

Christmas Trees

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Integrated Pest Management

Integrated pest management is a system of pest control methods that uses appropriate cultural practices and pesticide selection to reduce pest problems. The following are important considerations when trying to reduce pest problems.

Site Selection. Most conifers are very sensitive to the type of site on which they are grown. Several insect and diseases become a worse problem when Christmas trees are grown on poor sites. *Phytophthora* root rot only occurs on wet sites or in areas of the field where water tends to flow. The spruce spider mite is often worse in Fraser fir on south facing slopes, and windy ridges because of the warmer or dryer conditions. For Fraser fir, these and other pests are more of a problem at elevations lower than 3,000 feet in western North Carolina.

Scouting. Most pests of Christmas trees can cause considerable damage if left untreated. However, applying pesticides without prior knowledge of pest numbers in a field wastes pesticides, is harmful to the environment, and can

actually cause outbreaks of secondary pest problems. Therefore, scouting fields on a regular

basis to estimate pest numbers is imperative.

Ground cover Management. The choice of ground cover affects every other management practice including fertilizing, insect control, shearing, and harvesting. By maintaining appropriate ground covers around Christmas trees, natural insect and mite predators have a habitat in which to thrive so they will be present to control pest problems. See the “Weed Control” section of this publication for ground cover management suggestions.



Links to:

<https://www.ces.ncsu.edu/wp-content/uploads/2014/05/fig8.jpg>

Scouting for insects is an important part of Integrated Pest Management

Interplanting. After a block of trees is partially harvested, some growers interplant among remaining trees. This practice can be a poor management strategy. Pests that are more common on older trees will attack the younger trees sooner than if young trees were set in a separate block and pest control is more difficult in an uneven aged stand. Clear cutting a block before re-planting is generally the best practice.

Selective Harvesting. With some pests, pesticide controls can be reduced or even eliminated if the trees showing the worst damage are harvested as soon as possible. Tagging problem trees for harvest while scouting is a cheap and environmentally friendly way to control these pests.

Pesticide Selection. There are often several pesticides labeled for the control of certain pests. However, some pesticides create problems with non-targeted pests even while they control the target. Always use the least toxic pesticide at the appropriate time and at the lowest rate consistent with the control needed.

Spray Equipment and Coverage. Several insect pests of Christmas trees are particularly difficult to control. Some require thorough coverage of the entire surface of the tree, which can only be achieved with a high-pressure sprayer and a hand-held spray gun. Other insect pests require less thorough coverage and can be controlled when pesticides are applied with a mist blower. Most herbicides are applied with backpack sprayers.

Many pesticides labeled for use on pests of Christmas trees are classified as restricted use pesticides and require a grower to have a private pesticide applicators

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restricted use pesticides and require a grower to have a private pesticide applicator's license. Growers who employ workers must follow the Worker Protection Standards. When using any pesticide, be sure to follow all personal safety guidelines including personal protective equipment and restricted entry intervals.

For growers interested in growing Christmas trees organically, certain products like horticultural oil and insecticidal soap can give good control of pests if spray coverage and timing are appropriate.

Treatment of Common Christmas Tree Pests in North Carolina

The following summary (Table 3) shows the conifer species grown in North Carolina, the pests common to those species, and the likelihood that the particular pest can be a significant problem needing treatment during a rotation.

Table 3. Summary of pests and common treatments for North Carolina Christmas tree species

Tree Species	Pest or Disease	Notes on Common Treatments
Firs		
Fraser fir, balsam fir	Balsam twig aphid	Treat last 2 years before sale
White fir, Canaan fir	Balsam woolly adelgid	Treat 1 to 2 times in rotation
	Spruce spider mite	Problem during dry years
	Rust mite	More common in warm springs
	Elongate hemlock scale	Hardest pest to control
	White grubs	Scout before setting trees in pastures
	Cinara aphids	Uncommon, though most growers treat for at harvest
	Rosette bud mites	Only in some areas; treat 3- to 5-foot trees
	Phytophthora root rot	Only a problem in poor planting sites

