

# Pests of Forestry and Christmas Trees: Forest Insects

*Eric R. Day, Extension Entomologist, Virginia Tech*

*Scott M. Salom, Professor, Entomology, Virginia Tech*

*Lori Chamberlin, Forest Health Program Manager, Virginia Department of Forestry*

*Katlin DeWitt, Forest Health Specialist, Virginia Department of Forestry*

Every tree species serves as host to numerous insects that feed on roots, stems, branches, leaves, and fruits. Most of these insect species are of limited consequence. Some species occasionally reach outbreak population levels that can cause damage and impact tree and forest health. There are also well known species that are considered primary pests and frequently cause significant impact on tree and forest health. Non-native invasive insects have also become part of Virginia’s forests, and in some cases these pests are the worst, since there is often little host-tree resistance or natural enemies to help keep their populations in check. Pest populations tend to be cyclic, especially for native pests. A critical part of pest management is to survey and identify when pest populations are on the rise in an area. Knowing this helps with planning and decision-making.

The Red Imported Fire Ant (RIFA) has become established in many counties in south-central Virginia and impacts loggers who cut and move timber. For the management of Red Imported Fire Ants and for information on the quarantine, see section labeled "Red Imported Fire Ant Management for Foresters and Loggers" at the end of the of part 8-1.

For native pests, sound forest management practices can be used to limit site conditions responsible for allowing the pest populations to build up. Such practices are a basis for effective integrated pest management. Proper site selection, stand density, stand and tree vigor,

and proper sanitation are among the most important. Under poor management and inadequate protection practices, salvage operations may be the only recourse. Pesticide applications may be utilized for prevention of potential insect population buildup and suppression of outbreaks that threaten the vigor as well as survival of trees. However, use of pesticides is not recommended without knowledge of pest status. Use pesticides only if pests are present or are predicted to be present from a standard or systematic sample survey. They should be used in settings where compatible with management and of limited risk to the environment.

Technical assistance is available from the Virginia Department of Forestry and the U.S. Forest Service - Forest Health Protection, as well as the Virginia Cooperative Extension Service. State and federal forestry agencies may provide control services on a cost-sharing basis as well as survey and detection programs in cooperation with public and private forest land owners. Control programs for new, introduced, or as yet not established pests such as the spongy moth are conducted by the Bureau of Plant Protection and Pesticide Regulation of the Virginia Department of Agriculture and Consumer Services with the Cooperation of the Animal and Plant Health Inspection Service, the USDA, the US Forest Service, the Virginia Department of Forestry, and Virginia Cooperative Extension.

<b>Table 8.1 - Insects and Insecticides</b>		
<b>Special Note:</b> Some of the following chemicals may be restricted to conifers only or tree nurseries only; read the label and use only as directed.		
<b>Insect Host</b>	<b>Recommended Control</b>	<b>Remarks</b>
<b>Adelgids</b> Balsam woolly adelgid	Carbaryl Chlorpyrifos Dormant oil Esfenvalerate Imidacloprid Permethrin	Scout regularly for adelgid or trees losing apical dominance; remove infested trees if practical. Spray bark and foliage to runoff in June or when found May-October. If infested plants are few and scattered, rogue and burn, and spray trees in a 20 foot diameter circle around rogued trees. When removing infested trees, wrap trees in tarp so no adelgids fall off as the tree is removed. For additional information on this pest, refer to: <a href="http://bit.ly/1Rx5aMS">http://bit.ly/1Rx5aMS</a>
<b>Adelgids</b> Hemlock woolly adelgid (eastern and Carolina hemlock)	Dormant oil Imidacloprid Dinotefuran (Safari)	For soil applications of systemic pesticides, amount applied is based on diameter of trunk at breast height. Dinotefuran and imidacloprid soil applications, trunk injections, or basal spray should be applied in spring (March – April) or late fall (Oct. – Nov.). Do not use on trees with less than 50% foliage. For dormant oil use 1% rate during the spring months and 2% during the fall or winter. For foliar applications, spray foliage and twigs to run off in early spring. For additional information on this pest, refer to: <a href="http://bit.ly/1kHQosy">http://bit.ly/1kHQosy</a>
<b>Aphids</b> (various hardwoods)	Carbaryl Esfenvalerate Imidacloprid Malathion Permethrin	Thorough coverage of foliage for leaf-feeding aphids or twigs and branches for bark-feeding aphids. Treat when aphids are first seen. May occur throughout the season. Treat when high populations of aphids are seen.  For additional information on this pest, refer to: <a href="http://bit.ly/1Xtt6EA">http://bit.ly/1Xtt6EA</a>
<b>Aphids</b> (various conifers)	Carbaryl Esfenvalerate Imidacloprid Malathion Permethrin	Aphids rarely harm forest trees; heavily infested seedlings can be sprayed. Thorough coverage of new shoots, twigs and branches. Treat when first seen. May occur throughout season.

<b>Table 8.1 - Insects and Insecticides (continued)</b>		
<b>Special Note:</b> Some of the following chemicals may be restricted to conifers only or tree nurseries only; read the label and use only as directed.		
<b>Insect Host</b>	<b>Recommended Control</b>	<b>Remarks</b>
<b>Bark Beetles</b> Ips engraver beetles, Southern pine beetle, Turpentine beetle (pines), Walnut Twig Beetle (black walnut)	Bifenthrin Permethrin Imidacloprid	Bark beetle impact can be prevented or reduced by growing trees at lower densities, thinning during rotation, and in general keeping the basal area at about 80 square feet. In forest stands, salvage timber with a buffer strip of uninfested trees at the active head(s) of the infestation as soon as possible. This is called "cut and remove." Turpentine beetle infestations can be treated without felling by spraying the lower boles of infested and adjacent uninfested trees. In these situations, repeated sprayings may be necessary due to short residual time on the bark. Walnut Twig Beetle: If the tree is already infested, limited control with bark sprays of permethrin can be obtained. If wishing to protect an uninfested tree, soil drenches of imidacloprid can be used but walnuts cannot be harvested, the following year walnuts are OK to eat. For additional information on this pest, refer to: <a href="http://bit.ly/1PPPCVY">http://bit.ly/1PPPCVY</a>
<b>Roundheaded Borers</b>	Permethrin	This chemical is registered for preconstruction lumber and logs against wood destroying insects.  For wood borers in standing trees, heavily infested trees should be salvaged for fuel wood or felled and bucked to encourage predation of borer larvae by ants; if left standing, such trees serve as breeding grounds for borers that will infest and degrade additional trees. Spraying is impractical. Do not move infested wood out of area.  For additional information on this pest, refer to: <a href="http://bit.ly/1NvZUYV">http://bit.ly/1NvZUYV</a>
<b>Fall Cankerworms</b> (many hardwoods but prefers oaks)	<i>Bacillus thuringiensis</i> (BT) Carbaryl Diflubenzuron Tebufenozide	Apply treatment when egg hatch is complete and larvae are young, usually in early to mid- May. For all but Bt, do not allow spray or run off to get into bodies of water or streams. See label for aerial application dosage rates. Sticky banding of the trunk in the fall for adult fall cankerworm can be used to prevent wingless females from climbing the trees and mating with males. They also can be used to monitor activity.
<b>Defoliators</b> Caterpillars, beetles, etc.	<i>Bacillus thuringiensis</i> (BT) Carbaryl Diflubenzuron Tebufenozide	There are many other insects that occasionally defoliate Virginia forests. The impact of defoliation depends primarily on host condition, time of year, and degree of foliage loss. Tree growth and vigor are reduced most by heavy defoliation early in the year. Trees that are in good health at the time of defoliation will survive. Trees already under stress at that time of defoliation will lose vigor and sometimes die from the effects of secondary agents and adverse environmental conditions.
<b>Emerald Ash Borer</b> (Ash and Fringe Tree)	<b>Systemic insecticides</b> Azadirachtin Dinotefuran Emamectin benzoate Imidacloprid <b>Contact insecticides</b> Bifenthrin Carbaryl Cyfluthrin Permethrin	After cutting trees, do not move wood out of area. Destroy, chip, or leave wood on site.  For additional information on this pest, refer to: <a href="http://bit.ly/1Mmvvza">http://bit.ly/1Mmvvza</a>
<b>Fall Webworm</b> (many hardwoods)	<i>Bacillus thuringiensis</i> (BT) Carbaryl Diflubenzuron Tebufenozide	Rarely has significant impact on forest trees; high density populations rarely persist for more than two seasons. Stressed trees can be protected against defoliation impact by spraying the first webworm generation in mid- to late June. If necessary, spray the second generation in mid- to late August.  For additional information on this pest, refer to: <a href="http://bit.ly/1p6aa1C">http://bit.ly/1p6aa1C</a>
<b>Spongy Moth</b> (many hardwoods)	<i>Bacillus thuringiensis</i> (BT) Carbaryl Diflubenzuron Tebufenozide	Treat in the spring when most larvae are in second instars and most oak leaves are at least half expanded. For Bt, treat when larvae first emerge. Most treatments are coordinated through local- state-federal cooperative suppression programs.  For additional information on this pest, refer to: <a href="https://www.vdacs.virginia.gov/plant-industry-services-spongy-moth.shtml">https://www.vdacs.virginia.gov/plant-industry-services-spongy-moth.shtml</a> .
<b>Mites</b> Spruce spider mite (conifers, especially spruces, hemlock, Fraser fir in nurseries, and plantations. Seldom on pine)	Avid Clofentezine Dormant oil Etoxazole Floramite Spiromesifen	Treat in early spring and fall (usually late April and mid- September) when mites are most active; use oil as a dormant spray (makes foliage oily)  For additional information on this pest, refer to: <a href="http://bit.ly/1PPQ7iS">http://bit.ly/1PPQ7iS</a> and <a href="http://bit.ly/1k4Wr9Z">http://bit.ly/1k4Wr9Z</a>
<b>Mites</b> Eriophyid mite (Needle Sheath Mite)	Carbaryl Chlorpyrifos Dimethoate Dormant oil	Treat as soon as detected (early spring); oils may alter foliage appearance.

