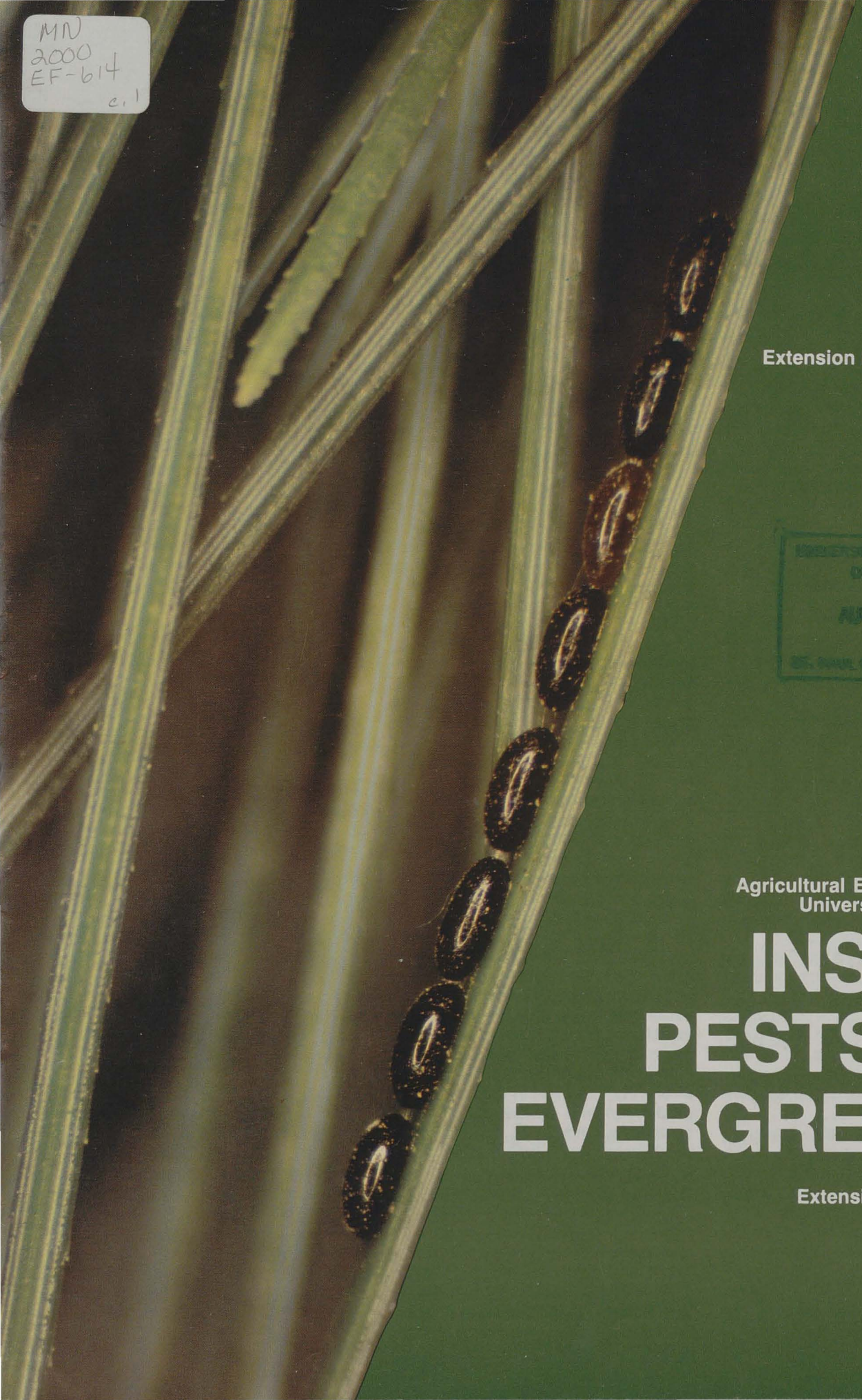

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INSECT PESTS OF EVERGREENS

Mark E. Ascerno
Extension Entomologist

INSECT PESTS OF EVERGREENS

Proper pest management of evergreen trees and shrubs involves using the appropriate control measure for the specific insect problem. It is important to keep in mind that complete elimination of insects is practically impossible. The goal, therefore, is to keep the insect population at a level that does little or no damage to the evergreen. Indeed, damage control rather than insect control is the true goal of pest management.

