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Aphid and Adelgid Pests

of Conifers in Oregon

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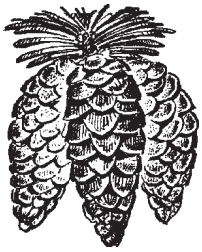

This publication covers the important *aphid* and *adelgid* pests of conifers in Oregon, excluding those that primarily feed on the roots of their host.

Conifers are plants that bear cones as reproductive structures. Examples are pine, fir, spruce, hemlock, Douglas-fir, and cedar.

Aphids and adelgids can be important pests in Christmas tree plantations, conifer nurseries, and landscape plantings. The *Identification Key* lists the tree species included in this publication and their pests.

Aphids are small, soft-bodied insects that suck plant sap from their hosts. Toxic or growth-regulating chemicals often are injected at the same time.

Adelgids are closely related to aphids but are distinguished from their better-known relatives because they feed only on conifers, while aphids have host plants in all plant families. Adelgids currently are placed in their own family, Adelgidae, while aphids belong to the family Aphididae. Both families belong to the large and diverse insect order *Homoptera.*

Aphid and adelgid life history can be extremely complex, often involving more than one host plant. Typically, there are several *parthenogenetic* (asexual) generations each year. The final generation before winter may be sexual, and winter usually is spent in the egg stage.

Many aphids and adelgids secrete a white, waxy covering from pores on the body. The wax provides protection against

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Most Common Aphid and Adelgid Pests by Host Tree

Tree	*Pests*
Douglas-fir *(Pseudotsuga)*	Cooley spruce gall adelgid (secondary host; can reach pest status) conifer aphids *(Cinara* sp.*)*
Grand fir *(Abies grandis)*	balsam twig aphid *(Mindarus abietinus)* conifer aphids *(Cinara* sp.*)* balsam woolly adelgid *(Adelges piceae)*
Noble fir *(Abies nobilis)*	conifer aphids *(Cinara* sp.*)* balsam woolly adelgid *(Adelges piceae)*
Pine *(Pinus)*	conifer aphids *(Cinara* sp.*)* pine bark adelgid *(Pineus strobi)*
Spruce *(Picea)*	conifer aphids *(Cinara* sp.*)* spruce aphid *(Elatobium abietinum)* Cooley spruce gall adelgid (primary host; usually not a pest)

OREGON STATE UNIVERSITY EXTENSION SERVICE

Identification Key

Important Aphid and Adelgid Pests of Northwest Conifers by Host Tree

Tree and Symptoms	*Pests*
DOUGLAS-FIR *(Pseudotsuga)*	
Aphids without much waxy covering. Produce large amounts of honeydew, which may be attractive to ants and yellow jackets or covered by sooty mold	**conifer aphids *(Cinara* sp.*)***
"Pepper" flecks (crawlers) on needles in late spring and / or white cottony tufts on needles before bud break or after about mid-June	**Cooley spruce gall adelgid *(Adelges cooleyi)***
TRUE FIRS *(Abies)*	
Aphids without much waxy covering. Produce large amounts of honeydew, which may be attractive to ants and yellow jackets or covered by sooty mold	**conifer aphids *(Cinara* sp.*)***
Swelling ("gouting") of branch nodes. Very small waxy adelgids may or may not be found. Trunk, branches, or twigs may be covered with white, waxy secretions in heavy infestations	**balsam woolly adelgid *(Adelges piceae)***
Twisting of new growth. Small greenish-yellow or bluish-gray aphids. Wax and honeydew may be present, causing needles to mat together	**balsam twig aphid *(Mindarus abietinus)***
SPRUCE *(Picea)*	
Aphids without much waxy covering. Produce large amounts of honeydew, which may be attractive to ants and yellow jackets or covered by sooty mold	**conifer aphids *(Cinara* sp.*)***
Pineapple-shaped galls or cones on branch tips	**Cooley spruce gall adelgid *(Adelges cooleyi)***
Twisting of new growth. Small greenish-yellow or bluish-gray aphids. Wax and honeydew may be present as well	**balsam twig aphid *(Mindarus abietinus)***
Old (more than 1-year-old) needles shed, especially on lower, shaded portions of tree. Aphids peak in late winter (February–March), decline toward summer. Small, green aphids	**spruce aphid *(Elatobium abietinum)***
PINE *(Pinus)*	
Aphids without much waxy covering. Produce large amounts of honeydew, which may be attractive to ants and yellow jackets or covered by sooty mold	**conifer aphids *(Cinara* sp.*)***
White flocking on bark of branches and trunk. Trunk may appear "snow covered"	**pine bark adelgid *(Pineus strobi)***
HEMLOCK *(Tsuga)*	
Aphids without much waxy covering. Produce large amounts of honeydew, which may be attractive to ants and yellow jackets or covered by sooty mold	**conifer aphids *(Cinara* sp.*)***
Cottony tufts on bark and twigs. May seriously weaken ornamental trees	**hemlock adelgid *(Adelges tsugae)***

