Horticultural, Landscape, and Ornamental Crops

Christmas Tree Plantation Pests
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In all cases, follow the instructions on the pesticide label. The PNW Insect Management Handbook has no legal status, whereas the pesticide label is a legal document. Read the product label before making any pesticide applications.

Notes
1. Product names are listed as examples only. There may be numerous product options for some active ingredients.
2. Experience has shown that use of pyrethroid insecticides is associated with subsequent spider mite outbreaks. Therefore, monitor fields closely after using these materials.
3. Check current label for application options (i.e. aerial vs. ground only), restrictions, re-entry intervals, pollinator safety, groundwater and stream buffer requirements, application timing, etc.
4. To avoid resistance, growers are advised to not use repeated application of the same active ingredient or repeated use of chemicals in the same mode of action group.

Note: Products are listed in alphabetical order and not in order of preference or superiority of pest control.

Pests common to Douglas-fir, True Fir, Pine and Spruce

Christmas tree (Common pests)—Conifer aphid
*Cinara occidentalis* and *Cinara abietis*

**Pest description and crop damage** C. abietis are large, dark aphids typically feeding on upper stems and tended by ants. May distort stems. *C. occidentalis* feed at the base of needles on 1 year and older foliage, often in the lower portion of the tree and may be quite damaging.

See table: Hosts and Symptoms of Major Aphid and Adelgid Pests of Christmas Trees

**Management—cultural control**
*C. abietis* is easily spotted and often controlled by squishing colonies by hand or spot spraying. Minor outbreaks of both species may be kept in check with beneficial insect predators or spot treatments.

Management—chemical control
♦ *azadirachtin* (Azadirect and others)—Some formulations are OMRI-listed for organic use.
♦ *Beauveria bassiana* (Naturalis L)
♦ *bifenthrin* (Brigade, OnyxPro, Sniper and others)—Restricted use pesticide. (Group 3)
♦ *chlorpyrifos* (Lorsban Advanced, Warhawk and others)—Restricted use pesticide. (Group 1)
♦ *Chromobacterium subtsugae* (Grandevo)—OMRI-listed for organic use.
♦ *cyantraniliprole* (Mainspring GNL)—(Group 28) (note: use 2016 or later product label)
♦ *dinotefuran* (Safari 20 SG)—Check registration status at time of application. (Group 4)
♦ *fluopyradifurone* (Altus)—(Group 4)
♦ *imidacloprid* (Admire Pro, Prey 1.6 and others)—(Group 4)
♦ *insecticidal soaps and oils* (Ecotec, M-pede, 440 Superior Oil, Ultra-Pure Oil and others)—Some formulations are OMRI-listed for organic use.
♦ *malathion* (organophosphate) (various formulations)—(Group 1)
♦ *pymetrozine* (Endeavor)—(Group 9)
♦ *spirodichlofen* (Envidor)—(Group 23)

Management—biological control
♦ aphid predators (*Aphidoletes aphidimyza*, *Aphidius* spp., *Hippodamia* spp., *Chrysopa* spp.)—Consider attracting predators with forage plantings and using products with low toxicity to predators.

See: Biological Control of Nursery Pests

Christmas tree (Common pests)—Eriophyid needle mite
*Epitrimeris* spp. and others

**Pest description and crop damage** Very tiny, white, worm-shape mites found along stem and needle bases. Infested foliage takes on an olive-green color; older needles drop prematurely.

Management—chemical control
Biology and distribution of this mite is not well understood. Apply when new growth is 1 inch or less.
♦ *abamectin* (Avid, Minx and others) (Group 6)
♦ *Beauveria bassiana* (Naturalis L)—OMRI-listed for organic production.
♦ *carbaryl* (Sevin and others)—(Group 1)
♦ *fenazaquin* (Magister)—(Group 21)
♦ *fenpyroximate* (Akari 5SC)—(Group 21)
♦ *horticultural oil* (Omni Supreme, 440 Superior Oil, Ultra-Pure Oil and others)—Test for phytotoxicity for any new product prior to widespread use. Some formulations are OMRI-listed for organic production.
♦ *spirodiclofen* (Envidor)—(Group 23)
Christmas tree (Common pests)—Root weevil (adult)

Strawberry root weevil (*Otiorhynchus ovatus*) and others

**Pest description and crop damage** Larvae are cream-colored, C-shaped grubs that feed on roots, sometimes girdling them. Adults feed on Douglas-fir and true fir needles, resulting in characteristic notching.

**Management—cultural control**

Site preparation with fallow period prior to planting will reduce habitat for weevils.

**Management—chemical control**

Control typically targets adult feeding at emergence.

♦ acephate (Orthene and others)—(Group 1)
♦ bifenthrin (Brigade, OnyxPro, Sniper and others)—Restricted use pesticide. (Group 3)
♦ dinotefuran (Safari 20 SG)—Check registration status at time of application. (Group 4)
♦ esfenvalerate (Asana XL and others)—Restricted use pesticide. (Group 3)
♦ permethrin (Ambush and others)—Restricted use pesticide. (Grp 3)
♦ thiamethoxam (Flagship 25 WG)—(Group 4)

Christmas tree (Common pests)—Spider mite

*Oligonychus ununguis* and others

**Pest description and crop damage** Dark green mite stippled and bronzed needles, beginning at the base. Overwinters as red-orange eggs.

**Management—chemical control**

♦ abamectin (Avid, Minx and others)—(Group 6)
♦ azadirachtin (AzaDirect and others)—Some formulations are OMRI-listed for organic production.
♦ *Beauveria bassiana* (Naturalis L)—OMRI-listed for organic production.
♦ bifenthrin (Acramite 4SC, Floramite SC)
♦ bifenthrin (Brigade, OnyxPro, Sniper and others)—Restricted use pesticide. (Group 3)
♦ Chromobacterium subtugae (Grandevo PTO)—OMRI-listed for organic use.
♦ clofentezine (Apollo SC)—(Group 10)
♦ etoxazole (TetraSan 5 WDG)—(Group10)
♦ fenazaquin (Magistar)—(Group 21)
♦ fenbutatin-oxide (Vendex and others)—Restricted use pesticide. (12)
♦ fenpyroximate (Akari 5 SC)—(Group 21)
♦ hexythiazox (Onager, Hexygon, Savey)—(Group 10)
♦ insecticidal soaps and oils (Ecotec, Captiva, M-pede, Ultra-Pure Oil, 440 Superior [Winter only] and others)—Some formulations are OMRI-listed for organic production.
♦ malathion (organophosphate) (various formulations)—(Group 1)
♦ propargite (Omite-30WS, Omite 6E)—Restricted use pesticide. (Group 12)
♦ thiamethoxam (Flagship 25 WG)—(Group 4)

Christmas tree (Common pests)—Spruce budworm

*Choristoneura fumiferana*

**Pest description and crop damage** Green-brown larvae up to 1-inch long feed on foliage and buds of fir, spruce, and Douglas-fir.

**Management—chemical control**

Apply May–June or when bud flush is at 90 to 95% and new growth is 0.75 to 1 inch. Pay particular attention to areas adjacent to infested forest. Two applications may be necessary.

♦ carbofuran (Sevin and others)—(Group 1)
♦ chlordane (Lorsban Advanced, Warhawk and others)—Restricted use pesticide. (Group 1)
♦ Chromobacterium subtugae strain PRAA4-I (MBI-203)—OMRI-listed for organic production.
♦ esfenvalerate (Asana XL and others)—Restricted use pesticide. (Group 3)
♦ flubendiamide (Belt SC)—(Group 28)
♦ methoxyfenozide (Intrepid 2F)
♦ spinosad (Blackhawk, Conserve, Entrust and others)—Some formulations are OMRI-listed for organic production. (Group 5)
♦ tebufenozide (Confirm)—(Group 18)

Christmas tree (Common pests)—White grub

Includes *Polyphylla decemlineata, Plecoma spp., Aphodius spp.*

**Pest description and crop damage** Small to large C-shaped, white scarab beetle larva with six legs and a brown head. Grubs feed on roots, often killing young trees. Many follow the soil moisture and may appear absent in summer.

**Management—chemical control**

To date, chemical control on established large grub populations has not been effective.

♦ bifenthrin (Brigade, OnyxPro, Sniper and others)—Restricted use pesticide. (Group 3)
♦ carbofuran (Sevin and others)—(Group 1)
♦ imidacloprid (Admire Pro, Nuprid 2F)—(Group 4)
♦ thiamethoxam (Flagship 25 WG)—(Group 4)

**See:** Biological Control of Nursery Pests
Douglas-fir

Christmas tree (Douglas-fir)—Black pineleaf scale
Nuculaspis californica


Management—chemical control
♦ azadirachtin (AzaDirect and others)—Some formulations are OMRI-listed for organic production.
♦ bifenthrin (Brigade, OnyxPro, Sniper and others)—Restricted use pesticide. (Group 3)
♦ buprofezin (Talus)—(Group 16)
♦ chlorpyrifos (Lorsban Advanced, Warhawk and others)—Restricted use pesticide. (Group 1)
♦ dinotefuran (Safari 20 SG)—Check registration status at time of application. (Group 4)
♦ horticultural oil (Ultra-Pure, 440 Superior Oil and others)—Some formulations are OMRI-listed for organic production.

Christmas tree (Douglas-fir)—Coneworm
Dioryctria spp.

Pest description and crop damage Small creamy-brown moth larvae bore into stems, especially around wounds.

Management—chemical control
Applications must be made before eggs hatch and larvae tunnel into stem. Using pyrethroid insecticides is associated with subsequent spider mite outbreaks.
♦ carbaryl (Sevin and others)—(Group 1)
♦ esfenvalerate (Asana XL and others)—Restricted use pesticide. (Group 3)
♦ phosmet (Imidan 70W)—(Group 1)
♦ spinosad (Blackhawk, Conserve, Entrust and others)—Some formulations are OMRI-listed for organic production. (Group 5)

Christmas tree (Douglas-fir)—Cooley spruce gall adelgid
Adelges cooleyi

Pest description and crop damage Adelgids appear as small cottony tufts on underside of needles. May cause yellowing, distortion, and premature needle drop. Aphids may distort stems.

See table:
Hosts and Symptoms of Major Aphid and Adelgid Pests of Christmas Trees

Management—chemical control
Apply to control crawler stage, usually when new growth is expanding in spring.
♦ bifenthrin (Brigade, OnyxPro, Sniper and others)—Restricted use pesticide. (Group 3)
♦ carbaryl (Sevin and others)—(Group 1)
♦ chlorpyrifos (Lorsban Advanced, Warhawk and others)—Restricted use pesticide. (Group 1)
♦ dinotefuran (Safari 20 SG)—Check registration status at time of application. (Group 4)
♦ imidacloprid (Admire Pro, Prey 1.6 and others)—(Group 4)
♦ insecticidal soap (M-Pede and others)—Some formulations are OMRI-listed for organic production.
♦ spirotetramet (Ultor, Movento)—(Group 23)
♦ sucrose octanoate (SucraShield and others)—Some formulations are OMRI-listed for organic production.
♦ thiamethoxam (Flagship 25 WG)—(Group 4)

Christmas tree (Douglas-fir)—Douglas-fir needle midge
Contarinia spp.

Pest description and crop damage Adult is a small midge (fly). Larvae mine needles; they often appear as a purple node above which the needles are distorted. Degree day models and traps are available to monitor pest emergence.

Management—chemical control
Time applications based on adult needle midge trap catch. Time to coincide with adult emergence.
♦ acephate (Orthene)—(Group 1)
♦ bifenthrin (Brigade, OnyxPro, Sniper and others)—Restricted use pesticide. (Group 3)
♦ chlorpyrifos (Lorsban Advanced, Warhawk and others)—Restricted use pesticide. (Group 1)
♦ dinotefuran (Safari 20 SG)—Check registration status at time of application. (Group 4)
♦ thiamethoxam (Flagship 25 WG)—(Group 4)

Christmas tree (Douglas-fir)—Douglas-fir twig weevil
Cylindrocopterus furnissi

Pest description and crop damage Small gray-black weevil with white mottling, sometimes with pink or orange spots. It may kill small branches and sometimes small trees.

Management—cultural control
Keep trees healthy. Remove and burn infested twigs. Avoid planting on drought-prone or wet sites. Frequently, cultural control provides the only practical option available.

Management—chemical control
♦ bifenthrin (Brigade, OnyxPro, Sniper and others)—Restricted use pesticide. (Group 3)
♦ esfenvalerate (Asana XL and others)—Restricted use pesticide. (Group 3)

Christmas tree (Douglas-fir)—Pine needle scale
Chionaspis pinifoliæ


Management—chemical control
Apply to crawler stage.
♦ azadirachtin (AzaDirect and others)—Some formulations are OMRI-listed for organic production.
♦ bifenthrin (Brigade, OnyxPro, Sniper and others)—Restricted use pesticide. (Group 3)
♦ buprofezin (Talus)—(Group 16)
♦ chlorpyrifos (Lorsban Advanced, Warhawk and others)—Restricted use pesticide. (Group 1)
♦ dinotefuran (Safari 20 SG)—Check registration status at time of application. (Group 4)
♦ horticultural oil/soap (M-Pede, Ultra-Pure, 440 Superior Oil and others)—Some formulations are OMRI-listed for organic production.
♦ sucrose octanoate (SucraShield and others)
**Christmas tree (Douglas-fir)—Tussock moth**

Includes
- Douglas-fir tussock moth (*Orgyia pseudotsugata*)
- Rusty tussock moth (*Orgyia antiqua nova*)

**Pest description and crop damage** Caterpillars with tufts (tussocks) of hair. Larvae may be found in large numbers under webbing on branches.

**Management—chemical control**
- Apply to control young larvae when present and feeding.
  - *Chromobacterium subtsugae* (Grandevo PTO)—OMRI-listed for organic use.
  - diflubenzuron (Dimilin 25W)—Restricted use pesticide. (Grp 15)
  - flubendiamide (Belt SC)—(Group 28)
  - spinosad (Blackhawk, Conserve, Entrust and others)—Some formulations are OMRI-listed for organic production. (Group 5)
  - tebufenozide (Confirm)—(Group 18)

**Christmas tree (Douglas-fir)—White pine weevil**

*Pissodes strobi*

**Pest description and crop damage** A small brown weevil, roughly 0.25 inch long, with the “snout” typical of other weevils. Wing covers are marked with irregular patches of brown and white scales. Important pest of spruce and pine, occasionally a pest of Douglas-fir.

**Management—chemical control**
- Apply to the tops to control egg-laying weevils as weather warms in spring. Several applications 3 to 4 weeks apart may be necessary.
  - bifenthrin (Brigade, OnyxPro, Sniper and others)—Restricted use pesticide. (Group 3)
  - diflubenzuron (Dimilin 25W)—Restricted use pesticide. (Grp 15)
  - phosmet (Imidan 70W)—(Group 1)

**Christmas tree (Pine)—Black pineleaf scale**

*Nuculaspis californica*

**Pest description and crop damage** Gray-black scale.

**Management—chemical control**
- azadirachtin (AzaDirect and others)—Some formulations are OMRI-listed for organic production.
- chlorpyrifos (Lorsban Advanced, Warhawk and others)—Restricted use pesticide. (Group 1)
- dinofuran (Safari 20 SG)—Check registration status at time of application. (Group 4)
- horticultural oil/soap (M-Pede and others)—Some formulations are OMRI-listed for organic production.

**Christmas tree (Pine)—Coneworm**

*See: Christmas tree (Douglas-fir)—Coneworm*

**Christmas tree (Pine)—European pine shoot moth**

*Rhyacionia buoliana*

**Pest description and crop damage** Larvae stunt and deform stems, especially terminals. The moth is established in western Washington but still relatively rare in Oregon.

**Sampling and thresholds** Pheromone traps and degree-day models are available to monitor for adults.

**Management—chemical control**
- Time applications to coincide with adult emergence.
  - carbaryl (Sevin and others)—(Group 1)
  - chlorpyrifos (Lorsban Advanced, Warhawk and others)—Restricted use pesticide. (Group 1)
  - diflubenzuron (Dimilin 25W)—Restricted use pesticide. (Group 15)
  - flubendiamide (Belt SC)—(Group 28)
  - phosmet (Imidan 70W)—(Group 1)
  - spinosad (Blackhawk, Conserve, Entrust and others)—Some formulations are OMRI-listed for organic production. (Group 5)
  - tebufenozide (Confirm)—(Group 18)

**Christmas tree (Pine)—Pine bark adelgid**

*Pinus strobi*

**Pest description and crop damage** Appear as white, woolly mass on trunk or stem. May severely distort new growth.

*See table:*

| Hosts and Symptoms of Major Aphid and Adelgid Pests of Christmas Trees |

**Management—chemical control**
- bifenthrin (Brigade, OnyxPro, Sniper and others)—Restricted use pesticide. (Group 3)
- chlorpyrifos (Lorsban Advanced, Warhawk and others)—Apply to control crawler stage around bud break. (Group 1)
- dinofuran (Safari 20 SG)—Check registration status at time of application. (Group 4)
- imidacloprid (Admire Pro, Prey 1.6 and others)—Apply to control crawler stage around bud break. (Group 4)
- sucrose octanoate (SucraShield and others)—Some formulations are OMRI-listed for organic production.
- thiamethoxam (Flagship 25 WG)—(Group 4)
**Christmas tree (Pine)—Pine needle scale**
*Chionaspis pinifoliae*

**Pest description and crop damage** White scale flock needles. Hosts: Douglas-fir and pines. Eggs hatch May or June, perhaps July.

**Management—chemical control**
- **bifenthrin** (Brigade, OnyxPro, Sniper and others)—Restricted use pesticide. (Group 3)
- **chlorpyrifos** (Lorsban Advanced, Warhawk and others)—Restricted use pesticide. (Group 1)
- **dinotefuran** (Safari 20 SG)—Check registration status at time of application. (Group 4)
- **horticultural oil/soap** (M-Pede, Ultra-Pure Oil and others)—Some formulations are OMRI-listed for organic production.

**Christmas tree (Pine)—White pine weevil**
*Pissodes strobi*

**Pest description and crop damage** A small brown weevil, roughly 0.25 inch long, with the “snout” typical of other weevils. Wing covers have irregular patches of brown and white scales. Important pest of spruce and pine, occasionally a pest of Douglas-fir.

**Management—chemical control**
- Apply to the tops to control egg-laying weevils as weather warms in spring. Several applications 3 to 4 weeks apart may be necessary.
- **bifenthrin** (Brigade, OnyxPro, Sniper and others)—Restricted use pesticide. (Group 3)
- **diflubenzuron** (Dimilin 25W)—Restricted use pesticide. (Group 15)
- **phosmet** (Imidan 70W)—(Group 1)

**Christmas tree (Pine)—Cooley spruce gall adelgid**
*Adelges cooleyi*

**Pest description and crop damage** Causes “pineapple” galls on spruce, the primary host.

**See table:**
Hosts and Symptoms of Major Aphid and Adelgid Pests of Christmas Trees

**Management—chemical control**
- Apply to control crawler stage, usually when new growth is expanding in spring.
- **bifenthrin** (Brigade, OnyxPro, Sniper and others)—Restricted use pesticide. (Group 3)
- **chlorpyrifos** (Lorsban Advanced, Warhawk and others)—Restricted use pesticide. (Group 1)
- **dinotefuran** (Safari 20 SG)—Check registration status at time of application. (Group 4)
- **imidacloprid** (Admire Pro, Prey 1.6 and others)—(Group 4)
- **spirotetramet** (Ultor, Movento)—(Group 23)
- **sucrose octanoate** (SucraShield and others)—Some formulations are OMRI-listed for organic production.
- **thiamethoxam** (Flagship 25 WG)—(Group 4)

**Christmas tree (Spruce)—Spruce aphid**
*Elatobium abietinum*

**Pest description and crop damage** Small, dull-green aphid causes extreme needle drop. Aphids appear early in the season (fall to winter months) and may increase rapidly during March and April.

**See table:**
Hosts and Symptoms of Major Aphid and Adelgid Pests of Christmas Trees

**Management—biological control**
This aphid eludes most predators except the brown lacewing.

**Management—chemical control**
- **azadirachtin** (AzaDirect and others)—Some formulations are OMRI-listed for organic production.
- **bifenthrin** (Brigade, OnyxPro, Sniper and others)—Restricted use pesticide. (Group 3)
- **chlorpyrifos** (Lorsban Advanced, Warhawk and others)—Restricted use pesticide. (Group 1)
- **dinotefuran** (Safari 20 SG)—Check registration status at time of application. (Group 4)
- **flupyradifurone** (Altus)—(Group 4)
- **imidacloprid** (Admire Pro, Prey 1.6 and others)—(Group 4)
- **insecticidal soaps and oils** (Ecotec, M-pede, Ultra-Pure Oil and others)—Some formulations are OMRI-listed for organic production. Note: Some oils may discolor blue spruce.
- ** pymetrozine** (Endeavor)—(Group 9)
- **spirotetramet** (Ultor, Movento)—(Group 23)
- **sucrose octanoate** (SucraShield and others)—Some formulations are OMRI-listed for organic production.
- **thiamethoxam** (Flagship 25 WG)—(Group 4)
**Christmas tree (Spruce)—White pine weevil**  
*Pissodes strobi*

**Pest description and crop damage** A small brown weevil, roughly 0.25 inch long, with the “snout” typical of other weevils. Wing covers have irregular patches of brown and white scales. Important pest of spruce and pine, occasionally a pest of Douglas-fir.

**Management—chemical control**
Apply to the tops to control egg-laying weevils as weather warms in spring. Several applications 3 to 4 weeks apart may be necessary.

- bifenthrin (Brigade, OnyxPro, Sniper and others)—Restricted use pesticide. (Group 3)
- diflubenzuron (Dimilin 25W)—Restricted use pesticide. (Group 15)
- phosmet (Imidan 70W)—(Group 1)

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**True Fir**

**Christmas tree (True fir)—Balsam twig aphid**  
*Mindarus abietinus*

**Pest description and crop damage** Small, yellow-green aphids with woolly exudates attack new terminals.

See table:
- Hosts and Symptoms of Major Aphid and Adelgid Pests of Christmas Trees

**Management—chemical control**
- bifenthrin (Brigade, OnyxPro, Sniper and others)—Restricted use pesticide. (Group 3)
- carbaryl (Sevin and others)—(Group 1)
- chlorpyrifos (Lorsban Advanced, Warhawk and others)—Restricted use pesticide. (Group 1)
- dinotefuran (Safari 20 SG)—Check registration status at time of application. (Group 4)

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### Hosts and Symptoms of Major Aphid and Adelgid Pests of Christmas Trees

<table>
<thead>
<tr>
<th>Tree and symptoms</th>
<th>Pest</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Douglas-fir (Pseudotsuga)</strong></td>
<td></td>
</tr>
<tr>
<td>Aphids without much waxy covering. Producing large amounts of honeydew, which may be attractive to ants and yellow jackets, or covered by sooty mold.</td>
<td>conifer aphid (<em>Cinara</em> spp.)</td>
</tr>
<tr>
<td>“Pepper” flecks (crawlers) on needles in late spring and/or white cottony tufts on needles before budbreak or after about mid-June.</td>
<td>Cooley spruce gall adelgid (<em>Adelges cooleyi</em>)</td>
</tr>
<tr>
<td><strong>True fir (Abies)</strong></td>
<td></td>
</tr>
<tr>
<td>Aphids without much waxy covering. Producing large amounts of honeydew, which may be attractive to ants and yellow jackets, or covered by sooty mold. Two species, <em>C. occidentalis</em> and <em>C. abietis</em>, are found in noble fir. The former is found typically on the tree bases on 1-3 year old branches and can be quite damaging, the latter is a large conspicuous aphid found on the leaders throughout the year.</td>
<td>conifer aphid (<em>Cinara</em> spp.)</td>
</tr>
<tr>
<td>Swelling 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.</td>
<td>balsam woolly adelgid (<em>Adelges piceae</em>)</td>
</tr>
<tr>
<td>Twisting of new growth. Small greenish yellow or bluish gray aphids. Wax and honeydew may be present, matting needles together.</td>
<td>balsam twig aphid (<em>Mindarus abietinus</em>)</td>
</tr>
<tr>
<td>Tree above-ground appears stunted and off-color. Below ground there may be colonies of white colored aphids feeding on roots, often tended by ants.</td>
<td>conifer root aphid (<em>Prociphilus americanus</em>)</td>
</tr>
<tr>
<td><strong>Spruce (Picea)</strong></td>
<td></td>
</tr>
<tr>
<td>Aphids without much waxy covering. Producing large amounts of honeydew, which may be attractive to ants and yellow jackets, or covered by sooty mold.</td>
<td>conifer aphid (<em>Cinara</em> spp.)</td>
</tr>
<tr>
<td>Pineapple-shape galls or cones on branch tips</td>
<td>Cooley spruce gall adelgid (<em>Adelges cooleyi</em>)</td>
</tr>
<tr>
<td>Twisting of new growth. Small greenish yellow or bluish gray aphids. Wax and honeydew may be present as well.</td>
<td>balsam twig aphid (<em>Mindarus abietinus</em>)</td>
</tr>
<tr>
<td>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.</td>
<td>spruce aphid (<em>Elatobium abietinum</em>)</td>
</tr>
<tr>
<td><strong>Pine (Pinus)</strong></td>
<td></td>
</tr>
<tr>
<td>Aphids without much waxy covering. Producing large amounts of honeydew, which may be attractive to ants and yellow jackets, or covered by sooty mold.</td>
<td>conifer aphid (<em>Cinara</em> spp.)</td>
</tr>
<tr>
<td>White flocking on bark of branches and trunk. Trunk may appear “snow covered.”</td>
<td>pine bark adelgid (<em>Pinus strobi</em>)</td>
</tr>
</tbody>
</table>
Christmas Tree Export Pests

Many insects have export restrictions, but the pests listed below do not cause tree damage so are listed separately.

Christmas tree (Export pests)—Slug and snail

**Various species**

**Pest description and crop damage** There is no crop damage, but slugs and snails are hitchhiking pests and restricted at a number of export destinations.

**Management—cultural control**

Shaking prior to loading will remove some. Minimizing the time trees are in contact with the ground prior to shipping will help limit numbers. Placing trees on pallets and using tarps should help.

**Management—chemical control**

♦ iron phosphate/spinosad (Bug-N-Sluggo) may be used in fields and on landings. (Group 5)
♦ metaldehyde baits (Deadline Bullet and others) may be used in landings and right-of-way areas. Lock Out Slug Bait may be used in plantations and on landings in Oregon only.

Christmas tree (Export pests)—German yellowjacket

*Vespula germanica*

**Pest description and crop damage** German yellow jacket is an extremely rare hitchhiking pest and restricted in a number of export destinations. Adults have yellow and black marks with a spade shape on the 1st abdominal segment and black spots down the sides of the 2nd to 5th segments. Easily confused with common yellow jacket.

**Management—cultural control**

Shaking prior to loading will remove some yellow jackets.

During harvest, close doors on trailers when not loading and place netting over stacks of trees in loading sites.

**Management—chemical control**

Spot treating nests with aerosol sprays and trapping with heptyl-butyrate traps early (March) will help control yellow jackets.

Christmas tree (Export pests)—Exports to Mexico

**Management—chemical control**

The regulations for tree imports into Mexico are prescriptive and state: “A pesticide treatment is required 3 to 6 weeks prior to harvest using one of the following insecticides: permethrin at 36.8% active ingredient (ai), esfenvalerate at 8.4% ai or bifenthrin at 7.9% ai in accordance with doses recommended on the label…. Check export regulations at harvest time as these may be phased out.

The pesticide label must also allow for the use of the product on Christmas trees. Only three esfenvalerate products meet both the ai and registration components of these rules:

♦ bifenthrin (7.9%)—(Group 3)
  - Menace, Qualipro and Bifen Golf and Nursery all meet the active ingredient listing for Mexico.
♦ esfenvalerate (8.4%)—(Group 3)
  - DuPont Asana XL, EPA Reg. No. 352-515
  - S-FenvaloStar (LG International), EPA No. 71532-21-3006
  - Zyrate, EPA No. 71532-21-83979
♦ permethrin (36.8%)—(Group 3)
  - No products meet both the Mexico ai and Christmas tree registration requirements.
Common Pests of Nursery Crops

John Rinehold

Latest revision—March 2018

We thank Robin Rosetta for significant contributions to previous revisions of this chapter.

In all cases, follow the instructions on the pesticide label. The PNW Insect Management Handbook has no legal status, whereas the pesticide label is a legal document. Read the product label before making any pesticide applications.

Protect pollinators: See How to Reduce Bee Poisoning from Pesticides.

Note: Products are listed in alphabetical order and not in order of preference or superiority of pest control.

Not all products listed are registered in all states.

Nursery crop pests—Aphids

Pest description and crop damage Aphids are small, soft-bodied insects with piercing-sucking mouthparts formed into a long needle-like stylet they hold under their body when not feeding. They are usually identified by host plant, and characters such as color, wing venation, antennae, and cornicals (two tubular structures on the hind section of the aphid). The same species can vary in color, shape, and size depending on the time of the year. Immature nymphs look like smaller versions of adult nymphs. Some aphid species produce waxy strands over their surface. All are soft-bodied insects with a piercing–sucking mouthpart called a stylet. Crop damage includes distorted plant growth, particularly terminals, deposition of a sweet, shiny liquid called honeydew, black sooty mold (which grows on the honeydew), waxy deposits (some species), yellowing, plant galls (on some hosts) and general plant decline. Several aphid species are also vectors of plant diseases, particularly viruses.

Biology and life history Most species of aphid have similar life cycles. Aphid females give birth to live offspring asexually most of the year without mating. Aphid populations generally are most abundant during the cooler spring and fall seasons. Populations can build up quickly at that time of year. Aphids usually are found in colonies. In spring and fall, under crowded conditions, or when the nutritional quality of their host plant is reduced, aphids may produce winged adults (alates) which can disperse. In the fall, aphids mate and produce eggs for overwintering, especially in colder climates. Some species of adult aphid overwinter on crops, weeds, or trees. There may be as few as two generations or as many as 16 generations each year, depending on the species and climate. Most aphids are associated with one or several host plants. Some have alternate hosts, overwintering on one host and moving to another as the season progresses. Several species have a wide host range, with many host plants including weed species. Examples of these species include: green peach aphid, Myzus persicae, and cotton or melon aphid, Aphis gossipea. There are aphid species that spend some of their life cycle on the root systems of the host plants. Commonly occurring examples include aphids in the family Pemphigidae which are root aphids on conifers and also spend time on alternate hosts such as poplar or ash.

Scouting and thresholds Monitor for aphids on at least weekly during the growing season. Scout for aphids near growing terminals near buds and fruit clusters, and leaf undersides, particularly alongside leaf veins. White cast skins, shiny honeydew, black sooty mold, and misshapen terminals are good indicators of aphid presence. Yellow sticky traps and yellow pan traps can help monitor flights of adults. Look for signs of natural enemy activity, including predators and parasites. The bodies of parasitized aphids, called mummies, will look slightly swollen brown or black, sometimes with an exit hole made by tiny wasps.

Management—biological control

See also: Biological Control of Nursery Pests

Management—cultural control

A strong spray of water alone often effectively removes aphids. Control of associated ant species which move and protect aphids from their naturally enemies may provide additional control of the aphid populations. Aphid populations tend to be higher in plants that are fertilized liberally with nitrogen and heavily watered, as this produces flushes of succulent growth. Avoid excessive watering, and use slow-release forms or organic sources of nitrogen.

Management—chemical control

See also: Chemical Control of Nursery Pests

There are a variety of chemical tactics available for these soft-bodied insects including relatively low toxicity contact products including soaps, oils, and botanicals. Good coverage with contact pesticides is essential. Also available are very selective chemical tools such as insect growth regulators and active ingredients with novel modes of actions such as pymetrozine (Endeavor) which disables the sucking mechanism of the aphids. Kaolin clay is used as a protective barrier and is best applied prior to infestations. Microbial pesticides such as those using the fungus Beauvaria bassiana (Botanigard, Naturalis O) generally benefit from higher levels of humidity such as can be found during the spring and fall and in many protected systems. Systemic insecticides are particularly useful when contact is difficult and to protect new growth over time. Broad spectrum insecticides are generally less IPM compatible but may be useful when multiple types of insects must be treated.

Nursery crop pests—Leafminers

Pest description and crop damage There several different types of leafminers, including mines made by the larval stages of flies, moths, sawflies, and beetles. Damage from leafminer feeding occurs as the larvae feeds between the upper and lower epidermis of leaves or stems. Mines start as small round puncture wounds. Some mines with a long winding trail (serpentine mines) through the leaf which gradually expands. Other mines are formed as a larger feeding area called a blotch mine.

Sawflies—The adult sawfly insects are generally small thick-waisted wasps, often black and about 0.25 inch long. The larvae are small, and light colored. The larvae feed between epidermal layers, creating large dark blotches in the leaves. After the insects leave, the affected areas turn light brown and crinkle. Aside from the effects on the appearance of the foliage, some defoliation and weakening of the tree can occur.
Moth larvae—Lepidopteran larvae in the moth family Lepidoptera. Species form tentiform (slightly puffed out “tent-like”) mines on many hosts including willows, poplars, apples, and hackberry. Additional moth leafminer species include lilac leafminer, Calopistus syringella and needle miners on pines.