Insect damage to evergreens varies with the condition of the plant, the insect species, and the insect population level. Healthy trees can withstand greater numbers of a pest than severely weakened ones. Therefore, maintaining a tree's vigor with proper watering and fertilization can help offset damage. In some cases that is all that needs to be done.

Learning to tolerate insects—even if you do not like them—can save you time and money on insect control. Most insects are either harmless or beneficial; only a few are significant pests. Insects on evergreens should be controlled if they cause damage, not simply because they exist.

Good pest management involves four steps: detection, identification, evaluation, and control.

Detection. Make sure there really is an insect present. There is no point in using chemical control measures when there are no insects on the plant. Most insecticides are short-lived and do not work well as preventatives. If they are applied too soon, they'll lose their effectiveness by the time the pest shows up.

Identification. The mere presence of an insect does not necessarily mean that there is a problem, since insects are not always pests. Even if the insect is a pest, it may not occur in large enough numbers to cause a problem. Therefore, it is essential to know what insect you are dealing with before taking steps to control it. For example, most people can identify a ladybug in its adult form but not in its alligator-like immature stage (figure 1). Inability to identify the immature ladybug could result in unnecessary spraying and destruction of this very helpful insect. This might lead to outbreaks of species that are really pests, since ladybugs feed on aphids and other harmful insects.

Evaluation. Once you've identified the insect as a pest, you must then determine how serious it is and whether it is present in large enough numbers to pose a threat to the evergreen. You also need to know at what stage in its life cycle and at what time of the year it can best be controlled.

Control. Select the appropriate method of control. Knowledge of the insect will help you decide whether it's best to use chemicals, to remove parts or all of the plant, or to increase the plant's vigor by watering and fertilizing.

Major pests of evergreens can be grouped as defoliators, sapsuckers, and wood borers. Defoliators damage foliage by chewing all or parts of needles, sapsucking insects withdraw the sap from needles or twigs, and wood borers penetrate the bark and wood. The most common species are listed here.

DEFOLIATORS

Evergreen trees and shrubs are very sensitive to defoliation damage. Unlike deciduous plants, they cannot refoliate quickly. In Minnesota most conifers retain their needles for three years; a loss of needles can result in a three-year reduction in the tree's food production and serious damage. If completely stripped of their needles, most evergreens will die, sometimes in a single season. For these reasons, it is advisable to protect evergreens from insects that consume the needles. The most important defoliators are sawflies and caterpillars. Several other groups of insects can also cause conifer defoliation, but with the exception of needleminers their occurrence is rare.

Sawflies

Sawflies belong to the group of insects that also includes wasps, bees, and ants. In the adult stage, sawflies are wasplike but do not sting or harm evergreens. The damage occurs during the larval stage, when they are immature and caterpillar-like. In this stage they feed on the needles.

It is important to distinguish sawflies from true caterpillars since control chemicals are not always equally effective on both groups. Several characteristics are useful in distinguishing sawfly larvae from butterfly or moth caterpillars (figure 2). First, sawflies tend to feed in groups. Second, their bodies are generally wider at the head than at the tail. Third, sawflies usually have more than five pairs of prolegs, whereas caterpillars have five pairs or less. Prolegs, which look like extra legs, are fleshy stumplike projections on the undersides of the last two-thirds of the body. The full-grown larva of most sawfly species is 3/4 to 1 inch in length, whereas many caterpillars are larger than that.

CONTROL. The object of control is to stop defoliation before it has become too extensive. The best approach is to examine your plants regularly and then spray with the appropriate insecticide when the sawfly larvae are first noted and damage is still minor (table 1). Spraying after the damage is nearly complete and the larvae are full-grown will not be effective.

Redheaded pine sawfly. The full-grown larva has a reddish brown head and a yellow body with six rows of irregular black spots (figure 3). The larvae feed in groups between mid-June and late July and again between mid-August and late September. They will attack several species of pine but prefer red and jack pines that are less than 15 feet tall.

