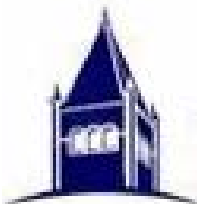


Christmas Tree Pest Manual

NH Pesticide Safety Education Program



UNIVERSITY *of* NEW HAMPSHIRE
Cooperative Extension

This manual was prepared for the New Hampshire Pesticide Safety Education Program as part of the study materials for the Christmas tree category for private and commercial applicators. Private applicators include the traditional farm commodity groups and Christmas tree growers. All applicators that apply pesticides as part of their job on land owned by others must have a commercial license.

Study guides include specific commodity manuals such as this manual and a “core” with materials that all applicators must know. These manuals can be ordered by contacting the UNH Cooperative Extension’s Family, Home & Garden Education Center, 200 Bedford Street, Manchester NH 03101, 603-629-9494. Additional information is available at UNH Cooperative Extension www.extension.unh.edu (search Pesticide Safety Education Program).

This manual is intended to provide information needed to meet the standards of the EPA for pesticide applicator certification and prepare you to take an examination given by the State of New Hampshire, Department of Agriculture. It is not intended to provide you with all the information needed for effective pest control.

For a more thorough treatment of the topic of identifying and controlling insects and diseases in Christmas trees, readers are referred to the *Christmas Tree Pest Manual, second edition* published in 1998 by the USDA Forest Service and Michigan State University Extension (Extension Bulletin E-2676) <http://www.na.fs.fed.us/spfo/pubs/misc/xmastree/index.htm>. The authors of this manual adapted much of the content from that publication.

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Web Sites and Contact Information for Christmas Tree Growers

New England Guide to Chemical Weed and Brush Control in Christmas Trees

<http://extension.unh.edu/Forestry/Docs/NEGTWC.pdf>

Readers are referred to this publication for information about herbicide use in Christmas tree plantations.

To find the location of the UNH Cooperative Extension office in your county:

www.extension.unh.edu Or phone the Family, Home, and Garden Education Center at 1-877-398-4769

For general information on how to grow Christmas trees:

<http://extension.unh.edu/forestry/FORSTEW.htm>

Diagnostic and testing services:

A fee is charged and an application form is required for all samples. See your county Extension office or the websites below. Samples can be taken to UNH or mailed.

Soil testing service:

www.extension.unh.edu/Agric/AGPDTS/SoilTest.htm

Insect Identification—Arthropod Identification Center

www.extension.unh.edu/Agric/AGPDTS/IDform.pdf

Disease Identification—UNH Plant Diagnostic Laboratory

www.extension.unh.edu/Agric/AGPDTS/PlantH.htm

For information contact the Administrative Assistant
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I. Pests That Cause Needle Discoloration and Distortion

BALSAM GALL MIDGE

Hosts: balsam and Fraser fir

Symptoms: Larvae of this tiny fly cause small gall formations at the base of new needles. Most infested needles are dropped in the fall, leaving bare branches.

Life Cycle: One generation per year.

Adult: May—eggs are laid beneath bud scales and on needles of opening buds.

Larvae: June to October—larvae form galls on needles, emerge and drop to the ground in the fall, and overwinter in the litter.

Pupae: Develop the following spring prior to adult emergence.

Control: Spray when terminal buds in the upper third of the tree average 1 ¼ inches in swollen length. Spray coverage of all buds is necessary. In heavy infestations, 2 sprays ten days apart may be necessary. A few yellow sticky boards placed in the tops of trees will capture adults and indicate population levels.

DROUGHT INJURY

Hosts: all species, particularly newly planted trees

Symptoms: Wilting of new growth, dying needles, and discolored foliage on top branches may appear one or more years after a drought. Needles usually die from the tip. Dead tops, shortened needles, and sparse interior foliage are the result from long-term or repeated droughts.

Control: Avoid planting drought sensitive species on sandy or gravel soils. Provide supplemental water to new plantings. Control weeds.

HERBICIDE INJURY

Hosts: all species

Symptoms: Abnormal growth such as twisted needles, or hooked, distorted, swollen shoots. Yellowing or browning of new needles may be evident, particularly on the side exposed to the herbicide. Symptoms usually appear within a few weeks after herbicide applications.