<p><b>Pine Tip Moth</b> Nantucket pine tip moth (2 and 3 needle pines only)</p>	<p>Carbaryl Confirm Diflubenzuron Esfenvalerate Imidacloprid Imidan Permethrin Tebufenozide</p>	<p>Thoroughly wet all shoots and needles in the spring and repeat 1 to 2 times later in the summer. Pheromone traps are used to time male flight activity. A general rule is to treat 10 days after catching males in traps so that susceptible early instar larvae are at their first peak. The distinct 1st generation that this rule depends on break down with each succeeding generation, of which there are three in Virginia.</p>
<p><b>Pine Webworm</b> (pine)</p>	<p><i>Bacillus thuringiensis (BT)</i></p>	<p>Rarely contributes to seedling mortality. Spray only when webworm population density is high and seedling stocking marginal. Treat as soon as detected.</p>
<p><b>Sawflies</b> Virginia pine sawfly, introduced pine sawfly, red-headed pine sawfly</p>	<p>Carbaryl Esfenvalerate Imidacloprid</p>	<p>Treat Virginia pine sawfly in April; introduced pine sawfly on white pine in June and September; red-headed pine sawfly, June to September. Since pine sawflies tend to avoid current season's foliage, defoliation is rarely total and trees can survive repeated infestations. See label for aerial application directions.  For additional information on this pest, refer to: <a href="http://bit.ly/1MmwGi2">http://bit.ly/1MmwGi2</a></p>
<p><b>Scale Insects</b> Pine needle scale, pine tortoise or scale, elongate hemlock scale, etc.</p>	<p>Carbaryl Dormant oil Malathion Permethrin</p>	<p>Treat for pine needle scale mid- to late May and mid- to late July; pine tortoise scale mid- June and July. For all other scale insects treat at crawler date. Scale insects rarely reach high densities or have serious impact on hardwood forests; spread of invading beech scale and associated beech bark disease can be slowed through salvage of infested trees. Spraying is not practical in the forest setting.</p>
<p><b>Spotted Lanternfly</b></p>	<p>imidacloprid bifenthrin zeta- cypermethrin carbaryl malathion Dinotefuran</p>	<p>The systemic insecticides dinotefuran and imidacloprid can be used as trunk sprays, trunk injections, or soil drenches, depending on the label. Use contact insecticides such as bifenthrin, zeta- cypermethrin, carbaryl, and malathion as spot sprays on nymphs and adults seen on the trunk, branches, and foliage of plants. Repeat spot sprays as needed. May not be economical or feasible for large forest tracts. Loggers shipping trees out of the Quarantine zone are required to get a Spotted Lanternfly Permit, see: <a href="https://www.vdacs.virginia.gov/plant-industry-services.shtml">https://www.vdacs.virginia.gov/plant-industry-services.shtml</a> and see: <a href="https://ext.vt.edu/agriculture/commercial-horticulture/spotted-lanternfly.html">https://ext.vt.edu/agriculture/commercial-horticulture/spotted-lanternfly.html</a></p>
<p><b>Tent Caterpillars</b> Forest tent caterpillar (many hardwoods)</p>	<p><i>Bacillus thuringiensis (BT)</i> Carbaryl Diflubenzuron Malathion Tebufenozide</p>	<p>Treat for forest tent caterpillar in early spring when first leaves are fully expanded. Forest tent caterpillars occasionally cause extensive hardwood forest defoliation. They do not make the web tents in the crotch of the tree branches.</p>
<p><b>Eastern tent caterpillar</b> (wild cherry)</p>		<p>Eastern tent caterpillar can fully defoliate trees in early spring but only have minor impact and should not be treated in the forest setting.  For additional information on this pest, refer to: <a href="http://bit.ly/1AdP9Gq">http://bit.ly/1AdP9Gq</a></p>
<p><b>Weevils</b> Pine reproduction weevils, Pales weevil, Eastern Pitchheating weevil. (conifers: feed on first year stumps and the base of recently dead trees as larvae. The adults may feed on live twigs.)</p>	<p>Esfenvalerate Imidan Permethrin</p>	<p>In forest plantations, wait one year to replant with seedlings if harvesting took place after June 1. Seedlings are currently treated in nursery beds prior to lifting under SLN registration; foresters and landowners can order seedlings that are already treated. In Christmas tree plantations, stump removal or stump treatment with insecticide (as described below) is recommended. Thoroughly soak stumps and ground surface 1 to 2 ft around stumps or slash prior to mid- March. Apply Imidan as 4% top dip for seedlings prior to planting. Follow label directions.  For seedlings: Apply as a full coverage spray to seedlings immediately after planting.  For stumps: Thoroughly soak stumps and ground surface around stumps or slash prior to mid- March. Only stumps or wood cut since previous summer need treatment. Dilute Asana in kerosene.  For additional information on this pest, refer to: <a href="https://www.pubs.ext.vt.edu/content/dam/pubs_ext_vt_edu/2902/2902-1102/ENTO-386.pdf">https://www.pubs.ext.vt.edu/content/dam/pubs_ext_vt_edu/2902/2902-1102/ENTO-386.pdf</a></p>
<p><b>White Pine Weevil</b> (eastern white pine, Scots pine, and Norway spruce: feed in the tops of trees only.)</p>	<p>Permethrin</p>	<p>Treat when plantations show 5% or more weeviled tips. Applications must be made prior to adult egg laying, usually April 1. Treat only 1.5 to 2 ft of the main terminal shoot, not the entire tree or laterals. A full 4 gal knapsack sprayer will treat approximately 200 terminal shoots.  For additional information on this pest, refer to: <a href="http://bit.ly/1XtwDD1">http://bit.ly/1XtwDD1</a></p>

**Precautions:** Do not allow any insecticides as sprays, drift, or runoff to contaminate bodies of water, streams, or drainage systems. Carbaryl is highly toxic to honeybees. Follow precautionary instructions on labels and use protective equipment wherever specified.

**Equivalents:** 1 lb WP/100 gal = 1 Tablespoon/gal; 1 pt EC/100 gal = 1 teaspoon/gal



# Pests of Forestry and Christmas Trees: Insecticide Recommendations for Fraser Fir Seedbeds and Liner Beds

Eric R. Day, Extension Entomologist, Virginia Tech  
 Kyle R. Peer, Superintendent, Reynolds Homestead FRRC

Insects	Insecticide	Rates	Timing and Comments
Root Aphids	Imidacloprid		Treat when aphids are first discovered and completely water in granular material. Treat only if damage such as yellowing is observed. Most of the time root aphids are not present in damaging numbers.
White Grubs	<i>Bacillus Popillae</i> (Milky spore disease) for Japanese beetle only; not effective on other grub species.  <i>Beauvaria bassiana</i>  Carbaryl (Sevin 10G)  Entomopathogenic Nematodes  Halofenozide (Mach 2)  Imidacloprid (Merit 0.75 WSP)  Lambda-Cyhalothrin (Scimitar)  Trichlorfon (Dylox 6.2)	For proper rates, see label.	<p>White grubs include several species of scarab beetle larvae. Treat with insecticides in July.</p> <p>Japanese beetle grubs are the only species that will be controlled adequately by milky spore products. Follow label instructions for application. When using these products, be aware that control is not immediate. Milky spore is a slow-acting disease agent; grubs will take up to 30 days to die. However, when the disease is established in the turf, control can be effective for years without further application. After application, the disease perpetuates and spreads by infecting and being transported by grubs. If another grub treatment is applied to an area treated with milky spore, this will slow the spread of the disease and is therefore not desirable.</p> <p>White grubs can also be controlled by entomopathogenic nematodes. Not all nematode species (named on the product label under the "Active Ingredients" section) available commercially will provide adequate control. Products with <i>Steinernema carpocapsae</i> should not be used for grub control. Entomopathogenic nematode products should be applied only when the pest is present. Apply nematodes late in the day to avoid exposure to UV light damage. Irrigate the day before and immediately after application. Early spring treatments are usually not effective because soil temperatures should be at least 60°F.</p> <p><i>Beauvaria bassiana</i> (an entomopathogenic fungus) products also provide control. Follow label instructions and water 1/2 inch immediately after application. Avoid fungicide applications when using these products. Several chemical insecticides are available for grub management. These products should be applied at the labeled rate and watered in with 1/4-1/2 inch of water. Most insecticides provide the best control when used against early instar grubs that are present in early to mid- August. Populations high enough to warrant treatment are 6 to 10 grubs/sq ft. White grubs stop feeding in September or October, so control during fall may not prove successful. Spring treatments usually are not effective. Cultural management: reducing thatch will increase penetration of any treatment applied to the turf.</p>
Cutworms	Permethrin		Treat when cutworms are first discovered, avoid weedy growth as cutworm moths prefer to lay eggs in thick vegetation as well as low-lying places.

<sup>1</sup> After transplanting from the liner bed to the field, consult the information listed under Christmas trees.  
<sup>2</sup> Generally most soil insects are controlled with fumigants used for weed control prior to planting. The following is remedial control for insects detected after the bed is established.

Insects	Insecticide	Rates	Timing and Comments
Balsam Woolly Adelgid	Asana XL Bifenthrin Horticultural Oil Imidacloprid Permethrin		Treat when found in June or May–October with Asana XL or Lorsban. Spray bark and foliage to runoff. Use horticultural oil in winter during dormant periods. Horticultural oil may give the foliage an oily appearance and burn some tips.
Balsam Twig Aphid	Asana XL Bifenthrin Imidacloprid		Treat in about the first week of May or just prior to buds opening in the spring. Severe cases only need be treated as this insect is generally a cosmetic pest.
	Dormant oil		Use 1% rate for Dormant oil. Maintain temperature restrictions.
Spruce Spider Mite	Bifenthrin Insecticidal Soap Mavrik Savey San Mite		Treat in early May or late September or when mites are found.
	Dormant oil		Dormant oil in late March will control mites in most situations.



# Pests of Forestry and Christmas Trees: Fungicide Recommendations for Conifer Seedbeds and Liner Beds

Carrie Fearer, Assistant Professor, Department of Forestry, Virginia Tech

**Table 8.4 - Diseases** (Refer to product label for application rates, directions, and precautionary information. Follow product label directions on pesticide resistance development and tank-mix and/or rotate products at risk for development to other modes of action, as advised on the product label to minimize chance of pesticide resistance development.)

Disease	Fungicide	Comments
Botrytis blight	Bravo Weather Stik, Daconil Zn, Echo 720 (chlorothalonil)	Begin applications in nursery beds when seedlings are 4 inches tall and when cool, moist conditions favor disease development. Make additional applications at 7- to 14-day intervals as long as conditions favorable for disease persist.
	3336 EG Turf and Ornamental Systemic Fungicide (thiophanate methyl)	
	Spectro 90WDG (chlorothalonil + thiophanate methyl)	
	Tourney (metconazole)	Apply as needed on 14 to 28-day interval.
Needle casts, tip blight	Bravo Weather Stik, Daconil Zn, Echo 720 (chlorothalonil)	Make first application in spring when new shoot growth is 0.5-2.0 inches in length. For nursery beds, apply the highest rate specified on a 3-week schedule until conditions no longer favor disease development.
	Spectro 90WDG Turf and Ornamental Fungicide (chlorothalonil + thiophanate methyl)	Apply at budbreak and repeat at 2-3 week intervals until needles are fully elongated and conditions no longer favor disease development.
Phytophthora root rot	Alude (dipotassium phosphite)	Can apply as foliar spray, soil drench, or bare-root dip.
	Mefenoxam 2 AQ Subdue Maxx Fungicide (mefenoxam)	Can be used as a foliar application and soil surface spray in at least 50 gal water in spring and again in fall.
	Subdue GR Granular Fungicide (Metalaxyl-M)	Granular product.
	Segway O Greenhouse and Nursery Fungicide (cyazofamid)	Can be used as a soil drench or soil surface spray or delivered via irrigation system.