Introduced pine sawfly. The full-grown larva has a black head, a yellow-green body with a black double stripe down the back, and many yellow and black spots (figure 4). Young larvae feed in groups while older larvae feed alone. Larval feeding occurs in late May and early June and again in late July to early September. They prefer to attack white pine in landscape settings but will also feed on Scotch, jack, and red pine.

Table 1. Insecticides to Control Defoliating Pests of Evergreens

Pest	Insecticide*		Amount per gallon of water	Remarks
Sawflies and caterpillars	malathion	57% EC	2 tsp.	Apply when larvae first appear but before defoliation is extensive.
	carbaryl (Sevin)	80% WP	4 tsp.	
		50% WP	2 tbsp.	
	acephate (Orthene)	15.6% EC	1½ tbsp.	
		75% SP	1 tsp.	
	methoxychlor	50% WP	2 tbsp.	
		25% EC	4 tsp.	
Caterpillars only	*Bacillus thuriengensis* (Dipel, Biotrol, Thuricide)		As labeled	
Spruce budworm	carbaryl (Sevin)	80% SP	4 tsp.	Apply as buds break and again 10 days later.
		50% WP	2 tbsp.	
Spruce needleminer	acephate (Orthene)	15.6% EC	1½ tbsp.	Apply mid-June to mid-July.
		75% SP	1 tsp.	
	carbaryl (Sevin)	80% WP	4 tsp.	
		50% WP	2 tbsp.	
	methoxychlor	50% WP	2 tbsp.	
		25% EC	4 tsp.	

**EC = emulsifiable concentrate; WP = wettable powder; SP = Soluble powder*

Yellowheaded spruce sawfly. The full-grown larva has a yellow or reddish brown head and olive-green body with six gray-green stripes (figure 5). The larvae feed in loose clusters and can be found from late May to mid-July. They prefer to feed on isolated white, black, and blue spruce such as those found in most landscapes.

Caterpillars

Caterpillars are the larval form of moths and butterflies. As adults they do not cause any feeding damage to evergreens but in the caterpillar stage they cause defoliation. Caterpillars can be distinguished from sawfly larvae by their uniform body width and their five or less pairs of prolegs; i.e., the fleshy projections on the underside of the last two-thirds of the body (figure 2).

CONTROL. Routinely examine the plants and then spray with the appropriate insecticide when caterpillars are first noted and damage is still minor (table 1).

Pine tussock moth. Tussock moth larvae are easily identified by four conspicuous tufts of hair on their bodies (figure 6). Full-grown larvae are 1½ inches long. The caterpillars feed on jack, red, and white pine and occasionally on spruces and firs. Most damage occurs in June.

Webworms construct "nests" of silk threads. The larvae feed on needles in and near the nest. The juniper webworm attacks juniper; the pine webworm attacks jack, red, and white pine (figure 7).

Spruce budworm. The spruce budworm is the most important forest defoliator in eastern North America. Young larvae are light brown with dark heads, while full-grown larvae are gray-brown with two rows of small cream-colored spots along the sides and shiny black heads (figure 8). The larvae feed first by mining (tunneling) buds and then consuming the needles. The presence of browning needles loosely webbed to the branch tips can be useful in identifying this pest. Feeding is completed by early July. Budworms prefer balsam fir, white spruce, and black spruce but they will also attack larch and pine.

Needleminers

Needleminers cause injury by hollowing out the needles, often clipping the needles off at the base. The spruce needleminer primarily attacks ornamental spruce by mining the needles and then densely webbing the mined leaves together at the base. Several needleminer larvae will live in the webbing, which is filled with pelletlike waste material known as frass. The larvae are green to greenish brown with a yellow-brown head (figure 9).

CONTROL. Apply the appropriate chemical between mid-June and mid-July (table 1).

SAPSUCKERS

Sapsucking insects feed by withdrawing sap from the plant through hollow, strawlike mouthparts. Feeding may occur on needles, shoots, or stems. The plant is weakened, making it more susceptible to disease, winter injury, drought stress, and nutritional problems. The degree of damage is often directly linked to the number of insects present. The greater the number, the greater the damage. Conversely, low population levels produce little or no damage. Therefore, control is suggested only when these insects are numerous.