water loss and predators. The presence or absence of wax often is a diagnostic feature used for identification.

Aphid and adelgid identification is difficult. The best place to start is with identification of the host tree since many of these pests are specific to one type of host. Use the *Identification Key* as a starting point.

Feeding habits and effects on host plants

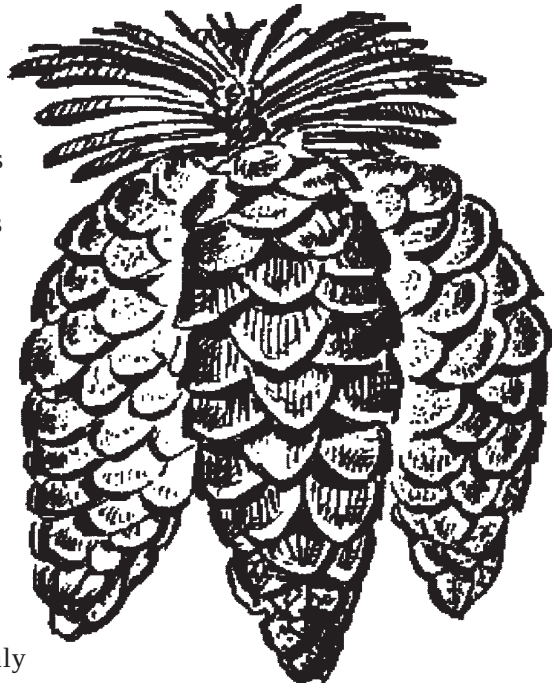
Aphids and adelgids feed by piercing host tissue and withdrawing the plant's sap through straw-like mouthparts. This mode of feeding produces large amounts of *honeydew*—the sticky, sugary liquid found below aphid or adelgid colonies. Honeydew attracts ants, yellow jackets, and other scavengers and supports growth of a black fungus called *sooty mold.*

Aphids and adelgids feed on needles, twigs, branches, trunks, and roots—in other words, virtually anywhere on the plant. However, each particular species usually is confined to a narrower range of feeding sites.

While feeding, these pests may inject toxins, growth-regulating hormones, or plant pathogens into their host plant. Injection of plant toxins *(toxemia)* is observed most easily in broadleaf plants, where you may find twisted, stunted growth above an aphid colony. Plant viruses also can be transmitted between plants by aphid feeding, but this is not known to occur in conifers.

Compounds that resemble natural plant growth hormones are injected by some conifer-feeding aphids and adelgids while they feed. These substances mimic natural plant chemicals that regulate growth and reproduction.

When artificially injected, these substances can cause dramatic changes in plant development. Perhaps the best example is the "pineapple" galls on spruce that are formed by growth hormones injected by developing nymphs of the *Cooley spruce gall adelgid.* This pest is discussed in greater detail below.



Life cycles

Aphid and adelgid life cycles are so complex and varied that we can make only broad generalizations. For example, in many species the insect's form changes depending on host tree or season.

Reproduction can be complex as well. At certain times of the year, no males are produced and reproduction occurs *asexually.* Even more strange, certain species sometimes give birth to live young and at other times lay eggs.

Because these pests change appearance from host to host and season to season, it often is better to identify aphids and adelgids based on the host tree.

Generalized aphid life cycle. Eggs overwinter on needles or bark. Young hatch in mid-March, begin feeding, and develop into adults in April.

Several generations can be produced during the warm months. Large colonies, often attended by ants, develop on twigs and branches. These colonies produce copious amounts of honeydew. Both winged and wingless forms can be found in the same colony.

