves. Infected leaf tissue grows much faster than uninfected tissue, resulting in the distorted blisters.

The fungus grows and produces spores within the leaf, until the cuticle (surface wax layer) is ruptured by the mass of fungal tissue. Spore dispersal occurs in the fall.

Prevention & Treatment: Leaf blister is rarely severe enough to require control measures. Once infection has occurred, fungicide treatments usually are ineffective. If infection is very heavy and if the tree is small enough to obtain good coverage, a fungicide could be applied in the spring just before bud break.

Bacterial Leaf Scorch: This disease is caused by the bacterium *Xylella fastidiosa* and is characterized by a disruption of water movement, decline of vigor, marginal reddening or yellowing followed by browning of margins of leaves, leaf drop, dieback, and eventual death. The symptoms usually first appear in early fall, following summer drought. Because trees infected with bacterial leaf scorch will decline gradually, it may take five to ten years before a tree may need to be removed. This disease may be observed more commonly in pin oak, red oak, white oak, bur oak, shingle oak and sycamore. It is occasionally found in red, silver and sugar maples, hackberry, elm and sweetgum.



Browning of edges of leaves caused by bacterial leaf scorch.
Edward L. Barnard, Florida Department of Agriculture and
Consumer Services, www.forestryimages.org

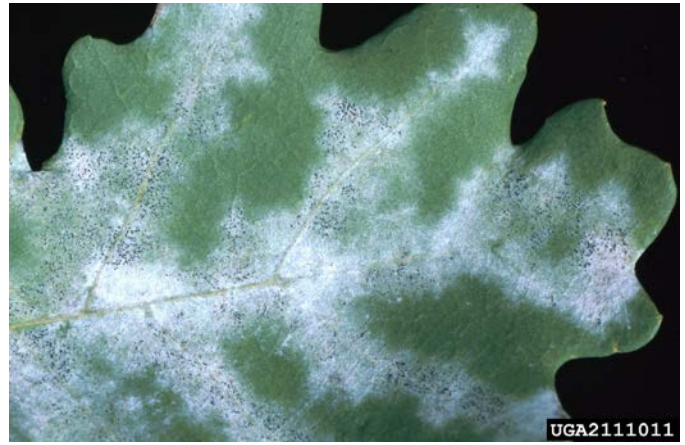
Prevention & Treatment: Remove infected trees and replant with several different species. Avoid planting all the same species close together. The bacterium is spread by leafhoppers and spittlebugs. Control weeds and wild plants, which support these insects. Extra care to fertilize and irrigate may prolong the life of an infected tree, but trees with extensive leaf scorch and dieback should be removed. Currently, spray treatments are not available. However, certified arborists can perform annual root flare injections of antibiotic treatments, using oxytetracycline (such as Bacastat), which can reduce symptoms by suppressing the pathogen.

Actinopelte Leaf Spot: This fungal disease may be a serious problem in wet weather. It is caused by the fungus *Tubakia dryina* (formerly called *Actinopelte dryina*). The symptoms are circular, dark to reddish brown leaf spots with a diameter of ¼ to ½ inch. Spots may run together to form irregular blotches. Tiny black specks in rings are visible in the spots and blotches. Severe infections cause the trees to lose their leaves prematurely. Trees of low vigor, that are repeatedly defoliated, may die.

Prevention & Treatment: Destruction of all infected plant material will reduce the spread of the fungus. Small trees defoliated several years in a row may need spraying. Apply mancozeb, chlorothalonil, thiophanate-methyl or a copper fungicide according to the instructions on the labels. Complete coverage is necessary for control. See Table 1 for examples of specific products.

Powdery Mildew: This disease is caused by several fungi (*Erysiphe trina*, *Microsphaera alni*, *Phyllactinia corylea* and/or *Sphaerotheca lanestris*). The symptoms consist of a white, powdery growth on both leaf surfaces. The foliage may be malformed, dropping prematurely or drying out and shriveling. Sometimes the grayish-white fungal growth changes to tan and then brown with age. Tiny black dots (fruiting bodies) may be seen in the brown felt, abundantly in some years, rarely in others.

Prevention & Treatment: Control is usually not practical nor warranted. Myclobutanil, triadimefon or thiophanate-methyl may be used to control powdery mildew in severe cases. Follow the directions on the label. See Table 1 for examples of specific products.