Control: Reduce application rates on sites that are prone to flashback injury. Avoid spraying herbicides to new, succulent shoots. Adjust spray equipment. Use more selective herbicides.

LOPHODERMIMUM NEEDLECAST

Hosts: Scotch, Austrian, and red pine

Symptoms: Tiny spots with brown centers and yellow margins appear on needles in early spring, followed by yellowing then browning of needles. Damage is usually more severe at the bottom of the tree. Black, football-shaped, fruiting bodies appear on dead needles.

Life Cycle:

Brown spots with yellow margins become evident on needles from March to April.

Needles turn brown from May to June

Needle casting occurs from June to July leaving tufts of green growth on branch tips.

New infections occur during wet periods from August to September.

Black football-shaped, fruiting bodies develop on dead needles from July to October.

Control: Plant disease-free stock. Apply a preventive fungicide if the disease has been severe. Spray once every two weeks, beginning at the end of July. If wet weather persists, additional sprays may be needed.

PINE NEEDLE SCALE

Hosts: all pines

Symptoms: Small white scales develop on needles which eventually cause yellowing and needle drop. Severe infestations result in branch or tree mortality.

Life Cycle: Two generations per year.

Nymphs: Crawlers hatch in overwintered eggs in mid May. They move to new needles to feed and grow.

Adults: Maturity occurs in early July, new eggs are laid, and a second generation of crawlers hatches by mid to late July. Eggs are laid and protected by dead female scales.

Control: Remove severely infested trees. Spray thoroughly with a dormant oil in late fall or early spring. If the infestation continues to be a problem, apply an approved pesticide in mid May, followed by a second spray in ten days. Spray again, if needed, in late July or early August. It is best to spray when crawlers are active. Use of sprays other than dormant oils can eliminate natural controls for scale insects, which may compound the problem. Superior or horticultural oils can be used when crawlers are active in June and late July.

RHABDOCLINE NEEDLECAST

Hosts: Douglas fir (especially Rocky Mountain variety)

Symptoms: Yellow on either surface of the needle appears from fall- winter. Spots eventually darken to a reddish brown. Spots enlarge to cause mottling and reddish brown needles which eventually cast. Heavily infested trees are left with only the current needles.

Life Cycle:

May to July—Needles are infected by spores released in moist weather. Only young needles of opening buds are susceptible.

Late fall—Yellow spots appear in late fall.

Spots turn reddish-brown from late fall- spring.

Early summer—Brown needles are cast.

Control: Avoid using susceptible varieties of Douglas fir, particularly those from Rocky Mountain seed sources. Plant disease-free stock. Plant Douglas fir where good air drainage can be assured. Control weeds and remove heavily infected trees. Apply an approved fungicide at bud break. Treatment should be repeated 2-3 times at two week intervals.

SPRUCE NEEDLE RUSTS

Hosts: black, white, Colorado blue, and occasionally Norway spruces.

Symptoms: Whitish blisters filled with yellow spores on the undersides of current year needles. In late spring to early summer, needles yellow and shed prematurely.

Life Cycle:

Spring—spores from the rust's alternate hosts (Labrador tea or leather leaf) infect nearby spruce.

Summer—spores from infected spruces are released, infecting nearby alternate hosts.

Control: Avoid planting susceptible spruces near wet areas where Labrador tea and leather leaf are growing. Plant resistant spruces such as Norway and Black Hills spruces.

Note: Repeating spruce rust, also known as Weir's cushion rust, appears on needles in the spring. This rust does not have an alternate host. Infected trees should be removed.

SPRUCE SPIDER MITE

Hosts: all spruces

Symptoms: Mottled needles with fine webbing between the needles. Needles brown and shed in heavy infestations. Tap branches over white paper to check mite population density (tiny black specks).

Life Cycle: Three generations per year.

Nymphs: Hatch in May or June, feed on sap and spin webs.

Adults: Appear in June or July, new eggs are laid and two or more generations follow at three week intervals.