Generalized adelgid life cycle. The complete life cycle takes 2 years and involves two hosts, a *primary* host and a *secondary* host. A gall is produced on the primary host, while feeding occurs on the secondary host on needles or bark under a covering of wax. No galls are formed on the secondary host. *Picea* (spruce) normally is the primary host; and fir, larch, Douglas-fir, hemlock, or pine is the secondary host.

Use pesticides safely!

- Wear protective clothing and safety devices as recommended on the label. **Bathe or shower** after each use.
- Read the pesticide label—even if you've used the pesticide before. **Follow closely** the instructions on the label (and any other directions you have).
- **Be cautious** when you apply pesticides. Know your legal responsibility as a pesticide applicator. You may be liable for injury or damage resulting from pesticide use.

Pest descriptions

Cooley spruce gall adelgid *(Adelges cooleyi)* has an extremely complex life cycle, part of which is spent on spruce while the other part is completed on Douglas-fir. The complete cycle may extend over 2 years and include several forms.

The most common form occurs on **Douglas-fir** and appears as small, white, cottony tufts on the underside of needles. In some years, the adelgid is so numerous that the ground below large Douglas-fir trees is sticky with honeydew.

The form of Cooley spruce gall adelgid that feeds on **spruce** produces a growth deformity or gall that resembles a cone or pineapple on branch tips. Galls are not formed on the secondary host, Douglas-fir. Unless the infestation is severe, this insect is not considered a pest of spruce.

The Cooley spruce gall adelgid is not the only adelgid to make galls on spruce. It is, however, the most common and is the one that alternates with Douglas-fir. It also may persist on Douglas-fir by reproducing parthenogenetically for many generations.

Balsam woolly adelgid *(Adelges piceae)* is a pest of **true firs** only. The insect is not native to this country, and only females have ever been detected. The adults are less than 1/25" long, wingless, and covered by dirty, white wax.

Because they are wingless, their only means of dispersal is by wind. They attack parts of the trunk and branches by inserting their mouthparts deep into the underlying tissue.

When attacked, firs often develop a condition called "gouting," in which the branch nodes swell. This deformity is caused by a growth hormone or toxin injected by the feeding adelgids. The condition persists even after the adelgids themselves are gone. Infestation causes bud deformity, branch die-back, and damage to parts of the outer bark.

Severe infestations can leave the entire trunk covered with waxy secretions. At this point, the tree may be beyond recovery. This insect is responsible for destruction of many thousands of board feet of fir timber each year.

Hemlock adelgid *(Adelges tsugae)* is a serious pest of ornamental hemlock. This adelgid settles on twigs or at the base of needles and produces a white, waxy mass. Its feeding causes premature needle drop and a general decline in tree vigor. The immature, or crawler, stage occurs from late March to June.

Pine bark adelgid *(Pineus strobi)*, like many other adelgids, feeds on the trunk and limbs of its host trees. Eastern white pine,