White pine	Pine bark adelgid	Treat 1 to 2 times in a rotation
	Cinara aphids	Seldom a pest
	Rust mites	More common in warm springs
	Pales and other weevils	Problem near harvested pine stands
	Pine sawflies	Seldom a problem
	Pine leaf adelgid	Found periodically near native stands of red spruce
	White pine blister rust	Seldom a problem
Virginia pine	Pine tip moth	Treat 3 to 4 times per year
Leyland cypress	Bagworms	Treat as required
Eastern redcedar	Cedar blight	Treat as required by infection
Spruces		
Blue spruce	Eastern spruce gall adelgid	Common problem
Norway spruce	Cinara aphids	Not common
White spruce	Spruce spider mite	Problem during dry years
	Needle cast	Not common

Insects

Balsam Twig Aphids (*Mindarus abietinus*). Balsam twig aphids (BTA) are small, pale green aphids that feed on fir and spruce trees in the spring. Feeding on the new growth of Fraser fir often results in permanently curled needles. Heavy infestations can also stunt growth.

Balsam Woolly Adelgids (*Adelges piceae*). The balsam woolly adelgids (BWA) are tiny, soft-bodied insects that appear as white, woolly spots on Fraser fir. This adelgid is native to silver fir of central Europe, and was introduced to this continent before 1900.

These adelgids are very small and difficult to see. It takes several months for trees to develop symptoms of insect damage. Because of this, the number of adelgids can increase unnoticed and cause serious losses for unsuspecting growers. Luckily, adelgids take a year or more to spread to many trees, so through careful scouting and conscientious control, serious losses can be avoided. Infested trees should be sprayed as soon as adelgids are observed with a high-pressure sprayer. The primary symptom of balsam woolly adelgid attack is a flat top or weak leader. Other symptoms include dead shoots or branches, swelling around the shoot nodes (gouting), reduced shoot growth, a stiff trunk, and growth rings with red, hard wood instead of the healthy, creamy white wood (observed when trees are cut).

Pine Bark Adelgids (*Pineus strobi*). The pine bark adelgids are tiny, soft-bodied insects that suck sap from the bark of both the trunk and branches of white pines. These adelgids appear as white, cottony spots. Large numbers cause yellow and stunted needles and reduced shoot growth. Damage is seen primarily on seedlings and young trees. Immature adelgids move to new growth during shoot elongation. Each year, check trees for the presence of pine bark adelgids when pruning top growth.

Pine Leaf Adelgids (*Pineus pinifoliae*). Pine leaf adelgids alternate between white pine and red spruce. It is only a problem on pines during odd-numbered years in western North Carolina. Adult female adelgids fly onto pines in June, produce eggs, and immediately die. The crawlers, which hatch from the eggs, move onto the new growth. At low numbers, pine leaf adelgids are beneficial, stimulating bud development. At high numbers, the adelgids cause "flagging" and distorted growth. Trees should be scouted in June to determine if adelgids are present. Damage can be prevented by prompt treatment with an insecticide. The pest is only a problem near native stands of red spruce.

Cinara Aphids (*Cinara* spp.). Cinara aphids are a group of several species of large, brown or black aphids that feed on many conifers including white pines, Virginia pine, Fraser fir, and spruces. They are much larger than balsam twig aphids, and are usually found in the early spring in dense clusters or colonies of up to several hundred aphids on the terminal, trunk, and first whorl of branches. They feed (suck the sap) on the bark between needles. Several dozen to several hundred trees on an acre may be affected and the rest remain clean.

In most instances, Cinara aphids have no affect on tree growth. They are easy prey to predators such as ladybugs, and usually disappear after several weeks. However

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to predators such as ladybugs, and usually disappear after several weeks. However, Cinara aphids can promote the growth of sooty mold and can create problems if they multiply on Christmas trees in people's homes. In rare instances, extremely high numbers of Cinara aphids feeding on trees before bud break can reduce terminal growth during years of drought.

Elongate hemlock scale (*Fiorinia externa*). This scale was introduced from Asia. Attacking many species of conifers it is primarily a problem on hemlocks and true firs. The scale is on the back side of the needle. Adult females are long and brown and the males are long and white. Crawlers can emerge any month of the year depending on the weather, but are most prevalent in late spring. Because the emergence of crawlers occurs over such a long period of time, this scale is extremely difficult to control. Feeding by the scale can result in yellow blotches on the needle and premature needle drop. When males are present in the summer, the white covering they produce will get on the upper surface of the needles, giving a gray appearance to the foliage.