Control: Spider mite injury is most severe during prolonged dry periods on droughty soils or where pesticide use has destroyed natural controls. Monitor mite infestations and spray only if necessary. Use a dormant oil spray in early spring before bud break or thoroughly spray infested trees with an approved miticide in mid June or early July. Repeat miticide applications at two week intervals as needed to control succeeding generations. Dormant oils may cause temporary discoloration of blue spruce. Once growth starts, use horticultural or superior oils and not dormant oils.

SWISS NEEDLECAST

Host: Douglas fir

Symptoms: Yellowing and browning needles. Browning is often uniform at the needle tips. Symptoms are most severe on lower branches. Symptoms may resemble those caused by environmental stress or nutrient imbalances.

Life Cycle:

Spring and fall—rows of black, fruiting bodies appear on green and yellow needles. Most infections occur between June and July, but spores may be released from April-September.

July to August—2 to 3 year old needles brown and are cast in late August. Many needles may not be shed however, until the following year.

Control: Plant disease-free stock. Plant Douglas fir where good air drainage can be assured. Infected trees should be treated with a fungicide for 3 years prior to harvest. (Treatment may not be required prior to that time). Apply an approved fungicide when new shoots are ½ to 2 inches long. Repeat application in 2 to 3 weeks and once again if rainfall is abnormally high.

WINTER INJURY:

Hosts: short-neededled Scotch pine varieties, white pine, Norway spruce, white fir, Fraser fir.

Symptoms: Browning of entire tree or portions that were above the winter snowline. South and southwest sides of trees are usually most susceptible. Injury shows in early spring.

Control: Avoid planting susceptible species in sites that are open and windswept, or provide or plant windbreaks.

II. Pests That Feed on Needles

GYPSY MOTH

Hosts: Prefers hardwoods, but will attack Christmas trees.

Symptoms: Partial to complete defoliation of branches or entire trees by groups of hairy caterpillars. Caterpillars can be up to 2 1/2 inches long and have black, blue, red, and yellow markings. Tan egg masses on tree stems and branches and groups of whitish moths.

Life cycle:

Larvae: Hatch from overwintered eggs in late April to mid May. When hardwood foliage is exhausted or moth populations are excessive, any Christmas tree species in the vicinity is vulnerable.

Pupae: June to July

Adults: Emerge in mid July to early August and begin laying eggs. Females are flightless.

Control: When caterpillars are less than 1/2" long, use biological or hormonal sprays. When the caterpillars are larger, contact or systemic insecticides are most effective.

SAWFLY LARVAE

Balsam fir sawfly larvae prefer balsam fir but will also feed on spruce. Black head with dark green body with six black stripes.

European pine sawfly larvae was introduced in the US in 1925 and prefers red, Scotch, mugo, jack, Japanese, and Swiss mountain pines. Black head and legs with greyish green body with lighter stripes and black dots.

Introduced pine sawfly larvae was introduced in the US in 1914 and prefers white pine, but will also feed on Scotch, red, jack, and mugo pines. Black head with yellow and white spots on body with black background.

Redheaded pine sawfly larvae prefers two or three needled pines (red, Scotch, mugo, jack, pitch) but may attack white pines as well. Red head with yellowish white body with rows of black spots.

Yellowheaded spruce sawfly larvae feeds on all spruces. Brown or reddish yellow head with light green body and two green stripes.

Life Cycle: These hairless caterpillar-like larvae appear any time from early May to late July. They are voracious eaters of the needles and often are found in groups. Some will raise up in a defensive posture when you wave your hand near them.

Control: These are easily controlled by one application of a contact insecticide when the larvae are first noticed feeding.

SPRUCE BUDWORM

Hosts: all spruces, firs, and occasionally pines

Symptoms: Defoliated shoot tips or branches. Clusters of brownish needles attached to the twigs with silk webbing. One inch caterpillars with black heads, light brown bodies when small, or gray brown with small cream-colored spots along the sides when mature.

Life Cycle:

Larvae: Emerge from eggs found on needles in late July- early August. Larvae move to branch tips, dangle from silken threads, and are blown to a new host tree in which they spin hibernacula and overwinter. Larvae emerge the next spring, go to branch tips again, and get blown to new host foliage. Feeding begins on open buds and needles in mid May.

