

## Christmas Tree Insects

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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" produced by the U.S. Forest Service 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 not only are ineffective and a waste of time, materials, and labor, but 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.

|                                |                             |                         |                      |
|--------------------------------|-----------------------------|-------------------------|----------------------|
| <b>Balsam Fir</b>              | white pine aphid            | sawflies                | pine webworm         |
| balsam woolly adelgid          | pine bark adelgid           | eriophyid mites         | aphids               |
| aphids                         | sawflies                    | spruce mite             | spittlebug           |
| balsam twig aphid              | bagworm                     | <b>Red Pine</b>         | woolly pine scale    |
| <b>Blue (and Sitka) Spruce</b> | pine needle scale           | pine tip moth           | <b>Virginia Pine</b> |
| spruce mite                    | pine webworm                | sawflies                | Virginia pine sawfly |
| white pine weevil              | eriophyid mites             | pine root collar weevil | pine tip moth        |
| sawflies                       | <b>Fraser Fir</b>           | pales weevil            | pales weevil         |
| aphids                         | balsam woolly adelgid       | eastern pine weevil     | pine webworm         |
| cooley spruce gall adelgid     | aphids                      | white pine aphid        | <b>White Fir</b>     |
| <b>Douglas Fir</b>             | spruce mite                 | <b>Scotch Pine</b>      | aphids               |
| spruce mite                    | eriophyid mites             | pine tip moth           | <b>White Spruce</b>  |
| white pine weevil              | balsam twig aphid           | pine needle scale       | spruce mite          |
| cooley spruce gall adelgid     | <b>Norway Spruce</b>        | pine tortoise scale     | white pine weevil    |
| <b>Eastern White Pine</b>      | white pine weevil           | pine bark adelgid       | sawflies             |
| white pine weevil              | eastern spruce gall adelgid | sawflies                | aphids               |
| pales weevil                   | aphids                      | pales weevil            |                      |
| eastern pine weevil            | pine needle scale           | eastern pine weevil     |                      |

## 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* (B.t., Dipel, Thuricide, etc.) in early to mid June should give satisfactory control.

**Spruce Spider Mite.** *Scouting:* Start scouting in mid-April and continue scouting for 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.

**Table 7.10 - 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 |     |       |     |       |         |         |         |         |         |         |     |     |
| Spruce Spider         | Scouting  |     |       |     | Scout | (Scout) | (Scout) | (Scout) | (Scout) | (Scout) | (Scout) |     |     |
|                       | Treatment |     |       |     |       |         |         |         |         |         |         |     |     |
| Balsam Twig           | Scouting  |     |       |     | Scout | Scout   |         |         |         |         |         |     |     |
|                       | Treatment |     |       |     |       |         |         |         |         |         |         |     |     |
| White Grubs           | Scouting  |     |       |     |       |         | Scout   |         |         |         |         |     |     |
|                       | Treatment |     |       |     |       |         |         |         |         |         |         |     |     |
| 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* (B.t., Dipel, Thuricide, etc.) in early to mid June should give satisfactory control.

**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. 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:*

## 7-14 Low-Management Crops and Areas: Christmas Tree Insects

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.

**Table 7.11 - Spruce 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 |
| Cooley Spruce Gall Adelgid and Eastern Spruce Gall Adelgid | Scouting  |       | Scout | Scout |       |         |         |         |         |         |         |     |      |
|  | Treatment |       | Treat | Treat |       |         |         |         |         |         |         |     |      |
| White Pine Weevil  | Scouting  |       |       | Scout |       |         |         |         |         |         |         |     |      |
|  | Treatment |       |       | Spray |       | Prune   | 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* (B.t., 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. *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.

## 7-16 Low-Management Crops and Areas: Christmas Tree Insects

**Table 7.12 - 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  |       |       |       | Scout |       |         |       |         |      |     |      |     |
|                         | Treatment |       |       |       |       | 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* (B.t., 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. 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, 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 aphids 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.