# Pests of Forestry and Christmas Trees: Weed Control in Fraser Fir Seedbeds and Liner Beds

Jeffrey F. Derr, Weed Scientist, Virginia Tech

Table 8.5 - Weed Control <sup>1</sup>		
Pest	Herbicide and Rate	Comments
Most Weed Species	dazomet (Basamid 218-421 lb/A or 5.0 to 9.6 lb/1000 sq ft)	Preplant soil fumigation. Incorporate after application. Irrigate or cover with plastic after application. Do not use below soil temperature of 43°F. Waiting period for seeding ranges from 10 to over 30 days.
Annual and Perennial Weeds	glyphosate (Roundup Pro 2.0-5.0 qt/A or 1.3-2.6 fl oz/gal, Roundup ProMax, 1.0-3.3 qt/A or 2.0 fl oz/gal, or other labeled formulation)	For site preparation prior to seeding. Apply when weeds are actively growing. Do not allow spray to contact desired foliage.
Many Annual Weeds	oxyfluorfen (Goal 2XL 1.0-4.0 pt/A or GoalTender 0.5-2.9 pt/A)	Apply after seeding but prior to seedling emergence. Preemergence control of weeds from seed. For small areas, apply 0.4-1.4 fl oz Goal 2XL or 0.2-0.7 fl oz GoalTender/1000 sq ft.
	oxyfluorfen (Goal 2XL 1.0-2.0 pt/A or GoalTender 0.5-1.0 pt/A)	Postemergence control of weeds less than 4 inches tall plus residual control. Do not apply sooner than 5 weeks after fir emergence. Fir seedlings must be hardened off prior to spraying. For small areas, apply 0.4-0.7 fl oz Goal 2XL or 0.2-0.37 fl oz GoalTender/1000 sq ft.
Annual and Perennial Grasses	sethoxydim (Segment II 1.3 fl oz/gallon plus 0.5 fl oz/gallon methylated seed oil or crop oil concentrate)	Postemergence control of most grasses. Spray to wet when grasses are actively growing. Will not control wild onion, yellow nutsedge, or any broadleaf weed.
<sup>1</sup> After transplanting from the liner bed to the field, consult the information listed under Christmas trees.		



# Pests of Forestry and Christmas Trees: Christmas Tree Insects

*Eric R. Day, Extension Entomologist, Virginia Tech*

*Scott M. Salom, Professor of Entomology, Virginia Tech*

*Lori Chamberlin, Forest Health Program Manager,  
Virginia Department of Forestry*

*Kyle R. Peer, Superintendent, Reynolds Homestead FRRC*

*Katlin DeWitt, Forest Health Specialist,  
Virginia Department of Forestry*

Early detection and accurate identification of insect pests is the key to prevention of serious damage and loss in Christmas tree plantations. Growers should be knowledgeable about the more common, injurious insects and mites — their recognition, host plants, damage, seasonal development, and habits. Chapter 10, Insects, in the “Christmas Tree Production Manual” is a helpful reference (Virginia Cooperative Extension Publication 420-075). The “Christmas Tree Pest Manual,” Michigan State University publication E-2676, contains full-color illustrations to aid in identification as well as biological and chemical information.

Effective control depends on the timely and thorough application of recommended control measures. Control measures applied improperly or not in accordance with label directions are ineffective and a waste of time, materials, and labor, and may constitute a misuse of pesticides. Use pesticides only if pests are present or are predicted to be present from a standard or systematic sample survey.

Amounts of pesticide to use in preparing sprays or applying treatment are specified in this control guide. Even so, they should be determined from the label on the container of the pesticide at the time of application. Be sure to read ALL of the directions and precautions on the label before and at the time of application of each treatment. Use ONLY the recommended amounts of the formulation. For many insecticides listed, other formulations are available and registered for use: Carbaryl (Sevin) - 50 WP, 80S, 4F, and Sevimol; Dursban-2E and 50WP (Lorsban is the trade name for chlorpyrifos marketed for agricultural crops); Orthene - 9.4% EC and 15.6% EC; diazinon-4E and 50WP; Malathion-50% EC and 25WP; Dipel-3.2% WP, 6L, and 8L; Thuricide-32 LV, HP, and HPC. Formulation often depends on type of application as well as company marketing policy. Dusts are not recommended, since they are readily washed off by rain. WP residues are not as persistent as emulsifiable concentrates; although addition of a sticker often improves residual activity. Insecticides marked \*\* are restricted-use pesticides.

## ■ Major Insects and Mites Infesting Christmas Trees

Insects and mites vary in their host preferences and their severity on different hosts. The following list of pests associated with each type of tree is an aid in identifying potentially damaging species. **The pests are listed in order of importance and occurrence generally.** Most insects and the spruce mite tend to be localized on scattered trees rather than uniformly distributed through plantations.

### Balsam Fir

balsam woolly adelgid  
aphids  
balsam twig aphid

### Blue (and Sitka) Spruce

spruce mite  
white pine weevil  
sawflies  
aphids  
Cooley spruce gall adelgid

### Douglas-Fir

spruce mite  
white pine weevil  
Cooley spruce gall adelgid

### Eastern White Pine

white pine weevil  
pales weevil  
eastern pine weevil  
white pine aphid  
pine bark adelgid  
sawflies  
bagworm  
pine needle scale  
pine webworm  
eriophyid mites

### Fraser Fir

balsam woolly adelgid  
aphids  
spruce mite  
eriophyid mites  
balsam twig aphid  
Cryptomeria scale  
Elongate Hemlock Scale

### Norway Spruce

white pine weevil  
eastern spruce gall adelgid

aphids  
pine needle scale  
sawflies  
eriophyid mites  
spruce mite

### Red Pine

pine tip moth  
sawflies  
pine root collar weevil  
pales weevil  
eastern pine weevil  
white pine aphid

### Scotch Pine

pine tip moth  
pine needle scale  
pine tortoise scale  
pine bark adelgid  
sawflies  
pales weevil  
eastern pine weevil  
pine webworm  
aphids  
spittlebug  
woolly pine scale

### Virginia Pine

Virginia pine sawfly  
pine tip moth  
pales weevil  
pine webworm

### White Fir

aphids

### White Spruce

spruce mite  
white pine weevil  
sawflies  
aphids

## ■ Fraser Fir Scouting Schedule for Insects and Mites

### SCOUTING AND CONTROL NOTES

(Specific chemical recommendations are in the following sections.)

**Bagworm:** *Scouting:* January: Look for overwintering bags. *Cultural Control:* Pick off and destroy bags in the fall and winter. Bags can be destroyed by dropping them in a can of kerosene or burying them at least 6" deep. *Chemical Control:* It is important to treat in mid-June when the larvae are small and susceptible to insecticides. Larger larvae with bags are not easily controlled. See the most recent Virginia Pest Management Guide for insecticides labeled for control of bagworms. *Biological Control:* Spraying with *Bacillus thuringiensis* (*Bt*, Dipel, Thuricide, etc.) in early to mid-June should give satisfactory control.

**Spruce Spider Mite:** *Scouting:* Start scouting in mid- April and continue scouting once a month until the first heavy frost. Walk through the plantation in a Z or W pattern. Pick a tree at random once every 50 feet. Check the shoot for mites or mite damage; you may need a 10X hand lens to see the mites. You should be examining at least 15 shoots per acre. Carry a sheet of paper with two columns marked to record the total number of shoots sampled and the total number of shoots with mites. The presence of damage alone is not enough; record it as positive if you find the mites or mite eggs. Based on research in North Carolina that is applicable to Virginia, the economic threshold is based on the size of the tree. On trees less than waist high, treat if the percentage of shoots with mites exceeds 40%. On trees waist high to year before sale, treat if the percentage of shoots with mites exceeds 20%. On trees at the year of sale, treat if the percentage of shoots with mites exceeds 10%. Use these guidelines for determining when to come back and sample again. If no mites or eggs are observed then return in 6-8 weeks. If less than 10% of the shoots have mites or eggs return in 4-5 weeks. If more than 10% of the shoots have mites or eggs return in 2 weeks. If there are more than 10 days of hot, dry weather check the trees sooner. *Cultural Control:* Avoid having bare earth under trees as this will reduce the number of predators on the tree and increase the number of Spruce Spider Mites. *Mechanical Control:* None known. *Chemical Control:* See Fact Sheet 444-235 for more detail.

**Balsam Twig Aphid:** *Scouting:* Start in early April to determine the amount of damage present. Walk through the field in a Z or W pattern. Scouting for Balsam Twig Aphid can be done at the same time as the Spruce Spider Mite scouting. Threshold for Christmas Tree Growers: Treat only if the trees are within 2 years of harvest. If more than 10% of the trees have at least one damaged twig then consider treating. The amount of damage an individual grower/buyer will tolerate is variable as some buyers consider a small amount of twig damage good because the upturned needles give the tree a silvery appearance. This may take a number of seasons of working with buyers to perfect how much damage you can leave and still not reduce your price. *Mechanical Control:* None known. *Cultural Control:* Maintain the trees in good growing condition and trees

should continue to vigorously grow even with populations of Balsam Twig Aphid present. *Chemical Control:* Treat between mid- April and bud break. If you wait until after bud break, it is too late for control this season and you should postpone treatment until next year. See Fact Sheet 444-228 for more detail.

**Balsam Woolly Adelgid (BWA):** *Scouting:* The best time to scout is in July as the adelgids are covered with a white cottony wax and are easily observed. In the winter they are much smaller and lack the woolly covering making them much harder to see. Look also for the trees that are flattening out on the top or have a crooked leader; this is early damage from the BWA. Walk through the field in a Z or W pattern. Threshold for Christmas Tree Growers: Treat the entire block if an infestation is found. *Mechanical Control:* If only one or two infested trees are found, wrap the infested trees in a tarp and cut down and remove. You will still need to spot spray the surrounding trees. *Cultural Control:* Avoid excess use of nitrogen fertilizer. **Chemical Control:** See Fact Sheet 444-233 for more detail.

**White Grubs:** *General Comment:* White grubs are seldom a problem on plantations where a grass strip is maintained between the trees. Scouting should be performed in areas where new trees are to be planted or where yellowing or slow growth occurs on established trees. *Scouting:* Check especially in areas where trees are yellowing or not growing. Look also in areas with poor grass growth or where polecats or foxes are digging up grubs. In June lift up 1-foot-square sections of sod, five sites per 2 acres. Threshold for Christmas Tree Growers: Treat if you find on average more than 1 grub per hole and you have damage. *Mechanical Control:* None known. *Cultural Control:* Maintain as much grass growing between the trees as possible as the white grubs prefer to feed on grass roots and only move to tree roots when nothing else is available. *Chemical Control:* Treat with Diazinon or Oftanol in the same manner you would treat a lawn. See Table 8.2 - Soil Insect, Pests of Forestry and Christmas Trees: Insecticide Recommendations for Fraser Fir Seedbeds and Liner Beds.

**Table 8.6 - Fraser Fir Scouting Schedule for Insects and Mites<sup>1</sup>**

Virginia Tech IPM Program - Prepared by Eric R. Day

Pest Problem	Activity	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC
Bagworm	Scouting	Scout											
	Treatment						Treat						
Spruce Spider Mite	Scouting				Scout	(Scout)	(Scout)	(Scout)	(Scout)	(Scout)	(Scout)		
	Treatment					Spray				Spray			
Balsam Twig Aphid	Scouting				Scout	Scout							
	Treatment				Treat								
White Grubs	Scouting						Scout						
	Treatment								Treat				
Balsam Woolly Adelgid	Scouting							Scout					
	Treatment							Treat					

<sup>1</sup>Modified in part from Fraser Fir IPM by Dr. Jill Sidebotton, N.C. Cooperative Extension

## ■ Spruce Scouting Schedule for Insects and Mites

### SCOUTING AND CONTROL NOTES

(Specific chemical recommendations are in the following sections.)

**Bagworm:** *Scouting:* January: Look for overwintering bags. *Cultural Control:* Pick off and destroy bags in the fall and winter. Bags can be destroyed by dropping them in a can of kerosene or burying them at least 6" deep. *Chemical Control:* It is important to treat in mid- June when the larvae are small and susceptible to insecticides. Larger larvae with bags are not easily controlled. *Biological Control:* Spraying with *Bacillus thuringiensis* (*Bt*, Dipel, Thuricide, etc.) in early to mid-June should give satisfactory control.