Pupae: Occurs in feeding shelters or protected locations on host trees in late June to early July.

Adults: Late June to early August

Control: Consider spraying when larvae are found at the frequency of one or two per 10 spruce buds or one or two per twenty fir buds. Spray thoroughly with an approved pesticide after larvae emerge in May. Repeat spray in seven to ten days if needed. Only a problem in Coos county.

SPRUCE NEEDLE MINER

Hosts: all spruces

Symptoms: Small clusters of dead needles webbed tightly together and flattened against the branch. Needles are hollowed out with a tiny hole near the base of each needle. Small trees are often attacked anywhere while large trees are usually injured on the inner parts of lower branches.

Life Cycle: One generation per year.

Larvae: Larvae hatch from eggs laid on needles in mid June. Needles are mined out, cut, and webbed together for protection as the larvae develop. Larvae overwinter in these nest-like enclosures, feed again in early spring, and pupate.

Pupae: Silken cocoons in nests in late April.

Adults: Mid May to mid June

Control: Spray with an approved pesticide in mid to late June. Repeat the spray in ten to fourteen days.

PINE WEBWORM

Hosts: all pines

Symptoms: Nests are made of brownish needles and pellets of insect waste spun together with webbing. Needles near the two to six inch wide nest are chewed off. Yellowish brown caterpillars about $\frac{3}{4}$ " long with two dark brown stripes on either side can be found in nests.

Life Cycle:

Larvae: Emerge from eggs laid on needles from July to August. Young larvae mine needles. Older ones inhabit protective nests.

Pupae: Occurs in a cell in the soil in August.

Adults: Emerge from overwintering pupal cells from June to August.

Control: Clip and destroy nests if they are few and scattered. If necessary, spray with an approved pesticide when webbing is noticed (usually between July and August).

III. Pests That Cause Shoot or Branch Injury

PINE BARK ADELGID

Hosts: white pine and occasionally Scotch pine.

Symptoms: White woolly patches on trunks, branches, buds, and needle bases. Discolored sparse foliage. Scattered needles turn yellow or brown in summer and drop off in the fall. Needles turn brown from the tips down. Look for ant activity on the foliage.

Life Cycle: Five generations per year.

Eggs: Laid in spring by overwintering females.

Adults: Winged and wingless females hatch. Wingless forms remain on host and reproduce repeatedly. Winged forms fly to nearby spruce and lay eggs.

Control: Avoid over spraying for aphid control. This may kill natural aphid predators. Remove nearby mound ant colonies, which can help promote aphid outbreaks. If necessary, spray with an approved pesticide during May and early June. Three applications at ten day intervals are necessary.

PINE LEAF ADELGID

Hosts: white pine, red and black spruces

Symptoms:

White pine— brown to yellow needles die from the tip down, reduced growth, dead and drooping shoots.

Spruces— compact terminal galls which resemble tree cones.

Life Cycle: Adults: Scale-like with a fringe of white hairs. Life cycle takes two years to complete. In the first winter, spruces are infested. During the remaining stages, including the second winter, nearby white pine are attacked.

Control: Occasional outbreaks of this pest may require spray control measures. Avoid overspraying for aphid control. This may kill natural aphid predators. If necessary, spray with an approved pesticide. Treat pine foliage in late June and repeat in ten days.

WHITE PINE ADELGID

Hosts: white pine

Symptoms: Reduced tree vigor, dead individual branches, or death of small trees. Dark brown shiny adult aphids clustered around a branch or leader. A black mold will grow on aphid excrement and cover needles and bark.

Life Cycle: Several generations per year.

Adults: Wingless females hatch from overwintering eggs in the spring. These females produce several generations of living young. In mid to late summer winged females hatch, migrate, and begin producing living young. Toward fall, winged males and females mate and overwintering eggs are laid.

Control: Avoid overspraying for aphid control. This may kill natural aphid predators. Remove nearby ant colonies, which can help promote aphid outbreaks. If necessary, spray with an approved pesticide during early May and repeat in ten days.

CYTOSPORA CANKER (also called Leucostoma Canker)

Hosts: spruces, especially Colorado blue and Norway (occasionally true firs and Douglas fir are infected).

