

# Crop Profile for Christmas Trees in North Carolina (Piedmont & Coastal Plains)

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## General Production Information



- An estimated 288,600 trees are grown on 697 acres by 135 producers east of the mountains.
- Cash receipts for Christmas trees grown east of the mountains are \$800,000 of the estimated \$72 million Christmas tree industry in North Carolina.
- Average production costs for Christmas trees other than Fraser fir are an estimated \$900 per acre per year.

## Production Regions

The primary Christmas tree-growing region in North Carolina is in the west, where Fraser firs are grown. The eastern region, centered around Halifax, Pitt, Wake, Wayne, and Robeson counties, produces primarily choose-and-cut Christmas trees. Other counties having a few producers include Chatham, Columbus, Duplin, Franklin, Harnett, Johnston, Lee, Lenoir, Lincoln, Nash, New Hanover, Onslow, and Orange. Trees produced in eastern North Carolina include Virginia pine (*Pinus virginiana*), eastern white pine (*Pinus strobus*), eastern red cedar (*Juniperus virginiana*), Atlantic white cedar (*Chamaecyparis thyoides*), Arizona cypress (*Cupressus arizonica*), and Leyland cypress (*Cupressocyparis leylandii*).

Because the needs and the pests are so different between the two regions, this profile focuses on the choose-and-cut production in eastern North Carolina.

## Production Practices

Christmas tree plantations east of the mountains are primarily small farms with a mixture of tree species.

Growers are part-timers, often converting old tobacco or soybean fields to Christmas tree production.

The majority of growers purchase seedlings from the North Carolina Forest Service. Seedlings are culled so only the best are planted. Trees are set by hand directly into the field except for white pine, which may be lined out for a year. Tree spacing varies from as little as 3 feet by 3 feet to 10 feet by 10 feet. The majority of trees are set on 6 feet by 6 feet centers.

Trees from the time they are two years in the field are sheared annually by hand. Virginia pine has two or more flushes every year and will be sheared at least twice. Shearing involves trimming the terminal to create a fuller, denser tree and maintaining the side shoot growth in the shape of a cone.

Ground covers are managed through mowing and weed-eating as well as herbicide use. Herbicides, insecticides, and fungicides are applied with hydraulic sprayers equipped with booms and nozzles, which are driven up and down each row. Trees heavily infested with scales or adelgids, or which have been badly damaged by the Nantucket pine tip moth, are often culled.

Trees are usually priced individually by tree height, quality, and species. Prices range from \$20 to \$35 each.

Pesticide-use data throughout the report are based on a survey of pesticide use by North Carolina Christmas tree producers in 1994.

## **Insect Pests**

### **Nantucket pine tip moth**

The Nantucket pine tip moth (*Rhyacionia frustrana*) is a common pest of Virginia pine. The tips of shoots are killed as a result of larval boring, initially into the base of the needles or buds and then into the shoot itself. Heavily infested trees may appear reddish because of so many dead tips. Repeated infestations produce distorted trees that are unmarketable. The most important damage is to the tree terminal since damaged side shoots are usually sheared off.

The Nantucket pine tip moth overwinters as pupae in injured tips of pines. Adult moths begin to fly on

sunny days in late winter, which may be as early as January or as late as March. They mate and lay eggs that hatch in 5 to 30 days, depending on the temperature. After hatching, tiny caterpillars first feed externally but soon bore into the buds or shoots. The larval period lasts from two weeks to a month. There are at least three generations in North Carolina.

**Cultural practices:**

Before planting, seedlings should be inspected and injured buds and twigs destroyed. In small plantings, damaged terminals should be destroyed in the dormant season to kill overwintering pupae. In larger plantings, pesticides will need to be applied.

**Biological control:**

Recently, many natural predators of the Nantucket pine tip moth have been identified. Research is under way to help growers better protect and utilize these natural controls.

**Chemical control:**

Pesticide timing is often difficult because once the caterpillars have bored into the shoots, they are protected from chemical control. Pesticides must be applied when caterpillars are still small. Pheromone traps are used to better time pesticide sprays.

### Spruce spider mite

The spruce spider mite (*Oligonychus ununguis*) has a wide host range of coniferous species. In eastern Christmas trees, it is primarily a problem in eastern red cedar. It is a cool-season mite and is a problem in the spring and early summer. Spider mites causes yellow spotting on needles, which discolor the foliage.

Spider mites hatch from eggs and develop through a larval and nymphal stage before maturing into adults. Males and females mate as soon as the females molt into the adult stage, and females soon begin laying eggs. There are many generations each year.

Growers are encouraged to scout for spider mites by beating foliage onto a white tray and examining the dislodged mites with a hand lens. Spider mites are often worse if natural predators are killed through overuse of insecticides.