There are some sapsucking insects that can cause severe damage when only a few are present. In these cases control is more important (table 2). Common sapsucking pests of conifers are spider mites, aphids, and scale insects.

Spider Mites

Spider mites are not insects but are more closely related to spiders. There are several species of mites, all producing similar damage. They attack pine, arborvitae, juniper, and spruce. Spruce trees are favored, especially those in landscape settings. Mite damage tends to be greatest during hot, dry weather.

Mite feeding causes the needles to take on a speckled, yellowish appearance (figure 10). Severely infested trees have a brownish cast, with many needles drying and dropping off the branches. Closer examination of the needles reveals the eight-legged spiderlike pest and numerous, small, light-colored spots, which are the mite feeding sites (figure 11). The mites also produce fine silken webs on the needles; these can be useful in identification. An easy way to test for mites is to hold a piece of white paper under a suspected twig and shake the twig gently. The mites will drop to the paper and appear as tiny, moving dark specks against the white background.

Mites have tremendous potential to reproduce rapidly. Therefore, control is suggested on prized landscape plants

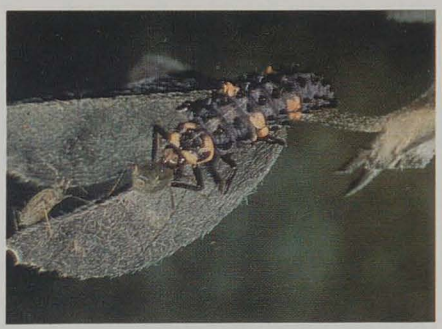

Figure 1. Ladybug adult (top).
Ladybug larva (bottom).

Figure 2. Sawfly larvae (top).
Caterpillar larva (bottom).

Figure 3. Redheaded pine sawfly larvae.

Figure 4. Introduced pine sawfly larva.

Figure 5. Yellowheaded spruce
sawfly larvae.

Figure 6. Pine tussock moth larva.

Figure 7. Juniper webworm damage.

Figure 8. Mature spruce budworm larva.

Figure 9. Spruce needleminer larva.

Figure 10. Spider mite damage.

Figure 11. Adult spider mite.

Figure 12. Pine bark aphid.

Figure 13. White pine aphid eggs.

Figure 14. Pine tortoise scale.

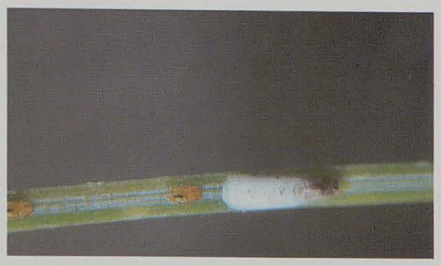

Figure 15. Pine needle scale adult and crawlers.

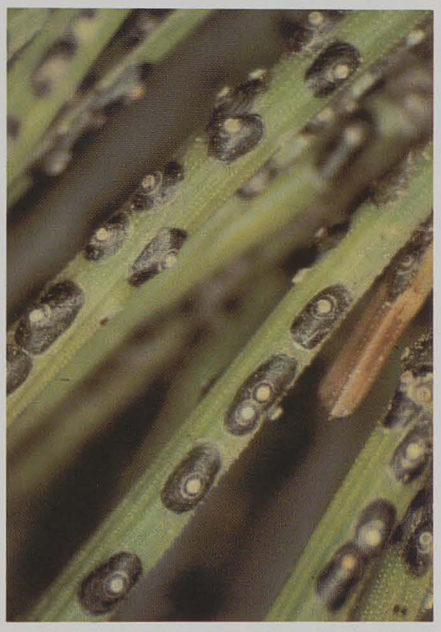

Figure 16. Black pineleaf scale.

Figure 17. Fletcher scale.

Figure 18. Spruce bud scale with eggs.