Symptoms: Death of branch tips and entire branches on the lower portions of infected trees. Infection usually spreads upwards from lower branches. White pitch oozes from canker sites. Cankers are difficult to spot in the absence of pitch.

Life Cycle: Orange masses of spores ooze from tiny black fruiting bodies around the cankers during wet weather. Rain and improperly disinfected tools can spread spores to stressed trees where infection occurs through wounds or dead areas.

Control: Keep host species well-maintained to avoid stress. Avoid planting susceptible species on poor sites. Shear only when branches are dry. Remove and destroy affected branches. Sterilize tools after pruning infected branches.

DIPLODIA SHOOT BLIGHT (also called Sphaeropsis)

Hosts: Scotch, red, Japanese black, and Austrian pine

Symptoms: Stunted, curled or dead current year shoots on many branches. The infected tissue is resin-soaked. The surrounding bark turns deep red. Tissue beneath the bark is often streaked black or olive green. Cankers appear as oblong sunken areas on branches or stems. The top of the tree above girdling cankers will die. Black beak-like fruiting bodies are visible on dead needles or shoot tissues.

Life Cycle: Spring to fall: Growing shoots on stressed trees are infected by spores released during wet weather from overwintering fruiting bodies. Infection often corresponds with wounds such as those caused by shearing or spittlebug feeding. The fungus enters host species through open wounds on shoots such as hail wounds and sites of insect feeding.

Control: Keep host species well-maintained. Avoid planting susceptible species on poor sites. Shear only when branches are dry. Remove and destroy affected branches. Sterilize tools after pruning affected branches. Destroy severely infected trees. Treat with an approved fungicide when new growth begins. Make additional applications at two week intervals. Four applications may be necessary in rainy springs.

EASTERN PINE SHOOT BORER

Hosts: all pines, white spruce, and Douglas fir.

Symptoms: Flagged (discolored and drooping) shoots. Branch ends broken-over near the bases, leaving flat stubs. Oval-shaped holes at the base of injury. Hollowed out twigs with white gray $\frac{3}{4}$ " long larva (before mid July).

Life Cycle:

Adult: Emerge from overwintering pupae in May.

Larvae: Hatch from eggs laid on needle sheaths of new shoots or lateral branches in June. Larvae bore into the pith and tunnel toward branch tips.

Pupae: Late July, early August.

Control: Prune out and destroy infested shoots while larvae are still active (June to July). If necessary, spray with an approved insecticide in mid May to kill larvae before they bore into shoots.

EUROPEAN PINE SHOOT MOTH

Hosts: Scotch, red, and Austrian pine

Symptoms: Dead, stunted, or stubby shoots anywhere on the tree. Hardened globs of pitch where larvae have bored into the shoots. Brownish, black-headed larvae 5/8" long on, or inside, new shoots (mid April to early June). Repeatedly attacked trees look bushy and multi-headed.

Life Cycle: One generation per year.

Adults: June

Larvae: Hatch from eggs laid on the bases of buds and needle fascicles, twig tips, or bark of shoots in late June. Larvae spin resin-coated webs and mine the bases of needles. In mid-summer, larvae move to buds and construct new resin-coated webs. Overwintering larva resume feeding the following April.

Pupae: May to June

Control: Prune out and destroy infested shoots while larvae are still active. Remove bottom whorls of trees to prevent overwintering below the snowline. Spray with an approved insecticide in the first two weeks of April and/or late June or early July.

FROST INJURY

Hosts: true firs (balsam fir, Fraser fir), Douglas fir, spruce and occasionally pine

Symptoms: Current year's shoots appear brown, wilted and eventually die. Nearly all shoots on a tree may be affected. Shoots often remain on trees until the following spring. Symptoms are more common on trees in low areas and frost pockets.

Control: Avoid planting susceptible species in frost pockets. Remove dead shoots when shearing.

NORTHERN PINE WEEVIL

Hosts: all pines and spruces

Symptoms: Flagged shoot tips anywhere on trees. Small circular feeding wounds at the base of injured shoots.

Life Cycle: One generation per year (overwinter as adults, larvae, or pupae)

Adults: Feed on inner bark of pine branches in June and August.