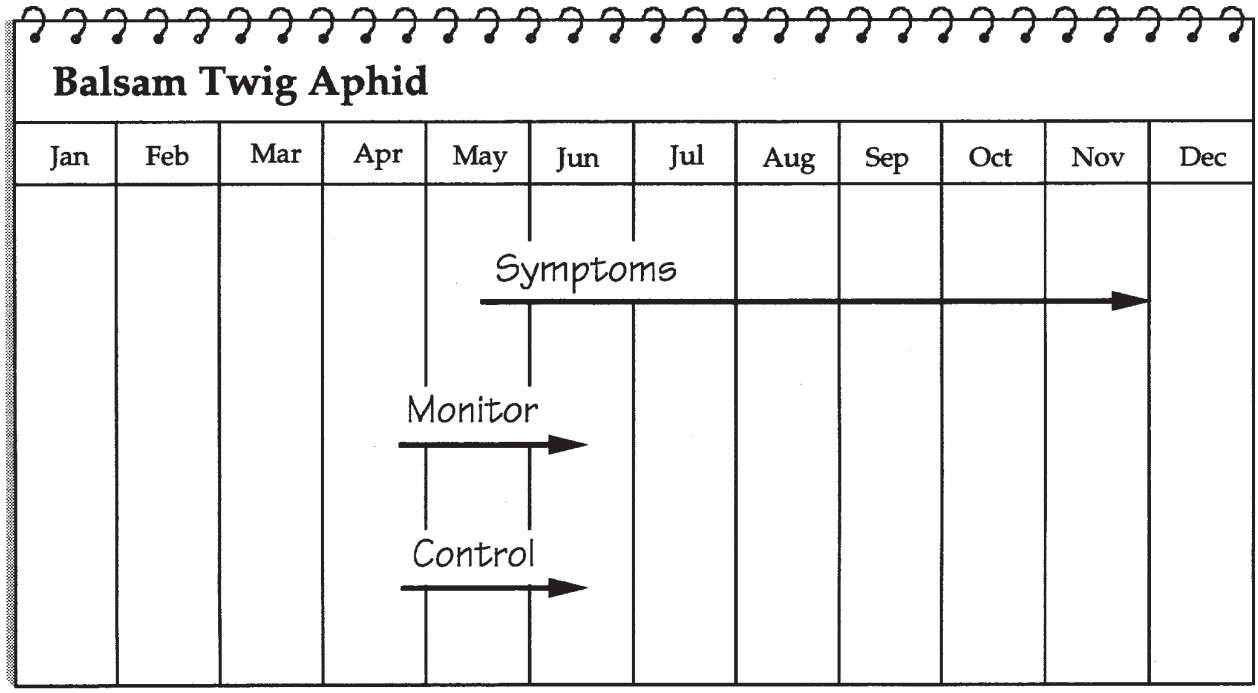


Figure 1.—Pest calendar: Balsam twig aphid.

Scotch pine, and Austria pine can be severely infested. The immature stages may be present early in the year. Infestation first occurs on the shaded portions of the trunk and limbs.

Balsam twig aphid *(Mindarus abietinus)* has a complex life history. It has been collected on alpine, balsam, Fraser, grand, and white fir; white and Colorado spruce; and juniper. Overwintered eggs hatch in spring.

Infestations result in needles being twisted and matted together with copious amounts of honeydew and wax. The aphids may be either bluish-gray or yellowish. In Christmas tree plantations, severe damage can require up to 2 to 3 years for regrowth to repair.

Spruce aphid *(Elatobium abietinum)* is a particularly destructive pest of ornamental spruce. The aphid is very small (1/25" –1/16" long) and is green. Discovery is difficult because of the insect's small size and because populations peak in late winter. Damage normally is noticed before the insects are detected.

Infested trees shed older needles, becoming thin or bare on the inside—often producing what is called a "bottle brush" appearance. It may take 5 years for the tree to recover its full complement of foliage.

Conifer aphids *(Cinara* sp.*)* are the most common aphids found in conifers. There are about 175 species worldwide.

Conifer aphids do not have secondary hosts. They usually are found on twigs and branches but may occur on trunks and roots. Most feed in groups; a few, however, are solitary. Several generations are produced each year, possibly building to high levels by late summer or early fall.

Conifer aphids always are associated with honeydew, which is attractive to ants and yellow jackets and may be covered by sooty mold.

Important natural enemies are ladybird beetles, lacewings, and syrphid fly larvae. Artificial releases of ladybird beetles *(Hippodamia convergens)* are **not effective,** however.

Instead you should rely on natural populations of ladybirds. Also, spot treating areas of infestation with insecticide or insecticidal soap may reduce the need to treat whole fields.

Control

Unfortunately, injury thresholds have not been established for aphid and adelgid pests in conifers. Your decision to treat, either chemically or non-chemically, should take into account several points.

First, how long is it until harvest? Trees destined for harvest this year may require more attention than trees that are 2 or more years from harvest.