White coating on leaf caused by powdery mildew. Petr Kapitola, State Phytosanitary Administration, www.forestryimages.org

Armillaria Root Rot: This disease, caused by the fungus *Armillaria mellea*, is widespread on oak. The symptoms are a slow decline of the tree. Mushroom fruiting structures on or near the root collar are prevalent in late summer and fall, especially during wet weather.



Armillaria root rot mushrooms near infected oak tree. Joey Williamson, ©2013 HGIC, Clemson Extension.

Prevention & Treatment: Remove diseased trees and as much of the root system as possible. Do not replant the site with a susceptible host. Trees which are resistant or tolerant to Armillaria root rot include baldcypress (*Taxodium distichum*), Chinese elm (*Ulmus parvifolia*), dawn redwood (*Metasequoia glyptostroboides*), eucalyptus, ginkgo (*Ginkgo biloba*), Japanese cedar (*Cryptomeria japonica*), Leyland cypress (*Cupressocyparis leylandii*), maple (*Acer* spp.), sourwood (*Oxydendrum arboreum*) and sweetgum (*Liquidambar styraciflua*).

Hypoxylon canker: This is a white-rot fungal disease primarily of oaks, hickories and pecans in South Carolina, and is caused by *Biscogniauxia atropunctata* var. *atropunctata* (syn. *Hypoxylon atropunctatum*). Many species of oaks are susceptible to this disease, but post oak, water oak, southern red oak, white oak and blackjack oak are most often affected. This opportunistic pathogen is a common inhabitant of bark of hardwood trees, but it is only of consequence when the trees are under severe stress. Environmental stress caused by drought, as well as by root injury during construction, utility trenching in the root zone, soil grade changes, soil compaction and root diseases, all can play a role in weakening the trees and in the subsequent infection by *B. atropunctata* var. *atropunctata*. Any root injury will reduce water uptake by trees, and drought stress appears to be the most significant factor in infection.

As the fungus spreads and forms cankers, the first symptom that may be observed is the dying back of the crown (top) of the infected tree. However, other tree problems may also result in dieback.

Subsequently, the outer bark begins to slough off in areas of infection, and pieces of bark can be seen at the base of the tree. This bark loss exposes the first sign of the fungus, which is a brownish fungal stroma where conidia (or asexual spores) of the pathogen are produced. This area may be several inches to several feet long on limbs and trunks. These conidia are wind-disseminated and can cause new infections on other trees.

As the infection continues to develop, the exposed area of fungal stroma changes to a gray or silver color, and finally to black as a second type of spore is produced. This is the sexual stage of the fungus, and these spores, which are also infectious, are spread by splashing rain or insects to nearby trees.

Prevention & Treatment: There are no controls for Hypoxylon canker on these hardwood trees once infection has begun on the trunk. If infection is observed on branches, these may be removed and burned, but there may be other infection sites that are not yet apparent on the tree.



Meg Williamson ©2010 Clemson University

Asexual brown fungal stroma and black sexual stage of *Hypoxylon* on oak.

Meg Williamson, Plant Problem Clinic, Clemson University

Stress reduction is the key to prevent infection.

Keep the trees as healthy as possible.

- Protect trees from damage during home construction and utility repairs. For more information, see [HGIC 1002, *Protecting Trees During Construction*](#).
- Water trees during periods of summer drought with 1 inch of irrigation water per week. For more information on proper irrigation, see [HGIC 1056, *Watering Shrubs & Trees*](#).
- Trees should be mulched with a 3-inch layer of organic mulch from the trunk to the dripline, but don't pile mulch against the trunk. For more information on mulching trees, see [HGIC 1604, *Mulch*](#).
- Do not apply weed killers near the tree, especially beneath the limb canopy.
- Fertilize trees with slow-release tree and shrub fertilizer during early April. For more information on proper fertilization, see [HGIC 1000, *Fertilizing Trees & Shrubs*](#).
- Remove and burn or dispose of any infected trees, and cut the remaining stumps flush with the soil.

Pine-Oak Gall Rust (Eastern Gall Rust): The fungus *Cronartium quercuum* causes gall rust on approximately 25 to 30 species of pine and oak. Infection of oak causes small brown or yellowing areas on the leaves. On the underside of the leaves, yellow to orange powder (spores) is visible.