Larvae: Hatch from eggs laid in the roots of pine stumps, slash, logs, weakened trees, and occasionally healthy young trees. Larvae are white, C-shaped, and 1/3 inch in length. They feed beneath the bark until fall, form cells of sawdust in the sapwood and pupate.

Pupae: August

Control: Remove pine slash, dead or dying pines and fresh stumps if possible or drench fresh stumps and surrounding soil with an approved pesticide in April and again in August. Spray trees in August or early September with an approved pesticide.

PALES WEEVIL

Hosts: white and Scotch pine, Douglas fir, occasionally spruces

Symptoms: Dead seedlings. Dead shoot tips anywhere in large trees. Small irregular patches of exposed wood on seedling stems or at tree bases. Flagged shoots on large trees.

Life Cycle: One generation per year (overwinter as adults or larvae)

Adults: Mid April to September—Feed on bark, twigs, and needles in the fall. Overwintering adults feed on the tender bark of the twigs of saplings and at the bases of seedlings.

Larvae: April to June—Hatch from eggs laid in the roots of pine stumps or weakened trees. White, C-shaped, ½ inch long. They feed beneath the bark until early fall and either form cells and pupate or overwinter as larvae and pupate the following spring.

Pupae: August or late May

Control: Remove pine slash, dead or dying pines and fresh stumps if possible, or drench fresh stumps and surrounding soil with an approved pesticide in April and again in August. Spray trees in mid to late April and again in August. Seedlings can be protected during their first year by dipping them in an approved pesticide prior to planting.

PINE SPITTLEBUG

Host: Scotch and white pine, all spruces and firs

Symptom: Flagged shoot tips anywhere on the tree. Sooty and glistening foliage. Frothy, white spittlemasses in May through early July with 1/4 inch long creamy yellow to black nymphs within.

Life Cycle: One generation per year

Adults: Feed without producing spittlemass from July to August.

Nymphs: May to July—Hatch from overwintering eggs. Feed on twigs and eventually move to the main trunk where several occupy one spittlemass.

Control: Often not necessary. Damage is most severe on young trees. Spittlebugs can help spread Diplodia shoot blight. If necessary, spray in early to mid July with an approved pesticide.

SARATOGA SPITTLEBUG

Hosts: Scotch pine and occasionally white pine, Fraser fir, and balsam fir

Alternate Hosts: sweetfern, brambles, and broad-leaved weeds

Symptoms: Reddish-brown flagged branches with numerous punctures covered with small drops of resin and tan flecks in the wood and inner bark. Alternate hosts in mid May to early June have frothy spittlemass with 1/3 inch long tan and white boat-shaped nymphs within. Spittlemasses are near ground level.

Life Cycle:

Adults: Feed mostly on two year old internodes by inserting mouthparts into the cortex of the shoots from late June to late September.

Nymphs: Hatch from overwintered eggs laid on pines in May. Nymphs crawl to nearby alternate hosts and feed through July.

Control: Often not necessary. Well-maintained plantations with good weed control are usually protected. If necessary, spray in early to mid July with an approved pesticide.

SCLERRODERRIS CANKER

Hosts: all pines, occasionally spruces, firs, and Douglas fir.

Symptoms: Cankers are oblong sunken areas on stem and branches with (often inconspicuous) green discoloration beneath the bark of dead branches. From May through June, an orange discoloration is usually visible at the bases of needles on the lower four feet of trees.

Life Cycle: Infection through buds or needles by spores during moist weather from April to October. Branch tips die from late summer to November. The fungus grows down the branch and forms a canker on the main stem. Small trees are often killed. Spores are splashed from one to two year old infections on dead branches or from culled trees.

Control: This is believed to be a potentially serious pathogen introduced from Europe. It is not well-established in New Hampshire, so if found, you should quickly remove and destroy infected branches. Dead trees should be removed. All infected trees should be burned or buried. Sterilize tools after shearing infested trees to avoid spreading the disease. Do not shear during wet weather. Plant disease-free stock.

WHITE PINE BLISTER RUST

Host: white pine

Alternate Host: currant, gooseberry.