### Bagworms

Bagworms (*Thyridopteryx ephemeraeformis*) have a wide host range. A single bagworm does relatively little harm. However, because the females do not fly, populations are often very dense on individual

trees. The resulting defoliation from a heavy population can kill conifers within one or two seasons.

Winter is spent as eggs in the mother's bag, which hatches in May and June. As the worms hatch, they spin a strand of silk that is often picked up by the wind and ballooned to nearby plants. When a suitable host plant is found, the young larva begins to form a new bag over its body. The larva feeds and grows, enlarging the bag as it does. By mid-August they are mature and pupate. Within four weeks the male moths mature and fly in search of females. After mating, the female mummifies around the egg mass. There is only one generation per year.

**Cultural control:**

If the bags are few in number, they can be picked off the tree and destroyed.

**Biological control:**

*Bacillus thuringiensis* (*Bt*) is effective against bagworms if it is used against the young larvae. Applications must be timed when the larvae are just through ballooning.

**Chemical control:**

Careful scouting and the use of degree days (around 900 DD base 50° F) can be used to better time pesticide applications. Early sprays are more effective than later ones.

### **Cinara aphids**

*Cinara* aphids (*Cinara* spp.) are large, dark brown to black aphids that feed on Virginia and eastern white pines and other conifers. Growth is reduced by heavy infestations. Sooty mold also grows on aphid-infested trees, reducing the marketability of the trees. In addition, *Cinara* aphid eggs can hatch on Christmas trees set up in homes, upsetting customers.

*Cinara* aphids can often first be spotted because of the activity of yellow jackets or hornets. Beating the foliage on a sampling board can dislodge aphids, making them easier to find. *Cinara* aphids are a favorite prey of predators. Pesticide applications are necessary only in go-to-market trees or heavily infested trees to prevent sooty mold buildup.

### **Pine bark adelgid**

The pine bark adelgid (*Pineus strobi*) is found primarily on eastern white pine, though occasionally other pines are attacked. This adelgid is more unsightly than injurious on older, timber-sized trees, but it may seriously damage small Christmas trees. The pine bark adelgid overwinters in all stages, though usually as immature females. In late winter, development resumes, and each female lays up to 24 eggs in

a woolly mass. From these eggs develop both winged and wingless forms. On pines there are several different forms of immature adelgids, but only the crawler stage and winged forms are capable of migrating. The stationary, wingless forms continue to reproduce parthenogenetically all season. There are five or more generations per year.

White pine Christmas trees should be treated for pine bark adelgid in the spring when the crawlers move onto the new growth, which is about the time the trees are sheared. Treatment should be made before the pests have had a chance to mature and lay eggs. Thorough coverage of stems and branches is essential.

### **Pine needle scale**

The pine needle scale (*Phenacaspis pinifoliae*) is a pest of most conifers including pines, firs, spruces, deodar cedar, and yew. Eastern white pine is seldom affected. Damage from the pine is not apparent until large populations have been present for more than one or two seasons. Trees are stunted and have short needles and shoots. Occasionally there will be yellow flecking on the needles.

The pine needle scale overwinters as eggs under the mother's armor. The eggs hatch in late spring, all the eggs hatching within 10 days. Crawlers move onto the foliage, often remaining on the older needles. Males emerge and mate with females in July. These settle on the current year's growth. There are two generations per year.

#### **Chemical control:**

Experience has shown that treating for the summer generation may be more effective than the spring generation. Sprays should be timed for when the crawlers have moved to the new growth.

### **Pine tortoise scale**

The pine tortoise scale (*Toumeyella parvicornis*) attacks Scots, Austrian, Jack, and red pines and severely affects Virginia pine. Eastern white pine is not generally attacked. The scale reduces tree growth, and honeydew makes trees less attractive and often unmarketable.

The scale overwinters as immature females. They mature in the spring and lay eggs that hatch in April to May in North Carolina. Crawlers move away from the parent and settle on a twig. Males emerge and mate. There are two to three generations in North Carolina, and the overlap of generations results in several stages of development present at the same time.

#### **Chemical control:**

The pine tortoise scale is usually localized in a small portion of the field. Trees known to have scales

should be flagged and only these targeted for treatment. Timing pesticide applications for emergence of the first generation of crawlers is the best way to get control.

### Pales weevils

Pales weevils feed on all pines and, to a lesser extent, other conifers. Weevils are drawn to the smell of resin on fresh-cut stumps and on recently damaged or dead pine trees. They seek these sites in the spring between May and June. Once located, they lay their eggs on the roots. The larvae are not considered a problem, but the adults that emerge in August and September feed on shoots and twigs. Feeding can kill seedlings or tops in Christmas trees. Because choose-and-cut farms usually have freshly cut stumps, Pales weevils are often a problem in Christmas trees. Seedlings are regularly treated before planting to protect against weevils. Insecticides used include Dursban (4 percent of the acreage), malathion (2 percent), Cygon (2 percent), Orthene (2 percent), and Imidan (less than 1 percent).