**White Pine Weevil (WPW):** *Scouting:* Look for resinous bleeding on terminal leaders in late March or early April to find when adult females are feeding and laying eggs. Check trees also in June to determine which tops are actively infested with WPW. Check for a final time in fall to determine the percent of trees that are infested. Threshold for Christmas Tree Farms and Forestry Plantations: If fall surveys indicate that more than 5% of the trees were infested with WPW the previous season, plan on treating the whole plantation or block. *Mechanical Control:* Prune out and destroy infested tops in late June. Make sure stems are cut below where weevils are feeding. Tops must be cut before the weevils make exit holes and leave. *Cultural Control:* Remove all old unattended stands of white pine and Norway spruce that may be harboring populations of WPW. *Chemical Control:* Treat the terminal leader with a registered insecticide before the buds open. Do not treat the lateral shoots as they are not the infestation point. Apply the insecticide no later than late March or early April. For valuable specimen trees it may be necessary to treat each year. *Remarks:* Repeated terminal dieback caused by WPW can give trees an asymmetrical crooked appearance that is aesthetically pleasing to many people. Often the nice old gnarly pine tree has been given its appearance by repeated attacks by WPW.

**Spruce Spider Mite:** *Scouting:* Start scouting in mid-April and continue scouting once a month until the first heavy frost. Walk through the plantation in a Z or W pattern. Pick a tree at random once every 50 feet. Check the shoot for mites or mite damage; you may need a 10X hand lens to see the mites. You should be examining at least 15 shoots per acre. Carry a sheet of paper with two columns marked to record the total number of shoots sampled and the total number of shoots with mites. The presence of damage alone is not enough; record it as positive if you find the mites or mite eggs. Based on research in North Carolina that is applicable to Virginia, the economic threshold is based on the size of the tree. On trees less than waist high, treat if the percentage of shoots with mites exceeds 40%. On trees waist high to year before sale treat if the percentage of shoots with mites exceeds 20%. On trees at the year of sale, treat if the percentage of shoots with mites exceeds 10%. Use these guidelines for determining when to come back and sample again. If no mites or eggs are observed then return in 6-8 weeks. If less than 10% of the shoots have mites or eggs return in 4-5 weeks. If more than 10% of the shoots have mites or eggs return in 2 weeks. If there are more than 10 days of hot, dry weather check the trees sooner. *Cultural Control:* Avoid having bare earth under trees as this will reduce the number of predators on the tree and increase the number of Spruce Spider Mites. *Mechanical Control:* None known. *Chemical Control:* See Fact Sheet 444-235 for more detail.

**Cooley Spruce Gall Adelgid and Eastern Spruce Gall Adelgid:** *Scouting:* Start scouting in April and look for small tufts of cotton like material at the base of buds. Look again in August and September to determine when the galls have opened up. Threshold for Christmas Tree Farms: Treat when 5% of the trees have ten or more galls; spot spraying may work with smaller infestations. *Cultural Control:* Avoid planting Douglas-fir within 500 yards of Norway Spruce. *Mechanical Control:* None known. *Chemical Control:* Treat with dormant oil in February or March. In severe cases treat with an insecticide in August or September just as the galls turn from brown to green and small openings are created for the adelgids to exit. Treatments can also be applied in April but this is trickier as it needs to be done when the small adelgid is feeding at the base of the needle just before the gall is formed. The adelgids will be covered with a small tuft of wax.

Pest Problem	Activity	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC
Bagworm	Scouting	Scout											
	Treatment			Pick			Spray						Pick
Cooley Spruce Gall Adelgid and Eastern Spruce Gall Adelgid	Scouting				Scout				Scout	Scout			
	Treatment		Oil	Oil					Treat	Treat			
White Pine Weevil	Scouting			Scout									
	Treatment			Spray			Prune						
Spruce Spider Mite	Scouting				Scout	(Scout)	(Scout)	(Scout)	(Scout)	(Scout)	(Scout)		
	Treatment					Spray				Spray			

## ■ Scotch Pine Scouting Schedule for Insects and Mites

### SCOUTING AND CONTROL NOTES

(Specific chemical recommendations are in the following sections.)

**Bagworm:** *Scouting:* January: Look for overwintering bags. *Cultural Control:* Pick off and destroy bags in the fall and winter. Bags can be destroyed by dropping them in a can of kerosene or burying them at least 6" deep. *Chemical Control:* It is important to treat in mid- June when the larvae are small and susceptible to insecticides. Larger larvae with bags are not easily controlled. See the most recent Virginia Pest Management Guide for insecticides labeled for control of bagworms. *Biological Control:* Spraying with *Bacillus thuringiensis* (Bt, Dipel, Thuricide, etc.) in early to mid-June should give satisfactory control.

**Pine Tortoise Scale:** *Scouting:* Look for darkened patches or branches on the side or top of the tree. Check the twigs and needles for the presence of the scale insects. High populations will cause browned dead shoots. The presence of honeydew (clear sticky droplets) will also indicate scales, but may also be from aphids, so it is important to identify the source. Ants, bees and wasps will feed on the honeydew and their activity may lead you to a scale infestation. Threshold for Christmas Tree Farms and Forestry Plantations: No known threshold but the presence **coupled** with objectionable damage will warrant treatment. Many trees will support low non-damaging populations. The pine needle scale is heavily fed upon by predators and parasites which control it most years. *Mechanical Control:* Remove infested branches or trees and burn. Works best if the infestation is localized. *Cultural Control:* If chronic problems with this scale are not resolved by chemical or mechanical control it is best to switch to non-susceptible hosts such as spruces, firs, hemlock, or white pine. *Chemical Control:* February or March - Treat with dormant oil. June - For severe cases two sprays 10-14 days apart are recommended during crawler emergence early in June. *Remarks:* Check wind break trees for infestation as scales may spread from these trees as new seedlings are set nearby.

**Nantucket Pine Tip Moth:** *Scouting:* March - Look for small copper-colored moths flying from trees when you shake the branches or walk by the tree. At the same time assess the tree for damage from last year. Use a pheromone trap to check for adult activity. *Cultural control:* July - For light infestations, simply shear off the damaged tips containing the insects. Ground beetles, ants and other scavengers should consume the tip moths once on the ground. *Chemical Control:* Late April - Treat with a residual insecticide such as dimethoate; cover all lateral branches and the leader. Additional spray dates: Late-June and Late-August - Treat again with dimethoate if damage is heavy. See Fact Sheet 444-238 for more details.

**Pine Needle Scale:** *Scouting:* Look for the white scales in the fall and winter and note which rows or blocks need treatment. In early May and early July wrap electrical tape, sticky side up, around twigs with high populations of scale. Treat one week after the first reddish-purple crawler is found. This will usually be about mid-May and mid- to late July. Threshold for Christmas Tree Farms and Forestry Plantations: Treat only if stunted growth, yellowing, or unsightly populations of scales are present. *Cultural Control:* Promote vigorous growth, as scales tend to cause more damage in poorly growing trees.

*Chemical Control:* Apply a 2% dormant oil in late March when temperatures are above 45°F. The dormant oil may remove the waxy bloom on the needles and give the trees a dull appearance but this is temporary and will be hidden by the summer's flush of growth. It would be advisable to avoid dormant oils on the year of harvest. Dormant oil is also sold as superior oil or horticultural oil. Malathion or diazinon can be applied one week after the first crawler is found on the tape or in mid-May and late July. Carbaryl (Sevin®) or dimethoate can be used just as the eggs start to hatch, which is indicated as the date the first crawler is found on the tape. It is thought that applications timed for the summer generation are the most effective. *Remarks:* Crawlers are blown about by wind and carried inadvertently by birds. Adult scales do not have wings and this is the only way pine needle scales are moved about.

**Sawflies:** Scouting and Thresholds for All Sawflies: Check the upper sections of pine tree for colonies of sawflies on the tips of lateral branches or on the leader. Spot treat where you find them or treat the whole block if more than 5% of the trees are infested. *Mechanical Control:* Cut off and destroy infested branches. Dip sawflies in kerosene or bury 6" deep. *Cultural Control:* Avoid susceptible hosts; replant with spruce or white pine, which are less frequently attacked by sawflies. *Chemical Control:* Spot spray as you find colonies feeding. One method is to carry a small sprayer on the mower and stop and spray as you find the sawflies. Be sure to avoid having the tractor exhaust discharging on a nearby tree as you spray as it may burn a spot. If a whole block needs treatment, a mist blower or back-pack sprayer will work well.

**Pine Spittle Bug:** Scouting and Thresholds for Pine Spittlebug: In May through early July look for spittle masses on shoots and trunk and for dead and yellow twigs. From mid- June look for oval-shaped adults which will not have a spittle mass. Check trees of all ages in May and June. A small number of spittle masses indicate low population and little threat. If there are a large number of masses check the plantation again in the fall for dead shoots. If dead shoots are present in the fall plan to treat the next season. *Cultural Control:* Maintain trees in the best possible growing condition. Avoid planting the wrong tree in the wrong spot. Consult guides or enlist help from your local county forester on which trees are best suited for your farm or site. Vigorously growing trees rarely suffer damage from spittlebugs. Plant trees that are resistant to Diplodia tip blight. Two- and three-needle pines, such as Austrian pine, tend to have more problems with Diplodia. *Chemical Control:* Control spittlebugs by spraying for the adults about mid- July. To determine the best timing check spittle masses once a week starting in late June. When 95% are empty, usually in mid- July, treat with a registered insecticide. Treat the entire plantation. *Remarks:* Consult the fact sheet if you suspect you have the Saratoga spittlebug, although most growers will have the pine spittle bug.

Table 8.8 - Scotch Pine Scouting Schedule for Insects and Mites													
Virginia Tech IPM Program - Prepared by Eric R. Day													
Pest Problem	Activity	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC
Bagworm	Scouting	Scout											
	Treatment		Pick				Spray					Pick	
Pine Tortoise Scale	Scouting		Scout										
	Treatment		Oil	Oil			Spray						
Nantucket Pine Tip Moth	Scouting			Scout									
	Treatment				Spray		(Spray)	Shear	(Spray)				
Pine Needle Scale	Scouting					Tape		Tape			Scout	Scout	Scout
	Treatment			Oil		Spray		Spray					
Sawflies	Scouting					Scout	Scout	Scout					
	Treatment					Treat	Treat	Treat					
Pine Spittle Bugs	Scouting					Scout	Scout						
	Treatment							Spray					

## White Pine Scouting Schedule for Insects and Mites

### SCOUTING AND CONTROL NOTES

(Specific chemical recommendations are in the following sections.)

**Bagworm:** *Scouting:* January: Look for overwintering bags. *Cultural Control:* Pick off and destroy bags in the fall and winter. Bags can be destroyed by dropping them in a can of kerosene or burying them at least 6" deep. *Chemical Control:* It is important to treat in mid-June when the larvae are small and susceptible to insecticides. Larger larvae with bags are not easily controlled. See the most recent Virginia Pest Management Guide for insecticides labeled for control of bagworms. *Biological Control:* Spraying with *Bacillus thuringiensis (Bt, Dipel, Thuricide, etc.)* in early to mid- June should give satisfactory control.

