INSECTS

Aphids

Family Aphididae

HOST Several hosts

DAMAGE/SYMPTOMS Aphids are sap-sucking insects and the saliva they release from feeding can cause discoloring, curling, distortion, or overall lack of vigor.

LIFE CYCLE The aphid life cycle varies significantly between species. In general, aphids overwinter in the egg stage on a host and reproduce in large numbers asexually during the growing season. Later in the summer, most aphids produce winged generations and move to a second host. In the fall, they return to their primary host, mate, and lay eggs.

MANAGEMENT A strong spray of water alone can effectively remove aphids. Aphid populations tend to be higher in plants that are fertilized liberally with nitrogen, as this produces flushes of succulent growth. Avoid excessive watering and use slow-release fertilizers. Placing cardboard wraps around the tree that are covered with a sticky substance, such as Tanglefoot, can prevent ants from climbing. Ants have a mutualistic relationship with aphids; they hoard the honeydew released from aphids and then defend the aphids from their natural enemies in return. There are a variety of lower toxicity contact products available including soaps, oils, and botanicals. Good coverage with contact pesticides is essential. Systemic insecticides are particularly useful when contact is difficult and to protect new growth over time (active ingredients such as imidacloprid and dinotefuran).

A Rose aphids. **B** Green peach aphid. **C** Black cherry aphids.


A
B
C

Ash Bark Beetles

Hylesinus spp.

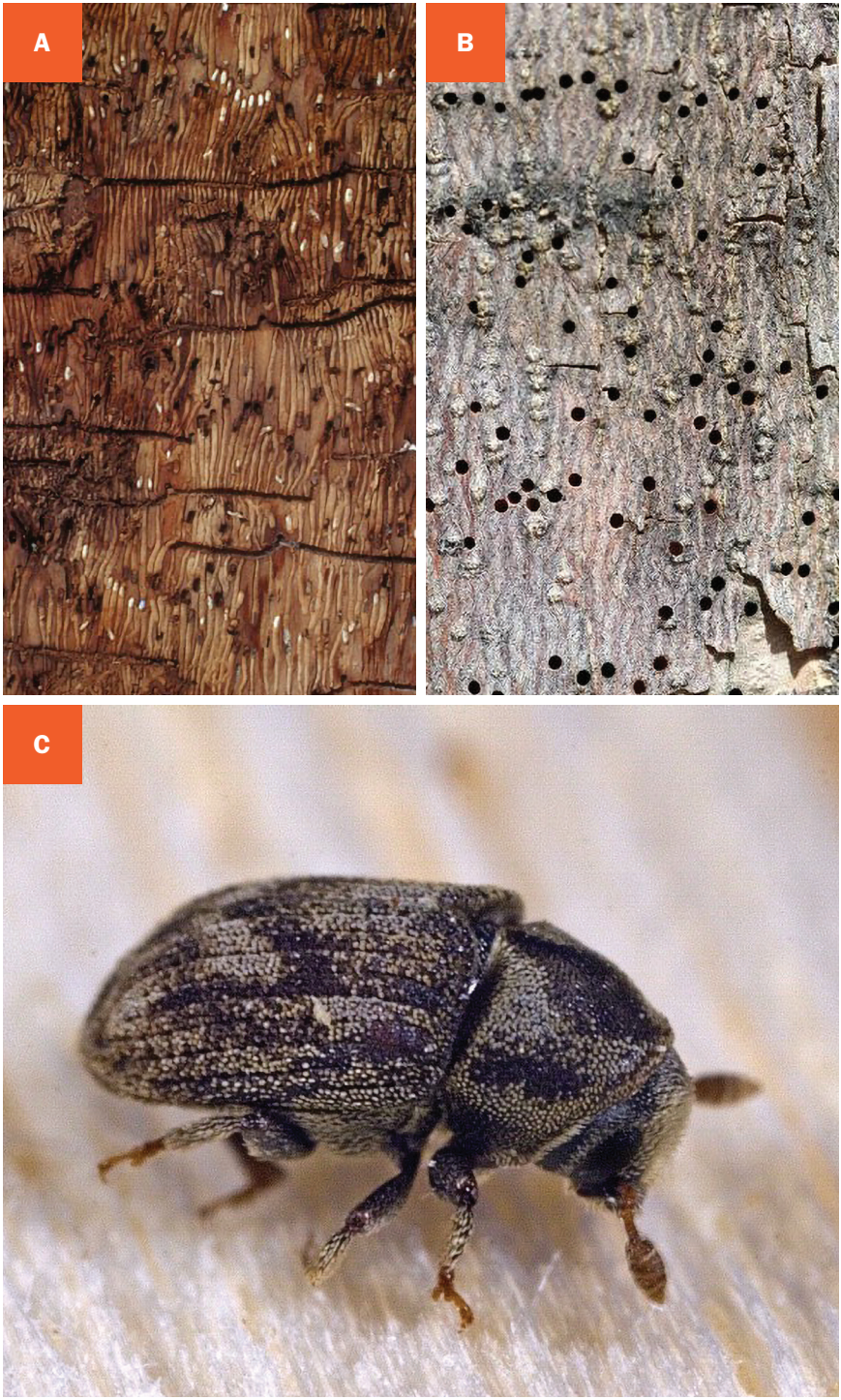
HOST Ash

DAMAGE/SYMPTOMS The small beetles (three to four millimeters) make a pattern of ventilation holes that form a ring around the branch. They prefer to breed in recently cut, broken, and stressed trees. They also infest trees weakened by mechanical injury, disease, or fire.

LIFE CYCLE The adult bark beetles emerge in the spring and fly to trunks or limbs of recently felled, dying, or weakened trees. They mate and lay eggs in branches. The larvae burrow under the bark where they continue to develop and feed, pupate, and then emerge as adults. The larvae either overwinter under the bark or the adults cut niches in the outer trunk in which they overwinter.

MANAGEMENT Stressed trees will attract the beetles. Infested branches can be identified with the presence of wilted leaves. Pruning is most successful in the spring before the adult beetles emerge from the bark. Maintain the health and vigor of the tree and prune infested branches. Preventive insecticides can be applied during adult egg-laying periods in mid-spring. An additional insecticide application can be applied in late summer around the base of the trunk to kill populations of overwintering beetles. Insecticides with the active ingredients carbaryl, bifenthrin, and permethrin can be used.

A Ash bark beetle galleries under the bark. **B** Beetle exit holes. **C** Eastern ash bark beetle adult.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B
C

Ash Flower Gall Mite

Eriophyes fraxiniflora

HOST Ash

DAMAGE/SYMPTOMS Damage is caused by a small, microscopic mite called an eriophyid mite. The mite distorts the male flowers of the ash. These galls are originally a greenish-yellow color but dry out and turn brown.

LIFE CYCLE Female mites overwinter under bud scales and protected areas. In the spring, females actively feed and lay eggs on the buds. The male flowers disfigure and form gall-like tissue where the mites continue to develop. The mites leave these galls later in the summer and move to bud scales to overwinter.

MANAGEMENT The pests are generally secondary and infest stressed trees. The galls rarely affect the health of the tree. Due to the protection of the mites within the galls, insecticide treatments are often minimally effective in controlling mite densities and often kill beneficial natural enemies of the mites. Larger trees are difficult to treat effectively. If chemical controls become necessary, a contact insecticide or miticide labeled for the host can be applied when the first blossoms appear. Also, a dormant oil can be applied prior to bud break.

A Ash flower gall mite early-season distortion. **B** Ash flower gall mite distortion during summer. **C** Late-season galls.


A
B
C

Ash Plant Bug

Tropidosteptes spp.