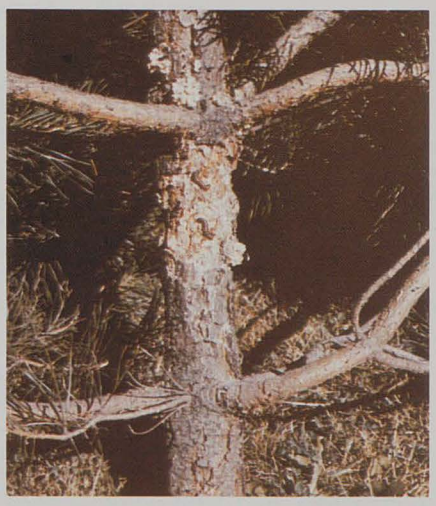

Figure 19. Zimmerman pine moth damage: pitch mass.

Figure 20. Zimmerman pine moth damage: wilting.

Figure 21. White pine weevil damage.

Figure 22. White pine weevil adult.

Table 2. Insecticides to Control Sapsucking Pests of Evergreens

Pest	Insecticide*		Amount per gallon of water	Remarks
Spider mites	dicofol (Kelthane)	35% WP	1½ tbsp.	Apply when mites first appear. Repeat in 7 to 10 days.
Aphids	acephate	15.6% EC	1 tbsp.	See descriptions of individual aphids for specific recommendations.
	(Orthene)	75% SP	1 tsp.	
	malathion	57% EC	2 tsp.	
	diazinon	25% EC	2 tsp.	
Scale insects	malathion	57% EC	2 tsp.	See descriptions of individual scales for specific recommendations.
	carbaryl (Sevin)	50% WP	2 tbsp.	
	acephate	15.6% EC	1½ tbsp.	
	(Orthene)	75% SP	1 tsp.	

**WP = wettable powder; EC = emulsifiable concentrate; SP = soluble powder.*

whenever mites are detected. The best chemical to use is one that will kill only mites; it will not kill true insects.

Aphids

Aphids are small, pear-shaped, soft-bodied insects which often cluster on needles, shoots, or stems of affected plants. Some are hidden beneath a wooly, whitish wax coating. Aphids often produce a sweet sticky material known as honeydew that becomes covered with a sooty black mold. Ants often feed on the honeydew and so are commonly found in association with aphids.

Pine bark aphid. The pine bark aphid is a serious pest of eastern white pine, especially on larger trees in shaded locations. It feeds on the bark of the trunk and the underside of branches, creating scattered patches of white fluffy material (figure 12). Heavily infested trees can become stunted and bushy, and in severe cases may die. Control is suggested whenever pine bark aphids are found, even if their numbers are small.

White pine aphid. The white pine aphid is common on eastern white and Scotch pine. It feeds in clusters on shoots and branches. Heavy populations can cause flagging and death in young trees. However, light to moderate populations cause little damage. The aphids are dark brown with white markings. They lay shiny black eggs in rows on the needles in late summer (figure 13). Control is suggested only when populations are large.

Scale Insects

Scale insects don't look like the usual insects. They are generally immobile and covered by a hard, waxy protective covering. The color varies from dark brown to white. The covering varies in shape from round to oval, and from flattened to humped. In many cases scale insects look like an abnormal bump or growth on the plant. However, scale insects are easily scraped from the tree without damage to the underlying plant tissue.

Like aphids, many scale insects secrete a sticky sweet fluid called honeydew. Usually a black sooty mold grows on the honeydew, causing foliage and branches to look black. This is often the first symptom to be noticed.

In addition to devitalizing a tree or shrub by sucking the sap, some scales also introduce a toxic substance into the plant that can cause damage out of proportion to the number of insects on the plant. Scale insects are very difficult to control in the hard-covered adult stage. Therefore, it is best to apply chemicals just after the eggs have hatched and again 10 days later. To do this properly, first identify the scale and then look up its normal hatch time in this publication or other appropriate reference. Examine the infested plant regularly from the normal hatch time until you can see the tiny (1/16 inch) football-shaped crawlers. Tapping the branch above a piece of white paper will help, since the crawlers are easier to see against a white background. Spray as soon as you see the crawlers (table 2).

Pine tortoise scale is primarily a pest on jack and Scotch pine but they occasionally attack Austrian, mugo, and red pine. Adult scales are reddish brown with black stripes, convex, and 1/8 to 1/4 inch in diameter. They are generally found on the twigs (figure 14). In light infestations, this scale tends to cluster toward branch tips. Their presence is often first made evident by the conspicuous sooty mold that grows on their honeydew secretions and by a yellowing of needles on the branch tips. Spraying should begin when the reddish crawlers hatch in late June to early July.