7-18 *Low-Management Crops and Areas: Christmas Tree Insects*

**Table 7.13 - 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 | Spray |              |       |       |       |       | Scout   | Scout |     |      |     |
|                    | Treatment |       |       |              |       |       |       |       |         |       |     |      |     |
| White Pine Weevil  | Scouting  |       |       | Scout        |       |       |       |       |         |       |     |      |     |
|                    | Treatment |       |       | Spray        |       | Prune | Prune |       | (Spray) |       |     |      |     |
| Pine Bark Adelgid  | Scouting  |       |       | Scout        |       |       |       |       |         |       |     |      |     |
|                    | Treatment |       |       | Oil          |       | Spray | Spray |       |         |       |     |      |     |
| Needle Sheath Mite | Scouting  |       |       | Scout        |       |       |       |       |         |       |     |      |     |
|                    | Treatment |       |       | Oil or spray |       |       |       |       |         |       |     |      |     |
| Pine Needle Scale  | Scouting  |       |       |              | Scout |       |       |       |         |       |     |      |     |
|                    | Treatment |       |       |              |       | Spray | Spray |       |         |       |     |      |     |
| Pine Spittle Bugs  | Scouting  |       |       |              |       | Scout | Scout |       |         | Scout |     |      |     |
|                    | Treatment |       |       |              |       |       |       | Spray |         |       |     |      |     |
| White Pine Aphid   | Scouting  |       |       |              |       | Scout | Scout |       |         | Scout |     |      |     |
|                    | Treatment |       |       |              |       | Spray | Spray |       |         |       |     |      |     |

**Table 7.14 - Recommended Control**

| Insect  | Name                        | Formulation | Amt/100 Gal             | Amt/3 Gal | Remarks   |
|---|-----------------------------|-------------|-------------------------|-----------|---|
| <b>Adelgids</b><br>balsam wooly adelgid<br>(Fraser, balsam fir) | <b>Asana XL<sup>1</sup></b> | 0.66 EC     | 0.5 pt                  | 0.5 tbsp  | Treat in June or when found May to 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 trees wrap it in a tarp so no adelgids fall off as the tree is removed from the field. |
|   | Bifenthrin                  | 7.9% EC     | 5.4-43.5 oz/100 gallons | see label |   |
|   | Permethrin                  | 38.4%       | see label               | see label |   |
|   | Imidacloprid                | see label   | see label               | see label |   |
|   | Asana                       | see label   | see label               | see label |   |
|   | Lorsban                     | see label   | see label               | see label |   |
|   | Metasystox-R                | see label   | see label               | see label |   |

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.

**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 honey bees. Follow precautionary instructions on labels and use protective equipment wherever specified.

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

**Table 7.14 - Recommended Control (cont.)**

| Insect   | Name                | Formulation | Amt/100 Gal | Amt/3 Gal    | Remarks  |
|--|---------------------|-------------|-------------|--------------|--|
| pine bark adelgid  | Diazinon            | 2E          | 1.0 qt      | 2.0 tbsp     | 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.  |
|  | Carbaryl (Sevin SL) | various     | see label   | see label    |  |
|  | Thiodan             | 3E          | 1.3 pts     | 4.0 tsp      |  |
|  | Imidacloprid        | see label   | see label   | see label    |  |
|  | Dormant Oil         | various     | 2.0 gal     | 1.0 cup      |  |
| <b>Adelgids (cont.)</b><br>spruce gall adelgids  | Carbaryl (Sevin SL) | 4 Liq.      | 1.0 qt      | 2.0 tbsp     | 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.   |
|  | Diazinon            | 2E          | 1.0 qt      | 2.0 tbsp     |  |
|  | Insecticidal soap   |             |             |              |  |
|  | Lindane             | 20% EC      | 3.0 qt      | 6.0 tbsp     |  |
|  | Malathion           | 57% EC      | 1.5 pt      | 4.5 tsp      |  |
|  | Thiodan             | 3E          | 1.3 pt      | 40.0 tsp     |  |
|  | Dormant oil         |             | 2.0 gal     | 1.0 cup      |  |
| <b>Aphids</b><br>white pine aphid,<br>spotted pine aphid,<br>balsam twig aphid,<br>spruce aphid. | Dimethoate          | 2E          | 2.0 qt      | 4.0 tbsp     | 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 4-8 oz/A. Treat for balsam twig aphid just before bud break or about late April. |
|  | Diazinon            | various     | see label   | see label    |  |
|  | Insecticidal soap   | -           | 2.0 gal     | 1 cup        |  |
|  | Lorsban             | -           | see label   | see label    |  |
|  | Malathion           | 57% EC      | 1.5 pt      | 4.5 tsp      |  |
|  | Mavrik              | 2 Aqua      | 0.33 lb     | 1.0 tsp      |  |
|  | Orthene             | 75 WP       | 0.33 lb     | 1.0 tbsp     |  |
|  | Provado             | 1.6         | see label   | see label    |  |
|  | Talstar             | 10 WP       | 0.5-1 lb    | 1.5-3.0 tbsp |  |

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.

**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 honey bees. Follow precautionary instructions on labels and use protective equipment wherever specified.