Fly larvae—Many dipteran leafmining larvae in the fly family Agromyzidae. These include Liomyza, tiny yellow and black flies whose larvae mine leaves on chrysanthemums. Other dipteran leaf miners include birch leafminer, Fennia pusilla, and leaf miners on elm, hawthorn, and alders.

Beetle larvae—An example of a beetle leaf miner is the European elm flea beetle, whose larvae feeding starts as small serpentine mines later forming blotch mines.

Biology and life history

Sawflies—Adults first appear in spring, when leaves are partly formed. The females lay eggs on newly expanding leaves, after the eggs hatch they mine out the middle layer of the leaf forming a blotch mine. After 2 to 3 weeks, the larvae drop to the ground and pupate. There are normally one generation per year.

Moth larvae—Many of these leaf miners have two generations per year.

Fly larvae—The female leaf miner flies insert their eggs (oviposit) inside the leaves. The eggs hatch and the larvae feeds in the mines, chews a hole through the leaf, and drops to the ground to pupate.

Scouting and thresholds Monitoring should include direct observation of susceptible plants during the time the adult insects begin activity in the spring and continue on a weekly basis. Yellow sticky cards or homemade yellow sticky traps can be used to monitor for adult fly leaf miners. Most leafminer damage does not impact plant health but may affect marketability.

Management—biological control

Naturally occurring parasitic wasps lay their eggs on or near the larvae in the mines. The larvae from the eggs feed on the leaf miner.

Management—cultural control

Removal and destruction of mined leaves can reduce pressure.

Management—chemical control

Most sprays are timed to coincide with egg laying by the adult insects, usually on newly expanding leaves. Some control of fly and beetle larvae within mines can be achieved with systemic insecticides such as the neonicotinoids.

See also: Chemical Control of Nursery Pests

Nursery crop pests—Scale

Pest description and crop damage There are two types of scale commonly encountered: hard scale and soft scale. Hard scale tend to be fairly small in size and lie flatter against the stems that do soft scale. Soft scale is often very rounded and will also produce honeydew with its associated black sooty mold. Scale may have only one or multiple generations per year. Scale often comes into nurseries on propagation material. This example shows the importance of inspections and sometimes, quarantine of any new plant material brought into the nursery. Early infestations can often be rogued or pruned out.

Biology and life history The life history varies with species, so species identification is needed to determine life cycle. Generally, scale overwinter as eggs or as an immature scale on twigs and branches. If scale overwinter as an immature, they resume feeding in the spring, and eggs are laid later in spring. If scale overwinter as eggs, these hatch in spring, and the young scale (called “crawlers”) migrate thorough the foliage to feed on the leaves. Most scale insects are female. Mature females are wingless and often secrete a hard shell-like covering for protection. The males are rare, small, non-feeding, and short-lived but look more like other insects as they have wings. With a few notable exceptions, the first immature stage, or the first “instar” females are generally the only stage that disperses on plant material. All other stages remain attached to the plant surface, sessile. Females lay eggs or crawlers under their secreted scale covering or in a cavity under their bodies.

Scouting and thresholds Look for scale along stems and leaf undersides. Inspect twigs during the dormant season for scale. Pay particular attention to weak plants. The crawlers are best observed starting in spring with a 10X magnifying glass. Double-sided sticky tape can be used to check for emerging scale crawlers.

Management—biological control

Check for presence of holes in the scale covers indicating parasitic wasp activity. Ants, fond of honeydew, will fight off scale natural enemies to protect the source. Control of ants may increase biological control. There are several naturally occurring lady beetles that specialize as natural enemies of scale including Chilocorus and Rhizobius. Larvae of green lacewings and other insects are aggressive predators of scale. However, biological control will not necessarily prevent significant scale infestations.

Avoid use of broad spectrum insecticides to preserve natural enemies.

Management—cultural control

Closely inspect all incoming plant material and plants used for propagation. Pruning and rouging may be an effective tactic in the landscape or on a limited number of nursery plants. As with aphids, avoid excessive nitrogen fertilizer, as this favors population increase. Control associated ant species as they move scale and protect them from natural enemies.

Management—chemical control

Scale pests are best controlled at the “crawler” stage: the immature, active stage when the insects are most sensitive to insecticides. Spray applications should be timed to coincide with emergence of the vulnerable crawlers. Another tactic is application of systemic insecticides that are drawn into the plant, managing multiple feeding stages of the scale. Time may be needed for some plants to translocate the insecticide to infested parts of the plant. Systemic insecticides are used against many scale species but generally have been less successful with hard scales and pit scales.

Dormant-season oil spray—Apply with enough water to cover the entire tree thoroughly.

See also: Chemical Control of Nursery Pests

For more information

PNW Nursery IPM: A Matter of Scale (http://oregonstate.edu/dept/nurspest/scale.htm)

WSU Extension Bulletin: EB1552E: Scale Insects on Ornamentals (http://cru.cahe.wsu.edu/CEPUBLICATIONS/EB1552E/EB1552E.PDF)
Nursery crop pests—Spider mite

Pest description and crop damage Several species of spider mites can cause damage in deciduous ornamentals. Appearance of these mites varies with the species, although all are 0.02 inch or smaller. Adults and nymphs can be yellowish, greenish, or reddish brown, depending on species. Mites damage plants by feeding on leaves, which causes stippling, bronzing, and possibly leaf drop. The reduction in photosynthesis causes loss of vigor. The most common pest species of spider mite on conifers is spruce spider mite. It can cause damage on a wide range of conifers. Adults and nymphs can be yellowish, greenish, or reddish brown. Mites damage plants by feeding on leaves, which causes stippling, bronzing, and possibly needle drop. Webbing occurs with high populations. The reduction in photosynthesis causes loss of vigor.

Biology and life history Most mite species share a similar life cycle. The majority of twospotted spider mites overwinter as adult females. Spruce spider mites, which are commonly found on conifers, overwinter in the egg stage. Mites become active in the spring. There may be eight to ten overlapping generations per year. Spruce spider mites overwinter as eggs laid at the base of needles or scales. Mites become active in the spring, usually around mid-April. There may be eight to ten overlapping generations per year. Spruce spider mite is a cool season mite with greatest rates of egg laying during the spring and fall.

Scouting and thresholds Observe the leaves for mites and webbing and check for the number of pest and predator mites. Tapping branches over a piece of white paper indicates numbers of mites present. Look for evidence of natural enemy activity.

Management—cultural control Suppression of broadleaf weeds such as mallow, bindweed, white clover, and knotweed with cultivation or grasses may reduce mite numbers. Wash mites from the tree with a strong stream of water. This also dislodges dust and dirt, which favor an increase in mite numbers. Water trees properly, as drought-stressed trees are more susceptible. Avoid excessive nitrogen applications, as this encourages mites.

Management—biological control See also: Biological Control of Nursery Pests

Management—chemical control See also: Chemical Control of Nursery Pests

Using an ovicide-larvicide in early spring can give good suppression of this mite.

For more information
PNW Nursery IPM: Spruce Spider Mite (http://oregonstate.edu/dept/nurspest/spruce_spider_mite.htm)
PNW Nursery IPM: Biological Control of Twospotted Mite (http://oregonstate.edu/dept/nurspest/two-spottedmite.htm)

Nursery crop pests—Weevil

Pest Description and Damage Black vine weevil is not always the most common weevil to infest landscape plants. In several landscapes in Oregon, the strawberry root weevil and obscure root weevil were dominant, and in Washington often the clay-colored weevil and species of the native woods weevils are the dominant species in many landscapes. Other species are also present in PNW states (see below). In Washington there are 16 species that have been found on a variety of plants in landscapes. In Oregon, there are several additional species, including Plinthodes tineatus and Otiorhynchus décoratus. It is important to identify the species of root weevil infesting plants (see descriptions below) because of variations in life cycle and susceptibility to pesticides. In the early 1970s, this handbook recommended aldrin, dieldrin, heptachlor and chlordane for the introduced weevils, and malathion and diazinon for native woods weevils.

Adult weevils are small dark beetles with a snout (rostrum) and elbowed antennae. They cannot fly so distribution is through migration or movement of infested pots, soil or debris. Also, the adults of most of the species are all females and capable of laying eggs after a period of feeding to mature their ovaries. They are slow moving and should not be confused with swifter predacious ground beetles. Larvae, found around roots, are C-shaped, legless, and white with tan heads, up to 0.5 inch in size. All species are quite similar in appearance and habits of feeding on root hairs, larger roots and root crown. Adult weevils are night feeders that mostly remain in the soil or in debris at the base of the plant during the day, then climb up to feed on leaves at night. Look for ragged notches on the edges of leaves, or flower petals.

Black Vine Weevil (Otiorhynchus sulcatus) — One of our largest root weevils (8–11 mm), this species is black with yellow patches of hairs and smooth rounded tubercles on the thorax. Weevils overwinter as larvae in the soil and adults emerge in early June. A few adults are active in winter months in milder climates. In June, larvae pupate, and adults emerge. Eggs are laid singly or in small clusters in or on the soil from June to September.

Strawberry root weevil (Otiorhynchus ovatus) — This 4–6 mm, reddish-black to black, shiny weevil has reddish legs; it appears smooth but on magnification has small hairs and pits. Adult emergence varies depending on climate. Eggs are laid singly or in small clusters in or on the soil from June to September.

Baryphtes pellucidus — One of the smallest weevils (2–4 mm), this weevil looks like a tiny strawberry root weevil but is thinner in the side profile and has a soft “down” hairs; one of the few root weevils with males and females (often in copula).

Lilac or privet weevil (Otiorhynchus merdionalis) — This weevil is the most common species in eastern Washington and known from collections in E. Oregon. It is 8–9 mm with both males and larger females (often found in copula). They appear uniformly blackish and shiny.

Rough strawberry root weevil (Otiorhynchus rugosstriatus) — This species is 6–8.5 mm, and a uniformly a dark mahogany color (reddish brown) with a “matte finish” It is distinguishable by the rounded shape of the elytra when viewed from above and short stiff hairs (just barely visible in the outline of the elytra).

Clay colored weevil (Otiorhynchus singularis) — This species is one of the most numerous in W. Washington landscapes. It is 6–9 mm, mottled brown (tan and brown scales) with scales on legs; there are no hairs on elytra or thorax, the underside is shiny dark brown. It is the earliest to emerge in spring, often in April.
Otiorhynchus raurus — This recent arrival in Oregon and Washington looks slightly shorter and broader than clay colored weevil, overall light brown with a darker thorax. The thorax has fine setae; underside dull brown rather than shiny beneath. Emerges in early spring.

Dark-eyed weevil (Sciaphilus speratus) — Another relative newcomer to landscapes, this slightly iridescent golden weevil has a distinctive dark eyes and dark stripe across the elytra.

Nut leaf weevil (Strophosoma meloagrammum) — This 4.5–6 mm weevil is a relative newcomer to landscapes. It is slightly iridescent with coppery-brown scales and a distinctive partial dorsal stripe between the elytra. It is a voracious feeder with a somewhat distinctive feeding pattern, often a “maze” of channels from the leaf edge. It is most commonly found in the fall and spring.

Obscure root weevil (Sciapithes obscurus) — This native species is diurnal and is more abundant in wooded areas, and in Oregon. It is 3–6.6 mm, is grayish with brown markings with a distinctive V-shaped line at the declivity (rump).

Grass weevil, crusted grass weevil (Trachypheles bifoveolatus) — This tiny 3–4 mm gray-brown weevil occurs but not commonly in landscapes. It enters houses in large numbers in fall in pastoral areas.

Woods weevil (Nemocestes incomptus) — This 6–9 mm native species is sooty dark brown to blackish color with a light band on the side of the thorax and elytra; it covered with short hairs on thorax and elytra. Adults emerge in late summer with numbers peaking in fall. They can feed throughout the winter months in warmer areas.

Horn’s woods weevil (Nemocestes horni) — This native species is easily mistaken for woods weevil but is slightly smaller (5–8 mm) with some lighter streaks.

Small woods weevil (Nemocestes montanus) — A smaller (4–5 mm) version of the woods weevil still has the light stripe on the thorax and elytra. Common and occasionally abundant.

Woodburn weevil (Dyslobus (syn. Lepesoma) granicollis) — This large native weevil 7–9 mm is found in low numbers especially near wooded areas.

Biology and life history Adults of most species are abundant from through May through September (Black vine weevil, Strawberry root weevil, Rough strawberry root weevil, Clay-colored weevil, Lilac weevil, Woodburn Weevil, Barypiethes pullucidus, Obscure root weevil). Weevils overwinter as larvae in the soil. Feeding may occur throughout mild winters. In April to June, larvae pupate, and adult emergence occurs. Adults are night feeders that remain in the soil or in debris at the base of the plant during the day, then climb up to feed on leaves. Adult weevils cannot fly, but walk or are carried from one location to another. Also, all adults are females capable of laying eggs. Adults are slow moving and should not be confused with swifter predacious ground beetles. Eggs are laid in clusters in or on the soil from June to September. The eggs hatch, and the larvae immediately wriggle through the soil to begin feeding. There is one generation per year.

The woods weevils, nut leaf weevil, grass weevil and Sciaphilus asperatus emerge in late summer and are active through the winter and very early in spring. Larvae of the fall emerging species are likely to be present during the summer months.

Scouting and thresholds Observe leaves for first signs of notching in early summer (primroses are an inexpensive preferred host and can be used as an indicator plant for conifer field production. Confirm presence of adults by night inspection of foliage on warm, still evenings. Or, look for adults by day in debris at the base of the plant. Laying a small piece of cardboard at the base of the plant provides a refuge that you can check easily in the early morning. Commercial root weevil traps are available. Inspect the pots of plants by tapping the plant out of the pot, and check for areas of missing roots on the sides and bottom of the pot or for small white, C-shaped grubs. Remove these before planting. If there is evidence weevil have been feeding on root hairs, moved into the rootball it is wise to shake off all soil into a bucket before planting to remove larvae feeding inside the root ball, on larger roots or the root crown. Clean up crossing, kinked roots at the same time.

Management—biological control

See also:
Biological Control of Nursery Pests

Management—chemical control

See also:
Chemical Control of Nursery Pests

Begin adult control when adults emerge in late May and June. Control larvae in the fall. Overwintering adult weevils can lay eggs without the pre-ovipositional feeding interval. Research in strawberries has shown around 25% of black vine weevil adults overwintered successfully. In mild years, growers may need to target these weevils earlier, in April and May, in order to achieve satisfactory weevil management.

For more information


Bichocontrol of Root Weevils (http://oregonstate.edu/dept/nurspest/Biocontrol_%20root%20weevils.html)


Proceedings of the North American Root Weevil Workshop. SR 1065 (http://hdl.handle.net/1957/8262)

PNW Insect Management Handbook
Chemical Control of Nursery Pests

**Bee warning** Read carefully before applying any material selected for use. Many insecticides are highly toxic to honeybees. Some should not be applied any time during bloom, while many others should be applied only in the early morning hours and/or late in the evening. Avoid spraying carbaryl and diazinon on plant surrounded by blooming flowers or weeds. Always take simple steps, such as removing (mowing) blooming clover from lawns adjacent to garden areas before applying materials that are hazardous to bees. In all cases, when given the choice, select the least hazardous material when plants in the infested vicinity are in bloom. Avoid using dusts wherever possible; spray formulations are preferred for bee safety.

**Protect pollinators:** See How to Reduce Bee Poisoning from Pesticides.

**Note:** Products are listed by alphabetical order and not in order of preference or superiority of pest control.

_For greenhouse plant see:_
Greenhouse Ornamental Pests
Characteristics of Insecticides

Using pyrethroid insecticides is associated with subsequent spider mite outbreaks: monitor plant closely after you use these materials.

### Pesticides available for use in commercial nursery applications

<table>
<thead>
<tr>
<th>Active ingredient</th>
<th>Trade name (examples)</th>
<th>Chemical class</th>
<th>Typical use pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>abamectin</td>
<td>Avid, Lucid</td>
<td>acyclic lactone</td>
<td>translaminar systemic</td>
</tr>
<tr>
<td>acephate</td>
<td>Acephate, Orthene</td>
<td>organophosphate</td>
<td>foliar systemic</td>
</tr>
<tr>
<td>acequinocyl</td>
<td>Shuttle</td>
<td>nathoquinone</td>
<td>spider mite</td>
</tr>
<tr>
<td>acetamiprid</td>
<td>Tristar</td>
<td>chloro-nicotinyl</td>
<td>whitefly, aphid, adelgid, scale, psyllid, mealybug, leafhopper, thrips, leafminer, plant bug, leaf eating beetles, fungus gnat larvae</td>
</tr>
<tr>
<td>alpha-cypermethrin</td>
<td>Fendona CD</td>
<td>synthetic pyrethroid</td>
<td>aphid, lepidoptera, flea beetle, webworm, grasshopper, plant bug, spittlebug</td>
</tr>
<tr>
<td><em>Bacillus thuringiensis</em></td>
<td>various (organic labels available)</td>
<td>microbial</td>
<td>specific, depends on variety; biopesticide</td>
</tr>
<tr>
<td><em>Beauveria bassiana</em></td>
<td>Botanigard, Mycotrol, Naturalis L</td>
<td>fungus</td>
<td>whitefly, aphid, psyllid, thrips, weevil, mealybug</td>
</tr>
<tr>
<td>beta-cyfluthrin</td>
<td>Tempo</td>
<td>pyrethroid</td>
<td>aphid, caterpillar</td>
</tr>
<tr>
<td>bifenthrin</td>
<td>Floramite</td>
<td>carbazate</td>
<td>spider mite—good coverage is especially important; compatible with predacious mite.</td>
</tr>
<tr>
<td>bifenthrin/imidacloprid</td>
<td>Atera, Bithor</td>
<td>pyrethroid/neonicotinoid</td>
<td>combination product; systemic, check label for pests.</td>
</tr>
<tr>
<td>buprofezin</td>
<td>Talus</td>
<td>insect growth regulator</td>
<td>scale, whitefly, mealybug, leafhopper, pear psylla acts on immature stages.</td>
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<tr>
<td><em>Burkholderia</em> spp.</td>
<td>Venerate XC (OMRI)</td>
<td>bioinsecticide</td>
<td>loopers, aphids, mites, thrips, whiteflies, armyworms</td>
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<tr>
<td>carbaryl</td>
<td>Sevin</td>
<td>carbamate</td>
<td>general, check label for pest list.</td>
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<td>chlorfenapyr</td>
<td>Pylon</td>
<td>pyrroles</td>
<td>spider mites</td>
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<td>chlorantraniliprole</td>
<td>Acelepryn</td>
<td>anthranilic diamide</td>
<td>caterpillar, aphid, lace bug, birch leafminer, beetle, borers</td>
</tr>
<tr>
<td>Active ingredient</td>
<td>Trade name (examples)</td>
<td>Chemical class</td>
<td>Typical use pattern</td>
</tr>
<tr>
<td>--------------------</td>
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</tr>
<tr>
<td>chlorpyriphos</td>
<td>Dursban</td>
<td>organophosphate</td>
<td>general, check label for pest list; restricted use pesticide.</td>
</tr>
<tr>
<td><em>Chromobacterium</em></td>
<td>Grandevo</td>
<td>microbial</td>
<td>general, check label for pest lift.</td>
</tr>
<tr>
<td>canola oil</td>
<td>Earth-Tone Horticultural Oil (organic)</td>
<td>botanical oil</td>
<td></td>
</tr>
<tr>
<td>citronella/farnesol/geraniol/nerolidol</td>
<td>Biomite</td>
<td>botanical</td>
<td>mite</td>
</tr>
<tr>
<td>clarified hydrophobic extract of neem oil</td>
<td>Triact (OMRI), Trilogy (OMRI)</td>
<td>botanical oil</td>
<td>fungicide, miticide, insecticide, whitefly, mealybug, aphid, leafhopper</td>
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<td>clofentezine</td>
<td>Ovation</td>
<td>tetrazine</td>
<td>spider mite</td>
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<td>clothianidin</td>
<td>Arena</td>
<td>neonicotinoid</td>
<td>aphid, mealybug, whitefly, adelgid, lacebug, leaf beetle, psyllid, root weevils, systemic</td>
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<td>cryolite</td>
<td>Cryolite Bait</td>
<td>inorganic</td>
<td>caterpillar, root weevil</td>
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<td>cyantraniliprole</td>
<td>Mainspring</td>
<td>raynoid</td>
<td>plant bug, lepidopera, soft scale, thrips, whitefly, Japanese beetle</td>
</tr>
<tr>
<td>cyflumetofen</td>
<td>Sultan Miticide</td>
<td></td>
<td>spider mite</td>
</tr>
<tr>
<td>cyfluthrin</td>
<td>Decathlon</td>
<td>pyrethroid</td>
<td>general – check label; restricted use pesticide.</td>
</tr>
<tr>
<td>cyfluthrin/imadclorpid</td>
<td>Discus</td>
<td>pyrethroid/neonicotinoid</td>
<td>general – check label; combination product; systemic; restricted use pesticide.</td>
</tr>
<tr>
<td>cyfluthrin/piperonyl butoxide/pyrethrins</td>
<td>1600 X-clade</td>
<td>pyrethroid/synergist/pyrethrins</td>
<td>general – check label combination product; restricted use pesticide.</td>
</tr>
<tr>
<td>cypermethrin</td>
<td>Cyper TC, Enforcer</td>
<td>pyrethroid</td>
<td>ant, silverfish, sowbug greenhouse, seedhouse, and commercial building treatments; restricted use pesticide.</td>
</tr>
<tr>
<td>cyromazine</td>
<td>Citation</td>
<td>triazine: insect growth regulator</td>
<td>acts on immature fungus gnat, leaf miner, shore fly.</td>
</tr>
<tr>
<td>deltamethrin</td>
<td>Deltagard GC</td>
<td>pyrethroid</td>
<td>general – check label; restricted use.</td>
</tr>
<tr>
<td>diazinon</td>
<td>Diazinon</td>
<td>organophosphate</td>
<td>general; restricted use pesticide.</td>
</tr>
<tr>
<td>diflubenzuron</td>
<td>Dimilin 4L</td>
<td>benzoylephylurea: insect growth regulator</td>
<td>acts on immature stages, conifer nursery; restricted use pesticide.</td>
</tr>
<tr>
<td>dimethoate</td>
<td>Dimethoate</td>
<td>organophosphate</td>
<td>general – check label; systemic.</td>
</tr>
<tr>
<td>dinofuran</td>
<td>Safari</td>
<td>neonicotinoid</td>
<td>aphid, mealybug, whitefly, fungus gnat, weevil, psyllid, borer, thrips, scale; systemic.</td>
</tr>
<tr>
<td>emanectin benzoate</td>
<td>Enfold</td>
<td></td>
<td></td>
</tr>
<tr>
<td>entomopathogenic nematode (live)</td>
<td><em>Heterorhabditis</em> spp., <em>Steinernema</em> spp.</td>
<td>microbial</td>
<td>soil pests such as root weevil.</td>
</tr>
<tr>
<td>esfenvalerate</td>
<td>Fenvastar EcoCap, Onslaught FastCap</td>
<td>pyrethroid</td>
<td>spiders, scorpions, check label for other pests.</td>
</tr>
<tr>
<td>ethoprop</td>
<td>Mocap</td>
<td>organophosphate</td>
<td>nematode, symphylan, field nurseries only, pre-plant only: Easter lilies (Curry County, OR); SLN OR-120005.</td>
</tr>
</tbody>
</table>
## Pesticides available for use in commercial nursery applications

<table>
<thead>
<tr>
<th>Active ingredient</th>
<th>Trade name (examples)</th>
<th>Chemical class</th>
<th>Typical use pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>etoxazole</td>
<td>TetraSan</td>
<td>oxazolin; insect growth regulator</td>
<td>spider mite</td>
</tr>
<tr>
<td>fenazaquin</td>
<td>Magus Mitecide</td>
<td>quinazoline</td>
<td>spider mite, whitefly</td>
</tr>
<tr>
<td>fenbutatin oxide</td>
<td>Vendex, Meraz</td>
<td>organotin</td>
<td>spider mite</td>
</tr>
<tr>
<td>fenpropathrin</td>
<td>Tame 2.4 EC</td>
<td>pyrethroid</td>
<td>general – check label; restricted-use pesticide</td>
</tr>
<tr>
<td>fenpyroximate</td>
<td>Akari EC</td>
<td>phenoxyprazole</td>
<td>spider mite, broad mite, cyclamen mite, eriophyid mite, mealybug</td>
</tr>
<tr>
<td>fenvalerate</td>
<td>Onslaught</td>
<td>synthetic pyrethroid</td>
<td>lepidoptera, aphid, plant bug, sawfly, spittlebug, thrips</td>
</tr>
<tr>
<td>flonicamid</td>
<td>Aria Insecticide</td>
<td>pyridinecarboxamide</td>
<td>aphid, thrips, whitefly, scale leafhopper, mealybug</td>
</tr>
<tr>
<td>flupyradifurone</td>
<td>Altus</td>
<td>butenolides</td>
<td>leafminer, leafhopper, mealybug, lace bug, scale, whitefly, aphid</td>
</tr>
<tr>
<td>garlic oil/powder/cottonseed oil/ oil of clove</td>
<td>Pestout (OMRI)</td>
<td>botanical</td>
<td>mite</td>
</tr>
<tr>
<td>hexythiazox</td>
<td>Hexagon</td>
<td>organosulfur</td>
<td>spider mite, ovisidal, larvald</td>
</tr>
<tr>
<td>hydramethylnon</td>
<td>Amdro, MaxForce</td>
<td>ant</td>
<td></td>
</tr>
<tr>
<td>imidacloprid</td>
<td>Imidacloprid, Marathon</td>
<td>chloronicotylin</td>
<td>caterpillar, sawfly, leafhopper</td>
</tr>
<tr>
<td>indoxacarb</td>
<td>Provaunt</td>
<td>carbamate</td>
<td></td>
</tr>
<tr>
<td>iron phosphate</td>
<td>Bug-N-Sluggo</td>
<td></td>
<td>slug, snail</td>
</tr>
<tr>
<td>Isaria fumosorosea strain 97</td>
<td>Preferal Microbial Insecticide</td>
<td>microbial</td>
<td></td>
</tr>
<tr>
<td>kaolin</td>
<td>Surround (OMRI)</td>
<td>clay</td>
<td>may leave residue</td>
</tr>
<tr>
<td>lambda-cyhalothrin</td>
<td>Cyonara , Scimitar GC</td>
<td>pyrethroid</td>
<td>general – check label; restricted use pesticide</td>
</tr>
<tr>
<td>limonene</td>
<td>Orange Guard</td>
<td>botanical, monoterpine</td>
<td>aphid, spider mite</td>
</tr>
<tr>
<td>malathion</td>
<td>Malathion SEC, Fyfanon, Prentox</td>
<td>organophosphate</td>
<td>check label for non-tolerant plant</td>
</tr>
<tr>
<td>metaldehyde</td>
<td>Metaldehyde</td>
<td>aldehyde molluscide</td>
<td>slug, snail</td>
</tr>
<tr>
<td>Metarhizium anisopliae strain 52</td>
<td>Met 52</td>
<td>biological, fungus</td>
<td>root weevil grubs</td>
</tr>
<tr>
<td>methidathion</td>
<td>Supracide</td>
<td>organophosphate</td>
<td>aphid, scale, leafminer, moth, weevil; restricted use pesticide</td>
</tr>
<tr>
<td>methiocarb</td>
<td>Mesurol</td>
<td>carbamate</td>
<td>slug, snail, thrips; restricted use use</td>
</tr>
<tr>
<td>methoxyfenozide</td>
<td>Intrepid 2F</td>
<td>diacylhydrazine</td>
<td>caterpillar</td>
</tr>
<tr>
<td>milbemectin</td>
<td>Ultiflora</td>
<td>macrocyclic lactonemite</td>
<td>mite; restricted use pesticide</td>
</tr>
<tr>
<td>mineral oil, petroleum distillate</td>
<td>Various</td>
<td>oil</td>
<td>soft-bodied pests</td>
</tr>
<tr>
<td>novaluron</td>
<td>Pedestal</td>
<td>benzoxyphenyl urea</td>
<td>whitefly, thrips, leafminer, armyworm; insect growth regulator</td>
</tr>
<tr>
<td>oil of rosemary/peppermint</td>
<td>Ecotec Broad Spectrum (OMRI)</td>
<td>botanical/botanical oil</td>
<td>aphid, beetle, caterpillar, fungus gnat, shorefly, leafhopper, leafminer, mite, soft scale</td>
</tr>
<tr>
<td>orthoboric acid</td>
<td>Niban</td>
<td>inorganic acid</td>
<td>slug, snail</td>
</tr>
<tr>
<td>oxydemeton-methyl</td>
<td>MSR Spray Concentrate</td>
<td>organophosphate</td>
<td>aphid, adelgid, thrips, white pine weevil, field-grown nursery stock; systemic; restricted use pesticide</td>
</tr>
<tr>
<td>Isaria fumosoroseus</td>
<td>PFR 97</td>
<td>biological, fungus</td>
<td>whitefly</td>
</tr>
<tr>
<td>permethrin</td>
<td>Ambush, Permethrin, Pounce, many labels</td>
<td>pyrethroid</td>
<td>general – check label; most are restricted-use pesticides</td>
</tr>
</tbody>
</table>
### Pesticides available for use in commercial nursery applications

<table>
<thead>
<tr>
<th>Active ingredient</th>
<th>Trade name (examples)</th>
<th>Chemical class</th>
<th>Typical use pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>phenylethyl propionate</td>
<td>EcoVia WD</td>
<td>botanical</td>
<td>general</td>
</tr>
<tr>
<td>phorate</td>
<td>Thimet 20G SLN OR</td>
<td>organophosphate</td>
<td>nematodes in Easter Lily</td>
</tr>
<tr>
<td>phosmet</td>
<td>Imidan</td>
<td>organophosphate</td>
<td>birch leafminer</td>
</tr>
<tr>
<td>pirimiphos-methyl</td>
<td>Actellic 5E SLN WA</td>
<td>organophosphate</td>
<td>mealybug</td>
</tr>
<tr>
<td>potassium laurate</td>
<td>M-Pede, Insecticidal Soap (several OMRI, organic)</td>
<td>soap</td>
<td>general, contact only, no residual.</td>
</tr>
<tr>
<td>propargite</td>
<td>Omnite</td>
<td>organosulfur</td>
<td>mite</td>
</tr>
<tr>
<td>propyleneglycol monolaurate</td>
<td>Acaritouch</td>
<td>fatty acid monoester</td>
<td>spider mite – good contact required.</td>
</tr>
<tr>
<td>pymetrozine</td>
<td>Endeavor</td>
<td>triazine</td>
<td>aphid, whitefly</td>
</tr>
<tr>
<td>pyrethrin/piperonyl butoxide (PBO)</td>
<td>PT 1600 X-clade, PT Pyrethrum TR</td>
<td>pyrethrins/synergist</td>
<td>general – check label.</td>
</tr>
<tr>
<td>pyrethrin/canola</td>
<td>PyGanic Dust (OMRI)</td>
<td>pyrethrins</td>
<td>general – check label.</td>
</tr>
<tr>
<td>pyridalyl</td>
<td>Overture</td>
<td>pyridazinone</td>
<td>lepidoptera, thrips</td>
</tr>
<tr>
<td>pyridaben</td>
<td>Sanmite</td>
<td>pyridazinone</td>
<td>spider mite, whitefly</td>
</tr>
<tr>
<td>pyrifluquinazon</td>
<td>Rycar</td>
<td>whitefly, aphid, leafhopper, thrips, mealybug</td>
<td></td>
</tr>
<tr>
<td>pyriproxynfen</td>
<td>Distance</td>
<td>insect growth regulator</td>
<td>greenhouse, shadehouse, lath structures only; acts on immature stage of aphids, whitefly, scale, mealybug, thrips</td>
</tr>
<tr>
<td>s-kinoprene</td>
<td>Enstar</td>
<td>insect growth regulator</td>
<td>cucumber beetle, ant, caterpillar, aphid, stink bug, leaf mite</td>
</tr>
<tr>
<td>silicon dioxide (diatomaceous earth)</td>
<td>Perma Guard Garden &amp; Plant Protection Insecticide</td>
<td>inorganic</td>
<td>aphid, leafhopper, lygus, mealybug, mite, thrips, whitefly</td>
</tr>
<tr>
<td>sodium borate complex</td>
<td>Prev-Am Ultra</td>
<td>sugar ester</td>
<td>soft-bodied insects</td>
</tr>
<tr>
<td>sorbitol octanoate</td>
<td>Sorbishield 90</td>
<td>fungal metabolite</td>
<td>thrips, caterpillar, midge</td>
</tr>
<tr>
<td>spinosad</td>
<td>Conserve, Entrust</td>
<td>fungal metabolite</td>
<td>thrips, caterpillar, midge</td>
</tr>
<tr>
<td>spiromesifen</td>
<td>Judo</td>
<td>ketoenole</td>
<td>spider mite, broad mite, cyclamen mite, false spider mite, eriocephyl mite, whitefly</td>
</tr>
<tr>
<td>spirotetramat</td>
<td>Kontos</td>
<td>tetramic acid</td>
<td>aphid, adelgid, whitefly, rust mite, spider mite, psyllid, spittlebug, mealybug, leafhopper; systemic chemistry</td>
</tr>
<tr>
<td>tau-fluvalinate</td>
<td>Mavrik Aquaflow</td>
<td>pyrethroid</td>
<td>general, container stock only</td>
</tr>
<tr>
<td>tebufenozide</td>
<td>Mimic</td>
<td>hydrazine, IGR</td>
<td>acts on moth immature stages.</td>
</tr>
<tr>
<td>thiamethoxam</td>
<td>Flagship</td>
<td>neonicotinoid</td>
<td>beetle grub, aphid, whitefly, mealybug</td>
</tr>
<tr>
<td>tolfenpyrad</td>
<td>Hachi-Hachi</td>
<td>pyrazole</td>
<td>aphid, leafhopper, lepidoptera, scale, thrips</td>
</tr>
<tr>
<td>trichlorfon</td>
<td>Dylox Turn &amp; Ornamental Ins.</td>
<td>organophosphate</td>
<td>caterpillar, bulb fly, cinch bug, beetle larvae</td>
</tr>
<tr>
<td>zeta-cypermethrin</td>
<td>various labels</td>
<td>pyrethroid</td>
<td>aphid, caterpillar, sucking insects</td>
</tr>
</tbody>
</table>
Pesticides registered for use on specific nursery pests