HOST Ash

DAMAGE/SYMPTOMS Plant bugs puncture the plant tissue and cause stippling on the upper surface of the leaf. Some of these areas will coalesce to form larger chlorotic spots. The bugs leave brown fecal spots on the underside of the leaf. If infestations are heavy, leaves can become severely distorted and drop to the ground.

LIFE CYCLE Plant bugs lay eggs under loose bark. The nymphs hatch in late April or early May and begin to feed on lower leaves. The adults mature by early June and insert eggs along the leaf midribs. There are typically two generations per year.

MANAGEMENT The damage from this plant bug is usually minor and the trees will recover. Smaller trees can be shaken, or water can be used to dislodge the nymphs when they are present on the leaves earlier in the year.

A Ash plant bug damage.


A

Aspen Blotch Leafminer

Phyllonorycter spp.

HOST Aspen, poplar, cottonwood

DAMAGE/SYMPTOMS The caterpillar feeding and mining cause white blotches on the underside of the leaves. Heavy outbreaks can cause reduced tree growth and branch dieback.

LIFE CYCLE Adult moths emerge from overwintering sites and feed on nectar. Females mate and deposit several eggs on newly emerging leaves. The larvae develop and feed within the leaf, causing blotchy looking tissue. They pupate, and the adults emerge in late summer as leaves are starting to senesce.

MANAGEMENT The leafminers attack stressed trees. Normally, no treatment is necessary, and the pests are controlled by natural enemies later in the summer. Keep aspen and cottonwood trees well cared for with frequent watering. Pick off the mined leaves and dispose of them (if there are only a few—sometimes this leafminer can be found on the majority of a tree's leaves). Rake up and dispose of leaves in the fall to reduce overwintering populations of the moths. Chemical controls are only moderately effective in controlling the pest and have sometimes made the populations worse by killing many of the natural enemies of the caterpillars. If insecticides are necessary in the future, they are most effective at the egg-laying stage of the moth (right after the tree leafs out). Products that could be used include those with the active ingredients spinosad, permethrin, bifenthrin, carbaryl, and zeta-cypermethrin. Systemic insecticides (active ingredients such as imidacloprid and dinotefuran) are not effective against larvae.

A Aspen blotch leafminer damage.


A

Blister Mites

Phytoptus spp.

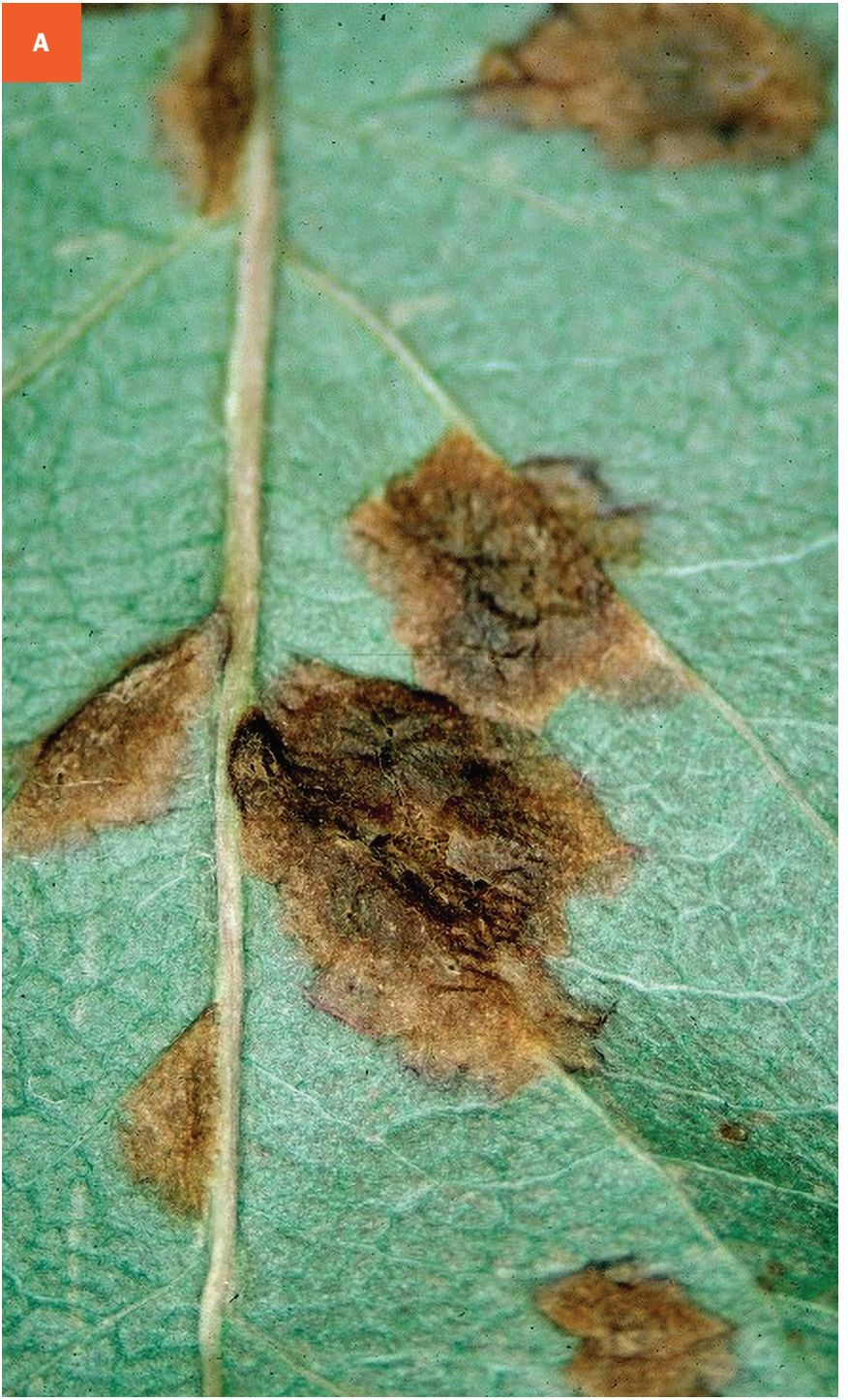
HOST Apple, crabapple, pear

DAMAGE/SYMPTOMS Eriophyid mite feeding creates a "blister" on the leaf surface, and the mites reside within this protected area.

LIFE CYCLE The mites overwinter as adults beneath bud scales. When the buds start to grow in the spring, mites attack the emerging leaves. Their activity increases in the summer with two to three generations per year.

MANAGEMENT The mites normally do not affect the health of the tree. If a small portion of the leaves are damaged, prune and dispose of them. Eriophyid mites are also controlled naturally by predatory mites, predatory thrips, and minute pirate bugs later in the summer. To control the mites chemically, a dormant oil can be applied prior to bud break. Neem oil, insecticidal soap, a miticide, sulfur and those insecticides with the active ingredients bifenthrin, deltamethrin, and permethrin can be applied as contact insecticides in the spring following bud break. Systemic insecticides with the active ingredients imidacloprid and dinotefuran can also be used against the pest and should be applied in the spring.

A Blister mite damage on apple leaf.


A

Bronze Birch Borer

Agrilus anxius

HOST Birch

DAMAGE/SYMPTOMS Girdling injuries cause dieback of limbs in the crown. D-shaped exit holes will be present on trunks and branches on parts of the tree that are unshaded. The infestations will also cause raised ridges in the bark. The galleries that are formed from boring underneath the bark make a zig-zag pattern and are packed with sawdust.

LIFE CYCLE Females lay eggs in bark crevices or in other protected sites. Egg laying begins in the upper crown of the tree or in branches (usually less than-half-inch thick) and then continues to thicker portions of the tree. The eggs will hatch after about two weeks. The larvae overwinter within the cambium and pupate in early spring. The adults exit the trees in late May or early June. There is one generation/year.