Pine needle scale is one of the most common and conspicuous scale insects found on evergreens. It attacks pines and spruces, with the mugo pine being most susceptible to severe injury. Adult scales look like white spots or flecks on the needles. Close examination reveals an elongated, flattened white cover with a small orange or reddish cap at one end (figure 15). When this scale is abundant the foliage takes on a gray or white tint. The best time to apply control measures is when the reddish crawlers hatch in May.

Black pineleaf scale attacks jack and mugo pines. The infestations are often localized, sometimes affecting just one or two trees in an area. The adult scales found on the needles are oval, 1/16 inch in diameter, and black with gray margins and a yellow central cap giving a "nipple" effect (figure 16). Injured needles turn yellow and eventually drop. A tree with a persistent infestation will characteristically have sparse, short needles. Control is suggested when crawler activity begins in May.

Fletcher scale attacks arborvitae and occasionally juniper. It causes drying of the foliage and dieback of the branches. The brownish, convex adults are about 1/8 inch long and feed on foliage and stems (figure 17). Control is suggested when eggs hatch, usually in the first week of July.

Spruce bud scale infests twigs of spruce, generally clustering at the base of recent twig growth. Lower branches are usually infested first. Adult scales are reddish brown, globular, and 1/8 inch in diameter. When clustered they are often mistaken for spruce buds (figure 18). Honeydew and resulting sooty mold are com-

Table 3. Insecticides to Control Wood Boring Pests of Evergreens.

Pest	Insecticide*	Amount per gallon of water	Remarks
Zimmerman pine moth	endosulfan 50% WP (Thiodan)	1½ tbsp.	Apply weekly from May to June to bark and main trunk. Prune and destroy infested limbs. Remove pitch masses by August.
White pine weevil	oxydemetonmethyl (Meta-Systox-R) 25% EC	1½ tsp.	Thoroughly spray newest growth in spring and again in late summer. Prune and destroy infested branches.
Pine root collar weevil	diazinon 25% EC	8 fl. oz. in 3 gals. of water.	Prune away lower branches and expose soil around trunk. Thoroughly spray trunk base and wet surrounding soil.
Bark beetles, flatheaded and roundheaded borers	No insecticide suggested		Increase tree vigor. Prune and destroy infested material.

**WP = wettable powder; EC = emulsifiable concentrate.*

monly associated with infestations of this scale. Spruce bud scale causes little damage except at very high population levels. Therefore, control is usually not necessary. If heavy populations are encountered, use control measures when crawlers are present, from mid-June to mid-July.

BORERS

Evergreen trees and shrubs are subject to attack by insects that bore or tunnel adjacent to or into the woody portion of the plant. These insects can be classified as primary borers (insects that attack healthy plants) or secondary borers (insects that attack dead, dying, or weakened plants). Attacks by secondary borers can often be prevented or controlled by increasing the vigor of the plant through cultural practices such as watering, fertilizing, or pruning. Primary borers are of more concern because simply keeping a tree healthy will not prevent them from causing damage.

Insecticides (table 3) are often inadequate since they are applied to the surface and have no effect on the insects once they are inside the plant. In such cases, pruning the infested limb or running a thin wire into the hole to kill the borer is all that you can do.

Primary Borers

Zimmerman pine moth. The Zimmerman pine moth prefers Scotch pine, particulary on sandy soil but will also attack red, jack, white, and mugo pines. This insect can attack the terminal shoot (branch tip) or any branch, especially where the branch emerges from the main trunk. A large, solid mass of pitch (hardened sap) forms at the site of attack and is one of the main signs that Zimmerman pine moths are present (figure 19). The tissue beneath the pitch mass is honeycombed by the feeding of the caterpillar, which is pink to gray with several rows of small dark spots. Terminal shoots that are attacked often flag (wilt) in the spring (figure 20).

The Zimmerman pine moth does not kill a tree. However, it may cause the shoots or lateral branches to die, resulting in a forked or crooked growth pattern. Feeding can also sufficiently weaken a tree at the point of attack so that breakage can occur in high winds or under heavy snow loads.