**Pales Weevil:** *Scouting:* In January count the number of stumps and determine if digging the stumps or spraying the stumps is the method of control. The other time to scout is in late summer and early fall on trees that are ready to be harvested. Check for resin covered wounds on small twigs and dead "flagged" twigs. These are places where weevils are feeding. *Mechanical Control:* Dig and remove new stumps where the tree was cut down less than one year ago, "first year stumps". *Cultural Control:* Let Christmas tree land lay fallow for one or two years before replanting and don't interplant new trees near stumps. *Chemical Control:* Purchase treated seedlings only; this will protect seedlings from pales weevil damage and more importantly will protect young trees from being infected with procerum root disease by the weevils. If you are interplanting seedlings next to stumps treat the stumps in February or March with Asana. These two pesticides can be mixed with diesel fuel or kerosene to increase their penetration into the bark. **See Fact Sheet 444-229 for more information.**

**White Pine Weevil (WPW):** *Scouting:* Look for resinous bleeding in late March or early April to find when adult females are feeding and laying eggs. Check trees also in June to determine which tops are actively infested with WPW. This can be indicated by a curled leader. Check for a final time in fall to determine the percent of trees that are infested. *Threshold for Christmas Tree Farms and Forestry Plantations:*

If fall surveys indicate that more than 5% of the trees were infested with WPW the previous season, plan on treating the whole plantation or block. *Mechanical Control:* Prune out and destroy infested tops in late June. Make sure stems are cut below where weevils are feeding. Tops must be cut before the weevils make exit holes and leave. *Cultural Control:* Remove all old unattended stands of white pine and Norway spruce that may be harboring populations of WPW. *Chemical Control:* Treat the terminal leader with a registered insecticide before the buds open. Do not treat the lateral shoots as they are not the infestation point. Apply the insecticide no later than late March or early April. For valuable specimen trees it may be necessary to treat each year. Consult the latest Virginia Pest Management Guide for current labeled insecticides. *Remarks:* Repeated terminal dieback caused by WPW can give trees an asymmetrical crooked appearance that is aesthetically pleasing to many people. Often the nice old gnarly pine tree has been given its appearance by repeated attacks by WPW.

**Pine Bark Adelgid:** *Scouting:* Check for the white cottony wax on the trunk and twigs. Look for abnormal abundant bud formation that gives the top of the tree a bushy broom like appearance. A profusion of twigs on the top of the tree is sometimes called witch's brooming. Threshold for Christmas Tree Farms and Forestry Plantations: This is rarely a pest and it is uncommon to have damage. If adelgids are present and more than 5% of tops are witch's broomed consider treating with an insecticide or oil. *Cultural Control:* Avoid applying excess nitrogen as this has been shown to increase populations of sucking insects on pines. Switch to a different species of tree other than white pine. *Mechanical Control:* None known. *Chemical Control:* Apply dormant oil at a 2% rate in March; this may temporarily slightly discolor the foliage but this will be covered by the summer flush of growth. Applications of a registered insecticide in May can be made instead for good control. *Remarks:* Try to educate your buyers that this is a mostly harmless pest that is found everywhere including yard trees.

**Needle Sheath Mite:** *Scouting:* Check trees in March by checking 10 needle bundles on 10 trees randomly selected in each block. Pull open the needles and look with a 10X hand lens at the base for small pale mites. In addition to the mites you will probably see yellowing and stippling, particularly on the south side of the tree. It takes practice to

observe the mites and if you are not sure of what you are finding a sub-sample of 10 needle bundles may be submitted to the Insect Identification Laboratory through your county extension agent. Threshold for Christmas Tree Farms and Forestry Plantations: If damage and mites are present it is advised to treat. *Cultural Control:* Switch to a different species of tree other than white pine. *Mechanical Control:* None known. *Chemical Control:* Treat with carbaryl (Sevin®) or dormant oil in March or April.

**Pine Needle Scale:** *Scouting:* Look for the white scales in the fall and winter and note which rows or blocks need treatment. In early May and early July wrap electrical tape, sticky side up, around twigs with high populations of scale. Treat one week after the first reddish-purple crawler is found. This will usually be about mid-May and mid-to late July. Threshold for Christmas Tree Farms and Forestry Plantations: Treat only if stunted growth, yellowing, or unsightly populations of scales are present. *Cultural Control:* Promote vigorous growth, as scales tend to cause more damage in poorly growing trees. *Chemical Control:* Apply a 2% dormant oil in late March when temperatures are above 45°F. The dormant oil may remove the waxy bloom on the needles and give the trees a dull appearance but this is temporary and will be hidden by the summer's flush of growth. It would be advisable to avoid dormant oils on the year of harvest. Dormant oil is also sold as superior oil or horticultural oil. After the first crawler is found on the tape or in mid- May and late July, an insecticide can be applied. It is thought that applications timed for the summer generation are the most effective. *Remarks:* Crawlers are blown about by wind and carried inadvertently by birds. Adult scales do not have wings and these are found on the tape.

**Pine Spittle Bug:** *Scouting* and Thresholds for Pine Spittlebug: In May through early July look for spittle masses on shoots and trunk and for dead and yellow twigs. From mid- June look for oval shaped adults which will not have a spittle mass. Check trees of all ages in May and June. A small number of spittle masses indicate low

population and little threat. If there are a large number of masses check the plantation again in the fall for dead shoots. If dead shoots are present in the fall, plan to treat the next season. *Cultural Control:* Maintain trees in the best possible growing condition. Avoid planting the wrong tree in the wrong spot. Consult guides or enlist help from your local county forester on which trees are best suited for your farm or site. Vigorous growing trees rarely suffer damage from spittlebugs. Plant trees that are resistant to Diplodia tip blight. Two- and three-needle pines, such as Austrian pine, tend to have more problems with Diplodia. *Chemical Control:* Control spittlebugs by spraying for the adults about mid- July. To determine the best timing, check spittle masses once a week starting in late June. When 95% are empty (adults are exposed outside the spittlemass), usually in mid- July, treat with a registered insecticide. Treat the entire plantation. *Remarks:* Submit a sample to the insect ID lab if you suspect you have the Saratoga spittlebug, although most growers will have the pine spittle bug.

**White Pine Aphid:** *Scouting* and Thresholds for Christmas trees: Check for sooty mold and yellowing in October to determine which areas of the planting have this aphid as it tends to occur in clumps and field edges. This aphid is more common on the upper sections of the tree. Fall scouting is important for finding populations on trees about to be harvested to insure that aphids will not emerge on trees that are brought indoors. In May and June again scout for the aphids and mark trees for spot spraying or spray entire blocks if more than 5% of the trees are infected. *Cultural Control:* Avoid applying excess nitrogen as this has been shown to increase populations of sucking insects on pines. *Mechanical Control:* None known. *Chemical Control:* Treat with insecticidal soap or a registered insecticide in May or whenever you find the aphids. *Remarks:* This is the aphid that customers complain about when they find small black insects crawling on the tree and decorations.

**Table 8.9 - White Pine Scouting Schedule for Insects and Mites**  
Virginia Tech IPM Program - Prepared by Eric R. Day

Pest Problem	Activity	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC
Bagworm	Scouting	Scout											
	Treatment		Pick				Spray					Pick	
Pales Weevil	Scouting	Scout							Scout	Scout			
	Treatment		Spray										
White Pine Weevil	Scouting			Scout			Scout				Scout		
	Treatment			Spray			Prune						
Pine Bark Adelgid	Scouting			Scout									
	Treatment			Oil		Spray	Spray						
Needle Sheath Mite	Scouting			Scout									
	Treatment			Oil or spray									
Pine Needle Scale	Scouting					Tape		Tape			Scout	Scout	Scout
	Treatment			Oil		Spray		Spray					
Pine Spittle Bugs	Scouting					Scout	Scout						
	Treatment							Spray					
White Pine Aphid	Scouting					Scout	Scout			Scout			
	Treatment					Spray	Spray						



Table 8.10 - Recommended Control		
Insect	Name	Remarks
<b>Adelgids</b> balsam woolly adelgid	Bifenthrin Dinotefuran Esfenvalerate (Asana) Imidacloprid Mineral oil Potassium laurate	Treat in June or when found May-October. Spray bark and foliage to runoff. If infested trees are few and scattered, rogue and burn, and spray trees in a 20 ft diameter circle around rogued tree. When removing infested tree wrap in a tarp so no adelgids fall off as the tree is removed from the field.
<b>Adelgids</b> pine bark adelgid	Carbaryl (Sevin) Chlorpyrifos (Dursban) Dimethoate Endosulfan Mineral oil Dormant oil	Treat in May for crawlers. Strong spray streams help to penetrate cottony masses. Spray bark to runoff including twigs and small branches. Insecticidal soap is also registered for adelgids.
		Oil may remove "bloom" from needles; apply as dormant spray before buds swell.
<b>Adelgids</b> spruce gall adelgid	Carbaryl (Sevin) Chlorpyrifos (Dursban)	Treat after galls have turned brown and opened in late August and September. Timing is more critical in spring: Treat before cottony egg masses appear at bases of buds or before new growth forms needles and bud scales have dropped, which is usually in April.
	Dormant oil	Oil may remove "bloom" from needles; do not use on blue spruce. Apply as dormant spray before buds swell.
<b>Aphids</b> White pine aphid, spotted pine aphid, balsam twig aphid, spruce aphid	Bifenthrin Carbaryl (Sevin) Chlorpyrifos (Dursban) Dinotefuran Esfenvalerate (Asana) Gamma-cyhalothrin Imidacloprid Lambda-Cyhalothrin Mineral oil Dormant oil Potassium laurate Pymetrozine Spirotetramat Thiamethoxam	Aphids are often on scattered individual trees, not all trees. Ants active on trees indicate those infested. Treat when aphids are first seen and before colonies enlarge. May appear at any time in the growing season. Provado should be applied at 4.0-8.0 oz/A. Treat for balsam twig aphid just before bud break or about late April.
<b>Bagworms</b>	Asana, Esfenvalerate, S- Fenvalerate Azadirachtin Bacillus thuringiensis subsp. Kurstaki Beta-cyfluthrin Bifenthrin (Brigade) Carbaryl (Sevin) Chlorantraniliprole Chlorpyrifos (Dursban) Clarified hydrophobic neem oil Cyfluthrin Deltamethrin (K-Othrin) Diazol Diflubenzuron, (Dimilin) Flubendiamide Fluvalinate Gamma-Cyhalothrin Indoxacarb Lambda-Cyhalothrin Larvin, Thiodicarb Malathion Methoxyfenozide Permethrin Pyrethrin Spinosad Spinosyn A Tebufenozide Zeta-Cypermethrin	Treat when bagworms are small in mid-June. The larger the worms, the harder they are to kill. Sevin may cause spruce mite buildup on spruces and firs. Dimilin cannot be used near water bodies. If only a few trees are infested, remove and destroy bags, July-May.