MANAGEMENT Birch are often stressed, making them more susceptible to the borer. Provide a large mulched area around the tree to conserve moisture and to protect the root system. Any limbs showing signs of infestation should be pruned out prior to beetle emergence in the spring. Preventive insecticides can be applied as trunk sprays (active ingredients include bifenthrin, permethrin, and carbaryl) and should be timed to coincide with egg laying in the summer. Systemic insecticides with the active ingredients imidacloprid, emamectin benzoate, azadirachtin, or dinotefuran can also be applied in the spring to prevent future infestations.

A Bronze birch borer adult. **B** Bronze birch borer damage on trunk.


A
5454856
B

Codling Moth

Cydia pomonella

HOST Apple, pear, crabapple

DAMAGE/SYMPTOMS Caterpillars tunnel inside the fruit and deposit insect excrement. Holes and egg-laying spots are also evident on the outside of the fruit.

LIFE CYCLE Codling moths overwinter as pupae in tree bark cracks and soil near trees. As temperatures warm in the spring (approximately above 50°F), adults emerge, mate and begin laying eggs near fruit sites on trees. After eggs hatch, larvae feed on leaves and shoots, and later burrow into fruit until they pupate to emerge again as adults. Depending on temperatures, there can be up to three generations in Montana per growing season.

MANAGEMENT Pick up and dispose of dropped fruit. In small plantings, individual fruits can be protected by pruning each cluster when the apples are about the size of a quarter. This can reduce larval burrowing between touching fruit. Remove small or weakly attached fruits until there are about one to two apples per cluster. Then fruit can be wrapped in nylon footlets. Staple the footlet at the top. Trees can also be wrapped in corrugated cardboard, which can help trap larvae that are leaving the apples to find a place to pupate. The cardboard should be removed and destroyed before adults emerge. Mating disruption is a management technique that involves releasing a male sex attractant into the air. This works optimally with areas of 10 acres or greater. Several contact insecticides are available for chemical control. The timing of chemical controls is critical and coincides with egg laying, which is after flowering and dependent on the number of accumulated degree days (based on weather). Never apply a chemical spray during bloom. Some reduced-risk contact insecticides include those with the active ingredients *Bacillus thuringiensis* (*kurstaki* strain), kaolin clay, horticultural oil, spinosad and the codling moth granulovirus. Other insecticides include broad-spectrum insecticides with the active ingredients carbaryl, permethrin, and malathion.

A Codling moth adult. **B** Codling moth caterpillar. **C** Codling moth damage on apples.


A
B
C

Cooley Spruce Gall Adelgid

Adelges cooleyi

HOST Spruce, Douglas-fir

DAMAGE/SYMPTOMS Adelgids resemble aphids and form cone-like galls on the new growth of spruce trees. At the end of the summer, the galls resemble miniature pinecones.

LIFE CYCLE The insects use both Douglas-fir and spruce as hosts. On Douglas-fir, the adelgids overwinter as nymphs and mature in May. Some will disperse to spruce trees. On spruce, winged adelgids lay eggs which hatch in the spring around bud break. The nymphs move to the base of the needles to begin feeding. Gall formation occurs on spruce only, and the adelgids will continue to feed and develop within the galls.

MANAGEMENT The galls on spruce rarely harm the tree, and most trees have a high resistance to them. The damage on Douglas-fir is minimal. Once the galls have turned brown, the insects have already left the galls; removing them will not remove the insects or reduce future populations of the insects. For chemical control, a contact insecticide can be applied prior to gall formation or a systemic insecticide can be applied to the spruce tree in early spring.

A Galls on terminals of spruce. **B** Brown galls on terminals. **C** Developing galls.


A
B
C

Cottony Maple Scale

Pulvinaria innumerabilis

HOST Hackberry, honeylocust, linden, maple, boxelder

DAMAGE/SYMPTOMS The scale damages its host plant by sucking the sap from the tree, which can cause dieback of twigs and branches. It secretes excessive honeydew as a waste product. This can be unattractive underneath the tree, can attract nuisance wasps, and can also attract sooty mold.

LIFE CYCLE The scale overwinters as a fertilized adult female on branches of the tree. Feeding activity resumes in the spring. A waxy, cottony egg sac is produced in late spring. Egg hatch occurs in late June through July, and the crawlers then move to the leaves.

MANAGEMENT Cottony maple scale is attacked by several natural enemies, including lady beetles, predatory flies and wasps, and sparrows. Dormant oils can be used in early spring prior to bud break. The crawlers are clear and flattened and can be monitored with a white piece of paper placed underneath the vegetation. Contact insecticides, such as bifenthrin and permethrin, can be applied to the crawler stage of the scale (late June through July). Systemic insecticides, containing the active ingredients imidacloprid and dinotefuran, can be applied in the spring.

A Cottony maple scale on maple branch. **B** Cottony maple scale adult.


A


B

Douglas-Fir Tussock Moth

Orgyia pseudotsugata

HOST Douglas-fir, spruce, fir

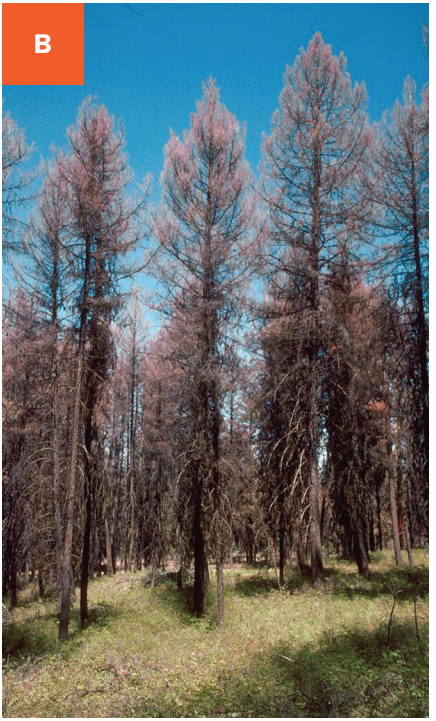
DAMAGE/SYMPTOMS Caterpillar feeding and defoliation typically starts on new, succulent foliage at the top of the tree and continues downward. Sometimes the defoliation can be severe, especially if occurring over repeated seasons. Caterpillars may be found under webbing and silk harborages on the branches.

LIFE CYCLE They overwinter as egg masses on twigs and branches. The eggs hatch in the spring at bud break, often in late May, and caterpillars begin feeding on the new growth. They then move to feed on older needles. Adults emerge in late summer (late July through mid-August). There is one generation per year.

MANAGEMENT A variety of predators and natural enemies normally keep populations down, including parasitic wasps, tachinid flies, spiders, and birds. If chemical control is necessary, contact insecticides are most effective during the early spring when caterpillars are younger. Monitoring for caterpillars is critical for the proper timing of insecticide applications. Some reduced-risk options for control include insecticides with the active ingredients *Bacillus thuringiensis* (*kurstaki* strain) and spinosad. Other contact insecticides include those with the active ingredients cyfluthrin, permethrin, and lambda-cyhalothrin.

A Douglas-fir tussock moth cocoon. **B** Douglas-fir tussock moth damage.
C Douglas-fir tussock moth caterpillar. **D** Douglas-fir tussock moth adult.


A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C


D

Engraver Beetles

Ips spp.

