

Survey and Monitoring of Fir Christmas Trees to Detect Insects and Diseases and Minimize the Need for Pesticide Applications

Ronald Kelley, Dept. of Forests, Parks and Recreation
29 Sunset Dr., Morrisville, VT 05661

General Monitoring

Periodic examination of Christmas trees throughout the year will help one detect many pests before they become a problem. Late winter and early spring is a good time to begin monitoring because this is usually off-season for many growers and past damage from balsam twig aphid, spruce spider mite and many diseases is usually visible. Early detection of potential problems allows time to deal with them before the next marketing season. It's a good idea to carry pruning shears and plastic flagging during these examinations. Trees of concern can be flagged for later survey or collection of samples. Damaged or diseased shoots or stems can be pruned from the trees. Good records should be kept of monitoring observations and survey results.

Balsam Twig Aphid Survey

A survey for balsam twig aphid **stem mothers** can be conducted in the spring to predict populations on balsam fir before injury occurs. This should be done when buds begin to swell and show green beneath the bud sheath and up until initial budbreak. This survey is best conducted when temperatures exceed 60 degrees F. If colder than that, stem mothers may be resting in protected locations and not easily dislodged. Survey a minimum of 10-30 trees per block, selecting trees scattered throughout. It works well to walk along a diagonal line through the block and sample trees nearest the line of travel. Sampling 30 trees is best if initial aphid counts are low or numbers per tree are highly variable but fewer trees may suffice if populations are high or fairly consistent per tree.

To do this, use a white or black board that is one square foot in size, place the board beneath a mid-crown branch of each selected tree and lightly beat the branch with a stick to dislodge the aphids. Make sure that the end of the branch is over the board. Count and record the number of aphids from each branch, then remove the aphids. Aphids should be light green or whitish. They may be seen walking along on the board but do not rapidly scurry off like some non-target insects. When done, divide the total aphids by the number of trees sampled to determine the average number of aphids per square foot. The following predictions are based on Vermont data gathered over many years.

Predicting population levels based on stem mother surveys:

- (1) If fewer than 1 aphid per square foot, damage is likely to remain light.
- (2) If 1 or more aphids per square foot, there is a potential for moderate to heavy damage to occur.
- (3) If 6 or more aphids per square foot, moderate to heavy damage is likely.

Control for this insect is most important if trees are within 2-3 years of harvest. Cut and Choose customers tend to tolerate more twig aphid damage than wholesale buyers. One study done in the Lake States showed that Cut and Choose customers seldom noticed the damage if fewer than 50% of the shoots were affected.

Surveys for overwintering **eggs** can be conducted if the grower has quality magnification equipment, knows what to look for and needs more lead time. But this survey is less reliable for prediction than the stem mother survey. Terminal shoots are collected during late winter to early spring from just above mid-crown for 30 trees per block. Shoots are examined under good lighting and a magnification of 15 to 20X and number of eggs per shoot recorded.

Predicting population levels based on egg surveys:

- (1) If egg counts are near 0 per shoot for 30 shoots, damage is likely to be light or not noticeable.
- (2) If egg counts average 1 or more per shoot, there is a potential for moderate to heavy damage to occur. It is a good idea to follow this up with a stem mother survey to verify that there are high populations.

Spider Mite Survey

Surveys for spruce spider mites can be conducted using a beating survey similar to that described for balsam twig aphid. This survey should be conducted after eggs hatch in late May to early June. This is usually at 120 to 180 Growing Degree Days or when apples are in bloom. Spider mites show up as little dots about the size of a pin head on the sampling board and stain red when squashed. If mites have been a problem in the past but none are detected during the first survey of the growing season, repeat the survey in another week or two in case hatch was delayed. Mite populations can increase dramatically and produce many generations per year so if mites are present, it may be advisable to resurvey every 2-3 weeks throughout the growing season.

Predicting mite population levels:

If more than 5 mites per square foot, high populations are likely.

Balsam Gall Midge Monitoring

Since populations of balsam gall midge are cyclical, usually about 7 years apart, light damage on scattered individual trees appears before the insect becomes a problem. These initial trees can be identified by careful scouting and flagged as sentry trees to monitor for adult midges or increases in damage in the next year. Most galled needles fall by early winter so damage is most easily detected between mid-summer and the first of October. Since gall midge adults are weak fliers, these initial trees often occur in wind-protected areas such as in low lying areas or near the edge of woods.

Using the sentry trees, monitor these just after bud break for gall midge adults laying eggs. This is best done on a warm day or evening when there is little wind. If multiple midges are seen on individual buds, expect heavy damage. The major biological control is an almost identical good midge that builds up its populations over time and out-competes the gall midge. So near the end of an outbreak, this good midge may be the predominant one observed on buds, yet there is probably no need for control at this point.

Balsam Shootboring Sawfly Survey

Since this insect is heaviest in even years, survey for this pest should be considered for even years when damage during the previous year was heavy enough to be of some concern. Adults can be monitored by hanging yellow 3x5 inch sticky cards in the mid-crowns of sentry trees. Use two branches per tree for a minimum of 5 trees per block. Edge trees are usually preferred. Cards should be placed about mid-April and adults counted periodically till just before budbreak.

Predicting shootboring sawfly damage:

- (1) If an average of 2 or fewer adults per card, expect little damage.
- (2) If 5 or more adults per card, this can result in heavy damage.

Monitoring for Disease

Damage from foliar diseases is best detected during the growing season before infected needles are cast. Needles infected by some fungi can persist for a long time while others do not. Some needles killed by **Rhizosphaera needle blight** will persist through the winter but light current infection will be easiest to detect during mid to late summer. Damage from **fir-fern rust** is most easily detected in July, soon after infected needles turn yellow but before they drop (by the end of summer). Needles killed by **Lirula needlecast** are very persistent and should be visible any time of year. Shoots killed by **Delphinella shoot blight** should be visible most of the year but are most obvious when the recently killed needles are present in mid to late summer. Shoots killed by **Diplodia** persist for a long time but scouting is best done before budbreak, removing infected shoots before they produce spores that can infect new shoots. Witches brooms caused by **yellow broom rust of fir** can also be removed at this time before they produce spores that infect the chickweed alternate host. These witches brooms break bud just before normal balsam fir shoots break, so if brooms are prevalent, scouting at this time is ideal. Scouting for root diseases is best done at any time of the year that one can easily examine roots and root collars to determine the causal organism.