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

7-20 *Low-Management Crops and Areas: Christmas Tree Insects*

**Table 7.14 - Recommended Control (cont.)**

| Insect   | Name                                 | Formulation  | Amt/100 Gal | Amt/3 Gal    | Remarks   |
|--|--------------------------------------|--------------|-------------|--------------|---|
| <b>Bagworm</b>   | <i>B.t.</i> (Dipel, Thuricide, etc.) | various      | see label   | see label    | 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. If only a few trees are infested, remove and destroy bags, July through May. |
|  | Carbaryl (Sevin SL)                  | 4 Liq.       | 1.0 qt      | 2.0 tbsp     |   |
|  | Confirm                              | various      | see label   | see label    |   |
|  | Dimethoate                           | 2E           | 2.0 qt      | 40.0 tbsp    |   |
|  | Diazinon                             | 2E           | 1.0 qt      | 2.0 tbsp     |   |
|  | Malathion                            | 57% EC       | 1.5 pt      | 4.5 tsp      |   |
|  | Mavrik                               | 2 Aqua -> AF | 1.0 pt      | 1.0 tbsp     |   |
|  | Orthene                              | 75 WP        | 0.33 lb     | 1.0 tbsp     |   |
| <b>Mites</b><br>spruce spider mite (spruces, firs, cedar - seldom on pine)   | Avid                                 |              |             |              | 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 Savey before mites are present.       |
|  | Dimethoate                           | 4L           | 0.5-1.0 pt  | 0.5-1.0 tbsp |   |
|  | Di-Syston                            | various      | see label   | see label    |   |
|  | Floramite                            | various      | see label   | see label    |   |
|  | Insecticidal soap                    | -            | 2.0 gal     | 1.0 cup      |   |
|  | Judo                                 | various      | see label   | see label    |   |
|  | Mavrik                               | various      | see label   | see label    |   |
|  | Ornamite                             |              |             |              |   |
|  | Ovation                              |              |             |              |   |
|  | Pentac                               |              |             |              |   |
|  | Sanmite                              |              |             |              |   |
|  | Savey                                |              |             |              |   |
|  | Talstar                              |              |             |              |   |
| Tetrasan   |                                      |              |             |              |   |
|  | Dormant oil                          | 70 sec.      | 1.0-2.0 gal | 0.5-1.0 cup  | Use as dormant treatment before buds swell. Oil sprays may remove needle "bloom" especially on blue spruce.   |
| eriphyid mites (white pine, spruce, fir)   | Carbaryl (Sevin SL)                  | 4 Liq        | 1.0 qt      | 2.0 tbsp     | 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."   |
|  | Dormant oil                          | 70 sec       | 1.0-2.0 gal | 0.5-1.0 cup  |   |
| rosette mite (fraser fir)  | Dimethoate                           | 2 E          | 1-1/3 pints |              | 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.   |
|  | Sanmite                              |              |             |              |   |
|  | Sulfer                               |              |             |              |   |
| <b>Pales Weevil</b> (see weevils)  |                                      |              |             |              |   |
| E-emulsifiable; EC-emulsifiable concentrate; WP-wettable powder; F-flowable; S-sprayable; SP sprayable powder; gal-gal-lon; pt-pint; lb-pound; tsp-teaspoon; tbsp-tablespoon;  |                                      |              |             |              |   |
| <sup>1</sup> <b>RESTRICTED-USE</b> 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. |                                      |              |             |              |   |
| Equivalents: 1 lb WP per 100 gal = 1 Tablespoon per gal; 1 pt EC per 100 gal = 1 teaspoon per gal  |                                      |              |             |              |   |