HOST Pine, spruce

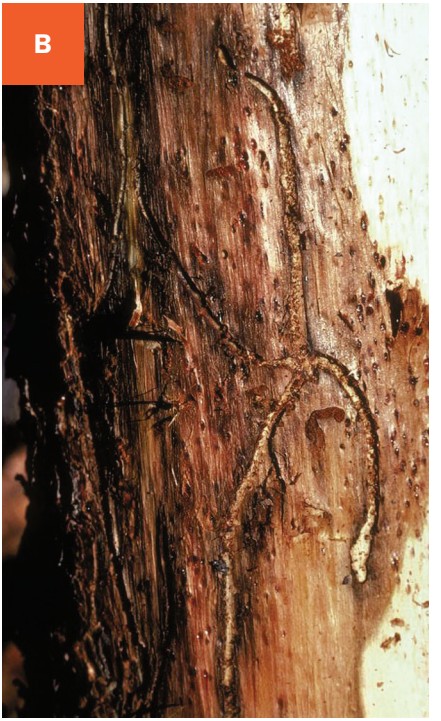
DAMAGE/SYMPTOMS Dieback at the top of the tree is evident with *Ips* beetle infestations but this can also be confused with many abiotic-related issues. At the base of the tree, the beetles leave a yellow or reddish/brown dust from boring activity. Shot-hole sized exit holes are evident on the outside of the bark. Galleries from larval feeding are apparent just below the outer bark.

LIFE CYCLE Adults overwinter underneath the bark. The larvae create galleries surrounding egg-laying areas. There can be up to four generations per year.

MANAGEMENT Once *Ips* beetles are in the tree, it is hard to kill the beetle and to correct the damage. Slash should be piled and burned prior to adult beetle emergence in May. Beetles can potentially be prevented from infecting other trees. Preventive contact insecticides (active ingredients bifenthrin, permethrin, and carbaryl) can be sprayed on the trunk of the tree prior to egg laying in May or to protect surrounding healthy trees.

A Pines damaged by *Ips* beetle infestations. **B** Galleries from *Ips* beetles. **C** *Ips pini* adult.


A


B


C
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Eriophyid Mites

Family Eriophyidae

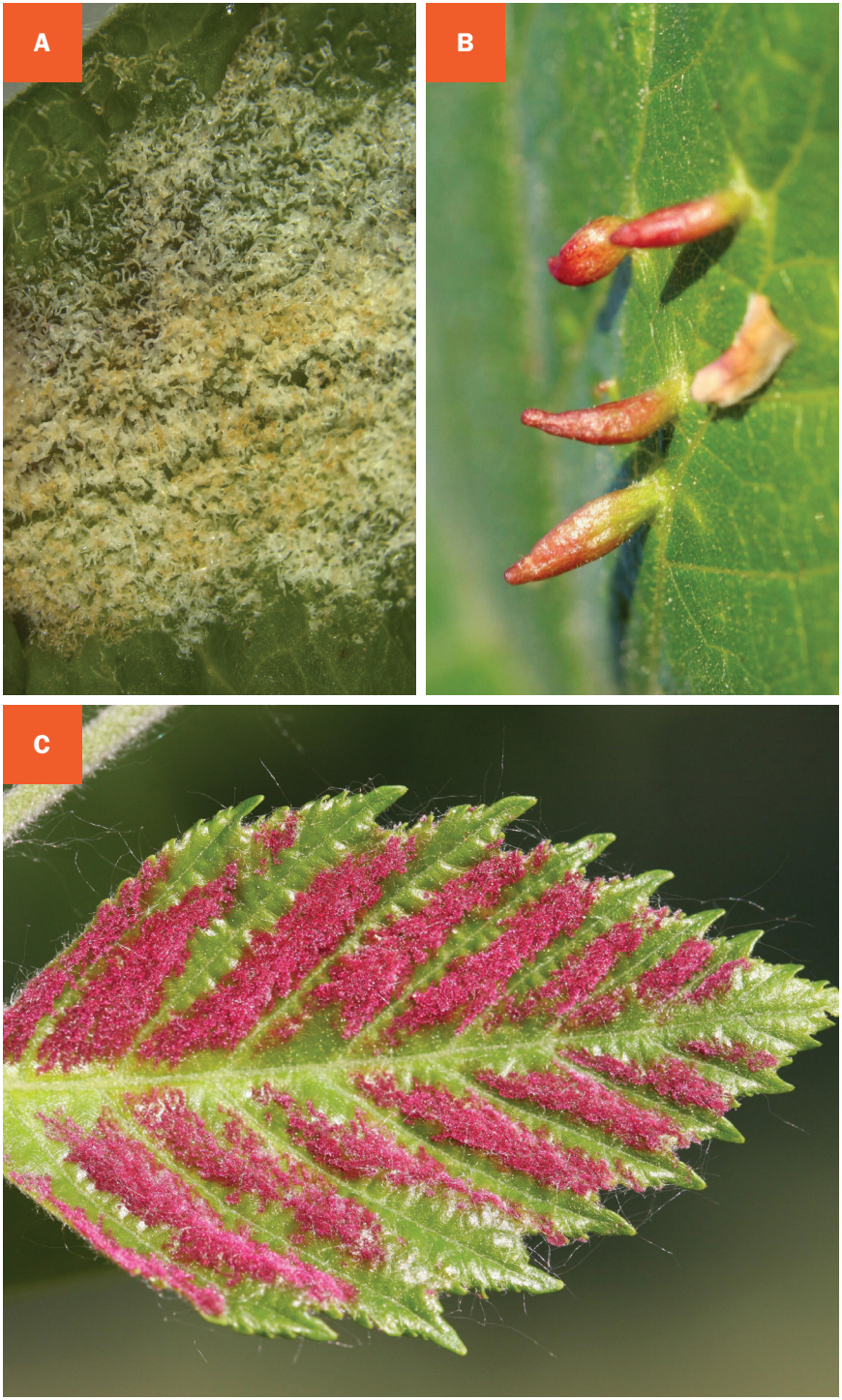
HOST Several hosts

DAMAGE/SYMPTOMS The damage caused from these microscopic mites rarely causes serious harm to the plant. The mites will pierce the leaf tissue and feed within the damaged areas. This results in either distortions or galls that can take the form of a blister, finger, hair, pouch, felt-like patch, witches' broom, or bump.

LIFE CYCLE Mites typically overwinter as fertilized adult females under bud scales or other covered areas. The females will emerge following bud break, and several generations are produced throughout the growing season.

MANAGEMENT Galls or injuries sustained by the mites are generally cosmetic and are not known to harm the tree. If practical, galls can be pruned out and discarded. Dormant oils can be applied in early spring to control the overwintering mites if several branches and leaves are affected. A miticide labeled for the host can be used at bud break to manage emerging females.

A Erinea galls on *Viburnum*. **B** Finger-like galls on lilac. **C** Felt-like galls on river birch.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European Elm Scale

Gossyparia spuria

HOST Elm

DAMAGE/SYMPTOMS The scale extracts fluids from the phloem of the tree, causing premature yellowing of leaves, especially on the lower branches. Heavy infestations can cause twig drop. The scale excretes excessive amounts of honeydew as a waste product, and black sooty mold can develop on this honeydew.

LIFE CYCLE The scale overwinters as a nymph at the base of buds in cracks of bark or twigs. At the end of June through early July, the female lays eggs that hatch into bright yellow active crawlers within several days. The crawlers will reside within grooves along the midrib and prominent veins on leaf undersides. The scale remains immobile at these sites for the remainder of the summer. There is one generation per year.

MANAGEMENT The scale can be controlled prior to bud break with dormant oils. It can also be controlled during the crawler stage with a contact insecticide. Resistance to systemic insecticides with the active ingredient imidacloprid has occurred with this scale insect.

A European elm scale adult. **B** European elm scale on bark.


A


B

Forest Tent Caterpillars

Malacosoma spp.