**adelgid**
- abamectin (Avid)
- acephate (Acephate 90WDG)
- acetamiprid (TriStar)
- azadirachtin (Azatin)
- bifenthrin (Talstar, various)
- canola oil (Earth-tone Hort Oil)
- carbaryl (Sevin)
- chlorpyrifos (Dursban, various)
- *Chromobacterium subsugae* (Grandevo)
- clothianidin (Arena)
- cyfluthrin (Decathlon)
- deltamethrin (Deltagard)
- dinotefuran (Safari)
- esfenvalerate (Fenvarast EcoCap)
- imidacloprid (Discus)
- kaolin (Surround) — May leave residue; thorough coverage essential.
- lambda-cyhalothrin (Scimitar, various)
- limonene (Orange Guard)
- methiocarb (Mesurol)
- mineral oil/petroleum distillate (various)
- neem oil (Trilogy)
- oxydemeton-methyl (MSR Spray Concentrate)
- potassium laurate (various)
- pyrethrin/PBO3
- sorbitol octaanoate (Sorbishield 90)
- spirotetramat (Kontos) — Systemic activity
- tau-fluvalinate (Mavrik Aquaflow)
- thiamethoxam (Flagship)
- zeta-cypermethrin (Talstar, Cynoff)

**aphid**
- abamectin (Avid)
- acephate (Acephate 90WDG)
- acetamiprid (TriStar) — Systemic activity
- alpha-cypermethrin (Fendona)
- azadirachtin (Azatin, Neemix, various) — Acts as an insect growth regulator and anti-feedant.
- *Beauveria bassiana* (Botanigard, Naturalis L) — Fungal pathogens.
- bifenthrin (Talstar, various)
- *Burkholderia* spp. (Venerate XC)
- canola oil (Earth-tone Hort Oil) — Other oils include clove, cottonseed, rosemary, peppermint, sesame.
- carbaryl (Sevin)
- chlorpyrifos (Dursban, various)
- *Chromobacterium subsugae* (Grandevo)
- cinnamaldehyde (Cinnacure)
- clarified hydrophobic extract of neem oil (Triact, Trilogy) — Avoid tank mixes of oxythioquinox, captan, sulfur, chlorothalonil.
- clothianidin (Arena)
- cyfluthrin (Decathlon)
- deltamethrin (Deltagard) — For perimeter treatments.
- diazinon (Diazinon)
- dimethoate (Dimate, Dimethoate)
- dinotefuran (Safari)
- esfenvalerate (Fenvarast EcoCap)
- fenpropatrin (Tame)
- fenvarelate (Onslaught)
- flonicamid (Aria)
- flupyradifurone (Altus)
- garlic oil/powder (Allitin Insect Repellent)
- garlic powder/oil of clove/cottonseed oil (Pest Out)
- horticultural oil (various)
- imidacloprid (Discus)
- imidacloprid/cyfluthrin (Discus)
- *Isaria fumosorosea* Apopka strain 97 (Preferal Microbial Insecticide, PFR 97)
- kaolin (Surround) — May leave residue; thorough coverage essential.
- lambda-cyhalothrin (Scimitar, various)
- limonene (Orange Guard)
- methiocarb (Mesurol)
- mineral oil (Trilogy)
- neem oil (MSR Spray Concentrate)
- peppermint/oil of rosemary (Ecotec Broad Spectrum)
- permethrin (Ambush, Pounce, Permethrin, various)
- potassium laurate (various)
- pyrethrin/PBO3
- pyrethrin/canola (various)
- pyrethrin/PBO3
- pyriproxyfen (Distance) — Apply to the immature stages of the insect.
- s-kinoprene (Enstar II) — Apply to the immature stages of the insect.
- silicon dioxide (diatomaceous earth - Perma Guard Garden & Plant Protection Insecticide)
- sodium borate
- sorbitol octaanoate (Sorbishield 90)
- spirotetramat (Kontos) — Systemic activity.
- tau-fluvalinate (Mavrik Aquaflow)
- thiamethoxam (Flagship)
- tolenpyrad (Hachi-Hachi)
- zeta-cypermethrin (Talstar, Cynoff)

**borers (general)**
- acephate (Acephate 90WDG)
- azadirachtin (Azatin, Neemix, various)
- bifenthrin (Talstar, various)
- carbaryl (Sevin)
- clothianidin (Arena)
- chlorpyrifos (Dursban, various)
- cinnamaldehyde (Cinnacure)
- cyfluthrin/imidacloprid (Discus)
- cyfluthrin (Decathlon)
- dimethoate (Dimate, Dimethoate)
- dinotefuran (Safari)
- esfenvalerate (Fenvarast EcoCap)
- garlic oil/powder (Allitin Insect Repellent)
- imidacloprid (Marathon, various)
- lambda-cyhalothrin (Scimitar, various)
- malathion (Ambush, Pounce, Permethrin, various)
- pyrethrins
- spinosad (Conserve, Entrust)
- zeta-cypermethrin (Talstar, Cynoff)

**caterpillars**
- acephate (Orthene, various)
- acetamiprid (TriStar)
- alpha-cypermethrin (Fendona)
- azadirachtin (Azatin, Neemix, various)
- *Bacillus thuringiensis aizawai* (Dipel, various) — Most effective on younger stages of the caterpillars.
- *Bacillus thuringiensis kurstaki* (Zentari) — Most effective on younger stages of the caterpillars.
- *Beauveria bassiana* (Botanigard, Naturalis O)
- bifenthrin (Talstar, various)
- *Burkholderia* spp. (Venerate XC)
- carbaryl (Sevin)
- chlorpyrifos (Dursban, various)
- *Chromobacterium subsugae* (Grandevo)
- cinnamaldehyde (Cinnacure)
- clothianidin (Arena)
- cyantraniliprole (Mainspring)
- cyfluthrin (Decathlon)
- esfenvalerate (Fenvarast EcoCap)
- deltamethrin (Deltagard)
- fenvarelate (Onslaught)
- garlic powder/oil (Allitin Insect Repellent) — Acts as an insect growth regulator and antifeedant. Other oils include canola, neem, peppermint.
- imidacloprid/bifenthrin (Atera)
- imidacloprid/cyfluthrin (Discus)
- indoxacarb (Provaunt)
- insect growth regulator
- *Isaria fumosorosea* Apopka strain 97 (Preferal Microbial Insecticide, PFR 97)
- lambda-cyhalothrin (Scimitar, various)
- malathion (Ambush, Pounce, Permethrin, various)
- pyrethrins
- spinosad (Conserve, Entrust)
- zeta-cypermethrin (Talstar, Cynoff)

**mass**
- esfenvalerate (Fenvarast EcoCap)
- garlic oil/powder (Allitin Insect Repellent)
- imidacloprid (Marathon, various)
- lambda-cyhalothrin (Scimitar, various)
- malathion (Ambush, Pounce, Permethrin, various)
- pyrethrins
- spinosad (Conserve, Entrust)
- zeta-cypermethrin (Talstar, Cynoff)

**Nursery pests**
- esfenvalerate (Fenvarast EcoCap)
- garlic oil/powder (Allitin Insect Repellent)
- imidacloprid (Marathon, various)
- lambda-cyhalothrin (Scimitar, various)
- malathion (Ambush, Pounce, Permethrin, various)
- pyrethrins
- spinosad (Conserve, Entrust)
- zeta-cypermethrin (Talstar, Cynoff)

**beetles**
- acephate (Acephate 90WDG)
- azadirachtin (Azatin, Neemix, various)
- bifenthrin (Talstar, various)
- carbaryl (Sevin)
- clothianidin (Arena)
- deltamethrin (Deltagard) — For perimeter treatments.
- diazinon (Diazinon)
- dimethoate (Dimate, Dimethoate)
- dinotefuran (Safari)
- esfenvalerate (Fenvarast EcoCap)
- fenpropatrin (Tame)
- fenvarelate (Onslaught)
- flonicamid (Aria)
- flupyradifurone (Altus)
- garlic oil/powder (Allitin Insect Repellent)
- garlic powder/oil of clove/cottonseed oil (Pest Out)
- horticultural oil (various)
- imidacloprid (Discus)
- imidacloprid/cyfluthrin (Discus)
- *Isaria fumosorosea* Apopka strain 97 (Preferal Microbial Insecticide, PFR 97)
- kaolin (Surround) — May leave residue; thorough coverage essential.
- lambda-cyhalothrin (Scimitar, various)
- limonene (Orange Guard)
- methiocarb (Mesurol)
- mineral oil (Trilogy)
- neem oil (MSR Spray Concentrate)
- peppermint/oil of rosemary (Ecotec Broad Spectrum)
- permethrin (Ambush, Pounce, Permethrin, various)
- potassium laurate (various)
- pyrethrin/PBO3
- pyrethrin/canola (various)
- pyrethrin/PBO3
- pyriproxyfen (Distance) — Apply to the immature stages of the insect.
- s-kinoprene (Enstar II) — Apply to the immature stages of the insect.
- silicon dioxide (diatomaceous earth - Perma Guard Garden & Plant Protection Insecticide)
- sodium borate
- sorbitol octaanoate (Sorbishield 90)
- spirotetramat (Kontos) — Systemic activity.
- tau-fluvalinate (Mavrik Aquaflow)
- thiamethoxam (Flagship)
- tolenpyrad (Hachi-Hachi)
- zeta-cypermethrin (Talstar, Cynoff)

**methoxyfenozide**
- methoxyfenozide (Intrepid) — Begin applications when larvae are observed or at the first sign of feeding damage.
- mineral oil/petroleum distillate (various) — Apply in delayed-dormant period to destroy overwintering egg masses.
tolenpyrad (Hachi-Hachi)

clearwing moth borer
acephate (Acephate 90WDG)
bifenthrin (Talstar, various)
chlorpyrifos (Dursban, various)
methoxyfenozide (Intrepid)—Specific to caterpillars; mimics action of molting hormone.
permethrin (Ambush, Pounce, Permethrin, various)
pyrethrin (Pyganic Dust)

coneworm
acephate (Acephate 90WDG)
azadirachtin (Azatin, Neemix, various)
Bacillus thuringiensis aazawai (Xentari)
Bacillus thuringiensis kurstaki (Dipel, various)
carbaryl (Sevin)
dimethoate (Dimate, Dimethoate)
garlic oil/powder (Allityn Insect Repellent)
permethrin (Ambush, Pounce, Permethrin, various)
phosmet (Imidan)
spinosad (Conserve, Entrust)

flea beetle
acephate (Orthene, various)
alphacypermethrin (Fendona)
azadirachtin (Azatin, Neemix, various)—Acts as an insect growth regulator and anti-feedant.
Beauveria bassiana (Botanigard, Naturalis L)
bifenthrin (Talstar, various)
carbaryl (Sevin)
chlorpyrifos (Dursban, various)
clothianidin (Arena)
cyfluthrin (Decathlon)
deltamethrin (Deltagard)—For perimeter treatments.
diazinon (Diazinon)
esfenvalerate (Fenvastar EcoCap)

ethoprop (Mocap)—Mocap for nematodes, symphylans, field nurseries only, pre-plant only; Easter lilies (Curry County, OR). Supplemental label needed. Restricted use pesticide.
SLN OR-120005
imidacloprid (Marathon, various)
imidacloprid/bifenthrin (Atera, Bithor)
kaolin (Surround)
lambda-cyhalothrin (Scimitar, various)
malathion (various)
peppermint (Ecotec Broad Spectrum)—Other oils include rosemary, canola oil.
permethrin (Ambush, Pounce, Permethrin, various)
pyrethrum (Pyganic Dust)
pyrethrin/piperonyl butoxide
spinosad (Conserve, Entrust)
spinosad (Conserve, Entrust SC OMRI approved)
tau-fluvalinate (Mavrik Aquaflow)
thiamethoxam (Flagship)

lace bug
acephate (Orthene, various)
aazadirachtin (Azatin, Neemix, various)
Beauveria bassiana (Botanigard, Naturalis L)
bifenthrin (Talstar, various)
carbaryl (Sevin)
Chromobacterium subsugae (Grandeo)
chlorpyrifos (Dursban, various)
clothianidin (Arena)
cyfluthrin (Decathlon)
deltamethrin (Deltagard)—For perimeter treatments.
dimethoate (Dimate, Dimethoate)
dinotefuran (Safari)
esfenvalerate (Fenvastar EcoCap)
flupyridafurone (Altus)
imidacloprid (Marathon, various)
imidacloprid/bifenthrin (Atera, Bithor)
imidacloprid/cyfluthrin (Discus)
kaolin (Surround)
lambda-cyhalothrin (Scimitar, various)
limonene (Orange Guard)
malathion (various)
minerall oil/petroleum distillate (various)
peppermint oil, rosemary oil
permethrin (Ambush, Pounce, Permethrin, various)
phosmet (Imidan)

leafhopper
acephate (Orthene, various)
acetamiprid (TriStar)
aazadirachtin (Azatin, Neemix, various)
Bacillus thuringiensis tenebrionus (Bt) (Novodor)—Labeled for elm leaf beetle.
bifenthrin (Talstar, various)
Chromobacterium subsugae (Grandeo)
clothianidin (Arena)
cyfluthrin (Decathlon)
dimethoate (Dimate, Dimethoate)
dinotefuran (Safari)
esfenvalerate (Fenvastar EcoCap)
imidacloprid (Marathon, various)
imidacloprid/bifenthrin (Atera, Bithor)
imidacloprid/cyfluthrin (Discus)
lambda-cyhalothrin (Scimitar, various)
mixed oil/petroleum distillate (various)
oil of rosemary (Ecotec Broad Spectrum)
permethrin (Ambush, Pounce, Permethrin, various)
phosmet (Imidan)

leaf beetle
acephate (Orthene, various)
acetamiprid (TriStar)
aazadirachtin (Azatin, Neemix, various)
Bacillus thuringiensis tenebrionus (Bt) (Novodor)—Labeled for elm leaf beetle.
bifenthrin (Talstar, various)
Chromobacterium subsugae (Grandeo)
clothianidin (Arena)
cyfluthrin (Decathlon)
dimethoate (Dimate, Dimethoate)
dinotefuran (Safari)
esfenvalerate (Fenvastar EcoCap)
imidacloprid (Marathon, various)
imidacloprid/bifenthrin (Atera, Bithor)
imidacloprid/cyfluthrin (Discus)
lambda-cyhalothrin (Scimitar, various)
mixed oil/petroleum distillate (various)
oil of rosemary (Ecotec Broad Spectrum)
permethrin (Ambush, Pounce, Permethrin, various)
phosmet (Imidan)
permethrin (Ambush, Pounce, Permethrin, various)
phosmet (Imidan)
kumquat laurate (various)
pyrethrins (Pyganic Dust)
pyrethrins/piperonyl butoxide
pyrifluquinazin (Rycar)
sodium borate
sorbital octonate (SorbiShield)
spinosad (Conserve, Entrust)
spirotetramat (Kontos)—Systemic activity.
tau-fluvalinate (Mavrik Aquafloat)
thiamethoxam (Flagship)
tolenpyrad (Hachi-Hachi)
zeta-cypermethrin (Talstar, Cynoff)

**leafroller**
acephate (Orthene, various)
azadirachtin (Azatin, Neemix, various)
*Bacillus thuringiensis aizawai* (Xentari)—
Works best on small larvae.
*Bacillus thuringiensis kurstaki* (Dipel, various)
*Beauveria bassiana* (BotaniGard, Naturalis L)
bifenthrin (Talstar, various)
canola oil (Earth-tone Hort Oil)
carbaryl (Sevin)
chlorpyrifos (Dursban, various)
*Chromobacterium subsugae* (Grandev)
cinnamaldehyde (Cinnacure)
cyfluthrin (Decathlon)
deltamethrin (Deltagard)
diazinon (Diazinon)
emamectin benzoate (Akari)
esfenvalerate (Fenvastar EcoCap)
fenpropathrin (Tame 2.4EC)
garlic oil/powder (Allitin Insect Repellent)
imidacloprid/bifenthrin (Atera, Bithor)
kaolin (Surround)
lambdacyhalothrin (Scimitar, various)
methoxyfenozide (Intrepid)—Specific to
caterpillars; mimics action of molting hormone.
mineral oil/petroleum distillate (various)
novaluron (Pedesta)—Apply to immature insects.
oil of rosemary (Ecotec Broad Spectrum)
permethrin (Ambush, Pounce, Permethrin, various)
pyrethrin (Pyganic Dust)
spinosad (Conserve, Entrust)
tebufenozide (Mimec)—Specific to
caterpillars; apply at initiation of egg hatch.
zeta-cypermethrin (Talstar, Cynoff)

**mite, eriophyid**
abamectin (Avid)
carbaryl (Sevin)
fenpyroximate (Akari)
milbemectin (UltiFlora)—Restricted use pesticide.
mineral oil/petroleum distillate (various)
pyrethrins/piperonyl butoxide
spiroymesifen (Judo)—Avoid geranium, ferns, English ivy, Alstromeria, Impatiens.

**mite, spider**
abamectin (Avid)
acephate (Orthene, various)
acequinocyl (Shuttle)
azadirachtin (Azatin, Neemix, various)
bifenthrin (Talstar, various)
carbaryl (Sevin)
chlorpyrifos (Dursban, various)
*Chromobacterium subsugae* (Grandev)
cinnamaldehyde (Cinnacure)
clofentezine (Ovation)
cyflumethoén (Sultan Miticide)
diazinon (Diazinon)
dimethate (Dimate, Dimethoate)
emamectin benzoate (Enfold)
esfenvalerate (Fenvastar EcoCap, Onslaught FastCap)
etoxazole (TetraSan)
fenazaquim (Magus Miticide)
fenbutatin-oxide (Vendex)
fenpyroximate (Akari)
garlic powder/oil of clove/cottonseed oil (Pest Out)—Horticultural oils are most effective against the egg stage. Other oils include clove, peppermint, rosemary.

**mite, needleminer**
abamectin (Avid)
acephate (Orthene, various)
acequinocyl (Shuttle)
bifenthrin (Talstar, various)
bifenthrin (Talstar, various)
chlorpyrifos (Dursban, various)

**peachtree borer**
azadirachtin (Azatin, Neemix, various)
bifenthrin (Talstar, various)
carbaryl (Sevin)
chlorpyrifos (Dursban, various)
esfenvalerate (Fenvastar EcoCap)
lambdacyhalothrin (Scimitar, various)
permethrin (Ambush, Pounce, Permethrin, various)
pyrethrins/piperonyl butoxide

**peach twig borer**
azadirachtin (Azatin, Neemix, various)
*Bacillus thuringiensis kurstaki* (Dipel, various)
bifenthrin (Talstar, various)
carbaryl (Sevin)
chlorpyrifos (Dursban, various)
*Chromobacterium subsugae* (Grandev)
cinnamaldehyde (Cinnacure)
diazinon (Diazinon)
esfenvalerate (Fenvastar EcoCap)
kaolin (Surround)
psyllid
acephate (Orthene, various)
acetamiprid (TriStar)
azadirachtin (Azatin, Neemix, various)
Beauvaria bassiana (Botanigard, Naturalis L)
bifenthrin (Talstar, various)
canola oil (Earth-tone Hort Oil)
carbaryl (Sevin)
chlorpyrifos (Dursban, various)
pyrethrin (Pyganic Dust)
spinosad (Conserve, Entrust)

plant bug
acephate (Orthene, various)
acetamiprid (TriStar)
alpha-cypermethrin (Fendona)
azadirachtin (Azatin, Neemix, various)
Beauvaria bassiana (Botanigard, Naturalis L)
bifenthrin (Talstar, various)
canola oil/pyrethrin (various)
carbaryl (Sevin)
chlorpyrifos (Dursban, various)

Chromobacterium subsugae (Grandevo)
clothianidin (Arena)
cyfluthrin (Decathlon)
deltamethrin (Deltagard)—For perimeter treatments.
dimethoate (Dimate, Dimethoate)
dinofuran (Safari)
esfenvalerate (Fenvastar EcoCap)
garlic oil/powder (Allityn Insect Repellent)—Other oils include
cottonseed, peppermint.
imidacloprid (Marathon, various)
Isaria fumosorosea Apopka strain 97 (Preferal Microbial Insecticide, PFR 97)
kaolin (Surround)
mineral oil/petroleum distillate (various)
oil of rosemary/peppermint (Ecotec Broad Spectrum)

root weevil
acephate (Orthene, various)
azadirachtin (Azatin, Neemix, various)
Beauveria bassiana (Botanigard, Naturalis L)
bifenthrin (Talstar, various)
clothianidin (Arena)
cryolite (Gowan Cryolite Bait)
cyfluthrin (Decathlon)
dinofuran (Safari)
imidacloprid (Marathon, various)
imidacloprid/cyfluthrin (Discus)
Isaria fumosorosea Apopka strain 97 (Preferal Microbial Insecticide, PFR 97)
lambdacyhalothrin (Scimitar, various)
malathion
mineral oil/petroleum distillate (various)
novaluron (Pestental)
permethrin (Ambush, Pounce, Permethrin, various)
potassium laureate (various)
silicon dioxide (diatomaceous earth
- Perma Guard Garden & Plant Protection Insecticide)
sorbitol octonoate (Sorbishield 90)
tau-fluvalinate (Mavrik Aquaflow)
thiamethoxam (Flagship)
zeta-cypermethrin (Talstar, Cynoff)

sawfly
acephate (Orthene, various)
azadirachtin (Azatin, Neemix, various)
bifenthrin (Talstar, various)
canola oil (Earth-tone Hort Oil)
carbaryl (Sevin)
chlorpyrifos (Dursban, various)
pyrethrin (Pyganic Dust)
spinosad (Conserve, Entrust)
thiamethoxam (Flagship)
tolpyrazone (Hachi-Hachi)
zeta-cypermethrin (Talstar, Cynoff)

scale
abamectin (Avid)
acephate (Orthene, various)
acetamiprid (TriStar)
azadirachtin (Azatin, Neemix, various)
bifenthrin (Talstar, various)
buprofezin (Talus)—Do not rotate with chitin synthesis inhibitors.
canola oil (Earth-tone Hort Oil)—Other oils include
cottonseed.
carbaryl (Sevin)
chlorpyrifos (Dursban, various)
cinnamaldahyde (Cinnacure)
clothianidin (Arena)
cyfluthrin (Discus)
deltamethrin (Deltagard)—For perimeter treatments.
diazinon (Diazinon)
dimethoate (Dimate, Dimethoate)
dinofuran (Safari)
esfenvalerate (Fenvastar EcoCap)
flonicamid (Aria)
garlic oil/powder (Allityn Insect Repellent)
imidacloprid (Marathon, various)
lambdacyhalothrin (Scimitar, various)
limonene (Orange Guard)
malathion (various)
methidathion (Supracide)
mineral oil/petroleum distillate (various)
oil of rosemary (Ecotec Broad Spectrum)
permethrin (Ambush, Pounce, Permethrin, various)
potassium laureate (various)
pyrethrin (Pyganic Dust)
S-kinoprene (Enstar II)
sodium borate
Sorbitol octonoate (Sorbishield 90)
spinetoram (Delegate)
thiamethoxam (Flagship)
tolpyrazone (Hachi-Hachi)
zeta-cypermethrin (Talstar, Cynoff)

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**thrips**
- abamectin (Avid)
- acephate (Orthene, various)
- acetamiprid (TriStar)
- azadirachtin (Azatin, Neemix, various)
- *Beauveria bassiana* (Botanigard, Naturalis L)
- bifenthrin (Talstar, various)
- bifenazate (Floramite)—Good coverage is especially important with bifenazate. Compatible with predatory mites.
- *Burkholderia* spp. (Venerate XC)
- canola oil/pyrethrin (various)
- carbaryl (Sevin)
- chlorpyrifos (Dursban, various)
- *Chromobacterium subsugae* (Grandevo)
- cinnamaldehyde (Cinnacure)
- cyfluthrin (Decathlon)
- deltamethrin (Deltagard)—For perimeter treatments.
- diflubenzuron (Dimilin 25W)
- garlic oil/powder (Allityn Insect Repellent)
- garlic powder/oil of clove/cottonseed oil (Pest Out)
- imidacloprid (Marathon, various)
- *Isaria fumosorosea* Apopka strain 97 (Preferal Microbial Insecticide, PFR 97)
- lambda-cyhalothrin (Scimitar, various)
- malathion (various)
- methoxyfenozide (Intrepid)
- mineral oil/petroleum distillate (various)
- oil of rosemary (Ecotec Broad Spectrum)
- permethrin (Ambush, Pounce, Permethrin, various)
- pyrethrin (Pyganic Dust)—Some products.
- spinosad (Conserve, Entrust)
- white pine weevil
- abamectin (Avid)
- acephate (Acephate 90WDG)
- bifenthrin (Talstar, various)
- chlorpyrifos (Dursban, various)
- *Isaria fumosorosea* Apopka strain 97 (Preferal Microbial Insecticide, PFR 97)
- lambda-cyhalothrin (Scimitar, various)
- malathion (various)
- methoxyfenozide (Intrepid)
- mineral oil/petroleum distillate (various)
- oil of rosemary (Ecotec Broad Spectrum)
- permethrin (Ambush, Pounce, Permethrin, various)
- pyrethrin (Pyganic Dust)—Some products.
- spinosad (Conserve, Entrust)
- whitefly
- abamectin (Avid)
- acephate (Orthene, various)
- acetamiprid (TriStar)
- azadirachtin
- *Beauveria bassiana* (Botanigard, Naturalis L)
- bifenthrin (Talstar, various)
- buprofezin (Talus)
- canola oil (Earth-tone Hort Oil)—Other oils include cottonseed, peppermint.
- canola oil/pyrethrin (various)
- carbaryl (Sevin)
- chlorpyrifos (Dursban, various)
- *Chromobacterium subsugae* (Grandevo)
- cinnamaldehyde (Cinnacure)
- clarified hydrophobic extract of neem oil (Triact, Trilogy)
- clothianidin (Arena)
- cyfluthrin (Decathlon)
- diazinon (Diazinon)
- dimethoate (Dimite, Dimethoate)
## Biological Control of Nursery Pests

### Biological treatments for use in commercial nursery applications

<table>
<thead>
<tr>
<th>Insect or mite</th>
<th>Natural enemy</th>
<th>Species</th>
<th>Useful information</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>aphid</strong></td>
<td>predatory midge</td>
<td><em>Aphidoletes aphidimyza</em></td>
<td>Commercially available. Maggot-like larvae are voracious predators of aphids. Adults may go into diapause with low light or short days.</td>
</tr>
<tr>
<td></td>
<td>parasitoid wasps</td>
<td><em>Aphidius ervi, A. matricariae, A. colemani, Aphelinus abdominalis, Diaeretiella rapae, Lysiphlebus testaceipes, Trioxys pallidus</em></td>
<td>Some species commercially available. Many parasitoids have preferred hosts</td>
</tr>
<tr>
<td></td>
<td>hover flies</td>
<td></td>
<td>Maggot-like larvae are voracious predators of aphids. Pollen and nectar feeding adults are commonly seen around flowers.</td>
</tr>
<tr>
<td></td>
<td>lady beetles (“ladybugs”)</td>
<td>Many species including: <em>Hippodamia convergens, Harmonia axyridis, Coleomegilla maculata, Coccinella septempunctata</em></td>
<td>Note: use of non-local, wild-harvested lady-beetles is discouraged due to potential movement of lady beetle pathogens and parasites.</td>
</tr>
<tr>
<td></td>
<td>lacewings</td>
<td><em>Chrysopa spp., Chrysoperla carnea, C. rufilabris, C. comanche</em></td>
<td>Some species commercially available.</td>
</tr>
<tr>
<td></td>
<td>minute pirate bugs</td>
<td><em>Orius spp.</em></td>
<td>Some species commercially available. Both adults and larvae are predators of small eggs, insects, and mites.</td>
</tr>
<tr>
<td></td>
<td>soldier beetles</td>
<td><em>Podabrus spp., Cantharus spp.</em></td>
<td>Both adults and larvae are predators. They supplement their diet with nectar and pollen.</td>
</tr>
<tr>
<td></td>
<td>big-eyed bugs</td>
<td><em>Geocoris spp.</em></td>
<td>Both adults and larvae are predators.</td>
</tr>
<tr>
<td><strong>caterpillars</strong></td>
<td>bacterial endotoxins Btk, Bta</td>
<td><em>Bacillus thuringiensis kurstaki</em> (Dipel, various), <em>Bacillus thuringiensis azawai</em> (Zentari)</td>
<td>Formulated into commercially available microbial pesticides. Best used on young larval instars.</td>
</tr>
<tr>
<td></td>
<td>viruses</td>
<td>Naturally occurring viruses including granulosis virus and nucleopolyhedrosis virus.</td>
<td>Some strains are commercially available for specific pests such as codling moth.</td>
</tr>
<tr>
<td></td>
<td>parasitoid wasps of eggs</td>
<td><em>Trichogramma minutum, T. bactrae, Trichogramma platne, T. brassicae, T. pretiosum, T. platneri</em></td>
<td>Some species are commercially available.</td>
</tr>
<tr>
<td></td>
<td>parasitoid wasp of larvae</td>
<td>Many species, particularly in the families: Braconidae, Ichneumonidae</td>
<td>Adult wasps often feed on nectar, insectary plants may enhance activity.</td>
</tr>
<tr>
<td></td>
<td>parasitic flies</td>
<td>Several species in the family, Tachinidae</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ground beetles</td>
<td>Several species in the family Carabidae</td>
<td></td>
</tr>
<tr>
<td></td>
<td>lacewings</td>
<td><em>Chrysopa spp., Chrysoperla carnea, C. rufilabris, C. comanche</em></td>
<td>Some species are commercially available</td>
</tr>
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### Biological treatments for use in commercial nursery applications

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<tbody>
<tr>
<td></td>
<td>entomopathogenic nematodes</td>
<td><em>Steinernema feltiae</em></td>
<td>Foliar applications in greenhouses</td>
</tr>
<tr>
<td>peach twig borer</td>
<td>braconid wasp</td>
<td><em>Macrocentrus ancylivorus</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td>chalcid wasps</td>
<td><em>Copidosoma (=Paralitomastix) varicornis, Hyperteles lividus</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td>itch mite</td>
<td><em>Pyemotes ventricosus</em></td>
<td></td>
</tr>
<tr>
<td>root weevil</td>
<td>pathogenic nematodes</td>
<td><em>Heterorhabditis heliothidis, H. medidis, Steinernema carpocapsae, S. feltiae, S. krusseii, S. riobravis</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td>carabid beetles</td>
<td>several species</td>
<td></td>
</tr>
<tr>
<td>spider mite</td>
<td>predatory mites</td>
<td><em>Neoseiulus californicus, N. fallacies, Amblyseius hibisci, Phytoseiulus persimilis, P. macrophililis, P. longipes, Galendromus (Metaseiulus) occidentalis</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td>minute pirate bugs</td>
<td><em>Orius</em> spp.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>predatory lady beetle</td>
<td><em>Stetorus</em> spp.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>predatory midge</td>
<td><em>Felitiella</em> spp.</td>
<td></td>
</tr>
</tbody>
</table>

Note: Adapted from Amy J. Dreves, Leonard Coop, and Mario Ambrosino.