Table 8.10 - Recommended Control (continued)		
Insect	Name	Remarks
<b>Mites</b> spruce spider mite (spruces, firs, cedar)	Acequinocyl Avermectin B1 Azadirachtin Bifenazate Bifenthrin (Brigade, Onyx Pro) Chloropyridazin (Sanmite) Clofentezine Emamectin benzoate Etoxazole Fenbutatin-oxide Gamma-cyhalothrin Hexythiazox Lambda-Cyhalothrin Malathion Dormant oil Potassium laurate Spinosad Spinosyn A Spirodiclofen Spiromesifen	Treat in early May and/or mid- to late September before major buildup occurs, or when present otherwise. Multiple generations are most prolific with cool spring and fall weather. Treat with hexythiazox before mites are present. Some of miticides are sold as mixtures with other products
<b>Mites</b> Eriophyid mites (white pine, spruce, fir)	Avermectin B1 Bifenthrin Carbaryl (Sevin) Fenpyroximate Lime sulfur Milbemectin (A mixture of $\geq 70\%$ Milbemcin A4, & $\leq 30\%$ Milbemycin A3) Mineral oil Dormant oil Pyrethrins Spirodiclofen Spiromesifen Sulfur	Treat in March or April, or when mites are found. They are active in cold weather, spring and fall. Oil sprays may remove needle "bloom."
<b>Mites</b> Rosette bud mites (fraser fir)	Avermectin B1 Fenpyroximate Lime sulfur Mineral oil Sulfur Mixtures of Avermectin B1 & Bifenazate	Treat between the last week of May and the third week of June. Treat 3-5 foot trees when more than 10% have damaged buds.
<b>Pine Tip Moth</b> Nantucket pine tip moth (all 2 and 3 needled pines)	Azinphos-Methyl, Gusathion Bifenthrin (Brigade) Carbaryl (Sevin) Chlorpyrifos (Dursban) Decemthion (Phosmet) Esfenvalerate (Asana) Imidacloprid Permethrin Piperonyl butoxide & Pyrethrins Pyrethrins Spinosyn A	Thoroughly wet all needles and shoots with full coverage spray. Treat in early to late April and repeat 1-2 times at 8-week intervals. Recommend using systemics for the 2nd or 3rd generations, since timing of larval presence is less precise at that time. Systemic: kills larvae in needles and new shoots before they cause serious damage. Full coverage spray of shoots and needles. Contact: kills young and larvae before mining needles and entering shoots. Treat when adults are active, repeat as indicated on the label, before larvae enter shoots.
<b>Pine Webworm</b>	Azadirachtin	Treat for pine webworm (yellow-brown larvae) in July and August; pine false webworm (green sawfly larvae) in May and June. Apply full-coverage spray before nests become enlarged.

Table 8.10 - Recommended Control (continued)		
Insect	Name	Remarks
<b>Sawflies</b> redheaded pine sawfly	Azadirachtin Chlorpyrifos (Dursban) Esfenvalerate (Asana) Imidacloprid Malathion Phosmet Spinosyn A	Treat when larvae first appear, before extensive feeding occurs, May to September. Introduced pine sawfly has two generations, June and August. Redheaded pine sawflies may produce colonies at any time in the summer. BT is site labeled for ornamental pine trees.
<b>Sawflies</b> introduced (European) pine sawfly	Acetamiprid Azadirachtin Chlorpyrifos (Dursban) Deltamethrin (K-othrin) Diazinon Esfenvalerate (Asana) Lambda-Cyhalothrin Malathion Phosmet Spinosad Thiamethoxam	
<b>Scale Insects</b> cryptomeria scale pine needle scale, pine tortoise scale, woolly pine scale elongate hemlock scale	Acetamiprid Azadirachtin Buprofezin Chlorpyrifos (Dursban) Diazinon Dinotefuran Gamma-cyhalothrin Lambda-Cyhalothrin Lime sulfur Malathion dormant oil Permethrin Spirotetramat	Cryptomeria scale should be treated with bifenthrin in May.  Elongate Hemlock Scale: treat with one of the following in June: Safari (dinotefuran) Talus (buprofezin) a mixture of Dimethoate with a synthetic pyrethroid (esfenvalerate or bifenthrin) Dormant oil may be applied in the winter but growers should only expect 75% control  Treat for crawlers of pine needle scale in mid- to late May and/or mid- to late July; pine tortoise scale mid- to late June; and woolly pine scale late June to early July. Use as dormant spray before buds swell. Not fully effective for pine needle scale. Oil spray may remove needle "bloom."
<b>Spotted Lanternfly</b>	Dinotefuran	Spotted lanternfly is not a pest of Christmas trees but may lay eggs on trees if the farm is in the infested zone. Check trees before shipping for Spotted Lanternflies. Growers shipping trees out of the Quarantine zone may be required to get a Spotted Lanternfly Permit, see: <a href="https://www.vdacs.virginia.gov/plant-industry-services.shtml">https://www.vdacs.virginia.gov/plant-industry-services.shtml</a> and see: <a href="https://ext.vt.edu/agriculture/commercial-horticulture/spotted-lanternfly.html">https://ext.vt.edu/agriculture/commercial-horticulture/spotted-lanternfly.html</a>

Table 8.10 - Recommended Control (continued)		
Insect	Name	Remarks
<b>Spittle Bugs</b>	Acetamiprid Asana, Esfenvalerate Azadirachtin Beauveria bassiana Beta-cyfluthrin Bifenthrin (Brigade) Bromchlophos, Dibrom Carbaryl (Sevin) Chlorantraniliprole Chlorpyrifos (Dursban) Clothianidin Cyfluthrin Deltamethrin (K-othrin) Endosulfan Fenpropanate, Danitol Gamma-cyhalothrin Gusathion, Carfene Imidacloprid Lambda-Cyhalothrin Malathion Permethrin Spirotetramat Tall oil fatty acids, potassium salts Thiamethoxam	Treat in mid- July when 95% of spit masses are empty. A strong stream of water will often remove spittle bugs from the tree.
<b>Weevils</b> Pine reproduction weevils, Pales weevil, Eastern Pitcheating weevil. (coifers: feed on first year stumps and the base of recently dead trees as larvae. The adults may feed on live twigs.)	Bifenthrin (for root weevils) Esfenvalerate Imidan Permethrin	In forest plantations, wait one year to replant with seedlings if harvesting took place after June 1. Seedlings are currently treated in nursery beds prior to lifting under SLN registration; foresters and landowners can order seedlings that are already treated. In Christmas tree plantations, stump removal or stump treatment with insecticide (as described below) is recommended. Thoroughly soak stumps and ground surface 1 to 2 ft around stumps or slash prior to mid- march. Apply Imidan as 4% top dip for seedlings prior to planting. Follow label directions. For seedlings: Apply as a full coverage spray to seedlings Immediately after planting. For stumps: Thoroughly soak stumps and ground surface around stumps or slash prior to mid- March. Only stumps or wood cut since previous summer need treatment. Dilute Asana in kerosene.
<b>Weevils</b> Pales weevil	Esfenvalerate (Asana) Permethrin	Apply as a full coverage spray to seedlings immediately after planting. Dilute Asana in water. Thoroughly soak stumps and ground surface 1-2 feet around stumps or slash prior to mid-March. Only stumps or wood cut since previous summer needs treatment. Dilute Asana in kerosene. Dilute permethrin in water.
<b>Weevils</b> White pine weevil	Asana Avermectin B1 Bifenthrin (Brigade) Diflubenzuron (Dimilin) Dinotefuran Emamectin benzoate Imidacloprid	Spray only the main upright leader down to the first branched whorl, prior to April 1-10. Remove and destroy infested shoots before mid- June; do not leave them on the ground.
E-emulsifiable; EC-emulsifiable concentrate; WP-wettable powder; F-flowable; S-sprayable; SP sprayable powder; gal-gallon; pt-pint; lb-pound; tsp-teaspoon; tbsp-tablespoon;		
<sup>1</sup> RESTRICTED-USE insecticide.		
<b>Precautions:</b> Do not allow any insecticides as sprays, drift, or runoff to contaminate bodies of water, streams, or drainage systems. Carbaryl is highly toxic to honey bees. Follow precautionary instructions on labels and use protective equipment wherever specified.		
Equivalentents: 1 lb WP per 100 gal = 1 Tablespoon per gal; 1 pt EC per 100 gal = 1 teaspoon per gal		

# Pests of Forestry and Christmas Trees: Christmas Tree Weeds

Jeffrey F. Derr, Extension Weed Scientist, Hampton Roads AREC

Weed control is considerably more complicated in crops with a long-duration cropping sequence such as Christmas trees. Perennial weeds are not likely to become a serious problem in annual crops since they can be removed either mechanically or chemically after harvest or before planting. Because perennial weeds such as poison ivy, brambles, shrubs, and small tree sprouts cannot be easily removed without serious risk to young Christmas trees, proper site preparation is critical to the long-range management of a tree plantation. After an effective site preparation program has been completed, preemergence herbicides may be used to prevent the re-establishment of annual grasses and broadleaf weeds. The maintenance of a weed-free strip in the planted row will increase tree survival and subsequent growth.

## ■ Sod Suppression in Fraser Fir

An alternative to mowing and/or complete vegetation control is sod suppression using low herbicide rates. The intent is to minimize weed competition while maintaining a groundcover to minimize soil erosion. Sod suppression treatments are generally applied in spring when grass has greened up but prior to budbreak of trees. Reapplication may be needed in mid- to late summer. Potential treatments include glyphosate, glyphosate plus oxyfluorfen, sethoxydim plus oxyfluorfen, and sethoxydim plus oxyfluorfen plus clopyralid. See herbicide labels for specific directions.

## ■ Weed Control in Christmas Trees

Crop	Weed Problem	Chemical Rate/A	Remarks
Preemergence to weeds	Annual grasses and yellow nutsedge	metolachlor 1.2-2.4 lb Pennant Magnum 1.3-2.6 pt	Apply prior to nutsedge and annual grass emergence and prior to bud break. Combine with simazine for greater broadleaf control. For small areas apply 0.5-0.9 fl oz Pennant Magnum/1,000 sq ft.
	Annual grasses, yellow nutsedge, and certain annual broadleaf weeds	dimethenamid 0.98-1.5 lb ai (Tower 6EC 21.0-32.0 fl oz/A)	Apply to established plantings prior to weed emergence or include a postemergence herbicide to control emerged weeds. Can also be applied to new plantings after the soil has settled from rain or irrigation. Apply as a directed spray either prior to bud break or after new growth has hardened. Combine with a preemergence broadleaf herbicide for broader-spectrum control. Use a shielded spray if trees have been in the ground less than one year. For small areas, apply 0.48-0.73 fl oz/1000 sq ft.
	Most annual grasses and certain annual broadleaf weeds	napropamide 4.0-6.0 lb (Devrinol 50DF 8.0-12.0 lb)	Apply prior to weed germination in fall or early spring. Rainfall or irrigation within 2-3 days after application is needed for maximum weed control. Tank mixing with other herbicides such as simazine improves the spectrum of broadleaf weeds controlled. For small areas apply 2.9-4.4 fl oz Devrinol 50DF/1,000 sq ft.
		oryzalin 2.0-4.0 lb (Surflan 4AS 2.0-4.0 qt, Oryzalin 4AS 2.0-4.0 qt)	Apply to established plants (at least two weeks in containers) as a directed spray before weeds emerge. May be tank mixed with other herbicides such as simazine to control a greater spectrum of broadleaf weeds in field grown Christmas trees. Should be applied in the fall or early spring when rainfall is likely to activate the herbicide. For small areas, apply 1.5-2.9 fl oz Surflan 4AS. Oryzalin is currently unavailable so consider other options.
		pendimethalin 2.0-4.0 lb (Pendulum AquaCap 2.1-4.2 qt)	Apply to established plants as a directed spray prior to weed germination and budbreak. For small areas apply 1.6-3.2 fl oz Pendulum AquaCap per 1000 sq ft.
	Most annual grasses and broadleaf weeds	flumioxazin 0.25-0.375 lb (SureGuard 8.0-12.0 oz)	Preemergence and early postemergence action. Apply as a directed spray to dormant trees prior to weed germination or to small emerged weed seedlings. Combine with a labeled postemergence herbicide for control of larger annual weeds or perennials. Can be applied overtop to dormant conifers. For small areas, apply 0.18-0.275 oz/1,000 sq ft.
		flumioxazin 0.21 lb plus pyroxsulfone 0.27 lb (SureGuard Xtra 20 fl oz)	Make only one application per year. Apply as a directed spray to dormant, established Christmas trees.
		indaziflam 0.036-0.075 lb (Marengo 7.5-15.5 fl oz)	Apply to established Christmas trees as a directed spray, ideally when the trees are dormant. Do not exceed 18.5 fl oz/acre/year. Long residual herbicide for preemergence control of many weeds. Include a postemergence herbicide for control of emerged weeds as indaziflam has limited postemergence activity.