Pine-oak gall rust spore containing pustules on an oak leaf.
Robert L. Anderson, USDA Forest Service,
www.forestryimages.org

Prevention & Treatment: All fungal spores, which infect both pine and oak, are primarily windborne. High humidity increases the incidence of infection. Chemical control is usually not warranted. The fungicide myclobutanil may be applied to oaks according to the directions on the label. Follow the directions on the label. See Table 1 for examples of specific products.

Mistletoe

If, after all the leaves have dropped in the fall, your trees still have clumps of green in the top, your trees are parasitized by mistletoe (*Phoradendron* species), a parasitic plant. Although mistletoe does obtain water and minerals from the tree, it does not depend totally on the tree for food. The green leaves of this plant contain chlorophyll and are capable of making their own food. Mistletoe produces small white berries, which are extremely toxic to humans. The stems and leaves are also toxic and are reported to cause skin irritation on contact in some people.

Prevention & Treatment: Mistletoe can be controlled by cutting out infected limbs 1 to 2 feet below the point of attachment. In a few instances, breaking out the tops of the mistletoe has proven an effective means of control. Ethephon (Florel Brand Fruit Eliminator) is labeled for mistletoe control. Large infestations may be difficult to control with a

single spray application, and retreatment may be required. Make applications after fall leaf drop through mid-winter.



Mistletoe infestation becomes obvious during winter.
Randy Cyr, GREENTREE Technologies,
www.forestryimages.org

Lichens

A lichen is an unusual organism composed of a fungus and an alga living together symbiotically. The alga converts sunlight and carbon dioxide in air to food. The fungus surrounds the alga, protecting it from drying, and lives off the food it provides. Lichens appear as green to gray-green leafy or crusty growths on the trunk and branches of trees in poor health. They are totally harmless and are in no way responsible for the poor health of the tree. The reason they are associated with declining plants is that as woody plants lose vigor and decline, the number and size of leaves decreases. This allows more sunlight, which lichens need to grow, to reach the trunk and branches.

Prevention & Treatment: If plant health is restored by correcting the real cause of decline, leaves will increase in size and number; less sunlight will get to the trunk and limbs; and lichens will gradually disappear.

Spanish Moss

Spanish moss (*Tillandsia usneoides*) is an epiphyte. An epiphyte is an organism that lives upon a plant, using only the plant for support and protection. Spanish moss does not feed directly on the tree but obtains its water and nutrients from the air and rain. Spanish moss is limited to warm, humid areas of the southern and coastal regions of the state. Each bundle of moss is made up of a mass of long, gray-green filaments, which are its stems and leaves. Since the leaves of Spanish moss require sunlight to produce their own food, it is usually found in trees that are in a state of decline. Heavy infestations of Spanish moss can lead to further tree decline by shading out lower leaves and the weight of large masses of wet Spanish moss can lead to limb breakage.



Heavy growth of Spanish moss weighting live oak limbs in rain.

Karen Russ, ©2008 HGIC, Clemson Extension

Prevention & Treatment: Increasing tree vigor through proper watering and fertilization is one way to restrict the growth of Spanish moss. Removal by hand may also be necessary to rid the tree completely.

Insects & Related Pests

Galls: There are at least 750 different galls that have been identified on oak. In fact, more galls occur on oak than on any other kind of plant. Galls are defined as irregular growths or swellings. They vary greatly in size, shape and their location on the plant. Gall development is a reaction by the plant tissue to feeding or egg laying by various mites and insects. While most galls do not seriously harm oak trees, most are unsightly and detract from the

beauty of the tree. Twig galls may kill individual limbs and sometimes the whole tree.



Large oak apple gall, one of many types of oak galls.
James Solomon, USDA Forest Service,
www.forestryimages.org

Control: Many gall-producing insects and mites are parasitized by other insects and are fed upon by various birds and animals. Simple removal and destruction of fallen leaves with galls will help to reduce the number of emerging adults that will produce the next generation. Where possible, all twig galls should be pruned out while green or before emergence holes appear. In most cases, chemical control is not practical or effective. This is especially true in the case of large trees.