**Aphids** have many natural enemies including parasites and predators. Some of the natural enemies can be encouraged with conservation, including use of selective pesticides, and habitat modification. Augmentation of natural enemies generally occurs most successfully in protected environments. More information on specific natural enemies can be found in the Aphid Natural Enemy Table. Additionally, aphids may also experience epizootics from both naturally occurring fungi such as *Entomophthora* spp. and application of commercially available microbial pesticides such as *Beauveria bassiana* (Botanigard, Naturalis L) and *Paecilomyces fumosoroseus* (PFR 97)

*For more information, see materials listed for aphid in:*

Chemical Control of Nursery Pests

**Caterpillars**—Soft-bodied caterpillars present a vulnerable target for parasitic wasps such as ichneumonids, braconids and chalcid and parasitic flies called tachinids. These wasps and flies use an ovipositor (ovi = egg, positor = placer) to insert their eggs onto or through the soft cuticle of the caterpillars. The eggs hatch to become internal or external parasites.

**Root weevils**—More information on the use of beneficial entomopathogenic nematodes see: PNW Nursery IPM: Entomopathogenic Nematodes: [http://oregonstate.edu/dept/nurspest/entomopathogenic_nematodes.htm](http://oregonstate.edu/dept/nurspest/entomopathogenic_nematodes.htm)

**Links:**

Suppliers of Biological Control Agents:
- Biocontrol of Root Weevils—[http://oregonstate.edu/dept/nurspest/Biocontrol_%20root%20weevils.html](http://oregonstate.edu/dept/nurspest/Biocontrol_%20root%20weevils.html)
- Biological Control of Twospotted Mite—[http://oregonstate.edu/dept/nurspest/two-spottedmite.htm](http://oregonstate.edu/dept/nurspest/two-spottedmite.htm)
- Conservation of Biological Control Agents:
- Koppert Biological Systems—[http://www.koppert.nl/Side_effects.html](http://www.koppert.nl/Side_effects.html)
- Biobest Biological Systems—[http://www.biobest.ca/](http://www.biobest.ca/)

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Spray in spring after overwintering eggs hatch, at about the time of hatching. These are brown to gray in color, with blue and orange spots on the body. Eggs of these moths are laid in the trees early to midsummer. They are attracted to lights at night. Larvae of the western tent caterpillar are hairy, dull yellow-brown, with rows of blue and orange spots on the body. Eggs of these moths are laid on twigs or buildings in masses. These are brown to gray in color, about 0.0625 inch long, and look like Styrofoam®. The larvae feed in large groups on foliage of host plants and can do significant damage by defoliation. Larvae of western tent caterpillars build large silken tents over leaves on which they feed. Larvae can totally defoliate small trees, which may not kill them but reduces growth and makes the trees more susceptible to diseases or poor weather. Healthy trees usually will grow new leaves by midsummer.

Scouting and thresholds Look for egg masses on twigs or other overwintering sites. Masses of young larvae are identified easily in early spring.

Management—biological control

See: Biological Control of Nursery Pests

Tent caterpillars have many natural enemies. Some birds eat the caterpillars, and small mammals consume the pupae. The larvae of a tachinid fly parasitizes the caterpillars.

Management—cultural control

Overwintering egg masses can be removed and destroyed when practical.

Management—chemical control

Dormant-season spray oil spray

Apply with enough water to cover the entire tree thoroughly. Apply in delayed-dormant period to destroy overwintering egg masses.

Growing-season spray

† Spray in spring after overwintering eggs hatch, at about the time leaves are 0.75 to 1 inch long. Control is much more effective if sprays are applied when larvae are small.

See: Chemical Control of Nursery Pests

For more information

PNW Nursery IPM: Western tent caterpillar (http://oregonstate.edu/dept/nurspest/tent_caterpillars.htm)

Andromeda (Pieris japonica)—Weevil

See: Common Pests of Nursery Crops

Apricot, flowering (Prunus)—Peachtree borer

Synanthedon exitiosa

Pest description and crop damage Peachtree borer is native to North America and common in the Northwest. The adult is a metallic blue-black, clear-wing moth. The male moth may have bands of light yellow on the abdomen, which makes it resemble a wasp. The female has an orange band around the abdomen. Full-grown larvae are 1 inch long and whitish with a brown head. The larvae burrow into the bark of the crown and feed on the cambium. Feeding is restricted to an area a few inches above and below the soil line. Young trees can be completely girdled and killed. Older trees rarely are girdled, but the feeding reduces vigor and makes them vulnerable to other pests and diseases. Infested trees bleed frass-infested gum during the growing season.

Biology and life history The borer overwinters as a larva on or under the tree bark, usually below ground. As temperatures rise above 50°F in the spring, the larva resumes feeding on the tissues under the bark. At maturity in May and June, the larva pupates. Adult moths emerge beginning in June and continue through September. Eggs are laid quickly after mating. Young larvae hatch after 8 to 10 days and bore immediately into the base of the tree.
Scouting and thresholds  Pheromone traps are available for this peachtree borer. This insect can do substantial damage if not controlled: one larva can kill a small tree. Entry holes and borer damage greatly affect marketability; action thresholds are very low. Prevention is key.

Management—cultural control
Rogue and destroy infested plants.

Mating Disruption  Pheromone mating disruption (Isomate P) at 100-250 dispensers/a. Dispensers must be placed in trees before first moth flight. Flight is usually from late June through September. If mating disruption is used, monitor blocks with traps baited with peachtree borer lures at 1 trap/2.5 a. If one or more moths are caught, a conventional insecticide application may be required.

Management—chemical control

See: Chemical Control of Nursery Pests

Apply in June and repeat at 3- to 4-week intervals throughout summer.

For more information

PNW Nursery IPM: Peach Tree Borer Mating Disruption (http://oregonstate.edu/dept/nurspest/peach_tree_borer.htm)

Apricot, flowering (Prunus)—Peach twig borer
Anarsia lineatella

Pest description and crop damage  Peach twig borer is a European insect first found in California in the 1880s. It is a major pest of apricots, peaches, plums, and prunes. There are no native hosts outside the orchard. The adult is a steel-gray moth with white and dark scale, about 0.33 to 0.5 inch long. The larva is a caterpillar, approximately 0.5 inch long, with a dark brown head and distinctive, alternating light and chocolate-brown bands on the body. The pupa is smooth and brown. The larva of the borer causes injury to fruit and trees. Feeding on the buds and twigs occurs early in the season, after which the larva bores into the shoots, causing a characteristic “flagging” or wilting of the new growth. Later generations of larvae feed on shoots or fruit, disfiguring the fruit.

Biology and life history  The borer overwinters as an immature larva in tunnels constructed in the crotches of twigs and branches. These overwintering sites can be identified by the small chimneys of frass and wood chips produced by the feeding of the larvae. Larvae become active at the pink bud stage and emerge to feed on buds and young leaves before boring into a shoot. These larvae eventually leave the mined shoot to pupate. Adults then emerge in mid- to late May. Eggs are laid on fruit, shoots, or undersides of leaves. Eggs are whitish to pale yellow and about 0.5 inch long when fully developed. Just back of the head is a broad, flat enlargement giving a “flat-headed” appearance. Individual plant damage can be one-sided depending on the site of feeding. Most damage occurs near the base of the plant, commonly at the soil line. Flatheaded borers tunnel extensively in the shallow, cambial tissue. Shothole borer adults are brown beetles less than 0.08 inch long. Larvae feed beneath the bark and may girdle the trunks and branches of trees. The larvae of the shothole borer feed beneath the bark on the trunk, leaving characteristic “shothole” symptoms (tiny holes in the bark) when they emerge. Larval feeding also may be associated with weeping sap on the trunk. Young, recently planted trees are most susceptible.

Scouting and thresholds  Watch for depressions in the bark or cracks through which frass may be seen. Entry holes and borer damage greatly affect marketability; action thresholds are very low. Prevention is key.

Management—cultural control
As the borer is attracted to weakened trees, the best control is to keep trees healthy. Avoid wounding plants, and follow good pruning, watering, and fertilization practices. Keeping weeds, grass, and trash from the base of the trees makes it easier to detect and remove borers. Rogue and destroy infested plants.

Management—chemical control

See: Chemical Control of Nursery Pests

Chemical management is rarely economic except for high value hosts. Apply as a protective trunk spray prior to adult flight in the summer.

For more information
PNW Nursery IPM: Flatheaded cedar borer (http://oregonstate.edu/dept/nurspest/Flatheaded_cedar_.htm)

Arborvitae (Thuja)—Borer
Flat-headed borers (Chrysobothris nixa) Shothole borers (Phloeosinus punctatus)

Pest description and crop damage  Flatheaded borers are pests of many different trees and shrubs. The 0.5 inch adults are either brown to metallic gray or black with red or orange markings, depending on species. Larvae are whitish to pale yellow and about 0.5 inch long when fully developed. Just back of the head is a broad, flat enlargement giving a “flat-headed” appearance. Individual plant damage can be one-sided depending on the site of feeding. Most damage occurs near the base of the plant, commonly at the soil line. Flatheaded borers tunnel extensively in the shallow, cambial tissue. Shothole borer adults are brown beetles less than 0.08 inch long. Larvae feed beneath the bark and may girdle the trunks and branches of trees. The larvae of the shothole borer feed beneath the bark on the trunk, leaving characteristic “shothole” symptoms (tiny holes in the bark) when they emerge. Larval feeding also may be associated with weeping sap on the trunk. Young, recently planted trees are most susceptible.

Scouting and thresholds  Check for overwintering sites on small trees. Otherwise, examine shoots in late April or early May. Wilted shoots are easy to spot: these should be opened check for larvae.

Management—biological control
A tiny parasitic wasp is active in orchards at shuck fall and parasitizes eggs.

Management—cultural control
Cut out mined shoots below the wilted area to eliminate larvae.
Arborvitae (Thuja)—Cypress tip moth

Pest description and crop damage The adult cypress tip moth (cypress tip miner) is silver-tan and approximately 0.125 inch long. The larvae are green, about 0.125 inch long. The cocoon is a white, somewhat papery structure made in dead or living foliage. The larvae tunnel in the growing points of the 1- and 2-year-old shoot tips. Damage typically is limited to the tips of twigs. The exit holes are dark and may resemble symptoms of leaf blight, a fungal disease. Foliage does not discolor in the affected areas until late winter. After this, the brown, dead twigs break off readily. Cultivars of Juniperus chinensis, J. virginiana, and J. sabina also are affected. The entire plant can appear brown in a severe infestation, and repeated infestations cause dieback.

Biology and life history Adult moths appear on plants around May–June. Eggs are laid on the shoot tips of host plants. The larvae tunnel under the leaf scale and feed on the foliage until the following spring. Larvae leave the mines and spin a white cocoon in which they pupate in spring. They have been found emerging and spinning cocoons in mid-April during 2004. Adult moths emerge from early May until late June with a peak in late May and early June. There is one generation a year.

Management—cultural control
American arborvitae (Thuja occidentalis) is very susceptible to infection. Western redcedar (Thuja plicata) is very resistant.

Management—chemical control
Sprays target adults from late June to August.
- abamectin
- acephate—Washington and Oregon only.
- azadirachtin
- bifenthrin
- carbaryl
- chlorpyrifos—Retail sale of chlorpyrifos (Dursban) for residential use was stopped as of 12/31/01.
- clothianidin
- cyfluthrin
- dinotefuran
- imidacloprid
- lambda-cyhalothrin

For more information

PNW Nursery IPM: Cypress tip moth (http://oregonstate.edu/dept/nurspest/cypress_tip_moth.htm)

Arborvitae (Thuja)—Root weevil

See: Common Pests of Nursery Crops

Arborvitae (Thuja)—Scale

Includes
Matsucoccus spp.
Pine needle scale (Chionaspis pinifoliae)

See: Common Pests of Nursery Crops

Pest description and crop damage Pine needle scale and Matsucoccus scale are among the scale that attack arborvitae. Scale are closely related to aphid, mealybugs, and whiteflies and, like these insects, also have piercing–sucking mouthparts. Large populations of scale can devitalize plants and retard growth, as well as discolor the foliage. Severe infestations can kill twigs. Large quantities of honeydew are produced by soft scale, which makes leaves and fruit shiny and sticky. Black sooty mold fungus may grow on this, giving the plants a dirty, sooty appearance.

Arborvitae (Thuja)—Spider mite

Oligonychus ununguis

See: Common Pests of Nursery Crops

Ash (Fraxinus)—Aphid

Several species, includes woolly ash aphid

See: Common Pests of Nursery Crops

For more information
PNW Nursery IPM: Woolly ash aphid (http://oregonstate.edu/dept/nurspest/woollyashaphid/introduction.htm)

Ash (Fraxinus)—Scale insect

Numerous species

See: Common Pests of Nursery Crops

Aspen (Populus tremuloides)—Leaf blotchminer
Phyllonorycter tremuloidiella

See: Common Pests of Nursery Crops

Pest description and crop damage Adults of this insect are tiny moths. Early instar larvae are flat. The larvae produce blotched mines, which may be more visible on one side of the leaf. Miners spin silk across the leaf surface, which dries and shrinks to create a ridge over the mine. The larvae feed initially on sap, then feed inside the leaves on tissue during summer. There may be more than one generation per year.

Management—cultural control
Aspen and cottonwood are very susceptible. Plant resistant trees where serious problems exist. Remove affected leaves as they are seen.

Management—chemical control

See: Chemical Control of Nursery Pests
Azalea (*Rhododendron*)—Azalea bark scale

*Eriococcus azaleae*

**Pest description and crop damage** This scale superficially resembles mealybugs in appearance. Mature female scale are about 0.125 inch long and appear like white cottony sacs, often located on twigs and stems of azalea, especially in branch crotches. The scale feeds on the bark of twigs and stems and has a devigorizing effect. Large quantities of honeydew are produced, which makes leaves shiny and sticky. Sooty mold fungus may grow on this, giving the plants a dirty, sooty appearance. Honeydew also can collect on decks and other landscape surfaces and become a significant nuisance.

**Biological and life history** The scale overwinters as an adult, and lays eggs in the spring. The young scale (called “crawlers”) are the mobile form of most species, and these migrate through the foliage to feed. As they feed and mature, they form a protective shell over their bodies. Crawlers are the most vulnerable life stage of most scale species. Adults of most species are well protected from predators and pesticide applications under the protective shell which gives them their name. There is usually one or possibly two generations per year.

*See: Arborvitae (*Thuja*)—Scale*

**For more information**

PNW Nursery IPM: Azalea bark scale (http://oregonstate.edu/dept/nurspest/azalea_bark_scale.htm)

Azalea (*Rhododendron*)—Azalea leafminer

*Caloptilia azaleella*

*See: Common Pests of Nursery Crops*

**Pest description and crop damage** The adult insect is a golden yellow moth about 0.5 inch long. The larvae are small, pale yellow to green caterpillars, 0.125 to 0.25 inch long. The larvae mine leaves during the early part of their development. During later stages of their development, they are also responsible for rolling leaves and chewing holes in them.

**Biological and life history** The insect overwinters as a pupa in rolled leaves, or possibly as a larva in a mined leaf. After the adult moth emerges, eggs are laid singly on the underside of leaves. The larvae emerge and mine into the leaf, causing the mined tissue to turn brown. Then they emerge from the leaf and roll it over their bodies with silk to feed. Later, they select an undamaged leaf, roll it up, and pupate in it. The adult moth emerges about a week later. There may be two to three generations per year.

**Scouting and thresholds** Observe new early-spring growth for rolled leaves and feeding damage.

**Management—biological control**

Very low temperatures in winter significantly reduce overwintering populations. Spiders and parasitic/predatory insects greatly reduce populations throughout the year.

**Management—cultural control**

Hand-pick larvae if found. Removal of overwintering sites, such as rolled leaves on the ground or plastered to plants, can reduce next year’s population.

Management—chemical control

*See: Chemical Control of Nursery Pests*

Apply first just after blooming. Apply again at 2 to 3 week intervals until control is complete. Applications in late summer and early fall have given exceptional cleanup for the following season.

**For more information**


Azalea (*Rhododendron*)—Lace bug

*Stephanitis pyrioides*

**Pest description and crop damage** Overwinters in egg stage. Eggs are laid in the midrib on the underside of leaves. A new introduction to the PNW, little is known about the phenology of azalea lace bug in this region. Azalea lace bug eggs first hatch in early summer, with 2-3 generations in the PNW likely. Nymphs, the young immature lace bugs, are nearly translucent and light yellowish-green when small. As they age, they darken and become spiny. The adult nymphs are around 0.25 inch long, with wings that are slightly colored with white and black patterns in a window pane effect and quite sculptured. The head capsule is round and swollen-looking from the side.

Lace bugs have piercing/sucking mouth parts. The initial damage shows up as light yellow stippling on the surface of the leaves. Higher populations can cause more severe damage on azaleas, causing the leaves to turn nearly white. On rhododendrons, severe damage may look like iron chlorosis with yellow leaves and green veins. Lace bugs leave small black fecal spots on the underside of leaves. Exuvia, or cast skins, are also often present.

**Management—biological control**

There are a range of predators that feed on azalea lace bug including azalea plant bug, tree crickets, earwigs, green lacewings, minute pirate bugs, and spiders. A Rutgers publication mentions one nursery study investigating augmentation with green lacewing larvae against newly hatched azalea lace bug nymphs resulted in 79-97% control.

**Management—cultural control**

Drought stressed plants are more susceptible to lace bug attack. Azaleas in the sun are reported to be nearly twice as likely to be infested. There are azaleas that show some resistance to azalea lace bug. High pressure water applications directed at leaf underside may dislodge the wingless nymph stages.

**Management—chemical control**

*See: Chemical Control of Nursery Pests*

Insecticidal soaps and oils must directly contact the insects to control them and are most efficacious in newly hatched nymphs and can have high levels of control if used correctly. Horticultural oil can also smother the egg stage. Neem-based products act as anti-feedants, insect growth regulators, and repellants. Early season control is very important with these tools.

The egg stage is embedded in the plant material and thus protected from most control (except for horticultural oils). Most of the remaining chemical options act either as contact insecticides such as the pyrethrins or carbaryl or have systemic activity such as acephate or the Neonicotinoids. Contact insecticides and some of the systemic insecticides may have a detrimental impact on beneficial insects. Timing of the neonicotinoid insecticides
Azalea (Rhododendron)—Spider mite
*Stigmeopsis (Schizotetranychus) celarius*, *Stigmeopsis longus*
See: Common Pests of Nursery Crops

**Pest description and crop damage** Small, light-green aphid, banded antennae.

**Management—biological control**
Releases are more effective at low populations of the spider mite. The predator mite requires 80% humidity, easily found in the canopy of bamboo grown in the Northwest. N. californicus may work in dryer conditions.

**Bamboo (Bambusa and others)—Bamboo spider mite**
*Stigmeopsis (Schizotetranychus) celarius*, *Stigmeopsis longus*
See: Common Pests of Nursery Crops

**Pest description and crop damage** Bamboo mites have a flattened body, which is straw-colored to greenish yellow with small blackish green spots. First impression is that leaves are under attack by a leafminer. The mite feeding on the plant cell contents leaves a distinct pattern of damage visible on both sides of the leaf. The feeding site damage is yellow and may look similar to variegation. Preferred bamboo hosts for this mite include the genera *Sasa*, *Indocalamus*, *Phyllostachys*, and *Pleioblastus*.

**Biology and life history** These mites form colonies on the underside of the leaves and live under a densely woven web. Generally the mites remain under the web to feed and lay eggs, leaving to defecate in black fecal piles slighted removed from the nest. Adults and nymphs can sometimes be found outside the webbing, particularly as they begin to form new nests. Multiple males and females can be found in the web nests and often many webbed nests will form alongside each other running down the underside of the bamboo leaves. There are many generations per year for *S. celarius*.

**Management—chemical control**
The predator mite *Neoseiulus fallacis* has been used successfully to control bamboo mite. The keys to the successful use of this mite are good scouting and releasing the mite at the proper threshold. Releases are more effective at low populations of the spider mite. These low levels of pests are not usually noticed without a rigorous scouting program. This particular predator mite requires 80% humidity, easily found in the canopy of bamboo grown in the Northwest. *N. californicus* may work in dryer conditions.

**Management—cultural control**
Bamboo mites only feed on bamboo and infestations can be avoided by screening all new material for the mites. Quarantine all new material to avoid spread of bamboo mites to existing bamboo nursery stock. Severe infestations can be treated by cutting down all cane growth on infested plants and burning or otherwise disposing of the foliage. The remaining foliage then can be treated more effectively for mites. Although severe, this treatment may be the only practical solution for heavily infested sites, particularly where chemical application presents difficulties.

PNW Insect Management Handbook
USDA Agriculture Handbook 193 mentions the use of hot water treatment for dormant rhizomes to eliminate mites. It suggests immersing them for 10 minutes in hot water at 50°C (122°F), then heeling into sand or sawdust and keeping them cool until planting time in the spring.

Management—chemical control

See:
Chemical Control of Nursery Pests

The nature of the webbing and protection it gives mites suggests the need for power equipment so that material can reach mites under webbing. Add a spreading surfactant, recommended by some labels (including bifenthrin), because bamboo leaves are difficult to wet.

For more information


PNW Nursery IPM website: Bamboo Mite IPM (http://oregonstate.edu/dept/nurspest/Bamboo/bamboomite.htm)

Barberry (Berberis)—Lecanium scale

*Lecanium* spp.

See:
Common Pests of Nursery Crops

Pest description and crop damage  Lecanium scale are about 0.125 inch in diameter and vary from red to dark brown in color. They are oval and raised, resembling small helmets or bumps on branches, stems, and the underside of leaves.

Biology and life history  Lecanium scale overwinters as an immature scale or a fertilized female on twigs and branches. They resume feeding in the spring, and eggs are laid underneath the scale in May–June. The eggs remain under the scale until hatching in early summer. The young scale are yellowish brown and flattened. They migrate to the undersides of leaves to feed. Young scale also can be dispersed by wind, rain, irrigation, or by the movement of people and machinery. After 4 to 6 weeks on the leaves, the young return to the stems and twigs to feed, mate, and overwinter. There is one generation per year.

Management—chemical control

Apply in July, August, or early September to control crawlers.

See:
Chemical Control of Nursery Pests

Beech (Fagus)—Aphid

Several species

See:
Common Pests of Nursery Crops

For more information


PNW Nursery IPM: Woolly beech aphid (http://oregonstate.edu/dept/nurspest/woollybeechaphid.htm)

Birch (Betula)—Aphid

Includes *Euceraphis betulae*

See:
Common Pests of Nursery Crops

Pest description and crop damage  Soft-body, greenish aphid leave sticky secretion on leaves and under trees.

For more information


Birch (Betula)—Birch leafminer

*Fenusa pusilla*

See:
Common Pests of Nursery Crops

Pest description and crop damage  Adult insect is a small (0.125 to 0.375 inch) black sawfly. Mature larvae are flattened and may be up to 0.5 inch long. The larvae emerge and feed in leaf tissues, leaving blotch-shaped or winding brown mines. Repeated severe infestations may result in decline of trees. Vigorous gray, white, and paper birches are attacked most commonly.

Biology and life history  The adult sawfly lays eggs in new leaves. Larvae drop to the ground and pupate in the soil for 2 to 3 weeks before emerging as adults. There may be up to four generations per year, depending on length of growing season.

Management—cultural control

Pinch leaves to kill larvae in minor infestations in small trees. Plant resistant species and cultivars, which include *Betula costata*, *B. davurica*, *B. maximowicziana*, *B. utilis var. jacquemontii*, *B. nigra*, *B. schmidtii*, and the varieties ‘Crimson Frost’ and ‘Purple Rain’.

Management—chemical control

See:
Chemical Control of Nursery Pests

Spray when first leaves are fully formed, usually about the first of May. Spray again from mid-June to mid-July.

For more information


Birch (Betula)—Bronze birch borer

*Agrilus anxius*

Pest description and crop damage  Adult is an olive-brown beetle with a blunt head and a tapering body about 0.5 inch long. Larvae are flatheaded borers. They grow to about 1 inch long and are creamy to white in color with a head wider than the body. The larvae bore into the branches or trunk after hatching and bore winding galleries along the cambial layer (between the wood and the bark). The galleries may heal, with swelling showing on the outside of the tree (lumpy bark), or may girdle and kill branches or trunks. Leaves may be yellow (chlorotic) as a result. The adults may feed on leaves, but cause little damage. Bronze birch borers attack trees weakened by age, environmental stresses, or previous insect attacks. Susceptible birch species include *B. papyrifera*, *B. pendula*, and *B. populifolia*. Ornamental cutleaf varieties of birch seem particularly susceptible to attack by this borer.

Biology and life history  The insect overwinters as a larva in the tree. As the weather warms in spring, the larvae resume feeding. They pupate in the tree, then the adult insect chews a D-shaped hole
in the bark to emerge, starting in late spring. They lay their eggs in bark cracks or under flaps of bark. The larvae hatch and bore immediately through the bark to feed on the vascular tissues. The life cycle takes 1 to 2 years to complete.

**Scouting and thresholds** Entry holes and borer damage greatly affect marketability, action thresholds are very low. Prevention is key.

**Management—cultural control**

Borers are less likely to attack healthy trees. Remove nearby infested trees immediately. Keep trees vigorous with proper watering, fertilizing, and other cultural practices. Plant resistant varieties and species, which include *B. lenta*, *B. nigra* (including *Heritage*), and *B. platyphylla*.

**Management—chemical control**

See: Chemical Control of Nursery Pests

Apply materials to the trunk and lower limbs. Avoid contacting foliage. Apply generally in late spring or when adults are active. Preventative treatments with a systemic Neonicotinoid have worked in some areas.

**For more information**


PNW Nursery IPM: Bronze birch borer (http://oregonstate.edu/dept/nurspest/bronze_birch_borer.htm)

**Birch (Betula)—Oystershell scale**

*Lepidosaphes ulmi*

See: Chemical Control of Nursery Pests

**Pest description and crop damage** The mature scale is approximately 0.125 inch long, hard-shelled, brownish or gray, and usually elongated like an oyster or mussel shell. Oystershell scale are found on trunks, branches, and twigs of many broadleaf deciduous plants. They occur less frequently on the leaves and other plant parts. Scale infestations often are limited initially to isolated colonies on single branches or twigs. Scale are closely related to aphid, mealybugs, and whiteflies and, like these insects, also have piercing–sucking mouthparts. Large populations of scale can devitalize plants and retard growth. Infested plants may show off-color foliage. Severe infestations can kill twigs.

**Biology and life history** Oystershell scale overwinters as eggs beneath the shell of the female scale. The young scale (called “crawlers”) move to feeding sites in late spring or early summer. Young scale also can be dispersed from plant to plant by wind, rain, irrigation, or by the movement of people and machinery.

**Management—chemical control**

See: Chemical Control of Nursery Pests

**For more information**


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**Boxwood (Buxus)—Boxwood leafminer**

*Monarthropalpus buxi*

See: Common Pests of Nursery Crops

**Pest description and crop damage** The adult is a small (0.1 inch) orange to yellow fly which emerges in early May. The larval stage of the boxwood leafminer is a small yellow to green maggot found inside the mined leaves. Leafminers feed by removing green tissue from between the upper and lower leaf surfaces. Feeding by leafminers can be detected by the presence of yellow to brownish blotch-like mines or by a blistered, thickened appearance of the leaves. Damage is mainly aesthetic, but repeated severe infestations may damage shrubs.

**Biology and life history** The insect overwinters as a larva in the mined leaves. In spring, it becomes active and grows rapidly. The orange pupae can be seen clinging to the leaf before the adult fly emerges. Female flies lay eggs on the upper surface of the current season’s growth. The larvae hatch and mine the leaves through the summer. There is one generation per year.

**Management—cultural controls**

Pick off infested leaves or clip out infested terminals. Plant resistant varieties, which include ‘Suffruticosa,’ ‘Pendula,’ and ‘Argenteo-variegata’.

**Management—chemical control**

♦ abamectin (Avid)—Apply when adults are laying eggs.

See: Chemical Control of Nursery Pests

**For more information**


PNW Nursery IPM: Boxwood leafminer (http://oregonstate.edu/dept/nurspest/boxwood_leafminer.htm)

**Boxwood (Buxus)—Boxwood psyllid**

*Psylla buxi*

**Pest description and crop damage** The greenish, aphid-like adult psyllids are about 0.125 inch long. The adults jump, and can even bite, although this is not serious. The immature psyllids (nymphs) are covered with a white, waxy secretion that gives them a cottony look. The nymphs feed on the developing buds and new growth. The presence of the boxwood psyllid is indicated by the cupping of leaves at the tips of terminals. Buds in cupped leaves often are dead. Honeydew, a shiny, sticky material produced by the insects, may be present. The honeydew may become covered with a growth of black sooty mold.

**Biology and life history** The insect overwinters as spindle-shape orange eggs under bud scale on boxwood. As the buds begin to open, the eggs hatch and the nymphs begin to feed. Adults can be found by late May. The adult females lay their eggs under the bud scale. There is only one generation per year.

**Management—biological control**

Ladybird beetles, lacewings, and parasitic wasps are all effective controls for this pest. Avoid the use of broad-spectrum sprays which would disrupt these controls.

**Management—cultural control**

English boxwood (Buxus sempervirens) is reportedly less susceptible.
Management—chemical control

See:
Chemical Control of Nursery Pests

For more information

PNW Nursery IPM: Boxwood psyllid (http://oregonstate.edu/dept/nurspest/boxwood_psylla.htm)

**Boxwood (Buxus)—Boxwood spider mite**

*Eurytetranychus buxi*

See:
Common Pests of Nursery Crops

Pest description and crop damage  The adult is a small greenish to brown mite. Their feeding causes small whitish, yellowish, or bronze streaks that look like pin scratches on the upper leaf surface. Heavy infestations can cause premature leaf drop. Damage is common throughout the Willamette Valley of Oregon.

Scouting and thresholds  Observe the leaves for mites and webbing and check for the number of pest and predator mites. Sufficient biological control usually is achieved by midsummer.

For more information
PNW Nursery IPM: Boxwood spider mite (http://oregonstate.edu/dept/nurspest/boxwood_spider_mite.htm)

**Boxwood (Buxus)—Holly scale**

*Dynaspidiotus britannicus*

See:
Common Pests of Nursery Crops

Pest description and crop damage  Scale covering is light brown to tan, 0.63 inch in diameter. They devitalize plants and spot leaves.

Management—chemical control

See:
Chemical Control of Nursery Pests

Apply to control the immature crawler stage, usually in late spring to early summer. Scout for crawlers and gather life history data. Oils are effective early to late spring, but oil spray may injure tender foliage.

**Camellia (Camellia)—Brown soft scale**

*Coccus hesperidum*

See:
Common Pests of Nursery Crops

Pest description and crop damage  Brown soft scale are yellowish to dark brown insects (adults are usually darker). They are found mainly on twigs, although young scale also may be found on the foliage, typically on the underside of leaves. Soft scale produce large amounts of honeydew, a sweet, sticky material which may become covered with a growth of dark sooty mold. Heavy scale infestations also can cause plants to become yellowish and wilted in appearance.

Management—chemical control

See:
Chemical Control of Nursery Pests

**Camellia (Camellia)—Cottony camellia scale**

*Pulvinaria floccifera*

See:
Common Pests of Nursery Crops

Pest description and crop damage  The cottony camellia scale is a flat, brownish or yellowish insect. Crawlers (young scale) feed on the underside of leaves. Cottony camellia scale produce large amounts of honeydew, a sweet sticky material which is often covered with a growth of black sooty mold. Foliage with scale infestations may turn yellowish or pale in color. The cottony camellia scale also is found on yew and holly.

Biology and life history  The scale overwinter on twigs or evergreen leaves as nymphs. In the spring, adult females lay cottony egg masses about 0.25 inch long on the underside of leaves. The eggs hatch, and the crawlers settle on the leaves to feed. There is one generation per year.

Scouting and thresholds  Inspect twigs during the dormant season for scale. Pay particular attention to weak plants. The crawlers are best observed during May to July with a 10X magnifying glass.

Management—chemical control

Most favorable period for control is in late summer or early fall after eggs have hatched.

See:
Chemical Control of Nursery Pests

For more information

PNW Nursery IPM: Cottony camellia scale (http://oregonstate.edu/dept/nurspest/cottony%20camellia%20scale.htm)

**Camellia (Camellia)—Root weevil**

*Otiorhynchus spp.*

See:
Common Pests of Nursery Crops

For more information
Cherry, flowering (*Prunus*)—Aphid

Includes black cherry aphid (*Myzus cerasi*) and rusty plum aphid (*Hysteroneura setariae*)

See: Common Pests of Nursery Crops

Pest description and crop damage Several aphid species attack cherry, including the rusty plum aphid and the black cherry aphid. The aphid feed initially on the shoot tips, which on young trees can cause stunting and malformation of the tips. On older trees, fruit set may be reduced in subsequent years if populations are high. Honeydew production can cause sooty mold problems on fruit.