Spruce Spider Mites (*Oligonychus ununguis*). These mites are tiny, soft-bodied pests that suck sap from the needles of conifers. Spider mite-infested needles first appear off-color from a distance, and speckled or stippled when viewed closely. As the number of mites increases, the damaged needles can become rusty, bronze, or brown in color by late summer or early fall. In addition, webbing produced by the mites is visible on the needles of heavily infested trees. Heavily damaged needles drop prematurely. Damage is permanent.

In the spring, mite eggs hatch and mite feeding, development, and reproduction occur almost continuously throughout the spring, summer, and early fall. In the fall, overwintering eggs are laid among bud scales and at the base of needles.

Rust Mites (*Nalepella* spp.). Rust mites are eriophyid mites, a group of tiny, elongated mites with four legs instead of eight, that require a hand lens or microscope to see. They feed on the needles of several conifers including white pine and Fraser fir. On white pine, they cause the needles to turn brown and die. Damage is usually confined to an area on the upper southeast portion of the tree. On Fraser fir, damaged needles appear bronze or rust colored, and may be on one side of the tree or throughout the tree. Damaged needles often shed prematurely. Rust mites are more common during long, warm springs and often disappear in the summer. Trees should be scouted to determine if treatment is necessary.

White Grubs (*Phyllophaga* and *Polyphylla* spp.). White grubs are the immature stage of beetles. Depending on the species, grubs can live in the soil for up to 3 years

of beetles. Depending on the species, grubs can live in the soil for up to 3 years before maturing into adult beetles.

White grubs damage trees by eating the roots. The needles of damaged trees will yellow, and the trees will eventually die. These symptoms can have many causes besides white grubs, especially on trees set 1 or 2 years in the field. *Phytophthora* root rot, drought damage, and improper planting can produce identical above-ground symptoms.

To distinguish white grub problems from other problems, a sample of affected plants should be pulled up and the roots examined. Grubs will eat the feeder roots and bark from primary roots, leaving little of the root system, though what is left will appear healthy. The grubs can also be found in the adjacent soil.

The grubs that eat conifer roots are the brown May and June beetle grubs. These grubs prefer the roots of grasses or wild strawberries. However, when they are present in pastures where herbicides have completely killed grass sod, they may be forced to eat the only remaining fresh food — the recently planted conifer roots. Though grubs are primarily a pest of young trees, older trees can also be damaged if grass growing between rows is suddenly killed because of herbicide applications or drought.

Fields should be scouted for white grubs before trees are planted. Grubs are difficult to kill, because insecticides may be bound to the clay and organic matter in the soil and will not move deeply enough into the soil to effect the grubs. Grub control is improved if the pesticide can be incorporated into the soil, which can only be done before trees are planted. It is especially important to scout old pastures that are to be planted, since grubs are extremely common at such locations.

Rosette Bud Mites (*Trisetacus* spp.). Rosette buds are deformed buds on Fraser fir. They are larger than normal buds and are rounded instead of pointed. Rosette buds usually do not break in the spring. If they do break and develop, they form multiple, weakened shoots. If many rosette buds are found on a tree, the tree develops holes in the canopy, especially if the tree is young when first affected. This decreases the quality and marketability of the tree.

Rosette buds are more common at higher elevations and in specific counties of western North Carolina. Rosette buds are caused by an eriophyid mite similar to rust mites except that it produces a gall, in which it lives throughout the year, where the bud should be.

Eastern Spruce Gall Adelgids (*Adelges abietis*). The eastern spruce gall adelgids produce a cone-like gall on the shoots of spruces. The immature adelgids feed and mature inside the gall. An appropriate insecticide can be applied in the spring prior to budbreak.

Bagworms (*Thyridopteryx ephemeraeformis*). Bagworms are caterpillars that live in bags made of foliage and silken threads. These insects prefer to eat the needles of redcedar and Leyland cypress. However, they will also cut the foliage of other conifers.