Symptoms: On young twigs look for patches of brown bark with yellow-green borders. On the branches or the trunk, spindle-shaped swellings appear in the third year, or resin flow and possible insect or rodent feeding may be evident on mature yellow-bordered cankers. Branches and tree trunks above stem cankers eventually die leaving dry, reddish-brown needles. Cream-colored blisters become visible pushing through infected bark in May.

Life Cycle:

Spring: Orange aeciospores are released from white blisters on pine to infect gooseberry.

Summer: Spores released from minute brown hair-like fungal structures on the underside of gooseberry leaves infect needles of white pine. The fungus moves down the needle into a branch or the main stem and produces the aeciospores two to three years later.

Control: Remove currant and gooseberry bushes within 1,000 feet of the plantation. The disease only occurs on white pines, so plant alternative species in areas where the disease is severe. Avoid planting in low, air-drainage areas. Prune and destroy infected branches before infections reach the main stem.

WHITE PINE WEEVIL

Hosts: all species, especially white pine, Norway spruce, Colorado blue spruce, and Douglas fir.

Symptoms: Dead or dying terminal leader. Leader curls into the shape of a shepherd's crook. White larvae up to ¼ inch long in the wood of the damaged terminal in June to August. Small brown beetles feeding on the leaders in April and May and again in August and September.

Life Cycle:

Adults: Emerge in late July and feed on the bark of terminals, drop to the litter, and overwinter.

In mid April to May they return to the terminals to lay eggs under the bark.

Larvae: Hatch and bore down through the terminal leaders and one or two whorls of branches.

Pupae: Pupation occurs in wood chip cocoons at the base of larval feeding.

Control: Clip and destroy infested leaders while larvae are still active (June to mid July). Drench leaders with an approved pesticide in mid April in southern New Hampshire and early May in northern New Hampshire to control adult egg laying beetles. Sometimes a second spring spray is necessary if egg laying occurs over a long period. A second spray between mid August and September may be necessary.

V. Pests That Cause Shoot or Branch Galls

COOLEY SPRUCE GALL ADELGID

Hosts: Colorado blue spruce, Douglas fir, occasionally other spruces

Symptoms:

On spruce—large 2 to 2 ½ inch long cone-like galls on the tips of new shoots. Galls are green at first and brown with age.

On Douglas fir—ellow spots on bent needles and small cottony galls on the undersides of the needles.

Life Cycle: One generation per year

Eggs: Laid in the spring under a layer of white, cottony wax near terminal buds.

Adults: Hatch and feed at the base on needles producing galls that protect them. Galls dry mid summer exposing nymphs which either continue to feed on blue spruce or fly to Douglas fir. Galls do not form on Douglas fir. Overwinters as a nymph.

Control: Avoid mixing Douglas fir and Colorado blue spruce in the same plantation. Clip and destroy scattered galls before they open in July. Apply a dormant oil in early spring or late fall when trees are dormant OR apply a horticultural oil (superior oil) in late summer or fall after the galls have opened. Oil may cause a temporary discoloration of blue spruce.

EASTERN SPRUCE GALL ADELGID

Hosts: Norway, red, white, and black spruce

Symptoms: Small, pineapple-shaped, ¾ to 1 inch long galls at the bases of new shoots. Galls are green at first and brown with age.

Life Cycle: One generation per year

Eggs: Laid by overwintering immature nymphs at bases of buds. Hatching occurs when buds begin to break.

Adults: Nymphs feed on needle bases which swell and form protective galls. Galls dry in late September and aphids lay eggs which hatch to produce overwintering nymphs.

Control: Clip and destroy scattered galls before they open. Apply a dormant oil in early spring or late fall when trees are dormant OR apply an approved pesticide in late April or early May and again in the fall after the galls have opened.

V. Pests That Cause Stem or Root Injury Resulting in Tree Mortality

ALLEGHENY MOUND ANT

Hosts: all species

Symptoms: Groups of dead or dying trees. Bases of trunks have small blister-like swellings. Large nearby ant mounds, one to three feet high. Large ants (1/4 inch long) with red tail ends.

Biology: Ants kill trees which shade mounds by injecting formic acid into the tissue of the main stem just above ground level. Ants also protect aphids and scales on live trees by discouraging their natural predators and parasites.