Control of the Zimmerman pine moth is difficult. The larval stage is vulnerable to insecticides only during May and early June. Multiple applications are necessary and even then they are only partially successful. Prune and destroy infested limbs. Cover open wounds with asphalt-base tree paint since this insect is attracted to wounds. Removal of hardened pitch masses in early August may also prove helpful for control.

White pine weevil prefers eastern white pine but will attack spruces and other pines. It prefers trees growing in the open. Weevils breed in and destroy leaders (the topmost shoot of the tree). This results in a forked or crooked growth pattern. Damaged new growth first curls into a "shepherd's crook" and then dies (figure 21). Removal of the outer bark reveals numerous meandering tunnels down the length of the shoot. The damage is caused by the feeding of the white pine weevil grub. This legless grub is white with a dark head.

The long-snouted adult beetle feeds externally and can also cause damage (figure 22). In the spring the adults prefer the previous year's terminal shoots; in late summer they feed on the tips of lateral branches. Feeding results in small holes in the bark covered with droplets of sap. Extensive feeding can girdle the twig and cause browning and tip dieback.

As with most borer damage, prune out and destroy infested branches. The adult, which feeds externally on the twigs, is susceptible to insecticides. A thorough spraying of the tips in spring and again in late summer when the adults are active can also help.

Pine root collar weevil. This weevil prefers both young and old Norway, Scotch, and jack pines growing on poor sites, especially where the soils are light and sandy. The legless, white grubs have a dark head. They feed just below the soil surface on the bark, inner bark, and sapwood of stems and large roots. This feeding girdles the bark and restricts the transport of nutrients, thus weakening the tree and retarding growth. Eventually the tree will yellow and then turn a deep reddish brown. A swollen trunk at ground line and darkened, pitch-infiltrated soil around the root collar indicate an infestation (figure 23). You may have to dig a few inches into the duff (organic matter) and soil to detect these symptoms.

You can control the insects by pruning away lower branches and exposing soil at the base of the tree. Follow this with an insecticide applied to trunks and surrounding soil anytime during

the growing season. Apply enough spray to thoroughly wet the tree's root collar and to soak the soil.

Secondary Borers

The presence of secondary borers is a sign that the plant is under stress. The insects are better than humans at detecting a stressed tree, so don't be deceived by a tree that may look healthy but is being attacked by secondary borers. Keeping a plant healthy and vigorous through cultural practices is the best and most practical method of control. Insecticides are generally not worth the effort since they do not correct the underlying reason for attack.

Bark beetles are commonly associated with injured, weakened, or dying trees. Small shotgun-sized holes indicate attack by bark beetles (figure 24). Removal of the bark will expose galleries engraved in the inner bark and on the surface of the wood (figure 25). Control measures include the removal and destruction of infested branches coupled with watering and fertilizing to increase tree vigor.

Flatheaded wood borers are common in evergreens of all kinds. They are almost always associated with dying trees. The larvae are wormlike but have a noticeably enlarged and flattened cobra-shaped head region; hence the name flatheads (figure 26). They construct tunnels in the wood, which are densely packed with dark sawdust. To control these borers, increase tree vigor and remove and destroy infested material.

Roundheaded wood borers produce tunnels in the wood like flatheads do, except that the tunnels of the roundheaded borer are loosely packed with coarse sawdust and wood shavings. The larvae do not have the conspicuous enlarged and flattened head of the flatheaded borers (figure 27). Control is the same as for flatheaded borers.

Figure 23. Pine root collar weevil damage.

Figure 25. Bark beetle galleries.

Figure 24. Bark beetle exit holes.

Figure 26. Flatheaded wood borer larva.

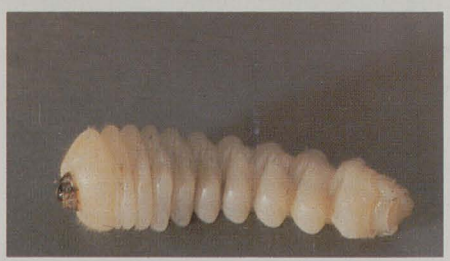

Figure 27. Roundheaded wood borer larva.

Editor: Louise Jones
Designer: Rose Mauch

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