Young bagworms can be controlled in June with an approved insecticidal spray. In the fall and winter, the eggs are present in the bags attached to trees. The bags should then be removed and burned. In many cases, natural enemies keep bagworms from becoming numerous.

Deodar Weevils (*Pissodes nemorensis*). These weevils are small, tan, snout-beetles, which look similar to white pine weevils. However, the annual life cycle and breeding habits of these two weevils are quite different. Deodar weevils chew on the branches and shoots of various conifers. If a large number of weevils are present, shoots and branches could be pitted or scarred and killed as a result of weevil feeding.

Deodar weevil infestation can be reduced by following both the white pine weevil and the pales and pitch-eating weevil control procedures. Generally, removing and destroying high stumps, discarded limbs, and dead trees will eliminate most of the potential deodar weevil breeding sites.

Pales Weevils (*Hylobius pales*) and **Pitch-Eating Weevils** (*Pachylobius picivorus*). These weevils are dark brown or black, robust, hard-shelled snout-beetles. They chew on the bark of conifer shoots, branches, and seedlings, particularly of pine. Both of these weevil species are found throughout the eastern United States and, in some cases, into Canada. However, they are more common in the South. Depending on location, their biology varies to some degree, but the nature of damage and the mode of control remain the same.

Dead or dying new pine seedlings, older tree branches, and shoots are usually the first noticeable indication that these weevils are present. The bark at the base of young seedlings fed on by these weevils will appear to be either completely or partly removed. On older pines, small resin-filled holes or pits in the bark of stems, shoots, and (living or dead) branches are signs of weevil feeding.

Insecticides can be used to protect newly planted pine seedlings. However, these insecticides can be time-consuming to apply, and if proper safety precautions are not strictly followed they can be very toxic to humans.

Nantucket Pine Tip Moths (*Rhyacionia frustrana*) and Pitch Pine Tip

Moths (*Rhyacionia rigidana*). These moths are small insects that have a small, orange colored caterpillar stage that bores into pine shoots (tips) and buds. White and longleaf pines are seldom attacked. The appearance, biology, damage, and control of these two insects are similar.

Brown or rusty-red, dead pine tips is the most noticeable indication that tip moths are present. Dead needles on a tip moth-killed shoot are usually not as long as the living needles on the undamaged part of the shoot.

Pine Sawflies, such as the **Redheaded Pine Sawfly (*Neodiprion lecontei*)** and the **Virginia Pine Sawfly (*Neodiprion pratti pratti*).** These insects eat pine needles. The redheaded pine sawfly has a caterpillar-like larvae with a reddish head and rows of black spots on a yellow body and commonly feeds on Scotch, Virginia, and white pines.

Virginia pine sawfly larvae have black heads and pale green bodies with black stripes. They commonly feed on Virginia pine. The biology, damage, and control of these and other pine sawflies are similar.

Groups of sawflies are often observed feeding on pine needles. Other indications that sawflies are probably present are the reddish-brown, straw-like remains of incompletely consumed needles or the bare twigs stripped of needles.

White Pine Weevils (*Pissodes strobi*). These insects are small, tan, snout-beetles with two white spots on the rear of their bodies. They chew on, and develop under, the bark of white pine leaders. They also attack Norway spruce and Scotch pine.

Although white pine weevil attacks usually occur during April, they frequently go unnoticed until later in the spring when pitch begins to flow from feeding punctures. These punctures are left by adult weevils in the bark of the preceding year's leader. By late spring or early summer, the new growth appears stunted, needles wilt, and the new leader assumes the shape of a shepherd's crook.

White pine weevils can be controlled by spraying white pine leaders in the spring with an approved insecticide when either the first sign of attack (pitch flow) occurs

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with an approved insecticide when either the first sign of attack (pitch flow) occurs or when needles wilt, but no later than immediately after leaders crook. Weevils can also be controlled by pruning-out and burning all infested leaders before the new adults emerge.