Table 8.11 - Herbicides for Weed Control in Christmas Trees (continued)			
Crop	Weed Problem	Chemical Rate/A	Remarks
Preemergence to weeds (continued)	Most annual grasses and broadleaf weeds	oxyfluorfen 1.0-2.0 lb (Goal 2XL 4.0-8.0 pt or Goaltender 2.0-4.0 pt)	Apply as overtop treatment to newly planted or established conifers before bud-break in the spring or after the foliage has hardened off. Preemergence control plus control of small weeds less than 3-4 inches in height. Will injure tender growth if applied after buds break dormancy. For small areas apply 1.5-2.9 fl oz Goal or 7.5-1.5 fl oz GoalTender 2XL/1,000 sq ft.
		pronamide 1.0-2.0 lb (Kerb 50W 2.0-4.0 lb, Kerb SC 2.5-9.5 pt)	Fall application to fir or pine species established one growing season. High rate has given control of quackgrass and other cool-season perennial grasses like fescue, bluegrass and orchardgrass. For small areas, apply 0.7-1.4 oz Kerb 50W or 0.9-3.5 fl oz Kerb SC/1,000 sq ft. RESTRICTED USE.
		simazine 2.0-4.0 lb (Princep 4L 2.0-4.0 qt)	Make application after rainfall has firmed the soil around the roots of Christmas trees and before weeds start to emerge. Simazine may be applied in spring or fall but do not use more than one application of simazine/year or injury may result. Do not use on seedlings less than 2 years of age. For small areas, apply 1.5-2.9 fl oz Princep 4L/1,000 sq ft.
Postemergence to weeds	Certain broadleaf weeds	clopyralid 0.09-0.25 lb (Stinger 1/4-2/3 pt)	Primarily controls legume and composite weeds (clover, vetch, thistles, ragweed, etc.). Use lower rates for small, actively growing weeds. Apply only to trees established at least one year. Can be applied overtop trees.
	Emerged weeds	glyphosate 0.75-3.7 lb ae (Roundup Pro, Roundup ProMax 1.0-3.3 qt, or other labeled formulation; for wiper applications, use 1 part herbicide to 2 parts water; for cut stump treatments, use a 50-100% solution).	For site preparation, apply in strips in the fall prior to planting. Do not disturb treated soil for at least 7 days after treatment. Apply as a directed spray to pine, spruce or fir when trees are not in active growth. Conifers are most tolerant to glyphosate in the fall. Do not allow spray to contact foliage of Christmas trees, especially if earlier applications are made. For small-area application with a hand sprayer, use 2.0 oz/gal of water and lightly wet the foliage. There are other glyphosate formulations available. Check label for application rates.
		glufosinate 0.5-1.5 lb (Finale XL T & O 27-82 fl oz, Cheetah Pro 24-82 fl oz)	Apply as a directed spray, keeping the herbicide off the Christmas tree branches. Contact herbicide with some systemic action. Controls a wide range of annual and perennial weeds. Apply when weeds are small and actively growing. No residual control, add a preemergence herbicide for extended weed control. Ensure complete coverage of weed foliage. For spot application, mix 0.5-3.2 fl oz Finale XL T&O per gal or 0.5-2.0 fl oz Cheetah Pro per gal.
		paraquat 0.63-1.0 lb (Gramoxone SL 2.5 - 4.0 pt + nonionic surfactant 1.0-2.0 pt/100 gal)	Apply as a directed spray for contact kill of annual weeds. For spot application, mix 0.5-3.2 fl oz Finale XL T&O per gal or 0.5-2.0 fl oz Cheetah Pro per gal. Do not allow spray to contact desired foliage. May be combined with other herbicides such as simazine for residual control. For small-area application, use 2/3 fl oz plus 0.5 fl oz spreader sticker/gal of water and lightly wet foliage. Thorough coverage is important. RESTRICTED USE.
		topramezone 0.09 lb (Frequency 4 fl oz + a crop oil concentrate or methylated seed oil at 1% v/v)	Apply as a directed spray for control of many broadleaf and certain grassy weeds. Controls glyphosate-resistant weeds such as horseweed, lambsquarters, and ragweed.
	Annual and perennial grasses	clethodim 0.07-0.24 lb (Envoy Plus 9.0-32.0 fl oz + 1.0% crop oil concentrate)	Apply to actively growing grasses. For spot treatment use a 0.44-0.85 fl oz/gal solution plus 1.0% crop oil concentrate. A repeat application may be required for perennial grasses control.
		fluazifop-P-butyl 0.25- 0.375 lb (Fusilade II 16.0-24.0 fl oz + 0.5 pt nonionic surfactant/25.0 gal)	May be applied overtop of selected trees (see label) but should be used as a directed spray after bud break until new growth hardens. (For spot treatment with hand held sprayers, use 0.75 oz of Fusilade II plus 0.5 oz of surfactant/gal of water) Treat perennial grasses at the following stages of growth: bermudagrass 4-8 inch runners; johnsongrass 12-18 inches tall; quackgrass 3-5 leaves, but not more than 10 inches tall. Apply only to actively growing grasses not under moisture stress. A repeat application may be necessary in 7-14 days on some perennial grasses.

Crop	Weed Problem	Chemical Rate/A	Remarks
Postemergence to weeds (continued)	Annual and perennial grasses (continued)	sethoxydim 0.28-0.47 lb (Segment II 1.5-2.5 pt/A) + 2 pt/A crop oil concentrate or 1.5 pt/A methylated seed oil	May be applied overtop young trees or banded to conserve material. Use lower rates on annual grasses less than 6 inches tall and high rate on taller annual grasses and perennial grasses. Apply only to actively growing grass. Do not use under severe moisture stress. For spot treatment, use use 1.3 fl oz Segment II + 0.6 fl oz COC or 0.5 fl oz MSO per gal. A repeat application may be needed to control perennial grasses.

Herbicide	Fraser Fir	Norway Spruce	Scotch Pine	White Pine
Devrinol	X	X	X	X
Envoy	X	X	X	X
Frequency	X	X	X	X
Fusilade	X	X	X	X
Goal	X	X	X	X
Gramoxone	X	X	X	X
Kerb	X	X	X	X
Marengo	X	X	X	X
Pendulum	X	X	X	X
Pennant	X	X	X	X
Segment	X	X	X	X
Princep	X	X	X	X
Roundup	X	X	X	X
Stinger	X	—	—	X
SureGuard	X	X	X	X
Surflan	X	X	X	X
Tower	X	X	X	X

<sup>1</sup>An "X" indicates the herbicide is labeled for that particular species. Check the product label for a more complete listing of plants and directions for use.

	Devrinol	Goal	Kerb	Pendulum	Pennant	Princep	SureGuard	Surflan	Tower	Marengo
<b>Annual Grasses</b>										
Crabgrass	E	F	F	E	G	F-G	F-G	E	G	E
Foxtails	E	F	F	E	G	G	F-G	E	G	G
Fall panicum	G	F	P	G	G	F-G	—	G	G	G
<b>Annual Broadleaves</b>										
Lambsquarters	G	G	F	G	P	E	E	G	P	F-G
Morningglory	N	F	P	P	N	G	G	P	N	P
Ragweed	F	G	P	N	N	E	E	P	P	F-G
Smartweed	P	G	F	F	P	E	—	P	P	—
<b>Perennial Grasses and Sedges</b>										
Bermudagrass	N	N	P	N	N	N	N	N	N	N
Johnsongrass	P	N	P	P	N	P	N	P	N	—
Fescue	N	N	E	N	N	P	N	N	N	P
Yellow nutsedge	P	N	N	N	G	N	N	N	F-G	N
<b>Perennial Broadleaves</b>										
Poison ivy	N	N	N	N	N	N	—	N	N	—
Blackberry	N	N	N	N	N	N	—	N	N	—
Honeysuckle	N	N	N	N	N	N	—	N	N	—

<sup>1</sup>E = 90% or greater control, G = 75 to 90% control, F = 50 to 75% control, P = slight control, and N = no control.

Table 8.14 - Weed Susceptibilities to Postemergence Herbicides Labeled for Use in Christmas Tree Production <sup>1</sup>								
	Fusilade	Envoy	Frequency	Gramoxone	Segment	Roundup	Stinger	Finale
<b>Annual Grasses</b>								
Crabgrass	E	E	G	E	E	E	N	G
Foxtails	E	E	G	E	E	E	N	G
Fall panicum	E	E	G	E	E	E	N	G
<b>Annual Broadleaves</b>								
Lambsquarter	N	N	G	E	N	E	N	G
Morningglory	N	N	G	E	N	G	N	G
Ragweed	N	N	G	E	N	E	G	G
Smartweed	N	N	G	E	N	E	F	G
Vetch	N	N	-	F	N	P	G	G
<b>Perennial Grasses and Sedges</b>								
Bermudagrass	G	G	F	P	G	G	N	F
Johnsongrass	G	G	-	P	G	G	N	F
Fescue	P-F	F	P	P	F	G	N	F
Yellow nutsedge	N	N	N	P	N	G	N	F
<b>Perennial Broadleaves</b>								
Canada thistle	N	N	-	P	N	G	G	F
Poison ivy	N	N	-	P	N	G	-	F
Blackberry	N	N	-	P	N	G	-	F
Honeysuckle	N	N	-	P	N	G	-	F

<sup>1</sup>E = 90% or greater control, G = 75 to 90% control, F = 50 to 75% control, P = slight control, and N = no control.