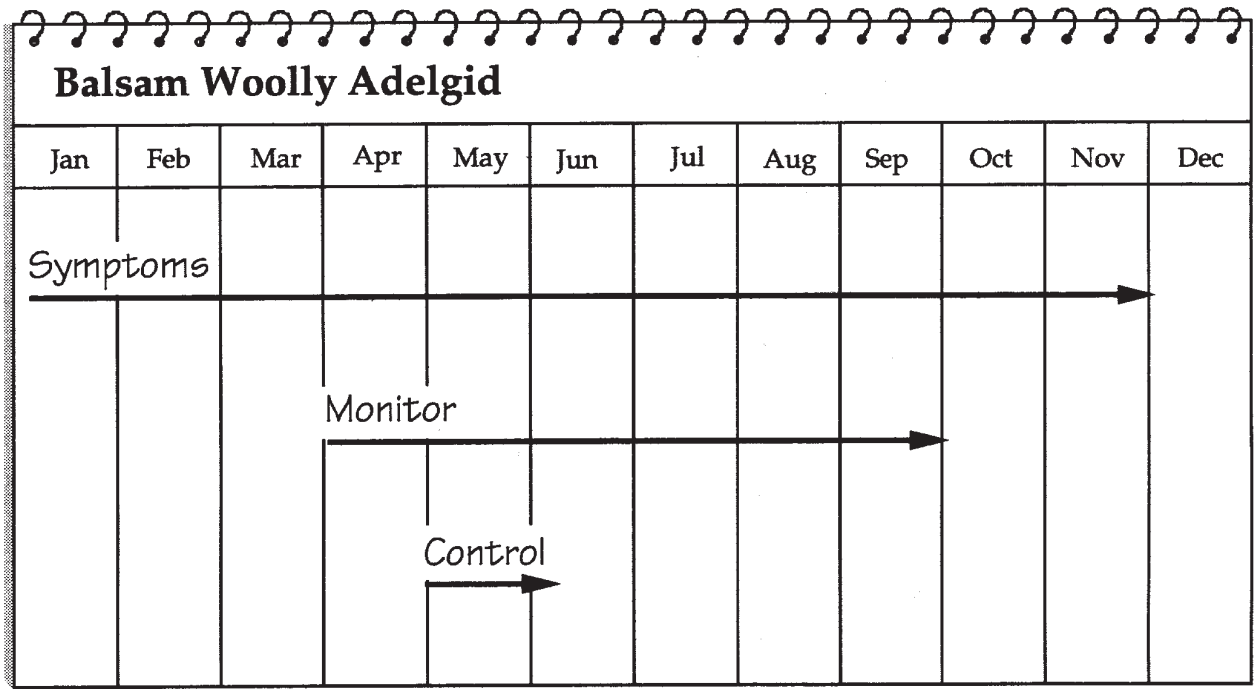


Figure 2.—Pest calendar: Balsam woolly adelgid.

Second, consider the presence of natural enemies and expected weather conditions. Artificial control might be more important if natural enemies are scarce and the weather is hot and dry than if natural enemies are common and the weather is cool and wet.

Also consider how much of the field you need to treat. It may be better in the long run to spot-treat a few heavily infested trees rather than waste money treating a whole field and risk disrupting the natural enemy complex.

For specific suggestions, consult the latest edition of the *PNW Insect Control Handbook,* revised annually by the Extension Services of Oregon State University, Washington State University, and the University of Idaho. The Handbook contains sections on both **Christmas Tree Plantation Pests** and **Ornamental Plants** where you will find information concerning pests of conifers. To order, send $19.50 to Publications Orders, Extension and Experiment Station Communications, Oregon State University, Administrative Services A422, Corvallis, OR 97331-2119. (541) 737-2513.

Pest calendars

The pest calendars in this publication are intended to assist you in recognizing aphid and adelgid pest problems. Each calendar has three "event lines." The top line indicates the best time to observe damage symptoms, the middle line when to monitor or scout for the pest, and the bottom line when to apply control measures, if needed. **Do not** rely only on these calendars when making pest control decisions—use them only as a guide.