Diseases

Phytophthora Root Rot (*Phytophthora cinnamomi*). *Phytophthora* root rot is the most serious disease of Fraser fir Christmas trees in western North Carolina. It is caused by a fungus that inhabits the soil and infects woody plants through the roots. It can lie dormant in the soil for several years waiting for a susceptible host and suitable environmental conditions, including warm soil temperatures (above 54 degrees F.) and soils saturated with water.

The above-ground symptoms of *Phytophthora* root rot on Fraser fir progress from yellow-green needles, wilting, and dead branches to death. The needles remain on dead branches and turn cinnamon brown. Roots of affected trees are cinnamon-red or black and lack white growing tips. Feeder roots are absent. Many of these symptoms may initially be present on only one side of the tree or on lower branches since the fungus first infects a root and grows toward the trunk on that side. Eventually, the entire tree will die. Infected trees are usually found grouped together in a field or nursery bed. A tree may be infected with the fungus for months or even years before above-ground symptoms are seen.

Phytophthora root rot is common in seed beds and transplant beds, because the fungus moves from one seedling to another through root to root contact. As a preventive measure all beds should be fumigated before planting and treated twice a year with fungicide. Diseased seedlings should be destroyed. To avoid *Phytophthora* in Christmas tree plantations, plant only on well-drained sites.

Needle Cast. Needle cast is the name applied to a disease caused by one of several fungi that cause a dieback of older needles, often followed by early shedding or "casting." These fungi usually do not kill trees but reduce their value as Christmas trees. From a distance, affected trees have a scorched appearance. The symptoms are most evident in the spring, at which time infected trees should be removed from the stand.

White Pine Blister Rust (*Cronartium ribicola*). White pine blister rust is caused by a fungus that has some of its spore stages on currant or gooseberry (*Ribes* spp.)

Uromyces that has some of its spore stages on currant or gooseberry (*Ribes* spp.) plants. These spores enter the pine needles and then grow into the inner bark of branches, where the blister rust causes spindle-shaped swellings to form. Three to 4 years following infection, yellowish blisters form in the bark and produce numerous spores. These spores then infect currant or gooseberry bushes. The spore stage that infects the white pine is produced on the alternate host (*Ribes*) in the fall. These are delicate spores that do not survive very far from the point of origin. Thus, it is possible to prevent spread of this fungus by eliminating currant bushes within 400 feet of the pines. The early stage of this disease is so difficult to detect that an infection may have been developing for at least 2 years before it is discovered. Prune out infected limbs as far in advance of tree harvest as possible. If the infection has reached the main stem, the tree should be destroyed. This disease is not common in North Carolina.

Cedar Blight (*Phomopsis juniperovora*). Cedar blight is caused by a fungus that initially attacks foliage, then spreads to stem tissues. Spores produced from tissue infected the previous year are an important source of inoculum early in the growing season. Although the disease can be quite serious from the standpoint of numerous tips being killed, older trees are seldom killed. Control consists of treating with a registered fungicide at regular intervals when infection is severe.

Needle Rusts are caused by several species of fungi that attack the needles of Virginia pine (and other pines) in the spring. The fungus produces bright orange blisters, which break and release orange-colored spores. Needle rusts rarely cause severe damage to the trees, but the rust may lower the trees' value. Infection of pines originates from spores that form on alternate hosts, such as goldenrod, aster, and certain other weeds. Fortunately, these fungi require specific weather conditions to develop, and those conditions do not occur every year.

Pine Stem Rust (*Cronartium* spp.) is characterized by round swellings or galls on the limbs or trunks. In the early spring, orange blisters are produced on these swellings. Branches bearing galls should be pruned before the disease extends to the trunk, or the tree may die. The best time to prune branches that have galls is when the stand is between 3 and 5 years old so that the trees may recover their form before harvest. Oak trees are the main alternate hosts for stem rust fungi.

Protection From Animals

Domestic livestock and wild animals can damage or kill trees of all kinds. Livestock and Christmas trees should generally be in separate areas.

In many areas deer, rabbits, and mice have damaged young trees extensively. Rodent damage usually occurs in areas of heavy grass cover, which favors growth of an over-population of these pests. Grass control is usually enough to discourage a rodent population buildup. In some instances, rodent control by poisoned bait may be recommended.

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