HOST Poplar, willow, ash, aspen, fruit trees, other hardwoods, currant

DAMAGE/SYMPTOMS The caterpillars feed on leaves and cause defoliation of trees and shrubs.

LIFE CYCLE Forest tent caterpillars overwinter in the egg stage. The caterpillars emerge in the spring and start constructing tents in the crotches of branches. They feed nightly through July, pupate, and emerge as adults in late summer. There is one generation per year.

MANAGEMENT The "tent" or webbed shelter can be cut out of the plant. Several natural enemies, such as parasitic wasps, help control the caterpillars. Since this tent is a resting area, it is easy to capture them during the day. However, wearing gloves is essential because of the irritating hairs on the caterpillar. If necessary, the young caterpillars can be controlled chemically with contact insecticides. Reduced-risk insecticides include those with the active ingredients *Bacillus thuringiensis* (*kurstaki* strain) and spinosad. Other contact insecticide options include the broad-spectrum active ingredients carbaryl, permethrin, and cyfluthrin.

A Western tent caterpillar. **B** Western tent caterpillar damage. **C** Western tent caterpillar damage. **D** Western tent caterpillar adult.


A


B


C


D

Giant Conifer Aphids

Cinara spp.

HOST Conifers

DAMAGE/SYMPTOMS In large groups, the aphids can often blend in with the bark. Aphids feed on the sap from woody areas of the tree. Heavy infestations can cause needle drop, yellowing, curling of the needles, and dieback. The aphids also produce copious amounts of honeydew.

LIFE CYCLE Females lay eggs on needles in late summer. In the spring, eggs hatch and aphids reproduce asexually throughout the summer. Early season populations are on the terminal growth and upper areas of the tree.

MANAGEMENT Heavy aphid populations can be a sign of stress, and evergreens often suffer from environmental stress due to planting issues (planted too deep) or being underwatered. Aphid populations tend to be higher in plants or trees that are highly fertilized. Hose off aphids with a strong stream of water. Placing cardboard wraps with Tanglefoot around the tree can also help (see management discussion under "Aphids"). Aphids are controlled by natural enemies when populations are low. For chemical control, contact insecticides that are labeled for the host can be used in early to late spring.

A Giant conifer aphids clustering at base of needles. **B** Giant conifer aphids on juniper.


A


B

Leafcurl Ash Aphids

Prociphilus fraxinifolii

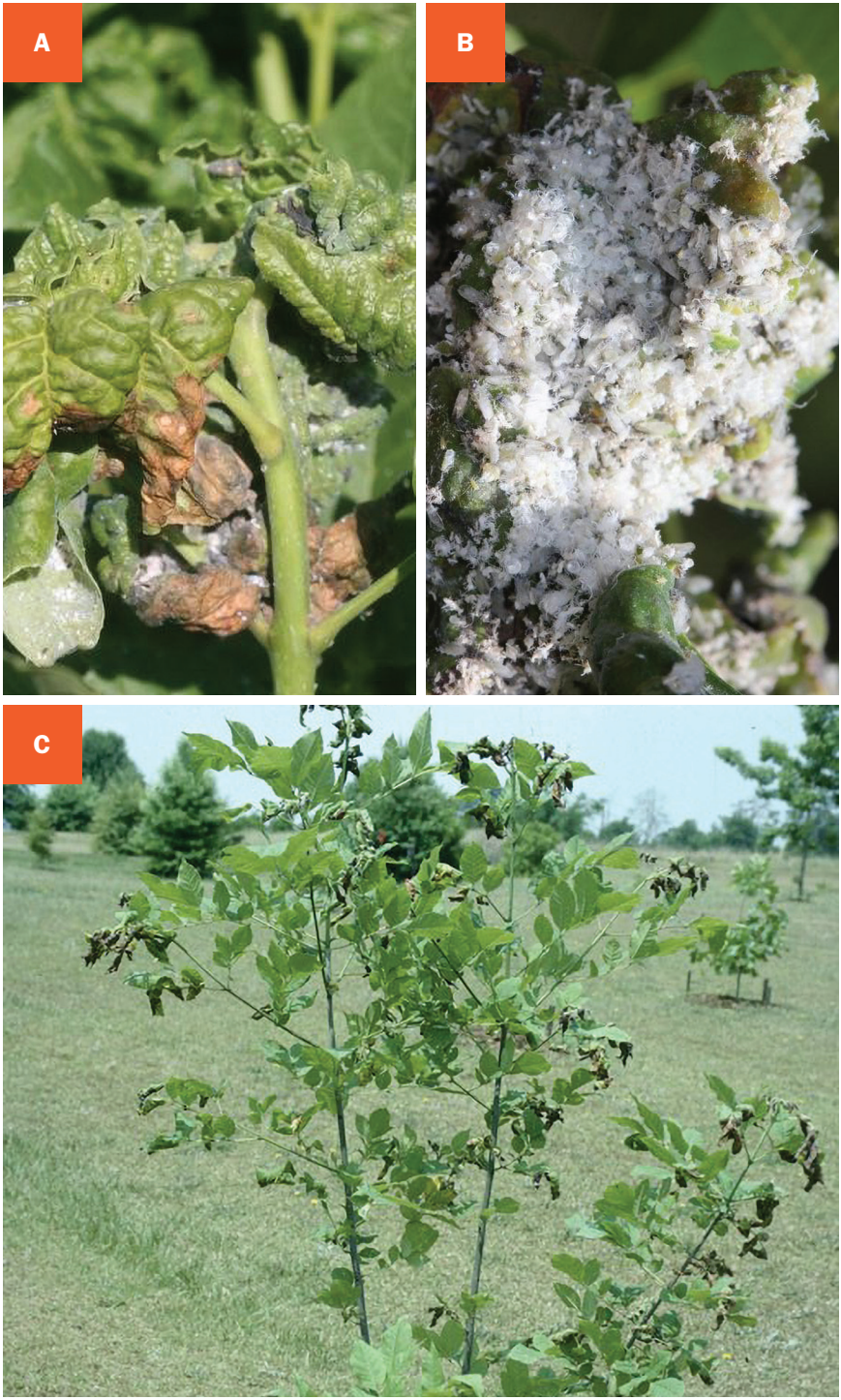
HOST Ash

DAMAGE/SYMPTOMS Aphid feeding creates tightly rolled and thickened leaves. Feeding damage is often referred to as a "pseudo gall" because it causes some distortion and twisting of the twigs next to the damaged leaves. The aphids are found inside the leaves with a waxy-cottony-type covering.

LIFE CYCLE Winged stages disperse to new growth of ash after bud break. Aphids continue to feed within the curled leaves and produce several generations. Populations decline after the new growth stops. Aphids oversummer or overwinter in debris below or near the ash tree.

MANAGEMENT Affected trees should recover from the leaf curling, and the aphids normally disperse from the tree shortly following the development of the new growth. Damage is generally cosmetic and doesn't typically harm the tree. Keep ash trees adequately watered. Refrain from fertilizing the tree; aphids respond to higher nitrogen concentrations. Pruning has not been very effective due to the high mobility of the aphid. Natural enemies come in later in the season and are an active part of control. Spraying or chemical control with a contact insecticide should be done prior to leaf curling. Once the leaves have curled, a contact insecticide will not be effective, and a systemic insecticide (active ingredients imidacloprid and dinotefuran) needs to be applied for control.

A Curling damage from aphids. **B** Aphid infestation within the leaf. **C** Damage on ash from the leafcurl ash aphid.


A
B
C

Leafhoppers

Erythroneura spp.