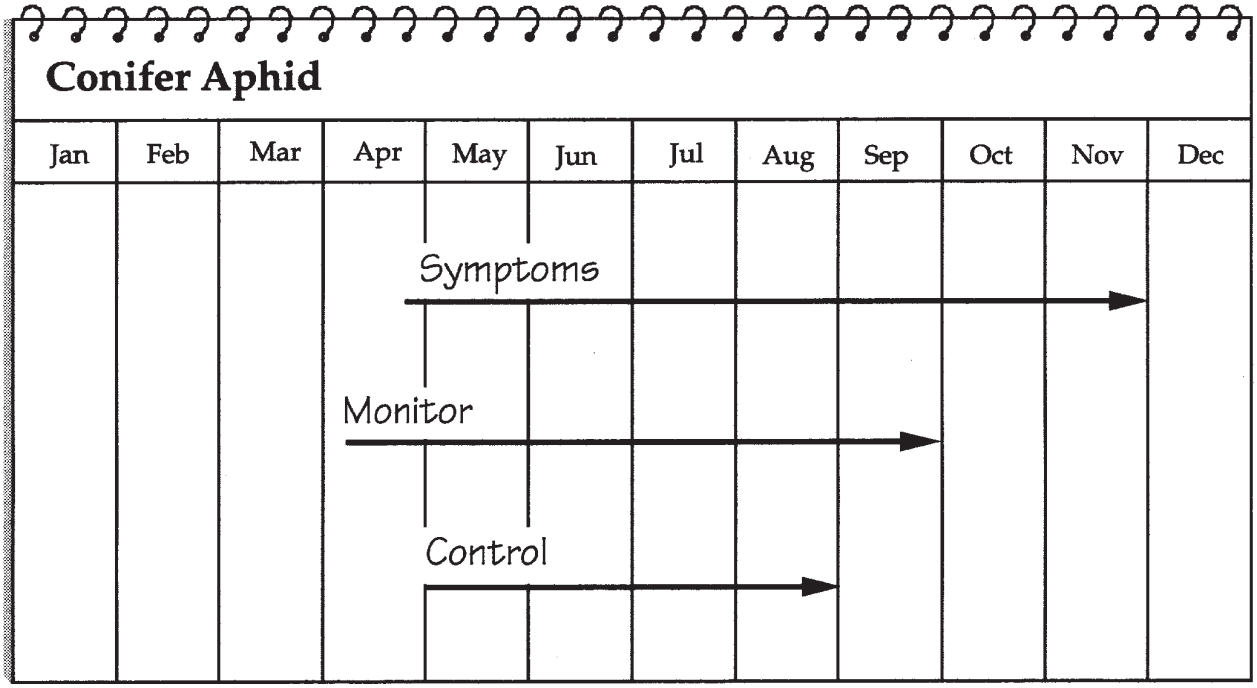


Figure 3.—Pest calendar: Conifer aphid.