Biological and life history The aphid overwinter as eggs in crevices and twigs. The eggs hatch near budbreak, and the nymphs feed on unopened buds and the underside of leaves. The leaves curl and protect the aphid as they feed. After two to three generations, winged forms are produced that migrate to summer hosts, which include weeds, ornamental plants, vegetables, or plants of the mustard family (in the case of black cherry aphid). After several more generations, the winged forms migrate back in the fall to the tree fruit to mate, and lay the overwintering eggs.

Scouting and thresholds Begin observing shoots prior to budbreak, as management is best done early and while the aphid are small.

Management—chemical control

See: Chemical Control of Nursery Pests

Sprays are most effective if applied before leaves curl. It is important to cover foliage thoroughly, including lower leaf surfaces.

Cherry, flowering (*Prunus*)—Apple-and-thorn skeletonizer

*Coryneura pariana*

Pest description and crop damage Adult moth is reddish brown, with a wingspread less than 0.5 inch, and irregular light and dark bands on the wings. Larvae are 0.5 inch long, yellow to greenish, with black spots and a yellow-brown head. Pupae are yellow to brown with a white silken cocoon. The larvae skeletonize and roll the leaf. Adults emerge after about 2 weeks to start a new generation. There are at least two generations per year.

Scouting and thresholds Watch for signs of skeletonizing, which from a distance looks like the leaf tips have been burned.

Management—chemical control

See: Chemical Control of Nursery Pests

Several applications may be needed during season. Do not apply to bloom.

For more information


PNW Nursery IPM: Apple-and-thorn skeletonizer (http://oregonstate.edu/dept/nurspest/apple_and_thorn_skeletonizer.htm)

PNW Insect Management Handbook

Cherry, flowering (*Prunus*)—Cherry bark tortrix

*Coryneura pariana*

Pest description and crop damage Cherry bark tortrix (CBT) occurs in Eurasia, Africa, and North America. CBT was first discovered in North America in 1989. By 1998, CBT was found in the Pacific Northwest as far south as Centralia, WA. CBT is slowly moving in surges southward and can be found as far south as Clackamas County. Eastern movement has yet to be seen due to the barrier of the Cascade Mountain range. Conditions in eastern Washington may not be favorable for CBT to survive except in protected riparian areas. CBT is a pest of most woody ornamental trees and shrubs in the family Rosaceae. CBT attacks *Prunus* (cherry, plum, and peach), *Malus* (apple, crabapple), *Pyrus* (pear), *Crataegus* (hawthorn), *Sorbus* (mountain ash), *Cydonia* (quince), *Pyracantha* (firethorn), and *Photinia*. The larvae are 0.33 to 0.4 inch long, pale gray to flesh-color with small, pale gray spines scattered on the surface, with a yellowish-brown head. Larvae feed directly on the cambial tissues of the tree and may cause death of the tree in sufficient numbers. Otherwise, the feeding activity decreases the supply of nutrients to the tree and increases susceptibility to disease, insect attack, and environmental stress, including cold injury. The first indication of attack is the exuding of gum-like resin, which often is mixed with fecal pellets and silk. The trunk and larger limbs of bearing fruit trees are affected, usually at pruning wounds.

Biological and life history CBT larvae overwinter under bark. During spring, they resume feeding and eventually pupate in a silken tube that protrudes beyond the bark surface where they were feeding. In Europe, pupation takes place from April until late August and lasts about 2 weeks. Adults fly from late April to September and are most active in the early morning; some may be attracted to lights at night.

Eggs are laid on tree bark, in crevices, or under loose bark, primarily at wounds (mechanical or old infestations). Eggs are placed singly or in overlapping groups of two or three and hatch in 2 or 3 weeks. Hatching larva penetrate the bark through openings (natural and mechanical wounds) and feed on the living tissue of the tree’s bark. Graft unions of ornamental trees are preferred sites for attack. Larvae do not penetrate the hardwood of the tree. During feeding, CBT larvae construct a frass tube consisting of fecal pellets and webbing. The tubes are about 0.25 inch long and look soft, as if they are made out of sawdust. They probably will be around the base of the trunk or where a branch and trunk meet. The frass tube is the location for pupation once CBT has completed the larval stage.

Scouting and thresholds Frass tubes are an excellent indication of CBT infestations, and susceptible trees should be monitored regularly. Since other insects can cause similar damage, inspection of the larvae is required for confirmation.

Management—biological control

Although some wasp species parasitize the larvae, effective biological control does not occur at present. Avoid sprays which will disrupt whatever control does occur.

See: Biological Control of Nursery Pests

Management—cultural control

Avoid unnecessary pruning cuts or injuries to the tree. Like most wood-boring insects, CBT is attracted to stressed trees. Keep trees as healthy as possible with appropriate watering, fertilizer applications, and pruning. Remove heavily infested branches or trees.

Management—chemical control

See: Chemical Control of Nursery Pests

Control is best when insecticides are applied during the end of September to the beginning of October, when insect flights are
Cherry, flowering (*Prunus*)—Pear sawfly
*Caliroa cerasi*

**Pest description and crop damage** Pear sawfly is a European insect now found in most areas of the U.S. It attacks both pear and cherry and also is found on mountain ash, hawthorn, and ornamental Prunus. The adult is a glossy black wasp, about 0.2 inch long. The larva initially resembles a small slug due to the olive green slime that covers the body, and the fact that the head is wider than the rest of the body. Mature larvae are 0.375 inch long and orange-yellow.

Larvae feed on the upper surface of leaves, skeletonizing them. Heavy feeding causes leaf drop, with reduction in vigor and yield, particularly on young trees.

**Biology and life history** Pear sawfly overwinters as a pupa in a cocoon 2 to 3 inches deep in the soil. Adults emerge over an extended period in late April–May. The adult female inserts eggs into leaf tissue, and eggs hatch in 10 to 15 days. Larvae immediately begin to feed on the upper surface of the leaf. After 3 to 4 weeks, they drop to the soil to pupate. Second generation adults emerge in July, and larvae from this generation feed in August and September. Most larvae from this generation drop to the ground to overwinter.

**Scouting and thresholds** Watch trees for the slug-like larvae in August and September when large populations can build up.

**Management—cultural control**
Individual larvae can be picked off, or they can be washed off with a strong stream of water.

**Management—chemical control**
See: Chemical Control of Nursery Pests

For more information

Cherry, flowering (*Prunus*)—Redhumped caterpillar
*Schizura concinna*

**Pest description and crop damage** Mature larvae are reddish or yellow and have several spines on each segment. The entire body is lined with white, dark reddish brown, and black lines. The head is red, and the fourth segment is humped. Has been a problem on cherry and other hosts east of the Cascades.

**Management—biological control**
See: Biological Control of Nursery Pests

**Management—cultural control**
Individual larvae may be picked off, and entire colonies can be cut out.

**Management—chemical control**
See: Chemical Control of Nursery Pests

For more information

Cherry, flowering (*Prunus*)—San Jose scale
*Quadraspisotus perniciosus*

**See:** Common Pests of Nursery Crops

**Pest description and crop damage** San Jose scale was introduced to the U.S. on flowering peach in the 1870s, and is now a pest of all tree fruits and many ornamental and wild trees and shrubs throughout the U.S., particularly in hot, dry climates. San Jose scale can be differentiated from other scale insects by the scale (shell) that covers the adult females. The scale is hard, gray to black, and cone-shape. The scale has a tiny white knob in the center with a series of grooves or rings around it.

**Biology and life history** San Jose scale overwinters in an immature state under a black shell. In spring, the tiny winged males emerge and mate with wingless females. Females give birth to live young about a month later (no eggs are seen). The young scale (called “crawlers”) are very small, flattened, and yellow, and move around on bark and foliage before settling down to feed. Young scale also can be dispersed by wind, rain, irrigation, or by the movement of people and machinery. A few days later, they secrete a waxy coating over their body that protects them from pesticides. From this point, female scale do not move. Crawlers appear during June and July and again in August to September. There are two generations per year.

**Scouting and thresholds** In cherry orchards, leaves of infested trees do not drop in fall, making detection straightforward. Inspect twigs during the dormant season for scale. Pay particular attention to weak plants. Observe the young bark for purplish-red halos, which indicate infestation. The crawlers are best observed during June and July with a 10X magnifying glass. Monitor crawlers by wrapping a piece of black sticky tape around an infested branch with the sticky side out.

For more information

Cherry, flowering (*Prunus*)—Shothole borer
*Scolytus rugulosus*

**Pest description and crop damage** Small black beetles with antennae, legs, and tips of elytra cinnamon red. Normally attack sickly trees by boring into limbs. Also bore into buds of healthy trees.

**Scouting and thresholds** Entry holes and borer damage greatly affect marketability, action thresholds are very low. Prevention is key.

**Management—cultural control**
Burn prunings and keep trees vigorous. Borer attack usually indicates trees are unhealthy.

**Management—chemical control**
See: Chemical Control of Nursery Pests

Apply materials to the trunk and larger limbs. Avoid contacting foliage. Apply generally in late spring or when adults are active.

For more information
**Cherry, flowering (Prunus)—Spider mite**

**Includes**
European red mite (Panonychus ulmi)
Twospotted spider mite (Tetranychus urticae)

**See:** Common Pests of Nursery Crops

**Pest description and crop damage** Several species of mites can cause damage in ornamental cherry. Principal mite pests of cherries include the European red mite and the twospotted spider mite. Appearance of these mites varies with the species, although all are 0.02 inch or smaller. Female European red mites are round with red bodies; males are yellowish-red. Twospotted mites are oval and yellowish-brown or green with distinctive black spots on the body. Mites damage fruit indirectly by feeding on leaves, which causes stippling, bronzing, and possibly leaf drop. The reduction in photosynthesis causes loss of vigor and yield.

**Biology and life history** Red mite overwinters as eggs on smaller branches and fruit spurs. They hatch at pink stage and commence feeding. There are six to seven generations per year.

**Management—chemical control**

Horticultural oils are most effective against European red mite, and during the egg stage of the mite life cycle.

**Chestnut (Castanea)—Shothole borer**

_Xyleborus dispar_

**Pest description and crop damage** An ambrosia-type bark beetle that is small and generally black or dark brown. This is a European beetle first found in Washington in Clark County in 1901. There are up to two generations per year. They overwinter as adults in the host trees, often with their dark rear ends visible in their galleries. Adults bore into sapwood. Males are smaller than females, and flightless. The females initially move to new, generally stressed trees, then emit an aggregation pheromone that attracts more beetles. Arriving beetles land on infested and nearby trees. New plantings are especially susceptible to attack.

**Scouting and thresholds** Monitor flights of beetles with ethanol-baited funnel traps from February through the end of summer. Look for fresh sawdust and sap on trees to detect injury. Yellow magnolias are very susceptible and can act as an indicator plant for beetle activity. Even one hole in a tree reduces its quality and most growers treat when beetle flights first occur on warm summer days in late winter or spring.

**Management—cultural control**

Keep trees vigorous. Rogue and destroy infested trees immediately.

**Management—chemical control**

See: Chemical Control of Nursery Pests

Control options are poorly understood at this time. Early spring applications are required. Apply materials to the trunk and lower limbs. Avoid contacting foliage.

**For more information**


PNW Nursery IPM: European shothole borer (http://oregonstate.edu/dept/nurspest/xyleborus_dispar.htm)

**Cotoneaster (Cotoneaster)—Aphid**

Several species

See: Common Pests of Nursery Crops

**Cotoneaster (Cotoneaster)—Cotoneaster webworm**

_Cremona cotoneastrl_

**Pest description and crop damage** The cotoneaster webworm is a dark brown caterpillar, 0.25 to 0.5 inch long. It typically ties clumps of leaves together with webbing and feeds within the nests, skeletonizing leaves. The webworm is primarily a problem on Cotoneaster horizontalis (rock cotoneaster).

**Biology and life history** The caterpillars feed during the summer and fall, overwintering in nests on the plant and pupating in the spring. The dark gray, night-flying adult moth emerges in the spring to lay eggs.

**Management—biological control**

See: Biological Control of Nursery Pests

**Cotoneaster (Cotoneaster)—Spider mite**

Several species, including _Tetranychus_ spp.

See: Common Pests of Nursery Crops

**Cottonwood (Populus)—Aphid**

See: Common Pests of Nursery Crops

**Cottonwood (Populus)—Satin moth**

_Leucoma salicis_

**Pest description and crop damage** The adult moth is satiny white. Larvae are approximately 2 inches long when grown and reddish brown with white patches on top and tufts of hairs along the sides. They can defoliate cottonwood, poplar, and willow seriously. They occasionally attack oak and aspen.

**Biology and life history** The insect overwinters as a larva in a small silken cocoon attached to the trunk or branch of the host tree. The larva becomes active and feeds after leaves have fully formed in the spring. After pupation, the adult moth emerges in midsummer. The adult moths are attracted to lights. The females lay eggs in masses on host plants, often on the leaves but also on bark. After hatching, the young larvae feed until fall, then hibernate. There is one generation per year.

**Scouting and thresholds** Watch for signs of skeletonizing.

**Management—biological control**

See: Biological Control of Nursery Pests
Management—cultural control
Larvae and pupae may be removed from affected leaves. Remove heavily infested twigs.

Management—chemical control
See:
Chemical Control of Nursery Pests

Apply when larvae are present and feeding.

For more information

Crabapple (Malus)—Leafroller and leaftier
Fruittree leafroller (Archips argyrospila)
Obliquebanded leafroller (Choristoneura rosaceana)

Pest description and crop damage There are several species of leafroller and leaftier pests of Malus. These are larvae of several moth species, which use native plants as hosts as well as fruit trees. They all cause similar damage to the trees but differ in their appearance and, more importantly, in their life cycle. The principal leafroller pests can be divided into single-generation moths, such as the fruittree leafroller and the European leafroller; and two-generation moths, such as the obliquebanded leafroller and thrlelineated leafroller. Adults of these species are variable in color, ranging from fawn-colored to dark brown. There are distinctive bands or motting on the wings. Wing spans range from 0.5 to 1 inch. The larvae of these species are all green caterpillars with a light brown to black head, depending on species. Leafrollers are similar in appearance, although larvae are up to 0.5 inch long, dirty white, with a brownish head.

As the name leafroller or leaftier implies, the larvae roll and tie leaves together for shelter and feeding. Leafroller larvae thrash about violently when disturbed, and may drop from the leaf suspended by a silken thread. The larvae web leaves and flowers together and feed on and tunnel into the unripe and ripe fruit. Feeding on growing points on young plants can promote undesirable branching. Larvae also feed on the surface of the fruit, causing deep, russetted scars.

Biology and life history The single-generation leafrollers overwinter as egg masses on twigs and branches. Eggs hatch in spring as buds are opening, and hatch is completed by petal fall. The larvae feed for 4 to 6 weeks, then pupate in the rolled leaves and emerge as moths in early summer. The overwintering eggs are laid in July. Two-generation leafrollers overwinter as immature larvae under the bark on scaffold branches of a variety of host plants. Larvae may feed during warm periods in winter, but become active in spring with onset of new growth. They feed for several weeks, then pupate in rolled leaves. Adult moths emerge in late April–May. These lay eggs for the next generation. The next generation hatches in early summer and does the most damage.

Leafrollers overwinter in silken cases as young larvae on bark of trees and other rough surfaces. In spring, the larvae spin silken threads and are carried by wind to host plants. The larvae web the leaves and flowers together beginning in late April, then feed on the developing fruit. The moths appear in June and July and lay eggs. There is one generation per year.

Scouting and thresholds Observe early spring growth for rolled leaves and feeding damage on new growth.

Management—biological control
See:
Biological Control of Nursery Pests

Very low temperatures in winter significantly reduce overwintering populations of larvae. Spiders and parasitic wasps, as well as predators like the brown lacewing, greatly reduce leafroller populations throughout the year.

Management—cultural control
Hand-pick rolled leaves containing larvae or pupae. Removal of overwintering sites, such as rolled leaves on the ground or plastered to trees, can reduce next year’s population.

Management—chemical control
See:
Chemical Control of Nursery Pests

Crabapple (Malus)—San Jose scale
Quadraspisidum pernicosus
See:
Common Pests of Nursery Crops

Daffodil (Narcissus)—Bulb mite
Rhizoglyphus echinopus

Pest description and crop damage Mature bulb mites vary from about 0.02 to 0.03 inch (0.5 to 0.9 mm) long and have four pairs of legs. Their bodies are shiny, white, somewhat transparent, and smooth with reddish brown appendages. They are usually found in colonies. Their oval shape and sluggish behavior can deceive the human eye into identifying them as eggs. They avoid the light, and hide under damaged or diseased tissue. Bulbs infested with bulb mites may rot and fail to produce new growth, or new growth may be off-color, stunted, and distorted. Although the bulb mite is not considered a primary pest of bulbs, it is often responsible for serious losses; the slightest injury to a bulb will allow bulb mites to enter and become established. Once the mites are inside the bulb, they rapidly turn the bulbs into rotten pulp. Injured or bruised bulbs are the most susceptible to damage. Not only do mites destroy bulb tissue, but they also carry fungi and bacteria which often spur additional damage. Bulb mites also heavily affect hyacinths and lilies.

Biology and life history Bulb mites rarely are noticed as isolated individuals, but rather as large colonies. All stages of the mite can be found throughout the year.

Management—cultural control
It is very important to avoid rough handling of bulbs to prevent injury that might afford an entry point for fungi and bulb mites. Bulb mites cannot withstand drought, and dry bulbs in storage usually are not attacked (unless mites are already deep inside tissue).

Management—chemical control
No chemical controls listed.
**Daffodil (Narcissus)—Narcissus bulb fly**

*Merodon equestris*

**Pest description and crop damage** The adult narcissus bulb fly is about 0.5 inch long and closely resembles a small bumblebee. The larva is yellowish-white and 0.75 inch long. The maggots burrow into the bulbs near the basal plate and feed inside the bulbs, destroying bulb scale and flower parts. Infested bulbs may develop a few, grassy-looking leaves if the bulb is not too badly damaged. Severely damaged bulbs are soft, brown, and decayed.

**Biology and life history** The female lays eggs near the bulbs during May or early June. The eggs hatch into grubs that move down into the soil and burrow into the base of the bulb to feed there, reducing the bulb’s center to a rotten mass. In the process, the embryonic flowers that would have unfolded the following spring are destroyed. After feeding, larvae leave the bulb to pupate in the soil. In the spring, the grubs emerge as adult flies to mate and lay eggs.

**Management—cultural control**

Narcissus fly can be evaded by deep planting (10 inches). Plant in open areas exposed to wind. Bulb flies are usually less of a problem in such sites. Covering foliage of plants with a row cover after bloom prevents egg-laying. Plant only firm, healthy bulbs. Soft bulbs may be infested from the previous season. Destroy any soft bulbs to prevent emergence of adult bulb flies.

**Management—chemical control**

No chemical controls listed.

**For more information**

The Narcissus Bulb Fly (http://whatcom.wsu.edu/ag/homehort/pest/bulbflies.htm)

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**Dahlia (Dahlia)—Western spotted cucumber beetle**

*Diabrotica undecimpunctata*

**Pest description and crop damage** The adult western spotted cucumber beetle is yellowish green, 0.25 inch long, and has 11 black spots on its wing covers. Mature larvae are white, except for the head and last abdominal segment, which are brown. They are about 0.625 inch long. The larvae appear to have “two heads.” The adult beetles eat small holes in the leaves. Larvae feed on roots and bore into the base of stems, killing small plants and reducing root mass in mature plants.

**Biology and life history** Cucumber beetles overwinter as fertilized females and are active beginning in early spring. Adults lay eggs at the base of plants. Eggs hatch in 7 to 10 days, and larvae feed in roots for about 3 weeks before pupating in the soil. Adults emerge 2 weeks later and feed on pollen, foliage, flowers, and pods. There are two generations per year.

**Management—biological control**

♦ nematodes—Soil must be warmer than 53°F (larvae only).

**Management—cultural control**

In most years, beetle populations diminish after egg laying and before the emergence of the summer population. Planting can be delayed until after the beetles have dispersed and deposited most of their eggs. Individual beetles can be picked off.

**Management—chemical control**

See: Chemical Control of Nursery Pests

**For more information**

PNW Nursery IPM: Western spotted cucumber beetle (http://oregonstate.edu/dept/nurspest/western_spotted_cucumber_beetle.htm)

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**Daphne (Daphne)—Lecanium scale**

*Lecanium spp.*

See: Common Pests of Nursery Crops

**Dogwood (Cornus)—Brown soft scale**

*Coccus hesperidum*

See: Common Pests of Nursery Crops

**Pest description and crop damage** Flat and brown. Small, about 0.19 inch long. Sooty mold indicates presence in abundance.

**Dogwood (Cornus)—Oystershell scale**

*Lepidosaphes ulmi*

See: Birch (Betula)—Oystershell scale

Common Pests of Nursery Crops

**Douglas-fir (Pseudotsuga)—Aphid**

*Cinara spp.*

See: Common Pests of Nursery Crops

**Pest description and crop damage** The aphid that infest Douglas-fir are large insects, up to 0.2 inch long. They may range in color from gray to brownish to dark. The aphid establish large colonies on the twigs but rarely are found feeding on needles. Feeding and honeydew production can cause sooty mold problems on foliage and nearby surfaces.

**Biology and life history** Most species of aphid have similar life cycles. The aphid overwinters as eggs on the host tree. Hatch occurs in the spring, and there may be several wingless generations during the growing season. In summer and fall, aphid may produce winged females and, later, winged males. They mate and produce eggs for overwintering, especially in colder climates.

**Management—chemical control**

See: Chemical Control of Nursery Pests

See “Douglas-fir” in: Christmas Tree Plantation Pests

**For more information**


**Douglas-fir (Pseudotsuga)—Coneworm**

*Dioryctria spp.*

**Pest description and crop damage** The adult coneworm is a mottled gray moth. The coneworms are small and cream-color or light brown with a darker head. Coneworms attack Douglas-fir by boring into shoot tips or stems, especially around wounds, and feeding on the soft bark tissues. The portion of the branch beyond the injured point may die back. Coneworms also may bore into green cones, feed on the soft bark of young growth, or feed inside the bark on the trunk cambium. Coneworms also attack pines, hemlocks, true firs, and spruce.
Management—cultural control
Plant nonsusceptible conifers where this pest is a problem. Remove and destroy infested cones and twigs when possible.

Management—chemical control
See: Chemical Control of Nursery Pests

See “Douglas-fir” in: Christmas Tree Plantation Pests

For more information

Douglas-fir (Pseudotsuga)—Cooley spruce gall adelgid
Adelges cooleyi
Pest description and crop damage This aphid-like insect feeds on newly growing needles. Adelgids appear as woolly or cottony tufts on the undersides of needles, with heavily infested trees appearing “frosted” or flocked. Small purplish insects are found underneath the cottony tufts.

Adelgid feeding can cause needles to become distorted or bent and yellowed. Infested needles turn brown and sometimes drop prematurely. This pest is a serious concern in Christmas tree plantations, but is less important in the landscape. Cooley spruce gall adelgids also infest spruces, but cause distinctive galls on spruce that are not seen on Douglas-fir.

Management—cultural control
Plant Douglas-fir and spruce as far apart as possible.

Management—chemical control
See: Chemical Control of Nursery Pests

Apply to control crawlers after eggs hatch, usually at the time when new tip growth is expanding.

See “Douglas-fir” in: Christmas Tree Plantation Pests

For more information

Douglas-fir (Pseudotsuga)—Douglas-fir needle midge
Contarinia spp.
Pest description and crop damage The adult Douglas-fir needle midge is a small fly. Three different midges infest Douglas-fir: one species feeds near the needle base, one feeds near the tip of the needle, and the third feeds near the middle. The tiny white larvae of the Douglas-fir needle midge mine the inside of needles, which become yellowed and distorted. Infested needles often have a sharp bend at the injury site. Damaged needles often drop from the tree, and heavy midge infestations can cause severe defoliation.

Biology and life history The midges pupate in the ground, with the adults emerging around budbreak in the spring. They lay eggs on the new growth, and the newly hatched larvae mine the needles and feed through the summer. At the end of the summer, they drop to the ground to pupate. There is one generation per year.

Sampling and thresholds Time applications, based on adult midge trap catch, to coincide with adult emergence.

Management—cultural control
Prune out heavily infested twigs and branches.

Management—chemical control
See: Chemical Control of Nursery Pests

See “Douglas-fir” in: Christmas Tree Plantation Pests

For more information

Ornamentals Northwest Archives: Douglas-fir needle midge (http://oregonstate.edu/dept/nurserystartup/onnpdf/onn060108.pdf)

Douglas-fir (Pseudotsuga)—Douglas-fir tussock moth
Orgyia pseudotsugata
Pest description and crop damage The adult moth flies during the day and is brown to gray, about 1 inch across. Mature larvae are about an inch long, hairy, gray or light brown, with black heads. They are distinguished by three long tufts of black hairs on their body (two in front, one in back) and lighter tufts along their back. The hairs from tussock moth caterpillars break off easily and may cause skin or respiratory irritation. The larvae start at branch tips at the top of the tree and work down, feeding mainly on the new foliage and causing severe defoliation. They may be found under webbing on the branches. The preferred hosts are Douglas-fir, grand fir, and white fir, although it also may be a problem on spruce, pine, and larch. They feed mainly on forest trees and are infrequent pests in the landscape.

Biology and life history The insect overwinters as eggs. The larvae emerge in the spring as buds break and begin feeding on the new growth. The insect pupates in cocoons on the host plant, and adults emerge in summer. The flightless females deposit eggs near the cocoon from which they emerged, usually on the trunk and underside of large branches. There is one generation per year.

Management—biological control
A variety of predators and parasites keep this pest under control most of the time. Severe tussock moth outbreaks are very sporadic and last usually about three years before subsiding.

See: Biological Control of Nursery Pests

Management—chemical control
See: Chemical Control of Nursery Pests

See “Douglas-fir” in: Christmas Tree Plantation Pests

For more information
Douglas-fir (*Pseudotsuga*)—Douglas-fir twig weevil
*Cylindrocopturus furnissi*

**Pest description and crop damage**  
Damage The Douglas-fir twig weevil is a small, wingless, grayish-black beetle with white markings and sometimes pinkish spots. The larvae mine under the bark or inside twigs. Infested twigs and small branches often turn a reddish-brown and die back. Small, stressed trees are especially susceptible to attack by the weevils, particularly in dry years.

**Biology and life history**  
The weevil overwinters as a larva or adult. The adult lays eggs in twigs in the summer. The larvae feed by mining just beneath the bark and pupate at the ends of the galleries the following spring. There is one complete generation per year.

**Management—cultural control**  
Pick off adults if seen. Remove and burn infested twigs. Keep trees healthy with proper cultural practices, as healthy trees can better withstand insect damage.

**Management—chemical control**  
No chemical controls listed.

See “Douglas-fir” in:  
Christmas Tree Plantation Pests

**For more information**  

Douglas-fir (*Pseudotsuga*)—Sequoia pitch moth
*Synanthedon sequoiae*

**Pest description and crop damage**  
The adult moth is clear-winged with yellow and black markings resembling yellow-jacket wasps. The larvae are about 1 inch long, yellowish, with a reddish brown head.

The larvae of the sequoia pitch moth feed by boring into branches or trunks. At the point where the larva enters the wood, small to large masses of white to pinkish pitch accumulate. The larva feeds locally underneath the pitch mass. This pest causes mainly aesthetic damage because of the pitch masses. Incidentally, they do not attack Sequoia, the coast redwood.

**Biology and life history**  
Eggs are laid on the bark of host trees. The larvae bore into the inner bark and establish a feeding site. The feeding site can be distinguished easily by the large accumulation of pitch and frass on the exterior of the bark. Pupation takes place within this mass, and the adult moths fly in summer. About half the population completes its life cycle in 1 year; the other half requires 2 years.

**Sampling and thresholds**  
A pheromone trap is available to time adult activity.

**Management—cultural control**  
Prune out and destroy tents with caterpillars. Caterpillar hairs can cause skin irritation if they are handled without gloves.

**Management—chemical control**  
See:  
Chemical Control of Nursery Pests

**For more information**  

Douglas-fir (*Pseudotsuga*)—Silverspotted tiger moth
*Halisidota argentata*

**Pest description and crop damage**  
Adult moths are brownish or tan with distinct silver-white spots on the wings. The caterpillars can reach 1.5 inches in length and are mostly reddish-brown with some blue-black or yellowish hairs.

The caterpillars of the silverspotted tiger moth feed on the needles, often “tenting” branches with dirty-looking webs. Feeding occurs through fall and winter, with webs becoming more noticeable by spring. Minor infestations cause little harm to trees. Douglas-fir is the preferred host, but pine, arborvitae, spruce, and true firs also are attacked.

**Biology and life history**  
Larvae hibernate in dense clusters on twigs and become active on warm winter days. Larvae mature in June.

**Management—cultural control**  
Healthy trees are not commonly attacked. Infestations often are associated with pruning wounds or mechanical damage to the tree. Trees which are wounded in the spring and summer when adult moths are flying are far more likely to be attacked than those pruned or injured in the fall and winter. The moths also may be attracted to trees undergoing stresses associated with drought or saturated soil. Remove pitch masses by hand.

**Management—chemical control**  
See:  
Chemical Control of Nursery Pests

**For more information**  
See:  
Common Pests of Nursery Crops

Elm (*Ulmus*)—Aphid

**Includes**  
woolly elm aphid (*Eriosoma americanum*)

**See:**  
Common Pests of Nursery Crops
**Elm (Ulmus)—Elm leaf beetle**

*Pyrrhalta luteola*

**Pest description and crop damage** Adult elm leaf beetles are approximately 0.25 inch long and yellow to greenish with two dark stripes. Older adults are darker. The 0.25 inch larvae are greenish or yellow with black lateral stripes and spots. Elm leaf beetles feed on the leaves both as larvae and as adults. They skeletonize leaves, feeding on the underside and eating all parts except the veins and upper cuticle, which turn brown. Adult feeding causes small holes in the leaves. Severe infestations may result in severe premature leaf loss. Trees may relace in late summer. Repeated infestations may weaken or kill trees. Weakened trees are also more susceptible to attack by elm bark beetles, which can carry the Dutch elm disease fungus.

**Biology and life history** The insect overwinters as adults in protected places both indoors and outdoors. In spring, the adults fly to trees as the leaves are expanding and chew circular holes in them. Eggs are laid in clusters on the leaves, and the larvae appear in late spring (typically May–June). The larvae emerge and feed on the undersides of leaves. They feed for a period, then migrate to the lower parts of the tree and pupate on the ground or in crevices near the base of the tree. The second generation emerges 1 or 2 weeks later. There are two generations per year.

**Management—biological control**

- Bacillus thuringiensis tenebrionis (Btt) (Novodor)

**Management—cultural control**

Plant resistant cultivars of American elm (*Ulmus americana*). These include ‘Dynasty,’ ‘Princeton,’ ‘Prospector,’ ‘Frontier,’ and ‘Pathfinder.’ (Note: Many American elm cultivars are highly susceptible to Dutch elm disease). Other elms reported to be somewhat resistant to elm leaf beetle feeding include Chinese elm (*U. parvifolia*) and the elm-like zelkovas (*Zelkova* spp.).

Provide proper culture to maintain plant health. Healthy plants are more tolerant of insect damage. Prune dead and dying branches in late fall or winter.

**Management—chemical control**

See: Chemical Control of Nursery Pests

Apply when first larval damage appears. Do not use acephate on American elm.

**For more information**


**Elm (Ulmus)—Elm leafminer**

*Fenusa ulmi*

**Pest description and crop damage** Small legless sawfly larva feed between the layers of leaf epidermis, resulting in large brown blotches. The elm leafminer, *Fenusa ulmi*, has been in the Northwest for a few years but has been noticeable in its expansion to new areas in Washington and Oregon recently. The sawfly attacks Scotch and Camperdown elms, *Ulmus glabra*, and English elm, *U. procera*.

**Biology and life history** The adult sawflies emerge coinciding with the breaking of the leaf buds of most elms, although after leaf expansion of American and European white elms (Scannell, 2000). The timing of emergence ranged from mid-March through mid-April depending on temperatures during the course of several years of study. The adults are all female and begin to lay eggs immediately after emergence. The eggs are usually laid near leaf veins initially but later oviposition is without regard to location of the veins. There are five instars of the larvae. The larvae were found about 10 days after the first emergence of the adult sawflies. The larvae eventually drop to the ground where they are reported to pupate through the summer, fall, and winter. There is one generation per year.

**Management—cultural control**

Remove infested leaves and destroy. American elm may have some resistance.

**Management—chemical control**

See: Chemical Control of Nursery Pests

Spray when blotch mines first appear or before leaves fall. Do not use acephate on American elm.

**For more information**

**Elm (Ulmus)—Spiny elm caterpillar (mourning cloak butterfly)**

_Nymphalis antiopa_

**Pest description and crop damage** The spiny elm caterpillar is the larval stage of the mourning cloak butterfly. The adult is approximately 2.5 inches across, with purplish-brown to black wings bordered by a creamy yellow stripe and a row of blue spots. The larvae are purplish-black with white specks and have a row of orange to red spots along the back. They have brownish prolegs and are clothed with long, forked spines. The caterpillars often feed in large groups and eat all the leaves on a branch before moving. Their feeding results in raggedly chewed leaves. Spiny elm caterpillars also feed on willow and poplar trees. They are not a serious pest.