**Table 7.14 - Recommended Control (cont.)**

| Insect   | Name                         | Formulation | Amt/100 Gal  | Amt/3 Gal    | Remarks  |
|--|------------------------------|-------------|--------------|--------------|--|
| <b>Pine Tip Moth</b><br>Nantucket pine tip moth<br>(all 2 and 3 needled pines, not white pines)  | Dimethoate                   | 2 E         | 2.0 qt       | 4.0 tbsp     | 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. Systemic: kills larvae in needles and new shoots before they cause serious damage.  |
|  | Confirm                      |             |              |              |  |
| NOTE Sevin, Orthene, Mavrik, Dylox, Turcam, Talstar, Dimilin, Permethrin, Imidan, <b>Pounce</b> <sup>1</sup> , <b>Ambush</b> <sup>1</sup> , and <b>Asana XL</b> <sup>1</sup> are also registered for tip moth. See label for dosage rates and number of applications. Di-Syston is labeled for incorporation in soil at planting time. |                              |             |              |              | 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>  | Diazinon                     | 4 E         | 1.0 pt       | 1.0 tbsp     | 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.   |
|  | Mavrik                       | various     | see label    | see label    |  |
|  | Carbaryl (Sevin)             | various     | see label    | see label    |  |
|  | Orthene                      | 75 WP       | 0.33 lb      | 1.0 tbsp     |  |
| <b>Sawflies</b><br>redheaded pine sawfly<br>(Scotch and Virginia pine)   | <b>Asana XL</b> <sup>1</sup> | 66 EC       | 5.8-9.6 pt   | 0.5 tbsp     | 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 |
|  | Dimilin                      |             |              |              |  |
|  | Dursban                      | 4 E         | 0.5 pt       | 0.5 tbsp     |  |
| introduced pine sawfly<br>(white pine, occasionally others)  | Methoxychlor                 | 2 E         | 2.0-3.0 qt   | 4.0-6.0 tbsp |  |
|  | Orthene                      | 75 WP       | 0.33 lb      | 1.0 tbsp     |  |
|  | Carbaryl (Sevin)             | various     | see label    | see label    |  |
|  | Dimilin                      |             |              |              |  |
|  | Dipel ( <i>B.t.</i> )        | various     | see label    | see label    |  |
| <b>Scale Insects</b><br>pine needle scale,<br>pine tortoise scale,<br>woolly pine scale  | Imidan                       |             |              |              | 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.   |
|  | Thuricide ( <i>B.t.</i> )    | various     | see label    | see label    |  |
|  | Lorsban                      | various     | see label    | see label    |  |
|  | Insecticidal soap            | -           | 2.0 gal      | 1.0 cup      |  |
|  | Malathion                    | 57% EC      | 1.5 pt       | 4.5 tbsp     |  |
|  | Orthene                      | 75 SP       | 0.66 lb      | 1.0 tbsp     |  |
|  | Carbaryl (Sevin)             | various     | see label    | see label    |  |
| Talstar  | 10 WP                        | 0.5-1.0 lb  | 1.5-3.0 tbsp |              |  |
|  | Di-Syston                    |             |              |              |  |
|  | Metasystox-R                 |             |              |              |  |

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.

**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 honey bees. Follow precautionary instructions on labels and use protective equipment wherever specified.

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

**Table 7.14 - Recommended Control (cont.)**

| Insect   | Name                                     | Formulation | Amt/100 Gal   | Amt/3 Gal   | Remarks  |
|--|--|-------------|---------------|-------------|--|
|  | Petroleum oil                            | 70 sec      | 3.0 gal       | 1.5 cup     | Use as dormant spray before buds swell. Not fully effective for pine needle scale. Oil spray may remove needle "bloom".  |
| <b>Spittle Bugs</b>  | Carbaryl (Sevin)                         | various     | see label     | see label   | Treat in mid-July when 95% of spit masses are empty.   |
|  | Malathion                                | 57% EC      | 1.5 pt        | 4.5 tbsp    |  |
|  | Acephate (Orthene)                       | 75 WP       | 0.33 lb       | 1 tbsp      |  |
|  | Cyfluthrin (Tempo)                       |             |               |             |  |
|  | Lorsban                                  |             |               |             |  |
|  | Asana                                    |             |               |             |  |
|  | high pressure water without insecticides |             |               |             | A strong stream of water will often remove spittle bugs from the tree.   |
| <b>Weevils</b><br>Pine Reproduction Weevils (pales weevil, Eastern weevil, pitchheating weevil (conifers)) | Imidan                                   | 50 WP       | see label     | see label   | Apply as 4% top dip for seedlings prior to planting. Follow label directions.  |
|  | Asana                                    | 20% EC      | 2.0 qt        | 4.0 tbsp    | Apply as a <b>full coverage spray</b> to seedlings immediately after planting. Dilute Asana in water.  |
|  | Lorsban                                  |             |               |             |  |
|  | Metasystox-R                             |             |               |             |  |
|  | <b>Asana XL</b> <sup>1</sup>             | 0.66 EC     | 5.8-9.6 fl oz | 1.0-2.0 tsp | Thoroughly <b>soak</b> stumps and ground surface 1-2 around stumps or slash prior to mid-March. Only stumps or wood cut since previous summer needs treatment. Dilute Asana in kerosene. |
|  | Lindane                                  | 20% EC      | 2.5 gal       | 0.5 pt      |  |
| White Pine Weevil (Tops of Tree only)  | Dimilin                                  |             |               |             | 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.           |
|  | Asana                                    |             |               |             |  |
|  | Permethrin                               |             |               |             |  |

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.

**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 honey bees. Follow precautionary instructions on labels and use protective equipment wherever specified.

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