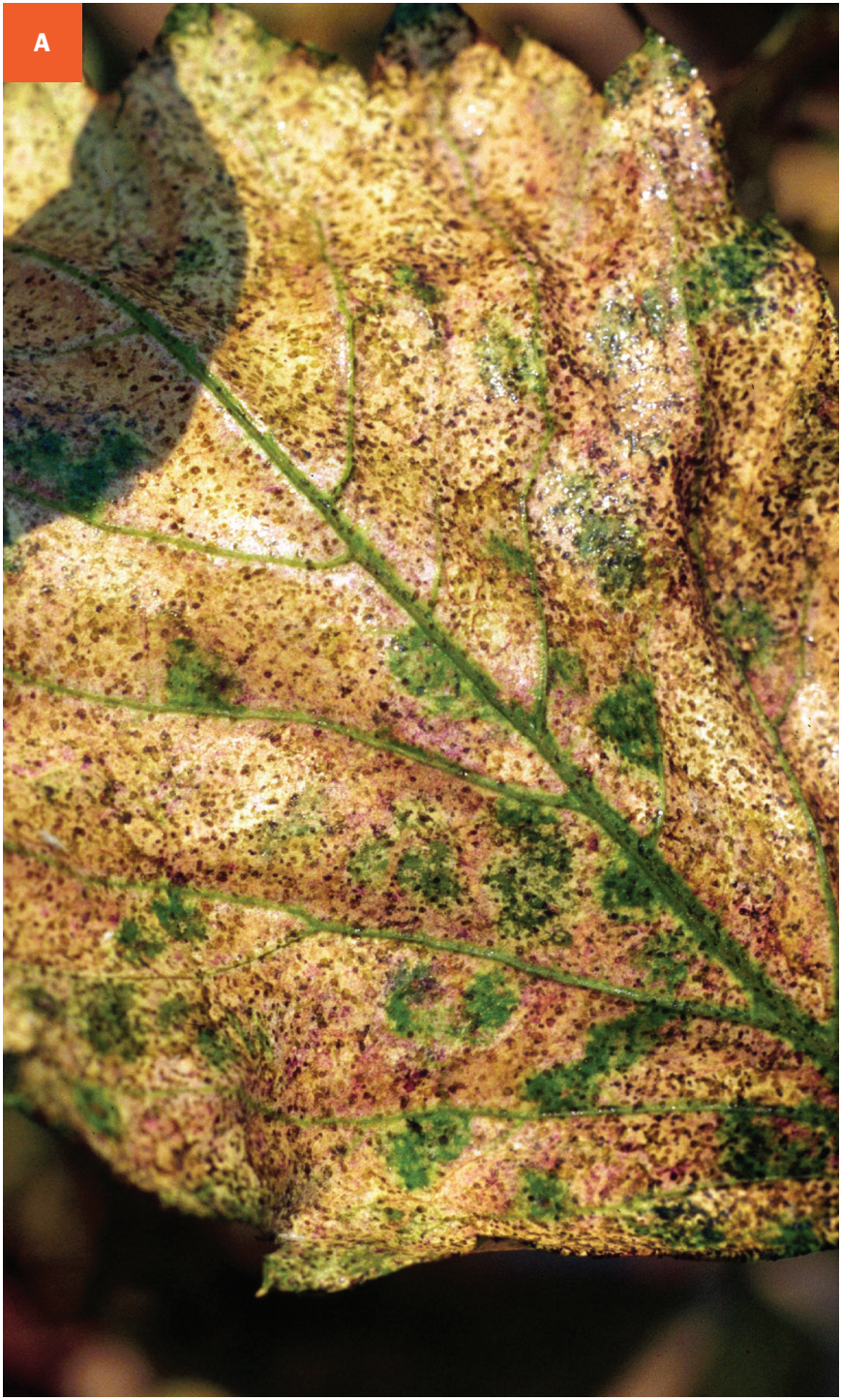
HOST Grape, Virginia creeper, maple

DAMAGE/SYMPTOMS Leafhoppers are sap-sucking insects. Their feeding results in stippling and flecking of the leaves. Heavier infestations can cause graying of the foliage and defoliation.

LIFE CYCLE Leafhoppers overwinter as adults in debris or sheltered areas around previously infested plants. The adults emerge in the spring and deposit eggs below the leaf surface. Eggs hatch within one to two weeks, and the nymphs begin feeding on the leaves. They become adults in approximately three weeks. There are three to four generations per year.

MANAGEMENT Most leaves and vines can tolerate relatively high populations of leafhoppers without affecting plant health. It is important to remove weeds and debris in late winter to early spring to reduce overwintering populations. The leafhoppers can be dislodged or trapped by shaking the plant and holding a sheet or piece of paperboard underneath with a sticky substance (such as Tanglefoot). They have many natural enemies, such as lady beetles, spiders, and parasitoid wasps in the genus *Anagrus* (attack leafhopper eggs). Several contact insecticides are available for control, including horticultural oils, insecticidal soaps, and those with the active ingredients *Beauveria bassiana* and spinosad. Insecticides with the active ingredient carbaryl can also be used. Complete coverage of the foliage is critical. To protect pollinators, apply only during late evening, night, or early morning when bees are not active.

A Feeding damage from leafhoppers on a Virginia creeper leaf.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Mountain Pine Beetle

Dendroctonus ponderosae

HOST Pine, Douglas-fir, fir, spruce

DAMAGE/SYMPTOMS Needles from infested trees turn a reddish-brown. Boring dust next to the tree is also a sign of infestation. Pink popcorn-like resin spots are often on the trunk.

LIFE CYCLE Mountain pine beetle adults are active in June and move to new trees in July through August. Females lay eggs under the bark. The larvae spend the winter developing in the phloem of the tree, forming distinct galleries. There is one generation per year, and beetle outbreaks occur every 10 to 30 years.

MANAGEMENT Once bark beetles enter the tree, the trees are not likely to survive. One preventive treatment option to protect healthy trees from attack is verbenone pine beetle repellent, which is an anti-aggregation pheromone. The verbenone pouches should be applied prior to beetle flight, which can be as early as late May in some locations. The pouches are only effective for one season and need to be replaced annually. A contact insecticide labeled for the host (active ingredients carbaryl, permethrin, and bifenthrin) can also be applied as a trunk spray in June through August (according to the label) for preventive measures on healthy trees.

A Mountain pine beetle adult. **B** Pitch tubes from mountain pine beetle infestations. **C** Galleries on the bark from mountain pine beetle infestations.


A
B
C

Oystershell Scale

Lepidosaphes ulmi

HOST Aspen, ash, cotoneaster, willow, lilac

DAMAGE/SYMPTOMS Branch dieback can occur with heavy infestations.

LIFE CYCLE Eggs hatch around mid to late May. The crawlers then feed, settle, mate, and produce an armored shell on branches for overwintering. The female produces eggs and remains protected underneath the shell throughout the winter.

MANAGEMENT In small numbers, oystershell scale rarely affects plant health. The scale is typically controlled by natural enemies later in the season. If practical, scrub the branches lightly with a plastic brush. If chemical control is necessary, apply a dormant oil before bud break. Monitor for the crawler stage and follow up with a contact spray if populations are heavy. The systemic insecticide and active ingredient dinotefuran can be applied in early May. The active ingredient imidacloprid is not very effective against hard scales such as the oystershell scale.

A Scale infestation on aspen. **B** Oystershell scale eggs. **C** Oystershell scale adult and eggs.


A
B
C

Pear Sawfly or Pearslug

Caliroa cerasi

HOST Pear, cherry, plum, quince, apple, cotoneaster

DAMAGE/SYMPTOMS These insects are not actually true "slugs" but are closely related to wasps. The damage is quite distinctive, showing a skeletonizing effect on the leaf surface. They can cause browning of the leaves, premature leaf drop, and reduced fruit size or production the following season.