### **Insecticide Use**

Many pesticides are used to control several different pests. The following table—showing the pesticide, rate, average number of times used through the growing season, and targeted pests—is a summary of insecticide use as determined in the 1994 survey of Christmas tree producers. Lindane controls many of these pests, but it also kills most of the natural predators. Growers cannot afford some of the newer materials like Provado because manufacturers do not sell the products in small enough packages.

**Table 1. Insecticide use on Christmas trees**

<i>Insecticide</i>	<i>Rate</i>	<i>Average applications per year</i>	<i>Pests controlled</i>
Orthene 75 SP (acephate)	5.3 oz/100 gal water	3.8	Tip moth, scales, bagworms
Cygon (dimethoate)	3 oz/ 6 gal water	3.6	Tip moth
Lorsban 4 E (chlorpyrifos)	1 pt/ acre	5.4	Scales, aphids, adelgids
Morestan 25 WP (oxythioquinox)	1 lb/ 100 gal water	4.9	Mites
Diazinon 25 EC (diazinon)	2 pt/ 100 gal water	1.5	Aphids

Lindane 20 EC (lindane)	1 pt/ 100 gal water	1.7	Adelgids, aphids
Sevin 50 WP (carbaryl)	2 lb/ 100 gal water	1.9	Scales

## Diseases

There are several diseases of conifers grown for Christmas trees in eastern North Carolina. According to the 1994 producer survey, less than 5 percent of the Christmas trees were treated for diseases. Chlorothalonil (Bravo) was used in these cases, with an average of two applications per year.

### Cedar/apple rust

Cedar/apple rust (*Gymnosporangium juniperae-virginianae*) is most often considered a problem of apples, but Christmas tree growers of eastern red cedars also have a problem. The pathogen produces unsightly galls on cedar. These exude horn-like projections in the spring that carry the spores that infect apples and crabapples. Because the galls do not affect the growth of cedars, they are usually just pruned from the trees.

### *Phomopsis* tip blight

*Phomopsis* tip blight, caused by *Phomopsis juniperovora*, damages new growth and succulent branch tips of eastern red cedar from mid-April through September. Older, mature foliage is resistant to infection. Diseased foliage turns dull red or brown and finally gray. Small, black, spore-containing, fungal fruiting bodies develop in the lesions. Spores are produced throughout the summer, and infection can occur whenever young foliage is available and moisture or humidity is high.

### *Cercospora* blight

*Cercospora* blight, caused by *Cercospora sequoiae*, attacks eastern red cedar and Arizona cypress.

However, the damage is seen on the older, more mature foliage. The symptoms start during late spring and summer. It produces a progressive browning and loss of foliage beginning on the lower branches close to the mainstem and moving upward and outward, sometimes killing the plant. Needles become bronze to tan or light brown and eventually gray. The fungus produces spores on the dead tissue in black structures. Wet weather and moderate temperatures favor *Cercospora* blight.

### **Phytophthora root rot**

*Phytophthora* root rot, caused by *Phytophthora cinnamomi*, can kill Christmas trees grown in wet or low-lying areas. Growers are encouraged to choose Christmas tree-producing sites carefully.

## **Weeds**

Weed control is very important to producing a high-quality Christmas tree. Competition from grasses and other vegetation can kill young trees or limit their growth by blocking sunlight and competing for soil moisture and nutrients. Tree quality can be reduced by vegetation that restricts lower-branch growth or by vines growing into trees and bending their tops. Some weeds such as briars, thistles, or poison ivy can restrict workers' ability to care for trees.

Managed ground covers, however, can enhance Christmas tree production by promoting water penetration, keeping the soil cool to keep tree roots near the soil surface, reducing erosion, and providing harbors for natural predators and parasitoids.

Eastern Christmas tree growers rely heavily on mowing to keep weed height in check. But both pre- and postemergent herbicides are used. Preemergent herbicides include Simazine (used on 19 percent of the acreage), Goal (8 percent), Surflan (6 percent), Oust (4 percent), and Devrinol (1.4 percent). Postemergent herbicides include Roundup (used on 28 percent of the acreage), Fusilade (19 percent), Poast (or Vantage) (10 percent), Goal (6 percent), Gramoxone (5 percent), and Stinger (1 percent). Postemergent herbicides are often applied twice.

## **On-Line Resources**

[North Carolina Integrated Pest Management](#)

[North Carolina Pesticide Impact Assessment Program](#)

[Christmas Trees, Horticultural Commodity of North Carolina](#)

## Contacts

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## References

1. Toth, S. J., Jr. 1997. A survey of pesticide use on potatoes and Christmas trees in North Carolina, Part II: Christmas trees. Data report to the National Agricultural Pesticide Impact Assessment Program.

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