Control: Treat mounds with an approved pesticide. Level the mound with a rake and time pesticide application to precede a heavy rain if possible.

ARMILLARIA ROOT ROT

Hosts: all species

Symptoms: Dead and dying trees, singly or in groups. Oozing pitch from the root collar. Creamy white tissue-like sheets or fans of fungal strands under the bark at the root collar.

Life Cycle: Fall: Honey-colored mushrooms develop on stumps or dead and dying trees. Spores from the mushroom are carried by wind to other stumps or dead trees and to the wounds near the base of healthy trees. The fungus develops rhizomorphs from infected sites. The rhizomorphs are tough fungal strands with a dark outer layer. These cord-like strands can extend for many feet and infect roots of healthy trees.

Control: Avoid planting on cutover sites if possible, especially hardwood sites. Keep plantation site properly limed and fertilized to maintain vigorous trees. If planting on cutover sites prepare the site by stumping and root raking before planting. Avoid planting next to stumps. Avoid drought-prone planting sites.

MICE (MEADOW VOLES)

Hosts: all species

Symptoms: Dead or dying trees, singly or in groups. Girdled trunk low on the stem.

Biology: Meadow voles feed on tree bark in winter months when other vegetation is not available. Damage is highest when mouse populations are high, snow is deep, and/or dense matted vegetation is around tree trunks.

Control: Late fall mowings and good herbicide programs help discourage mouse population build-ups.

PINE ROOT COLLAR WEEVIL

Hosts: Scotch and occasionally white pine

Symptoms: Dead or dying trees, singly or in groups. Leaning or fallen trees. Black, pitch-soaked bark at the root collar. Surrounding soil is often pitch-soaked. Yellow-white, C-shaped, legless larvae up to 1/3 inch long with brown heads in the bark or adjacent soil.

Life Cycle: One generation per year

Eggs: Laid at the bases of pines by overwintered adults in spring and summer.

Larvae: Feed on the inner bark of the root collar.

Pupae: Develop in soil near infested trees.

Adults: Emerge in late summer, feed on trees, and overwinter in the litter.

Control: Plant resistant Scotch pine varieties (S. French, Turkish, generally short-needled varieties). Prune off lower branches. Treat infested plantations with an approved pesticide. Spray the soil and bark at the base of the trees in mid June and repeat in ten days. Avoid replanting infested sites for one year.

WHITE GRUBS

Hosts: all species

Symptoms: Dead or dying trees, singly or in groups. Leaning or fallen trees. Dead or fallen trees have few fibrous roots. White C-shaped grubs up to 1 inch long with brownish heads in the upper 6 inches of soil from May to September. Large dead patches of grass or loose turf.

Life Cycle:

Eggs: Laid in soil by adult June beetles in June or July.

Larvae: Burrow into the soil and feed on the roots of grass or woody plants. Larvae feed for two to five years before becoming adults.

Adults: Emerge in May or June and feed on hardwood trees near the plantation.

Control: Inspect fields carefully before planting. Use herbicides to control grasses around trees and before planting. Plant seedlings carefully to avoid J-rooting, as these are attacked first. Apply an approved pesticide on the field from May to August. Treat entire field or planted rows. Time the applications to precede a heavy rain if possible.

ZIMMERMAN PINE MOTH

Hosts: Scotch and Austrian pines and occasionally other pines

Symptoms: Dead branch tips on entire trees. Pitch masses at branch whorls, on main stems or near terminal leaders. Occasional broken branch tips or stems at or near pitch mass sites. Whitish or reddish yellow or green larvae with a series of black dots each with a bristle in mid May to August.

Life Cycle: One generation per year

Eggs: Laid on bark from mid July to mid August.

Larvae: Spin silken cases and overwinter in bark crevices. From early April to early May emerging larvae bore into shoots or stems and form characteristic pitch masses at the entrance to feeding tunnels.

Pupae: Develop in feeding tunnels in May.

Control: Destroy infested branches or trees. Plant resistant Scotch pine varieties (Greek, Turkish, generally short needled varieties). Apply an approved pesticide to the bark and twigs in late April or early May. Further applications may be necessary from late June to early August.