**Biology and life history** The insect overwinters in protected places as an adult butterfly, and is found flying early in the spring after budbreak. The females lay eggs in masses on twigs, and the larvae hatch to feed in large groups. After feeding, the larva pupates by suspending itself from the leaf in a chrysalis. The second generation, if there is one, emerges in August.

**Management—biological control**
There are several wasp parasites of the larvae, and some birds also eat the larvae.

**Management—cultural control**
Hand-pick larvae and remove heavily infested branches.

**Management—chemical control**
See: Chemical Control of Nursery Pests

**For more information**

**Euonymus (Euonymus)—Euonymus scale**

_Unaspis euonymi_

**Pest description and crop damage** Euonymus scale females are dark, 0.0625 inch long, and muscel-shape. The males are narrow, elongative, and white. Crawlers are orange. Euonymus scale are found on both leaves and stems. Infested leaves develop yellow to white spots from scale feeding, and in severe cases significant defoliation can occur. Euonymus scale infests a wide range of ornamental genera that include Camellia, Buxus, Daphne, Hedera, Ilex, Jasminum, Ligustrum, Lonicera, Pachysandra, and Prunus.

**Biology and life history** The scale overwinters as fertilized females. Crawlers emerge in the spring from beneath the shells of the overwintering females. There may be two to three generations per year.

**Management—biological control**
See: Biological Control of Nursery Pests

**Management—cultural control**
Evergreen euonymus (E. japonica) is extremely susceptible to scale infestations, as is spindle tree (E. europaeus). Plant resistant species. _Euonymus alata_ (especially ‘Compacta’) and _E. fortunei_ ‘Acutus’ are seldom infested. Several other species, including _E. kiautschovicus_, will tolerate scale feeding. Hand-wipe to help control small infestations, when practical. Prune out heavily infested branches. Apply Tanglefoot, “stickem,” or a similar adhesive around infestations of adult scale to catch the crawler stage. As with aphids, avoid excessive nitrogen fertilizer, as this favors population increase.

**Management—chemical control**
See: Chemical Control of Nursery Pests
Apply in May and again in June or July.

**For more information**

**Fir (Abies)—Balsam twig aphid**

_Mindarus abietinus_

**Pest description and crop damage** Balsam twig aphid feed on needles and buds of firs. Three distinct forms of the balsam twig aphid occur. Aphid may be (1) small and yellow-green, (2) large and bluish-gray, or (3) have woolly white secretions which make them appear powdery. The aphid mat needles together and cause new growth to be deformed and stunted. Some needles are killed and drop from the tree, leaving rough twigs. The insects excrete a large amount of sticky honeydew which may be covered with a black growth of sooty mold. Healthy trees will tolerate moderate infestations easily.

**Biology and life history** Unlike other aphid species, there is one generation per year. The aphid overwinters as eggs on host trees. The eggs hatch and the nymphs molt into “stem mothers,” which are large and blue-gray, and capable of giving birth to live young. These aphid are covered with a white waxy coating and feed on new flushes of growth, doing most of the damage. They mature into the final, winged form, the females of which lay the overwintering eggs in bark crevices.

**Management—chemical control**
See: Chemical Control of Nursery Pests

Spray in spring. A second application may be needed in June. It is important to cover foliage thoroughly, including lower leaf surfaces.

**For more information**

**Fir (Abies)—Balsam woolly adelgid**

_Adelges piceae_

**Pest description and crop damage** The balsam woolly adelgid feeds on the stems of true firs. White or grayish cottony masses, inside which are the purplish-black insects, can be found on the twigs, branches, or trunk. Heavy adelgid infestations may cover the entire trunk. The feeding insects cause the tree to form swollen, knobs areas at nodes and tips of infested branches. Adelgid infestations weaken trees, cause foliage to become sparse, and can kill trees. This is a serious pest in the forest and the landscape on balsam, grand, subalpine, Pacific silver, and Fraser firs. Balsam fir and subalpine fir are particularly susceptible.
Biology and life history  The entire population consists of female insects, which are wingless. They are immobile except for a crawler stage. Eggs are laid on the bark, from which the crawlers emerge. Crawlers can be carried from tree to tree by wind. There are two to four generations per year.

Management—chemical control

See:
Chemical Control of Nursery Pests

Begin monitoring in late April to early May when crawlers can be seen. Spray in early spring at or near budbreak. Thorough coverage is necessary. Difficult to control with anything other than high-pressure spray equipment.

See “True fir” in:
Christmas Tree Plantation Pests

For more information

Fir (Abies)—Bow-legged fir aphid
Cinara curvipes

See:
Common Pests of Nursery Crops

Pest description and crop damage  About 200 species of Cinara attack pine, spruce, fir and cypress throughout the United States. Many of these are large (up to 0.2 inch), dark brown to black, and almost spider-like. Aphids congregate in large colonies to feed on the bark of twigs and even the main stem of small trees. The feeding causes yellowing of foliage, leaf drop and can cause limbs to die. Serious damage can be done to young trees.

Biology and life history  These aphid overwinter as eggs on twigs or branches. Adults and nymphs begin feeding on stems in the spring.

Management—biological control

See:
Biological Control of Nursery Pests

Management—cultural control
Hand-wipe to remove minor infestations when possible. Hose infested trees with a strong stream of water to wash off these insects.

Management—chemical control

See:
Chemical Control of Nursery Pests

It is important to cover foliage thoroughly, including lower leaf surfaces.

See “True fir” in:
Christmas Tree Plantation Pests

For more information

Fir (Abies)—Coneworm
Dioryctria spp.

Pest description and crop damage  The adult coneworm is a mottled gray moth. The coneworms are small and cream-color or light brown with a darker head. Coneworms attack true firs by boring into shoot tips or stems, especially around wounds, and feeding on the soft bark tissues. The portion of the branch beyond the injured point may die back. Coneworms also may bore into green cones, feed on the soft bark of young growth, or feed inside the bark on the trunk cambium. Coneworms also attack pines, hemlocks, Douglas-fir, and spruce.

Management—cultural control

Plant non-susceptible conifers where this pest is a problem. Remove and destroy infested cones and twigs when possible.

Management—chemical control

See:
Chemical Control of Nursery Pests

See also “True fir” in:
Christmas Tree Plantation Pests

For more information

Fir (Abies)—Spruce budworm

Pest description and crop damage  Adult moths are mottled orange-brown and have a wingspan up to 1 inch. The larvae are typically green to brown with a darker head and grow to approximately 1 inch in length. These larvae feed on the buds and foliage and may tie shoot tips together with webbing to make a nest.

Spruce budworms are mainly pests of balsam and subalpine firs. They also attack spruce and Douglas-fir. Although a significant problem in forestry situations, this insect is an infrequent pest in the landscape.

Biology and life cycle  The larvae overwinter in small silken cocoons which are hard to locate. The following spring, larvae emerge and spin long silken threads that aid in their dispersal. Eggs are light green and laid in shingle-like masses on the underside of needles in mid-July.

Management—biological control

See:
Biological Control of Nursery Pests

Management—cultural control
Hand-pick larvae when found.

Management—chemical control

See:
Chemical Control of Nursery Pests

Apply in May and again in June.

See also “True firs” in:
Christmas Tree Plantation Pests

For more information
Fir (Abies)—Spruce spider mite
*Oligonychus ununguis*

See:
Common Pests of Nursery Crops

Fuchsia (Fuchsia)—Fuchsia gall mite
*Aculeops fuchsiae*

**Pest description and crop damage** Tiny mites (Eriophyidae) infest growing tips, young leaves, and blooms and cause distorted, twisted, and blistered growth. They are primarily in coastal areas. They are spread by wind and by movement of infested stock.

**Management—biological controls**
Predatory mites are important biological control agents.

**Management—cultural control**
Fuchsia species and cultivars differ widely in susceptibility to these mites. For resistant and susceptible clones, see p. 486 in W.T. Johnson and H.H. Lyon (1991), *Insects That Feed on Trees and Shrubs*, 2nd ed., Cornell University Press.

**Management—chemical control**
See:
Chemical Control of Nursery Pests

Golden chain (Laburnum)—Aphid
Several species

See:
Common Pests of Nursery Crops

Golden chain (Laburnum)—Leafminer
*Leucoptera* (probably *laburnella*)

See:
Common Pests of Nursery Crops

**Pest description and crop damage** Mines leaves in blotches and can defoliate trees.—biological control

May be under control by natural parasites.

**Management—chemical control**
See:
Chemical Control of Nursery Pests

Use as foliar spray as soon as mines are seen.

Golden chain (Laburnum)—Spider mite
*Tetranychus* spp.

See:
Common Pests of Nursery Crops

Hawthorn (Crataegus)—Apple-and-thorn skeletonizer
*Choreutis pariana*

See:
Cherry, flowering (*Prunus*)—Apple-and-thorn skeletonizer

Hawthorn (Crataegus)—Hawthorn aphid
*Anuraphis craetaegifoliæa*

See:
Common Pests of Nursery Crops

**Pest description and crop damage** Pinkish green to yellowish green aphid; causes leaves to curl tightly.

Hawthorn (Crataegus)—Leafroller
Several species

**Pest description and crop damage** Several species of leafroller are pests of hawthorn. These are larvae of moths which use native plants as hosts as well as fruit trees. They all cause similar damage to the trees but differ in their appearance and, more importantly, in their life cycle. The principal leafroller pests of fruit trees can be divided into single-generation moths, such as the fruittree leafroller and the European leafroller, and two-generation moths, such as the obliquebanded leafroller and three-lined leafroller. Adults of these species range from fawn-color to dark brown. Distinctive bands or motting are on the wings. Wingspans range from 0.5 to 1 inch. The larvae of these species are all green caterpillars with a head that will be light brown to black depending on species.

As the name leafroller implies, the larvae roll and tie leaves together for shelter and feeding. Leafroller larvae thrash about violently when disturbed, and may drop from the leaf suspended by a silken thread. The larvae web leaves and flowers together and feed on and tunnel into the unripe and ripe fruit. Feeding on growing points on young plants can promote undesirable branching. Larvae also feed on the surface of the fruit, causing deep, russetted scars.

**Biology and life history** The single-generation leafrollers overwinter as egg masses on twigs and branches. Eggs hatch in spring as buds are opening, and hatch is completed by petal fall. The larvae feed for 4 to 6 weeks, then pupate in the rolled leaves and emerge as moths in early summer. The overwintering eggs are laid in July.

Two-generation leafrollers overwinter as immature larvae under the bark on scaffold branches of a variety of host plants. Larvae may feed during warm periods in winter, but become active in spring with onset of new growth. They feed for several weeks, then pupate in rolled leaves. Adult moths emerge in late April–May. These lay eggs for the next generation. The next generation hatches in early summer and does the most damage.

**Scouting and thresholds** Observe early spring growth for rolled leaves and feeding damage on new growth.

**Management—chemical control**
Apply when first rollers appear.

See:
Chemical Control of Nursery Pests

Hawthorn (Crataegus)—Pear sawfly
*Caliroa cerasi*

See:
Cherry, flowering (*Prunus*)—Pear sawfly

Hawthorn (Crataegus)—Scale insect
Several species

See:
Common Pests of Nursery Crops
**Hawthorn** (*Crataegus*)—Spider mite

*Tetranychus* spp.

*See:*

*Common Pests of Nursery Crops*

**Hemlock** (*Tsuga*)—Coneworm

*Diorctria* spp.

**Pest description and crop damage** The adult coneworm is a mottled gray moth. The coneworms are small and cream-color or light brown with a darker head. Coneworms attack true firs by boring into shoot tips or stems, especially around wounds, and feeding on the soft bark tissues. The portion of the branch beyond the injured point may die back. Coneworms also may bore into green cones, feed on the soft bark of young growth, or feed inside the bark on the trunk cambium. Coneworms also attack pines, hemlocks, Douglas-fir, and spruce.

**Management—cultural control**

Plant nonsusceptible conifers where this pest is a problem. Remove and destroy infested cones and twigs when possible.

**Management—chemical control**

*See:*

*Chemical Control of Nursery Pests*

**For more information**


**Hemlock** (*Tsuga*)—Hemlock adelgid

*Adelges* tsugae

**Pest description and crop damage** Hemlock adelgids are aphid-like insects. They appear as white, woolly tufts on the bark and needles. Adults are black beneath the woolly material. Needles drop prematurely, weakening the tree and sometimes leading to death. Trees with severe infestations may be stressed, predisposing them to other insect and disease problems. The hemlock adelgid is especially a problem on hemlock hedges.

**Biology and life history** The adelgid overwinters as woolly adults, with reddish-brown crawlers similar to scale crawlers appearing in spring and early summer. Hemlock adelgids are sometimes known as “hemlock chermes.”

**Management—cultural control**

Western hemlock (*Tsuga heterophylla*), mountain hemlock (*T. mertensifolia*), and Northern Japanese hemlock (*T. diversifolia*) are reported to be resistant to infestation. Eastern or Canadian hemlock is very susceptible. Wipe off minor infestations and prune out larger infestations if possible.

**Management—chemical control**

*See:*

*Chemical Control of Nursery Pests*

Apply to control crawlers after eggs hatch, usually at the time when new tip growth is expanding.

**For more information**


**Hemlock** (*Tsuga*)—Hemlock scale

*Abgrallaspis ithacae*

*See:*

*Common Pests of Nursery Crops*

**Pest description and crop damage** Hemlock scale feed on the needles of Eastern hemlock (*Tsuga canadensis*) and spruces (especially Colorado blue). Adult scale are round to oval, dark gray or black, and about 2 mm (0.1 inch) in diameter. Immature scale (crawlers) are green to yellow. Scale typically are found as small bumps on the underside of needles.

Scale feed on the needles by sucking out the cell contents. The initial symptom of infection is yellow spots on the upper surface of the needles. As few as 4 to 6 scale per needle will cause the needle to drop. Colorado blue spruce in particular loses large numbers of needles. Severe infestations may weaken trees sufficiently to cause death. The hemlock scale is most common on stressed trees.

**Management—chemical control**

*See:*

*Chemical Control of Nursery Pests*

Apply to control the early summer crawler stage.

**For more information**


**Holly** (*Ilex*)—Aphid

Several species

*See:*

*Common Pests of Nursery Crops*

**Holly** (*Ilex*)—Brown soft scale

*Coecus hesperidum*

*See:*

*Common Pests of Nursery Crops*

**Pest description and crop damage** Flat and brown. Small, about 0.19 inch long. When abundant, presence is indicated by sooty mold.

**Holly** (*Ilex*)—Cottony camellia scale

*Pulvinaria floccifera*

*See:*

*Common Pests of Nursery Crops*

**Holly** (*Ilex*)—Holly bud moth

*Rhopobota naevana ilicifoliana*

**Pest description and crop damage** The adult holly bud moth is a mottled brown and black insect with a wingspan of approximately 0.5 inch. The larvae are greenish-brown with dark heads and about 0.5 inch long. The larvae roll and web leaves. Another name for the holly bud moth is blackheaded fireworm. It also feeds on cranberry, blueberry, apple, and cherry.

**Biology and life history** This insect overwinters as eggs which hatch in spring at which time the new caterpillars feed on buds. Older caterpillars feed on leaves, first webbing them together. The feeding damage includes rolled leaves, holes, and blackened tissue, including tip dieback. The caterpillars generally pupate in leaves on the soil although pupae can be found on occasion within the rolled leaves while on the plant. The moth generally emerges...
in June and then lays eggs on the leaf underside. There are two generations a year. Other hosts include apple, blueberry, cherry, Crataegus, Fraxinus, Ilex, Prunus, Pyrus, Sorbus, Spiraea, Syringa, and Vaccinium.

**Management—cultural control**

Hand-pick larvae when found in rolled leaves. One cultural control for this pest is to collect and dispose of the fallen leaves to reduce successful emergence from the pupae.

**Management—chemical control**

See: Chemical Control of Nursery Pests

Do not spray holly in bloom. Apply when new growth is about 0.25 inch long and before blossoms open. Spreader sticker may be needed.

**For more information**


PNW Nursery IPM: Holly bud moth (http://oregonstate.edu/dept/nurspest/holly_bud_moth.htm)

**Holly (Ilex)—Holly leafminer**

*Phytomyza ilicis*

See: Common Pests of Nursery Crops

**Pest description and crop damage** This species of holly leafminer feeds only on English holly (*Ilex aquifolium*). The adult is a small, grayish black fly that emerges throughout May. Larvae are yellowish and about 0.0625 inch long. Characteristic damage by larvae includes the presence of yellow, brown, or reddish mines on the leaves. Initially, the mines are fairly narrow and winding, but become large blotches as the larva overwinters in the leaf. The upper and lower leaf surfaces remain after feeding but are separated easily.

**Biology and life history** The insect overwinters as a larva in the mined leaf. It pupates in early spring, and adult flies emerge in May. A few days later, females begin laying eggs on the undersides of leaves in the midvein. The eggs hatch, and the larva burrows into the leaf and commences making the mine. They continue mining through the late fall. There is one generation per year.

**Management—cultural control**

Hand-pick and destroy infested leaves in the fall.

**Management—chemical control**

See: Chemical Control of Nursery Pests

Apply just before bloom.

**For more information**


**Holly (Ilex)—Leafroller**

Several species, including obliquebanded leafroller (*Choristoneura rosaceana*)

**Pest description and crop damage** Green, smooth-body larvae feed on and web new growth in spring. Seldom abundant.

**Management—chemical control**

See: Chemical Control of Nursery Pests

**Holly (Ilex)—Lecanium scale**

*Lecanium spp.*

See: Common Pests of Nursery Crops

**Honeylocust (Gleditsia triacanthos)—Honeylocust plant bug**

*Blepharidopterus (Diaphnocoris) chlorionis*

**Pest description and crop damage** Small green plant bugs, overwintering as eggs. As honeylocust buds expand, eggs hatch and nymphs feed on new growth. Adults can be found a month after nymphs first appear; they also feed on new growth. Feeding can cause stippling and growth distortion. Heavy feeding can cause defoliation. There is one generation per year.

**Management—physical control**

Nymphs can be knocked off leaves with a high-pressure spray of water.

**Management—chemical control**

See: Chemical Control of Nursery Pests

Timing is focused on the newly expanding buds, targeting nymphs.

**For more information**


PNW Nursery IPM: Honeylocust plant bug (http://oregonstate.edu/dept/nurspest/honeylocust_plant_bug.htm)

**Honeylocust (Gleditsia triacanthos)—Honeylocust pod gall midge**

*Dasineura gleditchiae*

**Pest description and crop damage** A tiny midge, or fly, that develops in leaves, deforming them. There are multiple generations each year, as little as 3 to 4 weeks apart. Thornless varieties of honeylocust are especially subject to damage.

**Management—chemical control**

There are several strategies to midge management. One strategy is to target the overwintering larvae with a drench application prior to the emergent of the adults in the April. Another management tactic is to protect new foliage with insecticide. Horticultural oil applications applied to smother eggs have also proven efficacious. Sometimes repeat applications are needed, at 2 to 4 weeks, beginning late spring.

See: Chemical Control of Nursery Pests

**For more information**


PNW Nursery IPM: Honeylocust pod gall midge (http://oregonstate.edu/dept/nurspest/Honey_Locust_Pod_Gall_Midge.htm)

**Ivy (Hedera)—Aphid**

*Ivy aphid (Aphis hederae)*

See: Common Pests of Nursery Crops

**Pest description and crop damage** Soft-body, greenish aphid.
Japanese holly—Spider mite
Twospotted spider mite (*Tetranychus urticae*) and others

See:
Common Pests of Nursery Crops

Juniper (*Juniperus*)—Aphid
*Cinara* spp.

See:
Common Pests of Nursery Crops

Pest description and crop damage The aphid that infest junipers are large insects, up to 0.2 inch long. Color may range from gray to brownish to dark. The aphid establish large colonies on the twigs but rarely are found feeding on scales.

For more information

Juniper (*Juniperus*)—Cypress tip moth and allies
*Argyresthia cypressella*

See:
*Arborvitae (Thuja)—Cypress tip moth*

Management—cultural control
American arborvitae (*Thuja occidentalis*) is very susceptible to infection. Western red cedar (*Thuja plicata*) is very resistant.

Juniper (*Juniperus*)—Juniper scale
*Carulaspis juniperi*

See:
Common Pests of Nursery Crops

Pest description and crop damage The female scale is approximately 0.05 to 0.1 inch in diameter and white in color with a notable, central yellow spot. The male scale has a more elongated appearance. This insect feeds on the sap within the stem or leaf. Leaves, twigs, branches, and cones may be attacked. Their feeding can reduce the vigor of the foliage supported by that stem. Symptoms of scale feeding include loss of normal color and luster of foliage, no new growth, and yellowing and death of branches. Severe infestations may kill entire plants. The scale excrete large amounts of honeydew, a sweet, sticky material, which may become covered with sooty mold.

Biology and life history The insect overwinters as a mature female, filled with eggs. The crawlers emerge in late spring. There is one generation per year.

Management—cultural control
Keep plants healthy in order to resist infection better. Remove small infestations by hand, and cut out heavily infested branches.

Management—chemical control
See:
Chemical Control of Nursery Pests

Apply to control the immature crawler stage, usually in late spring to early summer. Scout for crawlers and gather life history data.

For more information

Juniper (*Juniperus*)—Juniper tip midge
*Oligotropus betheli*

Pest description and crop damage The adult is a tiny, yellow, mosquito-like fly. The larva is a maggot which lacks legs or a definite head. Juniper tip midge larvae feed in the tips of shoots, causing them to swell and form green galls. After the larvae have left, the galls turn brown (sometimes reddish) and the tips die back. Symptoms of mining and exit holes may be found at the junction between living and dead tissue or at the base of the swollen portion. The damage may appear very similar to that caused by fungal pathogens in the genus *Phomopsis*.

Management—cultural control
Remove green galls and damaged tips.

Management—chemical control
See:
Chemical Control of Nursery Pests

For more information

Juniper (*Juniperus*)—Juniper webworm
*Dichomeris marginella*

Pest description and crop damage The adult juniper webworm is a copper-brown moth with white bands on the edges of the front wings. The moth is about 0.5 inch across. The larva is a yellowish to brownish caterpillar with dark brown lines on the back and a dark head. The webworm caterpillars initially feed by mining inside leaves, then gather to feed in small colonies or nests of webbed foliage as they mature. Due to their habit of feeding deep in the plant canopy, damage may be overlooked easily. Damaged foliage turns brown and is covered with dirty webbing. Considerable amounts of foliage may be spun together, and small trees may be completely webbed. Damage frequently is observed in early spring, March to May. This pest infests only *Junipers*.

Biology and life history The caterpillars overwinter in the nest, which consists of webbed twigs, and resume feeding in spring. They pupate, and adult moths are flying in late spring. Eggs are laid on leaves of the current season’s growth. Larvae feed first as leafminers, then feed on the surface of leaves, building silken tubes around the feeding site. They overwinter in small groups in these webbed sites. There is one generation per year.

Management—cultural control
Hand-pick caterpillars and prune out infested growth. Irish juniper (*J. chinensis ‘Stricta’) is the preferred host, although Chinese juniper, red cedar, and *Juniperus communis* varieties *aurea, horizontalis, depressa, hibernica, suecia, and squamata meyeri* also are infested. *Juniperus procumbens* and *J. squamata* are infested only occasionally.

Management—chemical control
See:
Chemical Control of Nursery Pests

Sprays applied in late fall, winter, or early spring at relatively low temperature are effective against this pest.

For more information
**Juniper (Juniperus)—Spider mite**

*Oligonychus ununguis*

See:
Common Pests of Nursery Crops

**Management—chemical control**

See:
Chemical Control of Nursery Pests

Often difficult to control unless the sprayer can drive the spray into dense foliage.

**Kinnikinnick (Arctostaphylos)—Aphid**

Includes manzanita leafgall aphid (*Tamalia coveni*)

See:
Common Pests of Nursery Crops

**Pest description and crop damage** Apids are grayish or greenish and prefer new growth. The manzanita leafgall aphid feeds on the leaves of kinnikinnick and other manzanita species (*Arctostaphylos* spp.). Aphid feeding causes the leaves to thicken and form bright red galls. Older galls turn brown. Severe infestations may slow the growth of the plant. Non-gall-forming aphids may also be seen occasionally on kinnikinnick. They are greenish, soft-bodied insects that feed on leaves or stems. Honeydew, a sweet, sticky material, may be associated with aphid feeding. It may attract ants or become covered with a growth of dark, sooty mold.

**Management—biological control**

See:
Biological Control of Nursery Pests

**Management—cultural control**

Prune off and destroy galls where seen. Avoid frequent shearing and overfertilization, which encourages succulent new growth favored by aphid. For other aphid pests, wash aphid from plants with a strong stream of water or by hand-wiping. Avoid excessive watering, and use slow-release or organic sources of nitrogen. Control ants, which “farm” aphids and protect them from predators in order to harvest their honeydew.

**Management—chemical control**

See:
Chemical Control of Nursery Pests

Spray in spring to protect new foliage. It is important to cover foliage thoroughly, including lower leaf surfaces.

**For more information**


**Laurel, Portuguese (Prunus)—Peachtree borer**

*Synanthedon exitiosa*

See:
Apricot, flowering (*Prunus*)—Peachtree borer

**Lilac (Syringa)—Lilac leafminer**

*Caloptilia syringella*

See:
Common Pests of Nursery Crops

**Pest description and crop damage** Adult is a small, brownish moth. Greenish larvae mine and roll leaves down at tips. Leaf mining results in large, brown blotches. Ligustrum, Deutzia, Euonymus, Sorbus, and Fraxinus also may be attacked.

**Biology and life history** The insect overwinters as a pupa or larva, often in the mined leaf. The adult moth is found throughout the summer months. Eggs are laid along the midrib and other veins of the leaf. The larvae hatch and commence mining the leaves. There are several generations per year.

**Management—chemical control**

Be sure to wet undersides of leaves as well as tops. Spray all leaves to the dripping point. Repeat as necessary. Spray when blotch mines first are noticed or at least before leaves fall.

**Management—chemical control**

See:
Chemical Control of Nursery Pests

**For more information**


**Linden (Tilia)—Aphid**

*Eucallipterus tiliae*

**Pest description and crop damage** The linden aphid is green with black lateral stripes. The aphid feed in colonies on the undersides of leaves. Feeding damage to the plant is usually minor, although some leaf and shoot distortion can occur if populations are high. Aphid also produce honeydew, a sweet, sticky secretion that collects on plant tissues and encourages growth of a black sooty mold. This can interfere with photosynthesis of the plant.

**For more information**

**Linden (Tilia)—Linden gall mite**
Linden gall mite (*Phytoptus tiliae*)

**Pest description and crop damage** A very tiny mite that causes red to greenish galls on leaves. Damage is seldom serious.

**Management—chemical control**
No controls are registered.

**For more information**

**Linden (Tilia)—Spider mite**
*Tetranychus* spp.

See:
Apricot, flowering (*Prunus*)—Spider mite

**Madrone (Arbutus)—Madrone leafminer**
*Marmara arbutiella*

See:
Common Pests of Nursery Crops

**Pest description and crop damage** The adult is a moth. Larvae of this leaf- and twig-mining moth blaze sinuous, serpentine mines across the undersides of leaves. Although damage is unsightly on individual leaves, they do not affect the long-term health of the tree. This moth affects madrone throughout its range.

**Management—chemical control**

See:
Chemical Control of Nursery Pests

**Maple (Acer)—Aphid**

Includes: Norway maple aphid (*Periphyllus lyropictus*)

See:
Common Pests of Nursery Crops

**Pest description and crop damage** These aphids are black, soft-bodied insects on leaves; sticky secretions on leaves and under trees.

**Management—chemical control**

See:
Chemical Control of Nursery Pests

It is important to cover foliage thoroughly, including lower leaf surfaces. Apply oils during delayed-dormant period.

**For more information**
PNW Nursery IPM: *Periphyllus aphid* on maple (http://oregonstate.edu/dept/nurspest/Periphyllus_aphid.htm)

**Maple (Acer)—Cottony maple scale**
*Pulvinaria innumerabilis*

See:
Common Pests of Nursery Crops

**Pest description and crop damage** Mature cottony maple scale are small, flat, oval, brown insects 0.25 to 0.375 inch in diameter. The “cotton” is really waxy threads, and the ovisac may contain over 1,500 eggs. The insects produce copious amounts of honeydew which can collect on foliage and branches and cause growth of sooty mold. Honeydew is also a nuisance when it falls on nearby cars and sidewalks, and it also attracts bees, wasps, and ants. Occasionally, heavy outbreaks of this scale occur, usually on weakened or stressed trees. These outbreaks can cause the death of numerous small branches and occasionally the death of a tree.

Cottony maple scale reach epidemic numbers on silver maple, but noticeable populations can occur on red maple. It also is known to survive on other species of maple, honey and black locust, white ash, euonymus, oak, boxelder, dogwood, hackberry, sycamore, beech, elm, willow, basswood, and poplar.

**Biology and life history** Eggs hatch from mid-June to August and the crawlers emerge. The crawlers walk onto the leaves and tend to attach alongside the major leaf veins, usually on the underside. Here, the nymphs produce copious amounts of honeydew and grow by molting once. In September, the male scale emerge as tiny, winged, gnat-like insects that move around on the leaves in search of females. After mating, the males die and the females soon withdraw their mouthparts and crawl back onto small twigs and branches to overwinter.

**Scouting and thresholds** Inspect twigs during the dormant season for scale. Pay particular attention to weak plants. The crawlers are best observed during summer with a 10X magnifying glass.

**Management—chemical control**

See:
Chemical Control of Nursery Pests

Apply from June through summer.

**For more information**

**Maple (Acer)—Maple bladdergall mite**
*Vasates quadripedes*

**Pest description and crop damage** The maple bladdergall mite is a tiny eriophyid mite that feeds on the underside of leaves. Infested leaves initially develop small depressions which soon grow into brilliant red galls 0.125 to 0.25 inch in length. Later in the season, the galls may turn green or black. Silver and red maples are particularly susceptible to bladdergall mites. Severe infestations may cause leaves to become somewhat distorted. Although an aesthetic concern, bladdergalls are seldom harmful to the trees.

**Biology and life history** The mites overwinter in cracks and under bark scale and begin feeding in spring. Mite activity typically stops by around July.

**Management—cultural control**

Hand-pick severely infested or distorted leaves to improve appearance of small trees.

**Management—chemical control**

Spray in early spring before buds open.

**Management—chemical control**

See:
Chemical Control of Nursery Pests

Spray in early spring before buds open.

**For more information**

PNW Nursery IPM: Maple bladdergall mite (http://oregonstate.edu/dept/nurspest/maple_bladdergall_mite.htm)
Maple (Acer)—Maple shoot moth
Proteoteras aesculana

**Pest description and crop damage** Maple tip moth, *Proteoteras aesculana* Riley, also known as maple shoot borer and maple twig borer, is an occasional pest in nursery production in the Pacific Northwest. The moths are dark olive green with yellow and gray mottling. Larvae are pale white to gray and approximately 10 mm long when mature. The head is dark brown and the thoracic shield, yellow-brown. Damage occurs when the caterpillar bores into new growing terminals, causing tip dieback. New terminals must then be trained adding to labor time and costs. Hosts include maple, specifically red maple, silver maple, sugar maple, bigleaf maple, and boxelder.

**Biology and life history** In Oregon the moths are reported to emerge in July and August. Management is difficult as the larvae enter the shoots soon after emergence of the first two pair of leaves.

**Management—chemical control**
Recommendations from the work in Tennessee are that applications of protective insecticides be applied when the first two pair of leaves have come out. Another application 5–7 days later may be necessary on seedling trees due to seedling growth variability.

*See:* Chemical Control of Nursery Pests

**For more information**

PNW Nursery IPM: Maple tip moth (http://oregonstate.edu/dept/nurspest/maple_tip_borer.htm)

Maple (Acer)—Western flower thrips
Frankliniella occidentalis

**Pest description and crop damage** Adults are yellow to yellow-brown, 0.05 inch long, narrow, with wings. Larvae are smaller and wingless. Both stages feed on developing growth causing leaf distortion and black necrotic tissue. Most damage occurs when thrips disperse as nearby grass fields are harvested in the summer.

**Management—chemical control**

*See:* Chemical Control of Nursery Pests

**For more information**
PNW Nursery IPM: Thrips (http://oregonstate.edu/dept/nurspest/thrips.htm)

Mountain ash (Sorbus)—Pear leaf blister mite
Eriophyes pyri

**Pest description and crop damage** The leaf blister mite is a very tiny, white, sausage-shape eriophyid mite. They are seldom visible to the unaided eye. Eriophyid mite feeding on the underside of mountain ash leaves causes development of blisters on the upper leaf surface. These raised spots are generally light green, round, and look somewhat wrinkled. Older leaf blisters may turn brown. Severe infestations may result in premature leaf drop.