Oakworms: There are three closely related moths (*Anisota senatoria*, *A. stigma* and *A. virginiensis*) that occur in South Carolina. Their larvae (or caterpillars) are pests of oak, feeding heavily on the leaves. The orangestriped oakworm (*Anisota senatoria*) is the most commonly occurring. At maturity, it is about 2 3/16 inches (5.5 cm) in length and has two long slender black 'horns' that project from the second segment behind the head. In the fall, it crawls to the ground and burrows into the soil. It overwinters (survives the winter) in the soil and matures to an adult (moth). The moths appear in June and July. The female moths lay clusters of eggs on the undersurfaces of oak leaves. When the larvae hatch, they are small and greenish yellow. When small, the caterpillars typically feed in groups and eat all of the leaf except a lacy network of veins. Orangestriped caterpillars mature and reach their full size by early fall. Older caterpillars are black with yellow or orange stripes running the length of their bodies. Older caterpillars tend to be solitary eaters. They eat all of the leaf but the main vein.



Orangestriped oakworm in mid to late summer.
USDA Forest Service - Northeastern Area Archive, USDA
Forest Service, www.forestryimages.org

As a result of the caterpillar feeding, small trees may lose all their leaves by midsummer. While healthy trees can tolerate feeding by oakworms, young trees may be weakened if they lose all their leaves several years in a row. Mature trees may lose enough leaves to suffer twig dieback as a result of sunscald damage.

Control: With a light infestation on young trees, caterpillars can be handpicked and destroyed. On large trees, control is more difficult. Where possible, rely on birds, parasites and diseases to control their numbers naturally. If chemical control becomes necessary, the following insecticides are recommended: carbaryl, permethrin, cyfluthrin, lambda cyhalothrin, bifenthrin, acephate, and spinosad. *Bacillus thuringiensis (B.t.)* is a microbial insecticide that contains spores of this bacterium. It is effective against young larvae, and is a safer alternative when spraying up into a tree. Follow the directions on the label. See Table 1 for examples of specific products.

Scale: Various kinds of scale are pests of oak. Scales are unusual insects in appearance. As adults, they are small and immobile, with no visible legs. They vary in appearance depending on age, sex and species. Scales feed on sap by piercing the leaf or stem with their mouthparts and sucking. As they feed on plant sap, some scale insects (soft scale) excrete a sugary substance called honeydew. The sooty mold fungus feeds on the honeydew, resulting in unsightly, dark fungal growth.

Oak lecanium scale (*Parthenolecanium quercifex*) is a common pest on oaks. The adult females are $\frac{1}{16}$ to $\frac{1}{4}$ inch (2 to 6 mm) in diameter. They are round and reddish brown. Males have wings and are brown. The female lays eggs in April and May. Crawlers (immature scale insects) hatch from the eggs. The crawlers also suck sap from leaves. Serious scale infestations may result in stunted plant growth, small flowers, yellowing of leaves and early leaf drop. In addition, the presence of the honeydew results in dark splotches on the surface of the leaves.



Oak lecanium scale on small twigs.
James Solomon, USDA Forest Service, www.forestryimages.org

Control: A combination of various natural enemies, including ladybird beetles (ladybugs) and parasitic wasps, usually keep scales under control. In small trees with light infestation, scale can be scraped off or infested branches can be removed and destroyed. In a large tree, controlling scale chemically is not always practical. The size of the tree, the need for specialized equipment and the cost may prohibit this solution.

Scales are not easily controlled with chemical insecticides. The adults are protected by their waxy covering. For heavy infestations of scale insects, spray with horticultural oil in the spring and fall to kill adults, crawlers and eggs by smothering them. Be sure to thoroughly coat the trunk and all of the branches.

Crawlers are susceptible to conventional insecticides, however. Monitor the crawler emergence with sticky cards, double-faced tape wrapped around a branch, or by putting an infested shoot or leaf into a baggie and watching for crawler movement. Insecticides labeled for use by

homeowners against scale crawlers on oaks include cyfluthrin, permethrin, bifenthrin, lambda cyhalothrin, malathion, and carbaryl. Apply one of these materials when crawlers appear and repeat in 10 days. As with all pesticides, read and follow all label instructions and precautions. See Table 1 for examples of specific products.

Note: Chemical control of diseases and insects on large trees is usually not feasible since adequate coverage of the foliage with a pesticide cannot be achieved. The use of horticultural oil is a safer alternative to insecticides for spraying upward into a large tree.

Table 1. Insecticides & Fungicides to Control Oak Insect Pests & Diseases.