# Red Imported Fire Ant Management for Foresters and Loggers

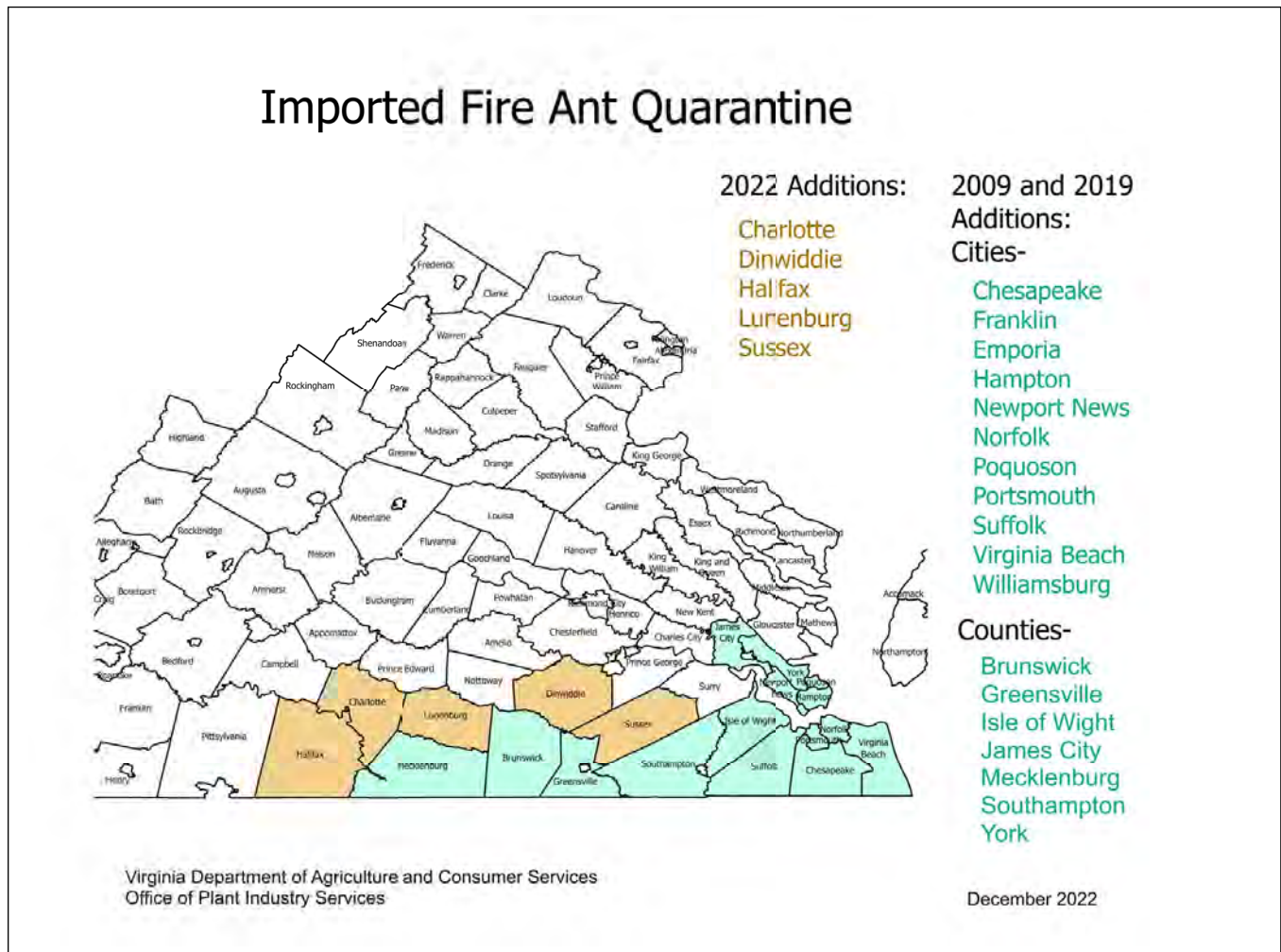
Eric Day, Scott Salom, Lori Chamberlin, Theresa Dellinger, and Katlin DeWitt

This guide is for foresters, woodland owners, and loggers in the Virginia quarantined counties of Brunswick, Greensville, Isle of Wight, James City, Mecklenburg, Southampton, and York and the independent cities of Chesapeake, Emporia, Franklin, Hampton, Newport News, Norfolk, Poquoson, Portsmouth, Suffolk, Virginia Beach, and Williamsburg.

If you suspect a fire ant infestation within the quarantine area, please use caution and contact your local Virginia Cooperative Extension office for identification. If you suspect a fire ant infestation in Virginia outside of the known locations, submit a sample for confirmation to the Insect Identification Laboratory, via your local Virginia Cooperative Extension office.

If you have questions or need a permit because you are moving logs, trucks, or equipment outside of the quarantine area, contact the Virginia Department of Agriculture and Consumer Services (VDACS) Office of Plant Industry Services. Or call 804-786-3515

## Fire Ant Quarantine in Virginia



For information on who needs to have a permit and inspection, please visit: <https://www.vdacs.virginia.gov/plant-industry-services-fire-ant-suppressionand-eradication.shtml>

## ■ Identification of the Red Imported Fire Ant, (RIFA), *Solenopsis invicta*

Several species of native mound ants that are capable of giving painful stings or bites are found in Virginia. The RIFA is an invasive species that has spread throughout the southeastern United States. It is a small red and black ant that is less than ¼ inch long. It has a thin, two-segmented waist and a two-segmented club on the end of each antenna. Its well known stinger is at the end of the abdomen and is retracted inside the body when not in use. For detailed information on distribution, biology and identification, see: <https://www.ento.vt.edu/fireant.html> and [https://www.pubs.ext.vt.edu/tags.resource.html/pubs\\_ext\\_vt\\_edu:fire-ants](https://www.pubs.ext.vt.edu/tags.resource.html/pubs_ext_vt_edu:fire-ants). For a fire ant inspection checklist for loggers, see: [https://www.pubs.ext.vt.edu/content/dam/pubs\\_ext\\_vt\\_edu/ENTO/ento-492/ENTO-492.pdf](https://www.pubs.ext.vt.edu/content/dam/pubs_ext_vt_edu/ENTO/ento-492/ENTO-492.pdf).

If you see red imported fire ants for the first time or suspect you have a new county record, please submit a sample to your local Virginia Cooperative Extension office. Specimens will need to be in a jar with rubbing alcohol. Use caution when collecting a sample and avoid being stung. An easy method is to use a plastic container and while wearing gloves and long sleeves, quickly scoop up some soil from the top of the mound where the ants are active and quickly mix in rubbing alcohol. Make sure not to step on an adjacent mound when sampling.

RIFA mounds are usually located in sunny locations in non-compacted soils. Look for them along fences, next to farm buildings, near electrical boxes, base of trees and stumps, and containerized trees. Ant mounds will be about 6-8 inches tall and about 12 inches in diameter. Fire ant colonies may also be located under crop debris and litter including trash.

### MANAGEMENT IN WOODED AREAS

Fire ants are not normally a problem on established forestry land and do not need to be controlled if no activity is taking place. Fire ants prefer open and sunny locations but are associated with trees when the trunk or base of the tree is exposed to sunlight. Fire ants have been located as well in forest clearings following timber harvests and during site preparation and reforestation operations. Fire ants are rare in shaded woods in part due to high population densities of native ants. For fire ant problems on the interface of housing and woodland areas see the Fire Ant section in the Virginia Pest Management Guide: Home Grounds and Animals.

### BEFORE AND DURING HARVEST

Check along newly established logging roads and edges of loading docks for fire ant mounds. Pay particular attention to the base of trees, fence rows, and on relatively undisturbed soils adjacent to those sites. Soil and sand packed by traffic are not likely to have fire ant mounds.

Insect	Recommended Control	Remarks
Fire Ants (All logging situations in the infested counties)	<p>Step 1, Bait treatment</p> <p>Amdro Pro (hydramethylnon)</p> <p>Extinguish (methoprene)</p> <p>Advion (indoxacarb)</p> <p>Step 2, Mound treatment</p> <p>acephate</p> <p>bifenthrin</p> <p>dinotefuran</p> <p>lambda-cyhalothrin</p> <p>spinosad</p>	<p>Timing of treatment: Apply when worker ants are actively looking for food, usually in late afternoon or in the evening. To test, put a small pile of bait next to a mound and see if the ants find it within 30 minutes.</p> <p>Baits: Use fresh bait, preferably from an unopened container.</p> <p>Apply when the ground and grass are dry and no rain is expected for the next 24 to 48 hours.</p> <p>Apply baits with hand-held seed spreaders. Don't apply baits mixed with fertilizer or seed.</p> <p>Baits can be applied anytime during the warm season but fire ants in Virginia have peak activity in late summer. Re-apply baits once or twice a year depending on the situation.</p> <p>Step 2 Treat problem mounds that still have ants with a labeled contact insecticide</p>

### SPECIAL INFORMATION FOR DRIVERS MOVING LOGS AND EQUIPMENT FROM SITES IN THE QUARANTINE ZONE.

Logs, plant material, soil, and the vehicles that move material are potential carriers of live fire ants. Conveyances (logging trucks, trailers and equipment) may pick up soil on any part of their structure during the course of operations, and this soil may contain RIFA. It is important to check for clumps of soil trapped on the truck or skidder before it leaves the site.

#### Regulated articles that may be moved by loggers

Under the terms of the Virginia Fire Ant Quarantine, articles that are capable of transporting the red imported fire ant (regulated articles) are prohibited from moving out of the quarantined area unless certified as free of RIFA. Individuals who plan to move regulated articles out of the quarantined area should Contact VDACS' Office of Plant Industry Services to determine options for certifying regulated articles as free of red imported fire ants.

**What is regulated?**

Regulated articles include, but are not limited to:

- Any life stage of red imported fire ant
- Soil, except soil shipped in original containers after commercial preparation
- Plants with roots with soil attached and rhizomes with soil attached
- Grass sod
- Used soil-moving equipment unless free of all non-compacted soil
- Used farm equipment, unless free of all non-compacted soil
- Pine straw stored in direct contact with the ground or harvested from infested counties
- Logs and pulpwood with soil attached

**Before the truck or equipment arrives at the site**

In order to avoid delays, check with VDACS prior to picking up logs from a site in the quarantine area (Brunswick, Greenville, Isle of Wight, James City, Mecklenburg, Southampton, and York and the independent cities of Chesapeake, Emporia, Franklin, Hampton, Newport News, Norfolk, Poquoson, Portsmouth, Suffolk, Virginia Beach and Williamsburg). A compliance agreement may be required.

**Parking or moving about on the site**

- Park on pavement or hard packed soil away from any visible fire ant mounds.
- Check where vehicles are parked overnight, as fire ants may move their nest over a few hours.
- Treat fire ant mounds anywhere vehicles are parked.

**Leaving the site**

Inspect the truck before beginning your trip even if it has been on site for only a short period of time. The business owner is responsible for getting the cargo inspected and giving you a copy of the permit before you leave the quarantine area. To obtain a permit, the business owner should contact VDACS (Office of Plant Industry Services. Or call 804-786-3515).

Insect	Recommended Control	Remarks
Fire Ants (Trucks, skidders, loaders, and other conveyances that can carry soil)	Sweep or powerwash soil from all vehicles, trailers, and equipment that is moved from a logging operation in an infested county. Set aside an area to clean conveyances.	Trailer landing gear, outriggers, and loaders all have the potential to carry soil infested with fire ants. Conveyances are defined as skidders, loaders, trucks, trailers, and any other equipment that can potentially move soil with fire ants.  Truckers should consult the USDA brochure entitled Truckers: Don't Let Imported Fire Ants Hitch a Ride at <a href="https://www.aphis.usda.gov/plant_health/plant_pest_info/fireants/downloads/ifa-truckers-brochure.pdf">https://www.aphis.usda.gov/plant_health/plant_pest_info/fireants/downloads/ifa-truckers-brochure.pdf</a>

**Post harvest**

Fire ants can be common after harvest with nests at the base of remaining trunks. If replanting is planned, control may be necessary to protect the tree planting crews. Monitor site prior to planting and treat as needed using the two-step method. Planting equipment will need to be checked for soil and possible fire ants before being removed from the site. See table above on how and when to treat fire ants.