LIFE CYCLE Adults emerge in late June to July. Females lay eggs on the upper surface of the leaves. The larvae feed on the upper leaf and drop to the soil to pupate. A second generation of adults emerge within a couple of weeks. The second generation can often be more damaging to the leaf tissue.

MANAGEMENT Pearslugs can be washed off with vigorous jets of water. Wood ash or dirt thrown on the slugs will help to dry them out and kill them. There are several contact insecticides labeled for chemical control, including horticultural oils, neem oil, or products with the active ingredient spinosad.

A Pearslug larvae on leaf. **B** Pearslug damage on peach leaf.


A


B

Pine Needle Scale

Chionaspis pinifoliae

HOST Pine, spruce, Douglas-fir

DAMAGE/SYMPTOMS White scale coverings appear on the needles. Heavy infestations can cause yellowing, lack of vigor, and needle drop.

LIFE CYCLE The pine needle scale overwinters on the needles in several different stages under the armored shell of the female. Egg hatch occurs from late April to June, depending on the temperature. The crawler stage happens to coincide with lilac bloom. The scale nymphs settle on the needles and remain immobile for the remaining season. The white shell of the female is formed in late July.

MANAGEMENT Heavy infestations are often indicative of a stressed tree. Low populations of pine needle scale will not harm the tree, and predators are very important for control of the scale. If chemical control becomes necessary, a dormant oil can be applied before bud break (note: some oils can cause discoloration of spruce needles). Check for the active crawler stage by putting a white piece of paper underneath some pine branches and shaking the vegetation. If the crawlers are active (about the size of a pin head), they will fall and move on the piece of paper. Follow up with a contact spray for the crawler stage, if necessary.

A Scale infestation on needles. **B** Pine needle scale adults.


A


B

Poplar Borer

Saperda calcarata

HOST Aspen, cottonwood, poplar

DAMAGE/SYMPTOMS The larvae bore into the sapwood and girdle trees. Heavily infested trees will establish a blackish stain on the bark below the attack. During high winds, branches can break off, which can allow for further invasion of wood rot.

LIFE CYCLE The adults are active from June through August. The females feed on the leaves and shoots for a couple of weeks. They then lay eggs on the surface of the bark, and the larvae will ultimately move into the sapwood. The larvae are a cream or yellow color, and they can reach over an inch long when mature. The larvae pupate in late spring beneath the bark. Adults start emerging in June. The life cycle of this beetle can reach up to three years.

MANAGEMENT Make sure the tree receives adequate water. Plant aspen trees in large groups so the trunks can be shaded. If the tree is heavily infested or showing major damage, it should be removed as it can negatively affect other trees in the area. For biological control, there are insect-attacking nematodes that can be injected into the borer holes. Contact insecticides can be sprayed on the trunk prior to egg laying to prevent further infestation in the tree. Applications should concentrate mainly around infested areas of attack, if any, and on the middle areas of the tree. Systemic insecticides have shown limited success in controlling larvae that are already present in the tree. Some active ingredients include dinotefuran, bifenthrin, permethrin, and carbaryl. Trunk injections can be done with the active ingredients emamectin benzoate and azadirachtin.

A Poplar borer adult. **B** Frass from insect tunneling. **C** Multiple stages of the poplar borer under the bark.


A
B
C

Root Weevils

Several species (*Otiorhynchus* spp. and many others)

HOST Lilac, dogwood, grape, peony, spirea, many deciduous shrubs

DAMAGE/SYMPTOMS The characteristic damage from adults includes notching along the leaf margins from chewing. The larvae feed on plant roots.

LIFE CYCLE The weevils generally overwinter as full-grown larvae in the roots of plants. Pupation occurs in the spring, and adults emerge in early June. Some will survive as adults and overwinter in buildings or structures.

MANAGEMENT Most often, no management is necessary. If damage or dieback is evident on the woody ornamental, treatment might be necessary. Treatment is most effective when adults emerge in late May through early June. Contact insecticides that contain the active ingredients bifenthrin, cyfluthrin, or lambda-cyhalothrin can be applied in the evening when the adult beetles are active.

A Black vine weevil. **B** Strawberry root weevil. **C** Root weevil damage on lilac.


A
B
C

Rough Bulletgall Wasp

Disholcaspis quercusmamma

HOST Bur oak, white swamp oak

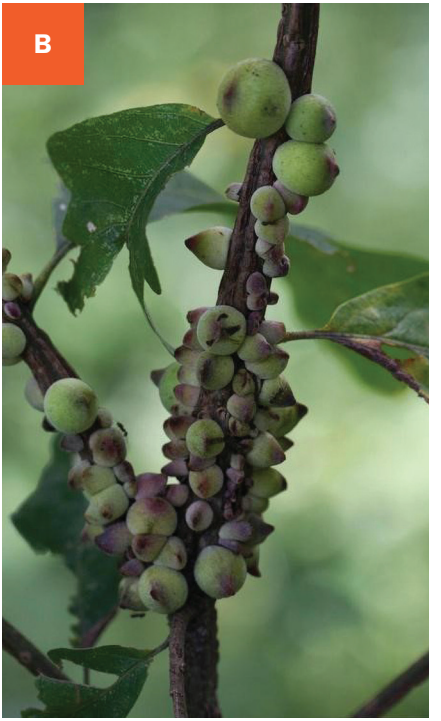
DAMAGE/SYMPTOMS In the summer, dark green swellings will develop on the current season's twigs, becoming almost knuckle-sized by August. The galls become woody on the branches. Branch dieback can occur with heavy infestations.

LIFE CYCLE There are two generations. A female-only generation (asexual generation) emerges from the hardened twig galls in late fall (late October through early November), and eggs are laid in the terminal growth of dormant buds. The following spring, as new shoot growth begins, pale- or cream-colored bud-shaped galls form (later turning a tan color), each containing an individual larva. Adult male and female wasps (sexual generation) emerge from these galls, mate, and lay eggs in the newly developing green twigs. After several weeks, dark green swellings appear and eventually form round galls. The galls are initially a reddish color but then turn brown and harden with subsequent development. A sweet substance similar to honeydew is released from the galls. Wasp larvae continue to feed and develop into pupae within the galls throughout the summer and into the fall.

MANAGEMENT The galls can cause dieback and significant damage if they become heavy on branches and start to weigh down the tree. Predators and parasitoid wasps are important for management of the pest. The active ingredient emamectin benzoate has been moderately effective in reducing future galling by the insects; however, the active ingredient is only commercially available, and it must be applied by a certified arborist. The wasps are difficult to control chemically because they are protected within the galls.

A Rough bulletgall wasp damage. **B** Early-season galls. **C** Adult wasp.