**Management—chemical control**

*See:* Chemical Control of Nursery Pests

**For more information**

PNW Nursery IPM: Pear blister mites (http://oregonstate.edu/dept/nurspest/pear_leaf_blister_mite.htm)

Narcissus (Narcissus)—Narcissus bulb fly
Merodon equestris

**Pest description and crop damage** The adult narcissus bulb fly is about 0.5 inch long and closely resembles a small bumblebee. The larva is yellowish-white and 0.75 inch long. The maggots burrow into the bulbs near the basal plate and feed inside the bulbs, destroying bulb scale and flower parts. Infested bulbs may develop a few, grassy-looking leaves if the bulb is not too badly damaged. Severely damaged bulbs are soft, brown, and decayed. The narcissus bulb fly attacks amaryllis, daffodil, Galtonia, hyacinth, iris, lily, Leucojum, Narcissus, Scilla, tulip, and Vallota.

**Biology and life history** The female lays eggs near the bulbs during May or early June. The eggs hatch into grubs that move down into the soil and burrow into the base of the bulb to feed there, reducing the bulb's center to a rotten mass. In the process, the embryonic flowers that would have unfolded the following spring are destroyed. After feeding, larvae leave the bulb to pupate in the soil. In the spring, the grubs emerge as adult flies to mate and lay eggs.

**Management—cultural control**
Narcissus fly can be evaded by deep planting (10 inches). Plant in open areas exposed to wind. Bulb flies are usually less of a problem in such sites. Covering foliage of plants with a row cover after bloom prevents egg-laying. Plant only firm, healthy bulbs. Soft bulbs may be infested from the previous season. Destroy any soft bulbs to prevent emergence of adult bulb flies.

**Management—chemical control**

Apply when adults become active (early May–June). Direct stream to base of plants.

*cyfluthrin (Decathlon)*
Oak, Garry (Quercus)—Leaf and twig gall

Pest description and crop damage  Leaf galls are caused by the feeding of several species of oak gall wasp larvae. Typical galls are enlarged or swollen plant tissues. These may assume several forms, depending on the species of wasp. The main gall wasps on Oregon white oak include Andricus californicus, which forms large, persistent, apple-like galls on twigs; Bassettia ligni, which causes seed shaped galls under the bark of branches that often girdle and kill the branch; Besbecus mirabilis, which forms mottled, spherical galls on the underside of leaves; and Neuroterus saltatorius, which forms mustard-seed-like galls on lower leaf surfaces that drop in the fall and jump around like Mexican jumping beans (caused by activity of the enclosed larvae).

The California gallfly causes the largest and most conspicuous of the galls on oak, achieving a diameter of 1 to 4 inches. It is a twig gall that is often called an oak apple. It starts out green and in time becomes red on the sunny side. Later in the season, the gall turns brown or greyish just before the adult wasps chew their way out. The gall does no apparent damage to the tree and is removed easily without harming the twig. The gall usually is round, but is sometimes kidney-shape. During its development, the gall may host up to a dozen larvae.

Jumping oak galls cause small yellow spots on the upper surface of infested leaves. On the underside of the leaves are tiny seed shaped galls. These appear in midsummer or later. Inside each gall is the larva of a tiny wasp. In the fall, the galls drop from the leaves to the ground, where the activity of the larva causes the gall to jump an inch or more off the ground. The wasps overwinter in the galls on the ground. In the spring, females lay eggs in opening oak buds. The larvae cause blister galls, deforming the leaves. Adult females emerging from these galls lay eggs on the leaves, producing the larvae which cause the jumping oak galls. Although they may be unsightly, jumping oak galls do relatively little damage.

Stem galls are caused by the feeding of several species of oak gall wasp larvae. Typical galls are enlarged or swollen. Galls associated with oak stems are often smooth and round, but may be elongate, thorny, or rough. They can be single galls or clusters of galls. Colors vary from green to reddish to brown, depending on the wasp species causing the gall and the age of the gall. Many galls also are formed on the leaves. Twigs can be weakened or killed by infestations.

Management—chemical control
- carbaryl—Apply as leaves unfold in spring. Washington and Oregon only.

For more information

Oak, Garry (Quercus)—Oak skeletonizer

Pest description and crop damage  This insect also is known as the oak ribbed casemaker. The adult moth is mottled white, brown, and black with a wingspread of about 0.33 inch. The mature larvae are about 0.25 inch long and pale yellow to green. Young larvae feed inside leaves, chewing away tissues and leaving a linear mine. Older larvae feed on the underside of leaves, leaving only the upper surface and veins, which turn brown. Severely damaged leaves may be almost transparent. The oak ribbed casemaker is reported on California white (valley) oak (Quercus lobata) and coast live oak (Q. agrifolia).

Biology and life history  This insect appears to pass the winter inside its characteristic cocoon. Immature larvae make flat, white, circular cocoons, while cocoons of mature larvae are white with distinctive longitudinal ribs. The latter can be found on leaves, twigs, or other nearby objects. The moths appear in spring and lay eggs on the undersides of leaves. The larvae emerge and feed on the foliage. There are two generations per year.

Management—biological control
Natural enemies probably help keep populations in check. Avoid use of broad-spectrum insecticides which kill beneficial insects.

Management—chemical control
See: Chemical Control of Nursery Pests

Apply in early summer when caterpillars are first active.

For more information

Oak, Garry (Quercus)—Pit scale

Asterolecanium spp.

See: Common Pests of Nursery Crops

Pest description and crop damage  Adult scale are covered with a hard shell and are about 0.06 inch in diameter. They may be brown, gold, or greenish. They feed on twigs and small branches, with young wood most commonly infested. Pit scale feeding causes the tissue of the twig to swell around the insect. The growth makes the scale appear to be in a pit on the bark. Numerous scale on a twig cause it to appear roughened. Severe infestations cause twig dieback. Heavy infestations of pit scale combined with drought stress or anthracnose (a fungal disease) can result in severe weakening or death of trees.

Biology and life history  Scale overwinter as mature females in pits on the twigs. Crawlers are produced in the late spring. These do not move far and typically colonize current season and 1-year-old wood. After settling to suck plant juices, the crawlers do not move for the remainder of their life cycle. There is one generation per year.

Management—chemical control
See: Chemical Control of Nursery Pests

Apply to control the immature crawler stage, usually in late spring to early summer. Scout for crawlers and gather life history data. Adding 1% horticultural oil increases effectiveness. Trees sometimes are injured when sprayed while under stress due to drought, root pruning, etc.

For more information
Oak, Garry (Quercus)—Western oak looper

*Lambdina fiscellaria somnioria*

**Pest description and crop damage** The adult moth is yellowish to dark brown. Mature larvae of the western oak looper are about 1 inch long and light brown with black spots when mature. They move in a characteristic “looping” or measuring-worm fashion. The western oak looper feeds primarily on the foliage of the Oregon white (or Garry) oak (*Quercus garryana*). It is probably the most damaging insect on white oak from Oregon north to British Columbia. In some years, oaks over large areas in the Willamette Valley are defoliated. The damage is temporary, since the trees leaf out the next year, and outbreaks are not sustained.

**Management—chemical control**

*See:*

- Chemical Control of Nursery Pests

Apply sprays in July or early August when larvae are feeding.

Peach, flowering (*Prunus*)—Aphid

*Includes Myzus persicae* and other species

*See:*

- Common Pests of Nursery Crops

**Pest description and crop damage** Several aphid species attack peaches, including the green peach aphid, mealy plum aphid, and rusty plum aphid. Green peach aphid adults have a black head and thorax and a green body. Nymphs are yellowish-green. Adults of the mealy plum aphid are pale bluish green with a white, powdery coating. The rusty plum aphid is rusty brown or deep purple with white bands on the legs.

The aphid feed initially on the shoot tips, which on young trees can cause stunting and malformation of the tips. On older trees, fruit set may be reduced in subsequent years if populations are high, and honeydew production can cause sooty mold problems on fruit. Green peach aphid is a bigger problem on nectarines and on summer vegetable crops, for which it is an important vector of some virus diseases.

**Biology and life history** The aphid overwinters as eggs in crevices and twigs. The eggs hatch near budbreak, and the nymphs feed on unopened buds and the underside of the leaves. The leaves curl and protect the aphid as they feed. After two to three generations, winged forms are produced that migrate to summer hosts which include weeds, ornamental plants, vegetables, or plants of the mustard family (in the case of black cherry aphid). After several more generations, the winged forms migrate back in the fall to the tree fruit to mate and lay the overwintering eggs.

**Scouting and thresholds** Begin observing shoots prior to budbreak, as management is best done early and while the aphid are small.

Peach, flowering (*Prunus*)—Leafroller

Several species

**Pest description and crop damage** There are several species of leafroller pests of fruit trees. These are larvae of several moth species which use native plants as hosts as well as fruit trees. They all cause similar damage to the trees but differ in their appearance and, more importantly, in their life cycle. The principal leafroller pests of tree fruits can be divided into single-generation moths, such as the fruittree leafroller and the European leafroller, and two-generation moths, such as the obliquebanded leafroller and threelined leafroller. Adults of these species range from fawn-color to dark brown. There are distinctive bands or mottling on the wings. Wing spans range from 0.5 to 1 inch. The larvae of these species are all green caterpillars with a light brown to black head, depending on species.

As the name leafroller implies, the larvae roll and tie leaves together for shelter and feeding. They thrash about violently when disturbed and may drop from the leaf suspended by a silken thread. Feeding on growing points on young plants can promote undesirable branching. Newly hatched larvae may work into blossoms and damage developing fruit, which then abort and fall off the tree. Larvae of the summer generation of the three-lined and obliquebanded leafrollers feed on the surface of fruit just before harvest.

**Biology and life history** The single-generation leafrollers overwinter as egg masses on twigs and branches. Eggs hatch in spring as buds are opening and hatch is completed by petal fall. The larvae feed for 4 to 6 weeks, then pupate in the rolled leaves and emerge as moths in early summer. The overwintering eggs are laid in July. Two-generation leafrollers overwinter as immature larvae under the bark on scaffold branches of a variety of host plants. Larvae may feed during warm periods in winter, but become active in spring with onset of new growth. They feed for several weeks, then pupate in rolled leaves. Adult moths emerge in late April–May. These lay eggs for the next generation. The next generation hatches in early summer and does the most damage.

**Scouting and thresholds** Observe early spring growth for rolled leaves and feeding damage on new growth.

**Management—biological control**

Very low temperatures in winter significantly reduce overwintering populations of larvae. Spiders and parasitic wasps, as well as predators like the brown lacewing, greatly reduce leafroller populations throughout the year.

*See:*

- Biological Control of Nursery Pests

**Management—cultural control**

Hand-pick rolled leaves containing larvae or pupae. Removal of overwintering sites, such as rolled leaves on the ground or plastered to tree trunks, can reduce next year’s population.

**Management—chemical control**

*See:*

- Chemical Control of Nursery Pests

Peach, flowering (*Prunus*)—Peach silver mite

*Vasates cornutus*

**Pest description and crop damage** Peach silver mites are tiny, four legged eriophyid mites, yellow to pinkish white, and somewhat wedge-shaped. On rare occasions when very high populations of peach silver mite survive the winter, they produce symptoms on the unfolding leaves. Symptoms consist of minute, yellow spots and a tendency for the leaf edges to curl toward the midrib. Ordinarily, however, most injury is not noticed until mid- to late summer, when heavily infested leaves take on a silvery appearance.

**Biology and life history** The mites overwinter as females in bark crevices, around buds, and under bud scale. They move to the leaves soon after budbreak in spring. Later in the season, they are found primarily on the lower leaf surface. Before leaf fall, females move to overwintering sites. Many generations are produced during the season.

**Management—biological control**

Treatments applied specifically for control of peach silver mite rarely are needed and should be avoided, because peach silver mites serve as early season food for predaceous mites, which in turn
aid in reducing populations of other pest mites. The use of broad-spectrum insecticides for other pests can cause high infestations of peach silver mite.

Management—chemical control
See: Chemical Control of Nursery Pests

Peach, flowering (*Prunus*)—Peachtree borer
*Synanthedon exitiosa*
See: Apricot, flowering (*Prunus*)—Peachtree borer

Peach, flowering (*Prunus*)—Peach twig borer
*Anarsia lineatella*
See: Apricot, flowering (*Prunus*)—Peach twig borer

Peach, flowering (*Prunus*)—Spider mite
*Tetranychus* spp.
See: Apricot, flowering (*Prunus*)—Spider mite

Photinia (*Photinia*)—Aphid
See: Common Pests of Nursery Crops

Photinia (*Photinia*)—Root weevil
See: Common Pests of Nursery Crops

Pine (*Pinus*)—Black pineleaf scale
*Nuculaspis californica*
See: Common Pests of Nursery Crops

Pine (*Pinus*)—Coneworm
*Dioryctria* spp.

**Pest description and crop damage** Small, brownish cream larvae of shoot moths that bore into fresh green cones. They also may bore into trunk cambium, branches, and shoots.

See “Pine” in: Christmas Tree Plantation Pests

Management—chemical control
See: Chemical Control of Nursery Pests

For more information

Pine (*Pinus*)—Eriophyid mites
*Trisetacus* spp.

**Pest description and crop damage** Microscopic, torpedo-shape mites that feed in needle sheaths, yellowing and distorting new needles.

See “Pine” in: Christmas Tree Plantation Pests

Management—chemical control

Carbaryl/oil has been used with success when applied three times about a week apart from mid-May into early June, or when new candles have elongated but before needles have fully elongated.

See: Chemical Control of Nursery Pests

For more information

Pine (*Pinus*)—European pine shoot moth
*Rhyacionia buoliana*

**Pest description and crop damage** Of concern mainly to pine tree exporters. May cause moderate flagging. Boring larvae kill tips of terminals and laterals. Small trees may be killed. One generation per year.

See “Pine” in: Christmas Tree Plantation Pests

Sampling and thresholds Pheromone lures and traps and degree-day models are available to monitor for adult flight. Successful management depends on applications that coincide with adult moth flight.

Management—chemical control
See: Chemical Control of Nursery Pests

For more information
**Pine (Pinus)—Pandora moth**

*Coloradia pandora*

**Pest description and crop damage** Large, heavy-body moth. Large, brown to yellowish green, spiny larvae feed on needles and may defoliate during outbreak years. Requires 2 years to complete life cycle. Control not needed except in outbreak years.

*See “Pine” in:*
- Christmas Tree Plantation Pests

**Management—chemical control**

*See:*
- Chemical Control of Nursery Pests

*For more information*


**Pine (Pinus)—Pine aphid**

*Cinara strobi*

*See:*
- Common Pests of Nursery Crops

**Pest description and crop damage** Colonies form in groups on needles. An extensive infestation yellows the tree and promotes sooty mold.

*See “Pine” in:*
- Christmas Tree Plantation Pests

**Management—biological control**

*See:*
- Biological Control of Nursery Pests

**Management—chemical control**

*See:*
- Chemical Control of Nursery Pests

*For more information*


**Pine (Pinus)—Pine bark adelgid**

*Pineus strobi*

**Pest description and crop damage** White, cottony masses on bark of trunk, branches, or twigs.

*See “Pine” in:*
- Christmas Tree Plantation Pests

**Management—chemical control**

*See:*
- Chemical Control of Nursery Pests

Spray in early spring at or near bud break. Thorough coverage is necessary. Difficult to control with anything other than high-pressure spray equipment.

*For more information*


**Pine (Pinus)—Pine butterfly**

*Neophasia menapia*

**Pest description and crop damage** A dark green caterpillar with two white stripes down each side feeds on needles. They do little damage except during outbreak years.

*See “Pine” in:*
- Christmas Tree Plantation Pests

**Management—chemical control**

*See:*
- Chemical Control of Nursery Pests

*For more information*


**Pine (Pinus)—Pine needle scale**

*Chionaspis pinifoliae*

*See:*
- Common Pests of Nursery Crops

**Pest description and crop damage** Elongate, flat, white scale on leaves. May cause severe damage. Pine needle scale also attacks spruce, fir, and occasionally cedar.

*See “Pine” in:*
- Christmas Tree Plantation Pests

**Management—chemical control**

*See:*
- Chemical Control of Nursery Pests

Apply to control the immature crawler stage, usually in late spring to early summer. Scout for crawlers and gather life history data.

*For more information*


PNW Nursery IPM: Pine needle scale (http://oregonstate.edu/dept/nurspest/pine_needle_scale.htm)

**Pine (Pinus)—Pine sheath miner**

*Zelleria haimbachii*

**Pest description and crop damage** Larvae are bright orange; mature insects are tan. Adults lay eggs on needles from early to midsummer. First they mine the needle, then they sever the sheath.

*See “Pine” in:*
- Christmas Tree Plantation Pests

**Management—chemical control**

♦ *malathion*

*See:*
- Chemical Control of Nursery Pests

*For more information*

Pine (*Pinus*)—Powdery pine needle aphid

*Eulachnus rileyi*

**See:**
Common Pests of Nursery Crops

**Pest description and crop damage**  Powdery gray aphid, active all season, causes early needle drop.

**See “Pine” in:**
Christmas Tree Plantation Pests

**Management—chemical control**

**See:**
Chemical Control of Nursery Pests

**For more information**

Pine (*Pinus*)—Sequoia pitch moth

*Synanthedon sequoiae*

**Pest description and crop damage**  Larvae of a clearwing moth feed in tree limbs and trunks. Trees under attack are almost always previously stressed. A mass of pinkish pitch at the feeding site is evidence of infestation.

**See “Pine” in:**
Christmas Tree Plantation Pests

**Sampling and thresholds**  Pheromone traps are available.

**Management—cultural control**

Keep trees vigorous.

**Management—chemical control**

**See:**
Chemical Control of Nursery Pests

Apply materials to the trunk and lower limbs. Avoid contacting foliage. Apply generally in late spring or when adults are active.

**For more information**

PNW Nursery IPM: Sequoia pitch moth (http://oregonstate.edu/dept/nurspest/sequoiapitchmoth.htm)

Pine (*Pinus*)—Spider mite

*Oligonychus* spp.

**See:**
Common Pests of Nursery Crops

**See “Pine” in:**
Christmas Tree Plantation Pests

Pine (*Pinus*)—White pine weevil

*Pissodes strobi*

**Pest description and crop damage**  Adults are about 0.25 inch long and light to dark brown with a prominent curved back. They kill terminal shoots and deform the tree.

**See “Pine” in:**
Christmas Tree Plantation Pests

**Management—cultural control**

Remove and burn infested shoots.

**Management—chemical control**

**See:**
Chemical Control of Nursery Pests

Control requires thorough applications to the terminals to prevent new infestations by egg-laying female weevils.

**For more information**

PNW Nursery IPM: White pine weevil (http://oregonstate.edu/dept/nurspest/white_pine_weevil.htm)

Plum, flowering (*Prunus*)—Hop aphid

*Phorodon humuli*

**See:**
Common Pests of Nursery Crops

**Pest description and crop damage**  Soft-body, bluish green insect found on the underside of leaves or in rolled leaves. Heavy infestations cause severe defoliation.

**Management—biological control**

**See:**
Biological Control of Nursery Pests

**Management—chemical control**

**See:**
Chemical Control of Nursery Pests

It is important to cover foliage thoroughly, including lower leaf surfaces. Difficult to control unless applications are made in early spring before leaves are rolled. Apply oils in dormant or delayed-dormant periods.

Plum, flowering (*Prunus*)—Leaf curl plum aphid

*Anuraphis helichryse*

**See:**
Common Pests of Nursery Crops

**Pest description and crop damage**  Causes extreme leaf curling.

**Management—biological control**

**See:**
Biological Control of Nursery Pests

**Management—chemical control**

To be effective, applications must be made early, before leaves curl. It is important to cover foliage thoroughly, including lower leaf surfaces. Apply oils in dormant or delayed-dormant periods.

**See:**
Chemical Control of Nursery Pests
Plum, flowering *(Prunus)*—Peachtree borer
*Syranthedon exitiosa*
See: Apricot, flowering *(Prunus)*—Peachtree borer

Plum, flowering *(Prunus)*—Pear sawfly
*Caliroa cerasi*
See: Cherry, flowering *(Prunus)*—Pear sawfly

Plum, flowering *(Prunus)*—Scale
Various species
See: Common Pests of Nursery Crops

**Poplar (Populus)—Carpenterworm**
*Prionoxystus robiniae*

**Pest description and crop damage** Large white larva (1 to 3 inches) bores 0.5-inch-diameter holes in trunk and main branches and eventually kills trees. Adult moth is speckled gray. Three-year life cycle.

**Management—cultural control**
Keep trees vigorous.

**Management—chemical control**
See: Chemical Control of Nursery Pests

Apply preventive spray to major branches and trunk as well as to crown of small trees. Apply in early June and early July.

**For more information**

**Poplar (Populus)—Lettuce root aphid**
*Pemphigus spp.*
See: Common Pests of Nursery Crops

**Pest description and crop damage** Aphid cause flask-shape galls on leaf petioles. Galls are not hazardous to trees.

**Management—chemical control**
See: Chemical Control of Nursery Pests

Apply preventive spray between major branches and trunk as well as to crown of small trees. Apply early June and early July.

**For more information**

**Poplar (Populus)—Oystershell scale**
*Lepidosaphes ulmi*
See: Common Pests of Nursery Crops

**Poplar (Populus)—Poplar-and-willow borer**
*Cryptorhyncus lapathi*

**Pest description and crop damage** Larvae bore under bark and into wood. They weaken and break limbs.

**Scouting and thresholds** Entry holes and borer damage greatly affect marketability; action thresholds are very low. Prevention is key.

**Management—cultural control**
Keep trees vigorous.

**Management—chemical control**
See: Chemical Control of Nursery Pests

Apply materials to the trunk and lower limbs. Avoid contacting foliage. Apply from mid-June to August, when adults are active.

**For more information**

**Poplar (Populus)—Satin moth**
*Leucoma salicis*

**Pest description and crop damage** Brownish caterpillars with white spots on back.

**Management—chemical control**
See: Chemical Control of Nursery Pests

Spray in late summer when larvae are seen.

**For more information**

**Privet (Ligustrum)—Lilac leafminer**
*Caloptilia syringella*

**For more information**
See: Lilac *(Syringa)*—Lilac leafminer

**Privet (Ligustrum)—Thrips**
*Caloptilia syringella*

**Pest description and crop damage** Slender and straw color. Cause leaf distortion.

**Management—chemical control**
See: Chemical Control of Nursery Pests

**For more information**
PNW Nursery IPM: Thrips (http://oregonstate.edu/dept/nurspest/thrips.htm)
Rhododendron (Rhododendron)—Aphid
*Masonaphis* spp.

See:
Common Pests of Nursery Crops

**Pest description and crop damage** Green, soft-body insects. White, cast skins are conspicuous. Usually found only on new tender growth.

Management—biological control
See:
Biological Control of Nursery Pests

Management—chemical control
See:
Chemical Control of Nursery Pests

Rhododendron (Rhododendron)—Azalea bark scale
*Eriococcus azaleae*

See:
Common Pests of Nursery Crops

**Pest description and crop damage** White, cottony sacs enclosing small, reddish eggs.

Management—chemical control
See:
Chemical Control of Nursery Pests

For more information
PNW Nursery IPM: Azalea Bark Scale (http://oregonstate.edu/dept/nurspest/azalea_bark_scale.htm)

Rhododendron (Rhododendron)—Carnation tortrix
*Cacaecimorpha pronubana*

See:
Laurel, Portuguese (*Prunus*)—Carnation tortrix

Rhododendron (Rhododendron)—Lecanium scale
*Lecanium* spp.

See:
Common Pests of Nursery Crops

Rhododendron (Rhododendron)—Root weevil
*Sciopithes obscurus, Otiorhynchus sulcatus*

See:
Common Pests of Nursery Crops

Rhododendron (Rhododendron)—Rhododendron bud moth
*Coleotechnites huntella*

**Pest description and crop damage** Pink larvae overwinter in the larger buds. They pupate in buds or twigs in the spring. Adults are gray moths, about 0.5 inch long, appearing in July. New larvae make blotch mines covered with silk and debris on the underside of host leaves. Later, they mine the midrib and then bore into twigs and bud bases in the fall.

Management—chemical control
See:
Chemical Control of Nursery Pests

Spray in May, June, and July. Covering bottoms of leaves is essential.

Rhododendron (Rhododendron)—Rhododendron lace bug
*Stephanitis rhododendri*

**Pest description and crop damage** Overwinters in egg stage. Eggs are laid in the midrib on the underside of leaves. Eggs hatch in late May or early June, although they have been noted as early as mid-April. Probably one generation a year in Oregon. Leaves are yellow and stippled. Undersides of leaves are dirty.

Management—chemical control
See:
Chemical Control of Nursery Pests

For more information
PNW Nursery IPM: Rhododendron lace bugs (http://oregonstate.edu/dept/nurspest/lace_bugs_on_rhodies.htm)
Washington State University: Rhododendron Lace Bug (http://www.puyallup.wsu.edu/plantclinic/resources/pdf/pls120rhodylacebug.pdf)

Rhododendron (Rhododendron)—Rhododendron whitefly
*Dialeurodes chittendeni*

**Pest description and crop damage** Small white insects with wings held roof-like over their heads. The eggs are small and white and laid on the underside of the leaf. Once the eggs hatch, the small oval nymphs settle and remain stationary, feeding at that site. Honeydew can be present with the associated black sooty mold fungus. The insect overwinters in the nymph stage. There is one generation a year.

Management—chemical control
See:
Chemical Control of Nursery Pests

Several applications may be necessary, about 5 to 7 days apart.

For more information

Rose (Rosa)—Leafcutting bee
*Megachile* spp.

**Pest description and crop damage** Smooth, circular, or crescent-shape areas are cut from leaves. Bees use pieces of leaves to form cells for young.

Management—chemical control
No controls are registered.

For more information
Rose (Rosa)—Leafroller

Many species

Pest description and crop damage Various colored caterpillars about 0.75 inch long when mature.

Management—chemical control

See: Chemical Control of Nursery Pests

Rose (Rosa)—Raspberry cane maggot

Pegomya rubivora

Pest description and crop damage New shoots wilt from a few inches to a foot from the tip. Damage is caused by a small white maggot that girdles the cane. This usually is not a serious pest. It is more often a pest of blackcaps and other cane fruits.

Management—cultural control

Cut off infested canes several inches below the wilted portion.

Rose (Rosa)—Redhumped caterpillar

Schizura concinna

Pest description and crop damage Mature larvae are reddish or yellow and have several spines on each segment. The entire body is lined with white, dark reddish brown, and black lines. The head is red, and the fourth segment is humped. This insect has been a problem on cherry and other hosts east of the Cascade Mountains.

Management—chemical control

See: Chemical Control of Nursery Pests

For more information


Rose (Rosa)—Rose aphid

Macrosiphum rosae

See: Common Pests of Nursery Crops

For more information


Rose (Rosa)—Rose curculio

Merhynchites bicolor

Pest description and crop damage Bright red beetle, 0.25 inch long, with black undersurface, head, and legs, and long snout. One form is entirely black. Adults make egg punctures in buds, which may fail to open. Usually not a serious pest.

Management—chemical control

See: Chemical Control of Nursery Pests

For more information


PNW Nursery IPM: Rose curculio (http://oregonstate.edu/dept/nurspest/rose_curculio_weevil.htm)

Rose (Rosa)—Rose leafhopper

Edwardsiana rosae

Pest description and crop damage Adult insect is greenish white; immature stages are the same color, flat, and elongate. Leaves look stippled. Heavy infestations result in defoliation.

Management—chemical control

See: Chemical Control of Nursery Pests

For more information


Rose (Rosa)—Rose midge

Dasineura rhodophaga

Pest description and crop damage The adult midge lays its eggs inside the sepals of new flower and leaf buds. The tiny maggot that hatches feeds in these areas causing blackened tissue, tip abortion, and distorted flower buds. There are two peaks of damage: in late June/early July and late August/early September.

Management—cultural control

Buy in bare-root or rinse off and dispose of container media when new plant material is brought in during the time midges are overwintering. Cut out and destroy infected tips. There are some roses with more resistance to the midge.

Management—chemical control

There are several strategies to midge management. One strategy is to target the overwintering larvae with a drench application prior to the emergent of the adults in the spring. Another management tactic is to protect new foliage with insecticide. Sometimes repeat applications are needed, at 2 to 4 weeks, if damage continues.

See: Chemical Control of Nursery Pests

For more information


PNW Nursery IPM: Rose midge (http://oregonstate.edu/dept/nurspest/rose_midge.htm)

Rose (Rosa)—Rose sawfly

Endelomyia aethiops

Pest description and crop damage Larvae are slug-like and light green. They skeletonize leaves or make holes in leaves.

Management—chemical control

See: Chemical Control of Nursery Pests

For more information


PNW Nursery IPM: Rose slug (http://oregonstate.edu/dept/nurspest/rosegal.htm)
Rose (Rosa)—Rose stem miner
*Marmara* spp.

**Pest description and crop damage** Adult is a small moth. Larvae make winding mines beneath the epidermis. Seldom a serious problem.

**Management—cultural control**
If mines detract from the plant’s appearance, prune and destroy infested canes.

**Management—chemical control**
No control measures have been developed.

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Rose (Rosa)—Rose thrips
*Frankliniella* spp.

**Pest description and crop damage** Slender, tiny, straw-color insects in buds and blooms cause distortion of leaves and flowers.

**Management—chemical control**
See:
- Chemical Control of Nursery Pests

For more information
PNW Nursery IPM: Thrips (http://oregonstate.edu/dept/nurspest/thrips.htm)

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Rose (Rosa)—Small carpenter bee
*Ceratina* spp.

**Pest description and crop damage** Small bees, 0.37 inch long and metallic blue or blue-green, burrow into the pith of cut stems and make cells for young. Cells are provisioned with pollen and nectar. Damage is not serious and is only in pruned stems.

**Management—cultural control**
- Cover cut stems with wax to prevent burrowing and egg laying.
- Prune out damaged canes.

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Rose (Rosa)—Spider mite
*Tetranychus* spp. and *Panonychus ulmi*

**Pest description and crop damage** Scale covering is circular, white, and about 0.06 inch in diameter. Causes foliage to turn brown and twigs to die back.

**Management—chemical control**
See:
- Chemical Control of Nursery Pests

Apply spray when scale crawlers begin to appear (usually early June) and repeat again 3 to 4 weeks later (early to mid-July).

For more information

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Skimmia (Skimmia)—Spider mite
*Tetranychus* spp., *Bryobia rubrioculus*, and *Panonychus citri*

**Pest description and crop damage**

**Management—chemical control**
See:
- Chemical Control of Nursery Pests
- Common Pests of Nursery Crops

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Spiraea (Spiraea)—Aphid
*Masonaphis spiraeae*

**Pest description and crop damage**

**Management—chemical control**
See:
- Chemical Control of Nursery Pests
- Common Pests of Nursery Crops

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Spiraea (Spiraea)—Snapdragon plume moth
*Platyptilia antirrhina*

**Pest description and crop damage** The small greenish larvae mine leaves. Later, they feed on terminal leaves and bore into developing flowers and inside the stems. Adult is grayish brown with narrow plumed wings and a 0.5 inch wingspread.

**Pest biology and life cycle**
Adults are considered weak fliers. They tend to remain on or near the host plant. They are most active during early evening. Single eggs are usually deposited on new forming flower heads or underside of leaves near new growth. It takes 2-4 weeks for the eggs to hatch and the new larvae burrow into stems, flower buds, and seed heads where the larvae feed and develop for about 3-5 weeks. Caterpillars pupate while hanging from plants. Adult is the overwintering stage.

**Management—chemical control**
See:
- Chemical Control of Nursery Pests

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Spiraea (Spiraea)—Spider mite
*Tetranychus* spp.

**Pest description and crop damage**

**Management—chemical control**
See:
- Chemical Control of Nursery Pests

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Spruce (Picea)—Carnation tortrix
*Cacaecimorpha pronubana*

**Pest description and crop damage**

**Management—chemical control**
See:
- Laurel, Portuguese (*Prunus*)—Carnation tortrix


**Spruce (Picea)—Coneworm**

*Dioryctria spp.*

**Pest description and crop damage** Small, brownish cream larvae of shoot moths bore into fresh green cones. May also bore into trunk cambium, branches, and shoots.

See “Spruce” in: Christmas Tree Plantation Pests

**Management—chemical control**

See: Chemical Control of Nursery Pests

**For more information**


**Spruce (Picea)—Cooley spruce gall adelgid**

*Adelges cooleyi*

**Pest description and crop damage** Aphid-like, with a covering of white, woolly exudate. Cone-like galls are formed at ends of twigs.

See “Spruce” in: Christmas Tree Plantation Pests

**Management—chemical control**

See: Chemical Control of Nursery Pests

Apply when new growth is unfolding in the spring. Once galls are forming, spraying will not control adelgids.