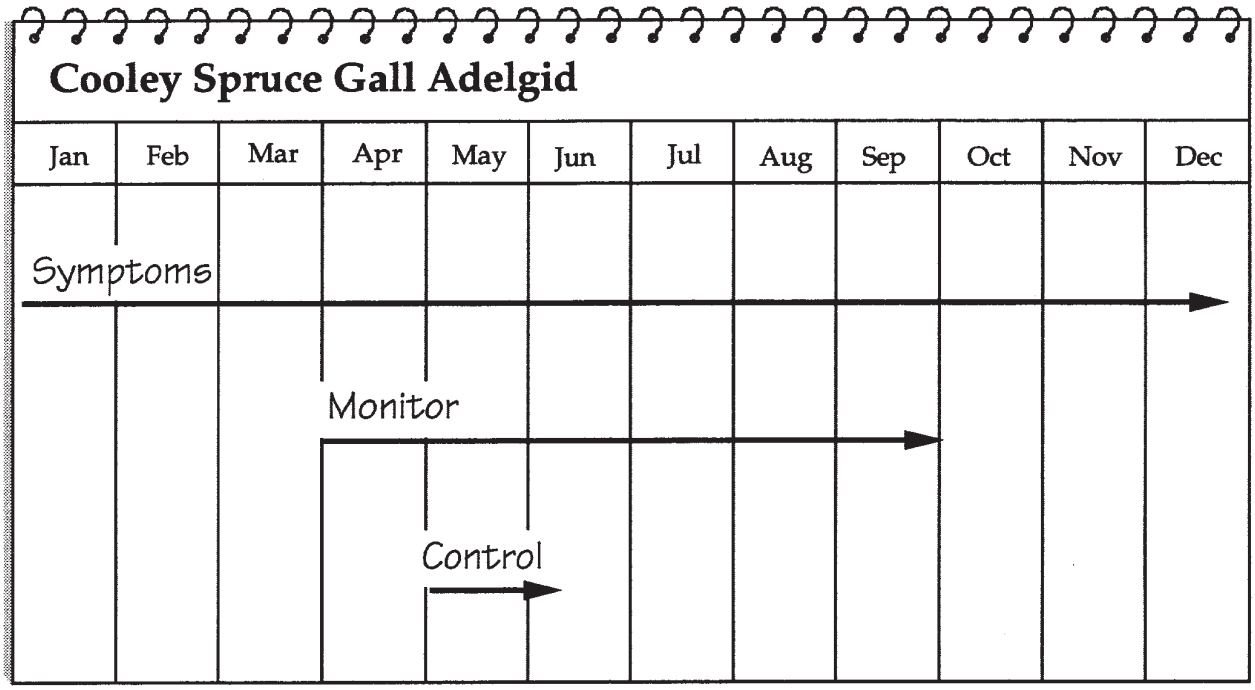


Figure 4.—Pest calendar: Cooley spruce gall adelgid.

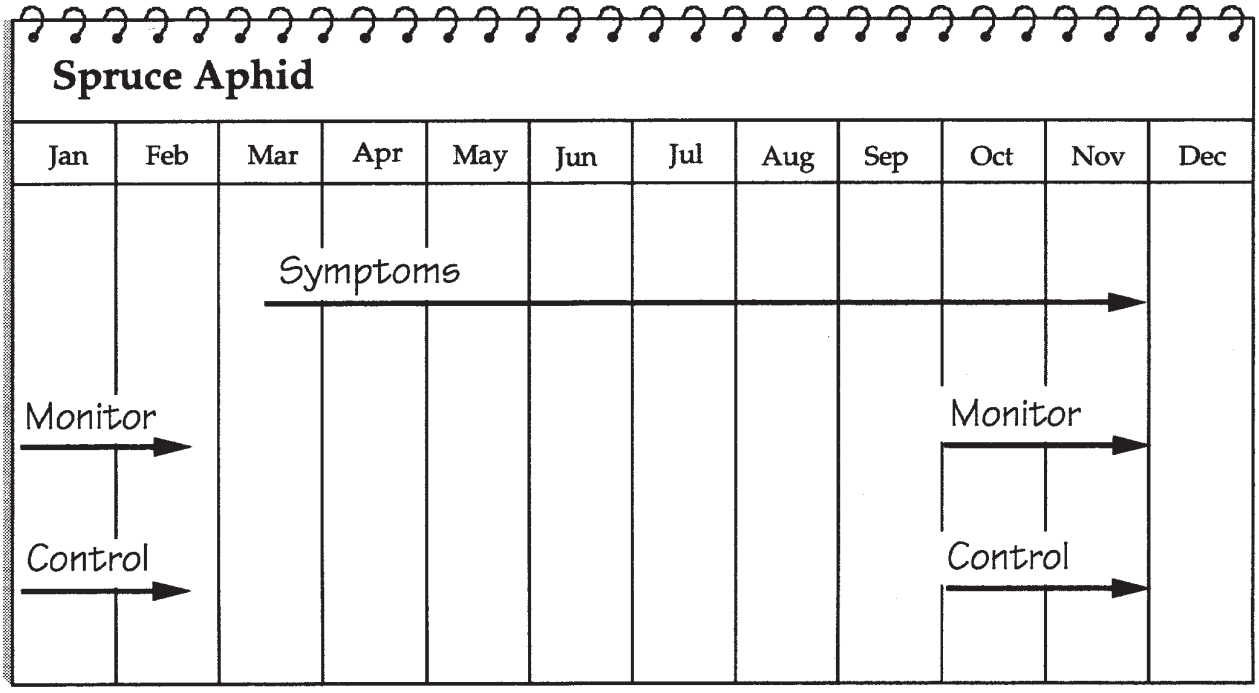


Figure 5.—Pest calendar: Spruce aphid.

Since pesticide registrations change frequently, resulting in more or fewer available pesticides and changes in permissible pesticide practices, this publication doesn't make specific pesticide recommendations. For current recommendations, refer to the *Pacific Northwest Insect Control Handbook,* published and revised annually by the Extension Services of Oregon State University, Washington State University, and the University of Idaho.

In addition, detailed instructions for pesticide use are provided on pesticide container labels and in other literature provided by pesticide manufacturers.

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