A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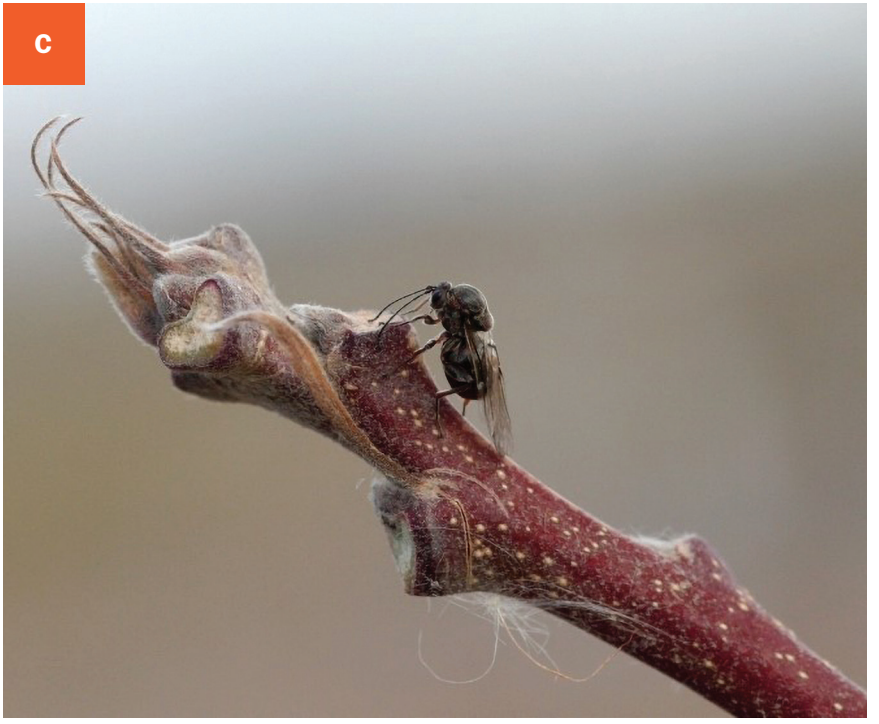
C

Spruce Bud Scale

Physokermes spp.

HOST Spruce

DAMAGE/SYMPTOMS The reddish-brown covering surrounding the scale resembles a spruce bud. Because of this, they are often unrecognized. The scale releases copious amounts of honeydew that can attract black sooty mold. Heavy infestations can cause dieback of lower branches.

LIFE CYCLE The scale nymphs spend the winter on the spruce needles or bud scales. In late spring, mating occurs followed by egg laying. Egg hatch occurs in June through early July. The crawlers migrate to the needles to start feeding and then move to the twigs later in the spring. There is one generation per year.

MANAGEMENT Provide spruce trees with adequate water. Dormant oils applied in early spring followed by a contact insecticide in late June (during the crawler stage) are recommended for management. Horticultural oils and some other oils can cause discoloration of the spruce needles. A systemic insecticide with the active ingredients imidacloprid or dinotefuran can be applied in the spring.

A Spruce bud scale at base of twig.


A

Spruce Spider Mite

Oligonychus ununguis

HOST Spruce, fir, pine, juniper, arborvitae, Douglas-fir, yew

DAMAGE/SYMPTOMS The spider mite is a sap-sucking arthropod, and its feeding results in flecking and greyish spots. Mites usually attack the older needles in the lower portions of the tree. With heavier infestations, needles will prematurely drop, and stunting of the needles can occur. Silk can also be evident on the needles.

LIFE CYCLE Eggs hatch in the spring, and they develop into adults in about a month. The spider mites are dormant in the warmer months and are more of a cool-season pest. There are typically two generations per year.

MANAGEMENT Spider mites respond to stressed trees. If practical, increase the humidity on the trees by jetting them with water on a regular basis. Mites have several natural enemies, such as predatory mites, plant bugs, and spiders to help control them. If chemical control is necessary, miticides, horticultural oil, neem oil, and insecticidal soap will minimize damage to the natural enemies of spider mites, which are important for spider mite control. Spider mites are resistant to many insecticides, and broad-spectrum insecticides should be avoided due to the killing of beneficial insects and other arthropods. The best time to treat spruce spider mite infestations is in May and again in September (second generation).

A Mite webbing on needles. **B** Adult mite.


A


B

Two-Spotted Spider Mite

Tetranychus urticae

HOST Wide range of deciduous trees, shrubs

DAMAGE/SYMPTOMS The spider mites pierce plant cells and suck the sap out, causing flecking injuries and yellowing. They also cause premature leaf drop. Leaves will start to look wilted, and heavy infestations can cause serious damage to plants.

LIFE CYCLE The spider mites typically overwinter under debris near host plants. Mites reach adulthood in about 10 days, and females can lay up to 60 eggs in two to three weeks. They seek shelter later in the summer and cease feeding activity.

MANAGEMENT Populations of spider mites increase with dryness and warm temperatures. Minimize drought by spritzing plants frequently. If chemical control is necessary, miticides, horticultural oil, neem oil, and insecticidal soap will minimize damage to the natural enemies of spider mites, which are important for spider mite control. Spider mites are resistant to many insecticides, and broad-spectrum insecticides should be avoided due to the killing of beneficial insects and other arthropods.

A Adult spider mites. **B** Spider mite damage on bean leaves.


A


B

Western Spruce Budworm

Choristoneura freemani

HOST Douglas-fir, fir, spruce, larch

DAMAGE/SYMPTOMS On the needles, insect excrement and webbing are present. The caterpillars can cause defoliation, deformation of the needles, and chewing damage.

LIFE CYCLE The caterpillars emerge in the spring and begin feeding. They pupate and reach adulthood in July. The females lay eggs, which hatch in about 10 days. In late July, young caterpillars create a cocoon-like structure to spend the rest of the season.

MANAGEMENT Beneficial predators can help to control populations of the budworms. Monitoring for the caterpillars allows for properly timed chemical applications. Several contact insecticides, including the bacterium *Bacillus thuringiensis* variety *kurstaki,* are available for caterpillar control.

A Western spruce budworm damage. **B** Western spruce budworm pupa and damage. **C** Western spruce budworm caterpillar.


A
B
C

White Pine Weevil

Pissodes strobi

HOST Spruce, white pine

DAMAGE/SYMPTOMS Feeding by the developing insects causes the top of the tree to suddenly wilt and die in early summer. This is often referred to as a "shepherd's crook." Once the top leader is killed, some side branches will change their growth habit and will grow upward to replace the dead leader.

LIFE CYCLE The weevil adults become active in early spring. They feed on the main branches near the leader and insert eggs into feeding cavities. Eggs hatch in about two weeks, and the larvae will tunnel under the bark. The larvae pupate, and adults emerge in late July through August. The adults overwinter in leaf litter and debris around spruce trees.

MANAGEMENT The infested terminal can be clipped, and a new leader can be trained. This should be done when the larvae are still inside the branch (before the end of July). Terminals should be cut only as far down as necessary to remove the weevil larvae. Destroy the pruned terminals. Rake up the needles and debris under the tree in the fall. Since the top leader and upper branches are the only parts of the tree affected by the insect, non-chemical controls are suitable. Chemical options are only recommended if necessary, and the timing of application is critical. Contact insecticides are most effective when sprayed at the terminal of the tree in the spring when adults are actively feeding and will not be as effective once the larvae have burrowed underneath the bark. Some active ingredients include permethrin, bifenthrin, and cyfluthrin. This can be difficult to time, but adult activity usually starts on warm, sunny days in late spring. A systemic insecticide (active ingredients including imidacloprid, emamectin benzoate, dinotefuran, or abamectin) can be applied as a soil drench in the spring followed by several days of watering to allow for sufficient root uptake.

A White pine weevil damage on blue spruce. **B** Weevil exit holes on top of tree. **C** Pupal chambers within the infested terminal.


A


B


C

Willow Redgall Sawfly

Pontania proxima

HOST Willow

DAMAGE/SYMPTOMS The sawflies produce bean-shaped swellings on the leaves.

LIFE CYCLE The adults emerge in the spring and lay eggs on the leaves. The larvae, which resemble green caterpillars, will feed and induce gall formation. The larvae then drop to the ground to spin a cocoon, and adults emerge within several days. There can be up to two generations per year.

MANAGEMENT Willow redgall sawfly damage is primarily a cosmetic issue and is not known to significantly affect the health of the tree. Rake up leaves and dispose of them off site at the end of the season. Natural enemies come in later in the season to help control the sawflies.

A Sawfly damage on leaf. **B** Sawfly adult.


A


B