Insecticides & Fungicides	Examples of Brand Names & Products
Acephate	Bonide Systemic Insect Control Concentrate
<i>Bacillus thuringiensis (B.t.)</i>	American Brand Thuricide Concentrate Bonide Thuricide <i>Bt</i> Concentrate Hi-Yield Thuricide Concentrate Safer Caterpillar Killer with <i>Bt</i> Concentrate Southern Ag Thuricide <i>Bt</i> Caterpillar Control Concentrate Tiger Brand Worm Killer Concentrate Monterey <i>Bt</i> Organic Laboratories Organocide Worm & Caterpillar Control
Bifenthrin	Bifen I/T Concentrate Ferti-lome Broad Spectrum Insecticide Concentrate Hi-Yield Bug Blaster Bifenthrin 2.4 Concentrate Ortho Bug-B-Gon Insect Killer for Lawns & Gardens Concentrate TalStar P Concentrate Up-Star Gold Insecticide Concentrate
Carbaryl	Garden Tech Sevin Bug Killer Concentrate
Chlorothalonil	Bonide Fung-onil Multi-Purpose Fungicide Ferti-lome Broad Spectrum Landscape & Garden Fungicide GardenTech Daconil Fungicide Concentrate Hi-Yield Vegetable, Flower, Fruit & Ornamental Fungicide Monterey Fruit Tree, Vegetable & Ornamental Fungicide Ortho Max Garden Disease Control Concentrate Southern Ag Liquid Ornamental & Vegetable Fungicide Tiger Brand Daconil
Copper-based Fungicides	Bonide Liquid Copper Concentrate Camelot O Fungicide/ Bactericide Concentrate Monterey Liqui-Cop Concentrate Southern Ag Liquid Copper Fungicide Natural Guard Copper Soap Liquid Fungicide Concentrate
Cyfluthrin	Bayer Advanced Vegetable & Garden Insect Spray Conc.; & RTS ¹
Horticultural Oil	Bonide All Seasons Spray Oil Concentrate Ferti-lome Horticultural Oil Spray Concentrate Monterey Horticultural Oil Concentrate Southern Ag Parafine Horticultural Oil
Lambda Cyhalothrin	Spectracide Triazicide Insect Killer for Lawns & Landscapes Concentrate; & RTS ¹

Malathion	Bonide Malathion Concentrate Hi-Yield 55% Malathion Insect Spray Gordon's Malathion 50% Spray Concentrate Martin's Malathion 57% Concentrate Ortho Malathion Plus Insect Spray Concentrate Southern Ag Malathion 50% EC Spectracide Malathion Insect Spray Concentrate Tiger Brand 50% Malathion Concentrate
Mancozeb	Bonide Mancozeb Flowable with Zinc Concentrate Southern Ag Dithane M-45
Myclobutanil	Spectracide Immunox Multi-Purpose Fungicide Concentrate Ferti-lome F-Stop Lawn & Garden Fungicide
Permethrin	Bonide Eight Insect Control Vegetable Fruit & Flower Concentrate Bonide TOTAL Pest Control – Outdoor Concentrate Hi-Yield Indoor/ Outdoor Broad Use Insecticide Concentrate Tiger Brand Super 10 Concentrate Martin's Vegetable Plus Concentrate
Propiconazole	Banner Maxx Fungicide Bonide Infuse Concentrate Bonide Eight Yard & Garden Ready to Spray (RTS ¹) Ferti-lome Liquid Systemic Fungicide II Concentrate
Spinosad	Bonide Captain Jack's Deadbug Brew Concentrate; & RTS ¹ Bonide Colorado Potato Beetle Beater Concentrate Ferti-lome Borer, Bagworm & Leafminer Spray Concentrate Monterey Garden Insect Spray Concentrate Natural Guard Spinosad Landscape & Garden Insecticide RTS ¹
Thiophanate-methyl	Cleary's 3336-WP Turf & Ornamental Fungicide Southern Ag Thiomyl Systemic Fungicide
¹ RTS = Ready to spray (hose-end applicator)	

Pesticides updated by Joey Williamson, HGIC Horticulture Extension Agent, Clemson University, 10/16. Revised and pesticides updated by Joey Williamson, HGIC Horticulture Extension Agent, Clemson University, 11/13. Revised by Joey Williamson, HGIC Horticulture Extension Agent, Clemson University, 12/10. Images added by Karen Russ, 11/09. Originally prepared by Marjan Kluepfel, HGIC Horticulture Information Specialist; J. McLeod Scott, HGIC Horticulture Extension Agent; James H. Blake, Extension Plant Pathologist; and Clyde S. Gorsuch, Extension Entomologist, Clemson University, 9/00.

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