**For more information**


**Spruce (Picea)—Douglas-fir tussock moth**

*Orgyia pseudotsugata*

**Pest description and crop damage** Mature larvae are about 1 inch long, hairy, gray or light brown, with black heads. Several light brown or cream-color tufts of hair are on the body. Defoliate trees. Also attacks Douglas-fir, true firs, pine, and larch.

See “Spruce” in: Christmas Tree Plantation Pests

**Management—chemical control**

See: Chemical Control of Nursery Pests

**Spruce (Picea)—Spruce aphid**

*Elatobium abietinum*

Small, dull green aphid causes extreme needle drop. Aphid appear early in the season (about February) and may increase rapidly during March and April.

See “Spruce” in: Christmas Tree Plantation Pests

**Management—chemical control**

See: Common Pests of Nursery Crops

Apply to control the immature crawler stage usually in late spring to early summer. Scout for crawlers and gather life history data.

**For more information**


**Spruce (Picea)—Spruce bud scale**

*Physokermes piceae*

Females are semiglobular and brown and resemble buds. They produce abundant honeydew.

See “Spruce” in: Christmas Tree Plantation Pests

**Management—chemical control**

See: Chemical Control of Nursery Pests

Spray in early summer when crawlers are present.
Spruce (*Picea*)—Spruce budworm  
*Choristoneura occidentalis*

**Pest description and crop damage**  Green to brown larvae, up to 1 inch long, attack foliage and buds of fir and spruce.

See “Spruce” in:  
Christmas Tree Plantation Pests

**Management—chemical control**

See:  
Chemical Control of Nursery Pests

Apply in spring (May) when larvae feed on old needles and before they enter buds. June to July applications will control larvae on new growth.

For more information  

Spruce (*Picea*)—Spruce needleminer  
*Endothenia albolineana*

**Pest description and crop damage**  Small, light greenish brown larvae mine and web needles. Adult moth is dark brown with a wing expanse of 0.5 inch.

See “Spruce” in:  
Christmas Tree Plantation Pests

**Management—chemical control**

See:  
Chemical Control of Nursery Pests

Apply late May or early June when moths and young larvae appear.

For more information  

Spruce (*Picea*)—Spruce spider mite  
*Oligonychus ununguis*

**Pest description and crop damage**  Black aphid on underside of leaves on Viburnum species referred to as “Snowball.” They do not attack Viburnum davidii.

See:  
Common Pests of Nursery Crops

For more information  

**Spruce (Picea)—Webworm**  
*Cephalcia abietis*

**Pest description and crop damage**  Larvae hibernate in dense clusters on twigs and become active on warm winter days. Larvae mature in June. Pine, arborvitae, and true firs also are subject to attack. Damage may occur in late fall or early spring.

See “Spruce” in:  
Christmas Tree Plantation Pests

**Management—chemical control**

See:  
Chemical Control of Nursery Pests

Viburnum (*Viburnum*)—Bean aphid  
*Aphis fabae*

For more information  

**Viburnum (Viburnum)—Viburnum leaf beetle**  
*Pyrchalta viburni*

**Pest description and crop damage**  Black aphid on underside of leaves on Viburnum species referred to as “Snowball.” They do not attack Viburnum davidii.

For more information  
Soil drenches are particularly effective but must be made several weeks before feeding activity is anticipated.

For more information

**Viburnum (Viburnum)—Root weevil**

*Otiorhynchus* spp.

See:
Common Pests of Nursery Crops

**Willow (Salix)—Carpenterworm**

*Prionoxystus robiniae*

**Pest description and crop damage** Large white grub (1 to 3 inches), bores holes 0.5 inch in diameter in trunk and main branches, and eventually kills trees. Adult moth, which is speckled gray, causes no damage. Three-year life cycle.

**Management—cultural control**
Keep trees vigorous.

**Management—chemical control**
See: Chemical Control of Nursery Pests

Apply to major branches and trunk; to trunk and crown of small trees. Apply in early June and in early July.

For more information

**Willow (Salix)—Giant willow aphid**

*Lachnus salignis* and other species

See:
Common Pests of Nursery Crops

**Pest description and crop damage** Large gray to gray-black aphid often are in large numbers on twigs, branches, and trunk. Their legs generally are light brown. A prominent black tubercle is in the center of the back with slightly smaller tubercles on either side. Aphid may be a nuisance around homes when they collect on the sides of the house and crawl through window openings.

**Management—biological control**
See: Biological Control of Nursery Pests

**Management—chemical control**
See: Chemical Control of Nursery Pests

For more information

**Willow (Salix)—Poplar-and-willow borer**

*Cryptorrhynchus lapathi*

See:
Poplar (*Populus*)—Poplar-and-willow borer

**Willow (Salix)—Satin moth**

*Leucoma salicis*

**Pest description and crop damage** Adult moth is satiny white. Larvae are approximately 2 inches long when grown, reddish brown, with white patches on top and tufts of hairs along sides. They can seriously defoliate trees such as cottonwood, poplar, and willow. They occasionally attack oak and aspen.

**Management—chemical control**

See: Chemical Control of Nursery Pests

For more information

**Willow (Salix)—Spiny elm caterpillar (mourningcloak butterfly)**

*Nymphalis antiopa*

**Pest description and crop damage** Adult is a large butterfly, with purplish brown wings bordered with a wide yellow stripe inside of which is a row of blue or purple spots. Larvae are purplish black with a row of orange or red spots along the back. They have brownish prolegs and are clothed with long, forked spines.

**Management—chemical control**

See: Chemical Control of Nursery Pests

For more information

**Yew (Taxus)—Cottony camellia scale**

*Pulvinaria floccifera*

See:
Common Pests of Nursery Crops

**Yew (Taxus)—Lecanium scale**

*Lecanium* spp.

See:
Common Pests of Nursery Crops

**Yew (Taxus)—Root weevil**

*Otiorhynchus* spp.

See:
Common Pests of Nursery Crops

**Yew (Taxus)—Spider mite (false)**

*Pentamerismus taxi*

**Pest description and crop damage** Deep red, small, short-leg mite, generally flattened. This mite generally is found on yew but also on other evergreens.

**Management—biological control**
Spider mites have many natural enemies, including other mites.

**Management—chemical control**
See: Chemical Control of Nursery Pests

For more information
Greenhouse Ornamental Pests

John Rinehold

Latest revision—March 2019

In all cases, follow the instructions on the pesticide label. The PNW Insect Management Handbook has no legal status, whereas the pesticide label is a legal document. Read the product label before making any pesticide applications.

Always use appropriate safety equipment when applying pesticides. This is especially important in greenhouses, where the enclosed space presents special dangers of inhaling materials. Use approved respirator equipment when making these applications.

Notes
1. Materials and methods listed here should not be used for food crops, including vegetable starts.
2. Not all pesticides listed for a particular pest are registered on all greenhouse crops. Be certain to check the label regarding your application.
3. This information is presented to assist you in selecting appropriate pest control methods. The pesticide label is the final word on what does or does not constitute a legal application. Due to the wide variety of plants, locations, and conditions under which pesticides are applied, greenhouse plants are particularly susceptible to insecticide injury. Phytotoxic effects that have been observed are noted on the manufacturer’s label. To test for phytotoxicity, treat a small number of plants and observe for plant injury. In general, sprays prepared from wettable powder (WP) formulations are less likely to cause injury than those prepared from emulsifiable concentrates (EC), but wettable powder sprays may leave an undesirable residue on some plants.

A few simple greenhouse sanitation practices can decrease the frequency of insecticide application. Weeds under the benches provide food for greenhouse pests and can be a source of reinfection. Miscellaneous plants that are not part of a crop, but that are kept for long periods of time, may contribute to greenhouse pest problems. Such plants may harbor insect pests from one crop to the next. Weed growth outside the greenhouse, particularly against the sides of the building, also can be a source of reinfection.

Aphids are soft-bodied insects with piercing-sucking mouthparts. They are usually identified by host plant, and characters such as wing venation, antennae, and cornicles. The same species can vary in color, shape, and size depending on the time of the year. Crop damage includes distorted plant growth, particularly terminals, shiny honeydew, black sooty mold (which can grow on the honeydew), waxy deposits (some species), yellowing, and general plant decline.

There are winged (alate) aphids which can migrate, and wingless adult aphids which remain on the host but can reproduce asexually, producing large aphid populations quickly. Most aphids are associated with one or several host plants. Some have alternate hosts, overwintering on one host and moving to another as the season progresses. Several species, including many common in greenhouses, have a wide host range, with many host plants including weed species. Examples of these species include: green peach aphid (Myzus persicae), cotton or melon aphid (Aphis gossipea), potato aphid (Macrosiphum euphorbiae), and cabbage aphids (Brevicoryne brassicae).

Scouting and thresholds Scout for aphids near growing terminals and leaf undersides, particularly alongside leaf veins. White cast skins, shiny honeydew, black sooty mold, and misshapen terminals are good indicators of aphid presence. Yellow sticky traps and yellow pan traps can help monitor flights of adults.

Management—biological control

Natural enemies include:

- hover flies, many species—Maggot-like larvae are voracious predators of aphids. Pollen and nectar feeding adults are commonly seen around flowers.
- lacewings (Chrysopa spp., Chrysoperla carnea, C. rufilabris, C. comanche)—Some species commercially available.
- lady beetles (Hippodamia convergens, Harmonia axyridis, Coleomegilla maculata, Coccinella septempunctata)—Note: Use of non-local, wild-harvested lady beetles is discouraged due to potential movement of lady beetle pathogens and parasites.
- pirate bugs (Orius spp.)—Some species commercially available. Both adults and larvae are predators of small eggs, insects, and mites.
- parasitoid wasps (Aphidius ervi, A. matricariae, A. colemani, A. abdoulianalis, Diaretiella rapae, Lysaphelen testaceipes, Trioxys pallidus)—Some species commercially available. Many parasitoids have preferred hosts. See specific aphid for more information.
- predatory midge (Aphidoletes aphidimyza)—Commercially available and has given good control. Maggot-like larvae are voracious predators of aphids. Adults may go into diapause with low light or short days.

Management—chemical control

Good spray coverage, including the underside of leaves, is important. Aphids excrete honeydew which attracts ants. Ants may need to be controlled by an underbench treatment before releasing biological control agents.

- abamectin (Avid 0.15EC) at 0.009 lb ai/100 gal (8 fl oz). REI 12 hr. For suppression only.
- acephate (Precise, Orthene TR) at 0.024 lb ai/1,000 sq ft broadcast (0.6 oz). REI 24 hr.
- acetamiprid (Tristar 30SG) at 0.24 lb ai/100 gal (1.3 oz). REI 12 hr.
- azadirachtin (Azahar, Azatin XL)—Insect growth regulator, antifeedent. Some formulations are OMRI-listed for organic use.
- Beauveria bassiana (BotaniGard, Mycotrol, Naturalis L)—Works by contact, good coverage required. Some formulations are OMRI-listed for organic use.
- bifenthrin (Talstar) at 0.084 to 0.168 lb ai/1,000 sq ft. REI 12 hr. Restricted use pesticide.
- canola oil (various RTU products)—Good contact is essential. Some formulations are OMRI-listed for organic use.
- chlorpyrifos (Quali-Pro Chlorpyrifos) at 0.25 to 0.5 lb ai/100 gal. REI 24 hr. Restricted use pesticide.
- clarified hydrophobic extract of neem oil (Triact 70)
- clothianidin (Arena 0.25G) at 0.315 to 0.63 oz ai/100 gal. REI 12 hr. Soil treatment refer label.
Greenhouse ornamentals—Fungus gnat

**Includes**
- Bradysia coprophila
- Bradysia impatiens
- Bradysia paupera

**Pest description and crop damage** Larvae are small white, legless maggots with black head capsules. Adult midges are delicate, black-bodied insects with long legs and antennae. Their wings have a y-shaped vein along its edge distinguishing them from shore flies which are stout-bodied with short antennae and five white spots on their dark wings. The maggots can feed on decaying organic matter as well as plant roots. Larval feeding causes damage to seedling roots and high populations can kill young plants. Both larvae and adult can move spores of plant pathogens.

**Biological and life history** Eggs are laid in the container substrate or greenhouse floor. The tiny eggs hatch in 4 to 6 days, larvae feed for another 2 to 14 days, then pupate in the substrate or ground for another 5 to 6 days before emerging as an adult. Adults can live a week to 10 days. There are multiple generations per year. Higher populations are associated with wet, low drainage areas of production. Increasing drainage and maintaining a moss and algae free production area will reduce conducive conditions.

**Scouting and thresholds** Scouting for fungus gnats is usually done with yellow sticky traps. This will give one an indication of the numbers of adult fungus gnats. Some people place potato slices on the soil or medium to monitor for the larvae. Check roots of puny-looking plants for signs of the larvae.

**Management—biological control (larvae)**
Natural enemies include:
- parasitic nematode (Steinernema feltiae)—Commercially available. Applied as drench to substrate. Generally will need to be applied more than once.
- predatory mite (Stratiolaegus)—Commercially available.
- rove beetle (Athela coriaria)—Commercially available.
- soil-dwelling mite (Hypoaspis miles)—Applied to substrate.

**Management—chemical control**
Use yellow sticky traps to assess infestation and control efforts. Often, fungus gnats are a serious pest in propagation facilities, where larvae damage young roots. Infestations are associated with highly organic potting mix. Much of the management is directed at controlling the larval stages in the media and floor. Adult control is generally less effective in controlling populations.

- acephate (Orthene TR) at 0.024 lb ai/1,000 sq ft broadcast (0.6 oz). REI 24 hr.
- acetamiprid (Tristar 30SG) at 0.5 lb ai/100 gal (2.7 oz). REI 12 hr.
- azadirachtin (Azahar, Azatin XL)—Insect growth regulator.
- Bacillus thuringiensis israelensis (Bti) (Gnatrol) as drench to substrate to kill larvae. Use a Bt formulation specifically designed for fungus gnats. Generally will need to be applied more than once. Some formulations are OMRI-listed for organic use.
- bifenthrin (Telstar) at 0.168 to 0.335 lb ai/1,000 sq ft. REI 12 hr. Restricted use pesticide.
- chlorfenapyr (Pylon) at 0.08 to 0.16 lb ai/100 gal. REI 12 hr.
- cyfluthrin (Decathlon) at 1.3 oz/100 gal. REI 12 hr.
- cyfluthrin/imidacloprid (Discus N/G) at 0.063 lb ai/100 gal foliar; 0.009 to 0.014 lb ai/1,000 ft soil. REI 12 hr. Drench and irrigation permitted.
- diflubenzuron (Adept) at 0.5 oz ai/100 gal soil. REI 12 hr.
- dinoflubenzuron (Safari 20SG) at 0.1 to 0.2 lb ai/1,000 ft sq; 0.05 to 0.1 lb ai/100 gal. REI 12 hr.
- flonicamid (Aria) at 0.022 to 0.067 lb ai/100 gal. REI 12 hr.
- flometroline (PFR 97) at 0.175 to 3.5 lb ai/100 gal foliar. REI 4 hr.
- pyriproxyfen (Distance) at 0.054 to 0.081 lb ai/100 gal (8 to 12 fl oz) foliar. REI 12 hr.
- thiamethoxam (Flagship 25WG) as fogger. REI 12 or 24 hr.
- tolfenpyrad (Hachi-Hachi) at 0.14 to 0.33 lb ai/100 gal. REI 12 hr.
- pyrethrum/piperonyl butoxide—Adult control.
- pyrethrum/piperonyl butoxide—Adult control.
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PNW Insect Management Handbook
**Greenhouse ornamentals—Leafminer**

*Liriomyza trifolii*

**Pest description and crop damage** Leafminer adults are small flies, the most common is *Liriomyza trifolii*, which is about 0.125 inches long and black and yellow. The larvae are legless maggots. Mines from larval feeding in the leaves can make plants unmarketable.

**Biology and life history** The adult leafminer inserts its eggs into the leaf material. The egg hatches and the small white maggot mines within the leaves. The maggots then drop to the floor or substrate to pupate. Leafminers can complete a generation in about two weeks at 95°F. There can be many life cycles per season.

**Scouting and thresholds** Leafminers can be monitored with yellow sticky cards and looking for direct sting or oviposition damage on the leaves.

**Management—biological control**

Natural enemies include:
- entomopathogenic nematodes (*Steinernema feltiae*)—Foliar applications in greenhouses
- parasitic wasps (*Dacnusa sibirica*)—Commercially available. Used for management of *Liriomyza ssp.*
- parasitic wasps (*Diglyphus spp.*)—Commercially available. Used for management of *Liriomyza ssp.*

**Management—chemical control**

- abamectin (Avid 0.15 EC) at 0.009 lb ai/100 gal (8 fl oz). REI 12 hr. Apply at 7 day intervals.
- acephate (Precise, Orthene TR) at 0.024 lb ai/1,000 sq ft broadcast (0.6 oz). REI 24 hr.
- acetamiprid (Tristar 30SG) at 0.5 lb ai/100 gal (2.7 oz). REI 12 hr.
- azadiractin (Azahar, Azatin XL)—Insect growth regulator. Some formulations are OMRI-listed for organic use.
- bifenthrin (Talstar) at 0.335 to 0.67 lb ai/1,000 sq ft. REI 12 hr. Restricted use pesticide.
- chlorpyrifos (Quali Pro Chlorpyrifos) at 0.25 to 0.5 lb ai/100 gal. REI 24 hr. Restricted use pesticide.
- cyfluthrin/imidacloprid (Discus N/G) at 0.063 lb ai/100 gal foliar; 0.009 to 0.014 lb ai/1,000 ft soil. REI 12 hr.
- cyromazine (Citation) at 2 oz ai/100 gal. Apply to larval stage. REI 12 hr.
- diflubenzuron (Adept) at 0.5 oz ai/100 gal soil. Apply to larval stage. REI 12 hr.
- dinofeturan (Safari 20SG) at 0.1 to 0.2 lb ai/1,000 ft sq; 0.05 to 0.1 lb ai/100 gal. REI 12 hr.
- fenpropathrin (Tame 2.4EC) at 0.1 to 0.2 lb ai/a (5.3 to 10.7 fl oz). REI 24 hr.
- garlic oil/powder (Allitin)—Insect repellent. Some formulations are OMRI-listed for organic use.
- imidacloprid (Marathon II) at 0.027 oz ai/100 gal foliar. Drench and irrigation permitted. REI 12 hr.
- Isaria fumosoroseus (PFR 97) at 0.175 to 3.5 lb ai/100 gal foliar. REI 4 hr.
- kaolin (Surround)—May leave residue. Some formulations are OMRI-listed for organic use.
- lambda-cyhalothrin (Scimitar GC) at 0.013 to 0.043 lb ai/100 gal. REI 24 hr. Adult leafminers only.
- mineral oil/petroleum distillate (Biocover LS)—Some formulations are OMRI-listed for organic use.
- novaluron (Pedestal) at 0.039 to 0.052 oz ai/100 gal. Apply to larval stage. REI 12 hr.
- oil of rosemary/peppermint (Ecotec for WA only)—Some formulations are OMRI-listed for organic use.
- pyriproxyfen (Distance) at 0.054 to 0.081 lb ai/100 gal (6 to 12 fl oz) foliar. Apply to larval stage. REI 12 hr.
- s-kinoprene (Enstar AQ) at 0.012 to 0.024 lb ai/100,000 sq ft. REI 4 hr.
- spinosad (Entrust) at 0.156 lb ai/100 gal. OMRI-listed for organic use.

**Greenhouse ornamentals—Mealybug**

Includes

Citrus mealybug (*Planococcus citri*)
Longtailed mealybug (*Pseudococcus longispinus*)

**Pest description and crop damage** Like other soft-bodied, piercing mouthpart insects, mealybugs suck plant juices, cause tissue distortion, and plant decline, and secrete honeydew copiously. Keys are commercially available to distinguish species of mealybugs, scales, and whiteflies. citrus mealybug, *Planococcus citri*, is a common pest in such situations. The longtailed mealybug, *Pseudococcus longispinus* is another familiar species in protected systems distinguished by two long waxy filaments forming a "tail."

**Biology and life history** Adult mealybugs lay their eggs generally in an ovisac or egg sack often near a stem juncture or under thick stipules. The ovisac is made out of a white, waxy secretion and may be filled with several hundred eggs. Once the eggs hatch, the tiny nymphs move around the plant where they feed. Adult female mealybugs resemble the nymphs, though larger, but the males look like small white-colored flies and are uncommonly seen.

**Scouting and thresholds** Scout for the white egg sacs near stem nodes and branch connections. Some species of mealybugs spend time as a root infesting aphid, so new plant acquisitions should be inspected for infestations above and below the plant surface.

**Management—biological control**

Natural enemies include:
- lady beetle, *Cryptolaemus montrouzieri*, "mealybug destroyer"
- predatory wasp, *Leptomastix* (for citrus mealybugs), *Pseudaphycus angelicus* (for longtailed mealybug),

**Management—chemical control**

Mealybug and scale pests are best controlled at the “crawler” stage: the immature, active stage when the insects are most sensitive to insecticides.

- acephate (Precise, Orthene TR) at 0.024 lb ai/1,000 sq ft broadcast (0.6 oz). REI 24 hr.
- acetamiprid (Tristar 30SG) at 0.5 lb ai/100 gal (2.7 oz). REI 12 hr.
- azadiractin (Azahar, Azatin XL)—Some formulations are OMRI-listed for organic use.
- Beauvaria bassiana (Botanigard, Mycotrol, Naturalis L)—Some formulations are OMRI-listed for organic use.
- bifenthrin (Talstar) at 0.168 to 0.335 lb ai/1,000 sq ft. REI 12 hr. Restricted use pesticide.
- buprosifen (Talus 70DF) at 0.75 lb ai/a. REI 12 hr. Works on immature stage.
- chlorpyrifos (Quali-Pro Chlorpyrifos) at 0.5 lb ai/100 gal. REI 24 hr. Restricted use pesticide.
- clarified hydrophobic extract of neem oil (Triact 70)
- clothianidin (Arena 0.25G) at 0.45 to 0.63 oz ai/100 gal. REI 12 hr. Soil treatment refer label.
- cyfluthrin (Decathlon) at 1.9 oz/100 gal. REI 12 hr.
- cyfluthrin/imidacloprid (Discus N/G) at 0.063 lb ai/100 gal foliar; 0.009 to 0.014 lb ai/1,000 ft soil. REI 12 hr.
- dinofeturan (Safari 20SG) at 0.1 to 0.2 lb ai/1,000 ft sq; 0.05 to 0.1 lb ai/100 gal. REI 12 hr.
fenpropatrin (Tame 2.4EC) at 0.3 lb ai/a (16 fl oz). REI 24 hr.
fenproxymate (Akari 5SC) at 0.079 lb ai/100 gal. REI 12 hr.
flonicamid (Aria) at 0.067 to 0.134 lb ai/100 gal. REI 12 hr.
flupyradifurone (Altus) at 10.5 to 14 fl oz/a. REI 4 hr.
garlic oil/powder (Allitin)—Some formulations are OMRI-listed for organic use.
imidacloprid (Marathon II) at 0.027 oz ai /100 gal foliar. REI 12 hr. Drench and irrigation permitted.
Isaria fumosorosea (PFR 97) at 0.175 to 3.5 lb ai/100 gal foliar. REI 4 hr.
kaolin (Surround)—Some formulations are OMRI-listed for organic use.
lambda-cyhalothrin (Scimitar GC) at 0.013 to 0.043 lb ai/100 gal. REI 24 hr.
mineral oil/petroleum distillate (Biocover LS)—Some formulations are OMRI-listed for organic use.
naled (Dibrom 8) as vapor treatment
potassium laureate (several labels)—Some formulations are OMRI-listed for organic use.
pyrethrins/canola oil (E.B. Stone, Earth-tone, Worryfree)
pyrethrins/piperonyl butoxide
pyrifluziquazon (Rycar) at 0.013 to 0.1 lb ai/100 gal. REI 4 hr.
pyrifluquinazon (Rycar) at 0.09 lb ai/100 gallon
achetate (Orthene TR) at 0.024 lb ai/1,000 sq ft broadcast (0.6 oz). REI 24 hr.
acetamiprid (Tristar 30SG) at 0.5 to 0.1 lb ai/100 gal (2.7 to 5.3 oz). REI 12 hr.
azadiractin (Azahar)—Some formulations are OMRI-listed for organic use.
bifenthrin (Talstar) at 0.168 to 0.335 lb ai/1,000 sq ft. REI 12 hr. Drench and irrigation permitted.
buprofezin (Talus 70DF) at 0.88 lb ai/a. REI 12 hr.
canola oil/pyrethrin (E.B. Stone, Earth-tone, Worryfree)—Some formulations are OMRI-listed for organic use.
chlorpyrifos (Quali-Pro Chlorpyrifos) at 1 lb ai/100 gal. REI 24 hr. Restriction use pesticide.
chlothianidin (Arena 0.25G) at 1 to 1.5 oz ai/100 gal. REI 12 hr. Soft scale.
cyantraniliprole (Mainspring) at 0.013 to 0.1 lb ai/100 gal. REI 4 hr.
fractionated oil (several labels)—Some formulations are OMRI-listed for organic use.
fractionated oil (several labels)—Some formulations are OMRI-listed for organic use.
fractionated oil (several labels)—Some formulations are OMRI-listed for organic use.
flupyradifurone (Altus) at 10.5 to 14 fl oz/a. REI 4 hr.
garlic oil/powder (Allitin)—Some formulations are OMRI-listed for organic use.
hard scale insects tend to be fairly small in size and lie flatter against the stems than do soft scale insects. Soft scale insects are often very rounded and will also produce honeydew with their associated black sooty mold. Scale insects may have only one or multiple generations per year. Scale insects often come into a greenhouse on propagation material. This example shows the importance of inspections and, sometimes, quarantine of any new plant material brought into the greenhouse. Early infestations can often be rogued or pruned out.
Biological activity and systemic activity.
edge and leaf undersides. Double-sided sticky tape can be used to check for emerging scale crawlers.

Management—biological control
Check for presence of holes in the scale covers indicating parasitic wasp activity.
Natural enemies include:
- lady beetles, Chilocorus spp.
- Rhizobius—Soft scale predator.
Management—chemical control
Mealybug and scale pests are best controlled at the “crawler” stage: the immature, active stage when the insects are most sensitive to insecticides. Spray applications should be timed to coincide with emergence of the vulnerable crawlers. Ants, fond of honeydew, will fight off scale natural enemies to protect the source.
- acephate (Orthene TR) at 0.024 lb ai/1,000 sq ft broadcast (0.6 oz). REI 24 hr.
- actetamiprid (Tristar 30SG) at 0.5 to 0.1 lb ai/100 gal (2.7 to 5.3 oz). REI 12 hr.
- azadiractin (Azahar)—Some formulations are OMRI-listed for organic use.
- bifenthrin (Talstar) at 0.168 to 0.335 lb ai/1,000 sq ft. REI 12 hr. Restricted use pesticide.
- buprofezin (Talus 70DF) at 0.88 lb ai/a. REI 12 hr.
- canola oil/pyrethrin (E.B. Stone, Earth-tone, Worryfree)—Some formulations are OMRI-listed for organic use.
- chlorpyrifos (Quali-Pro Chlorpyrifos) at 1 lb ai/100 gal. REI 24 hr. Restricted use pesticide.
- clothianidin (Arena 0.25G) at 1 to 1.5 oz ai/100 gal. REI 12 hr. Soft scale.
- clarified hydrophobic extract of neem oil (Triacl 70)
- fenpropatrin (Tame 2.4EC) at 0.3 lb ai/a (16 fl oz). REI 24 hr.
- fenpropatrin (Tame 2.4EC) at 0.3 lb ai/a (16 fl oz). REI 24 hr.
- fenpropatrin (Tame 2.4EC) at 0.3 lb ai/a (16 fl oz). REI 24 hr.
- fenproxymate (Akari 5SC) at 0.079 lb ai/100 gal. REI 12 hr.
- fenpropatrin (Tame 2.4EC) at 0.3 lb ai/a (16 fl oz). REI 24 hr.
- fenpropatrin (Tame 2.4EC) at 0.3 lb ai/a (16 fl oz). REI 24 hr.
- fenpropatrin (Tame 2.4EC) at 0.3 lb ai/a (16 fl oz). REI 24 hr.
Greenhouse ornamentals—Spider mite

Including
Twospotted spider mite (Tetranychus urticae)

Pest description and crop damage Several species of spider mites can cause damage in deciduous ornamentals. Appearance of these mites varies with the species, although all are 0.02 inch or smaller. Adults and nymphs can be yellowish, greenish, or reddish brown, depending on species. Mites damage plants by feeding on leaves, which causes stippling, bronzing, and possibly leaf drop. The reduction in photosynthesis causes loss of vigor.

Biology and life history Most mite species share a similar life cycle. The majority of twospotted mites overwinter as adult females. Mites become active in the spring. There may be eight to ten overlapping generations per year.

Scouting and thresholds Observe the leaves for mites and webbing and check for the number of pest and predator mites.

Management—biological control
Natural enemies include:
- minute pirate bugs, Orius spp.
- predatory lady beetle, Stictorus spp.
- predatory mite, Felitellia
- predatory mites, Neoseiulus californicus, N. fallacies, Amblyseius hibisci, Phytoseiulus persimilis, P. macrophilus, P. longipes, (Metaseiulus), Galedromus occidentalis

Management—chemical control
- abamectin (Avid 0.15 EC) at 0.005 lb ai/100 gal (4 fl oz). REI 12 hr.
- acephate (Precise, Orthene TR) at 0.024 lb ai/1,000 sq ft broadcast (0.6 oz). REI 24 hr.
- acephate/fenpropathrin (Valent Tame/Orthene)
- acequinocyl (Shuttle O) at 6.4 to 12.8 fl oz/a. REI 12 hr.
- bifenthrin (Talstar) at 0.168 to 0.335 lb ai/1,000 sq ft. REI 12 hr.
- chlorfenapyr (Pylon) at 0.04 to 0.08 lb ai/100 gal. REI 12 hr.
- chlorpyrifos (Quali-Pro Chlorpyrifos) at 0.25 to 0.5 lb ai/100 gal. REI 24 hr. Restricted use pesticide.
- clofentezine (Ovation SC) at 0.0625 lb ai/100 gal. REI 12 hr.
- cyflumetofen (Sultan) at 0.18 lb ai/100 gal. REI 12 hr. Limit 2 treatments.
- etoxazole (Tetrasan 5WDG Miticide) at 0.4 to 0.8 oz ia/100 gal. REI 12 hr.
- fenazaquin (Magus Miticide) at 0.15 to 0.3 lb ai/a. REI 12 hr.
- fenbutatin-oxide (Vendex 50W) at 4 to 8 oz ai/100 gal. REI 48 hr. Restricted use pesticide.
- fenpropathrin (Tame 2.4EC) at 0.15 to 0.3 lb ai/a (8 to 16 fl oz). REI 48 hr.
- fenproximate (Akari 5SC) at 0.053 to 0.079 lb ai/100 gal. REI 12 hr.
- geraniol (Ecotec Plus) at 1 to 4 fl oz/100 gal. OMRI-listed for organic use. REI 0 hr.
- hexythiazox (Hexagon DF) at 0.5 to 1 oz ai/100 gal. REI 12 hr.
- Isaria fumosorosea (PRF 97) at 0.175 to 3.5 lb ai/100 gal foliar. REI 4 hr. Some formulations are OMRI-listed for organic use.
- kaolin (Surround WP)—May leave residue. Some formulations are OMRI-listed for organic use.
- lambda-cyhalothrin (Scimitar GC) at 0.047 to 0.156 lb ai/100 gal. OMRI-listed for organic use.
- methiocarb (Mesurol 75W) at 0.375 to 0.5 lb ai/100 gal. REI 12 hr. Restricted use pesticide.
- mineral oil/petroleum distillate (Biocover LS)
- naled (Dibrom 8) as vapor treatment
- potassium laurate (numerous labels)—Some formulations are OMRI-listed for organic use.
- pyrethrin/piperonyl butoxide
- pyridaben (Sanmite) at 3 to 4.5 oz ai/100 gal. REI 12 hr.
- pyrethrin/piperonyl butoxide
- pyridaben (Sanmite) at 3 to 4.5 oz ai/100 gal. REI 12 hr.
- tau-fluvalinate (Mavrik Aquaflow) at 0.063 to 0.156 lb ai/100 gal. REI 12 hr.
- acephate (Precise, Orthene TR) at 0.024 lb ai/1,000 sq ft broadcast (0.6 oz). REI 24 hr.
- acephate/fenpropathrin (Valent Tame/Orthene)
- abamectin (Avid 0.15 EC) at 0.009 lb ai/100 gal (8 fl oz). REI 12 hr. Suppression.
- acetamiprid (Tristar 30SG) at 0.75 to 1.5 lb ai/100 gal (4 to 8 oz). REI 12 hr.

Greenhouse ornamentals—Thrips

Greenhouse thrips (Heliothrips haemorrhoidalis)

Pest description and crop damage The insects are very small with fringed wings. Monitoring is usually made by visual inspection for the thrips or their damage. Their damage is usually evident as a scraping of the epidermal layers of the plant leaf. Thrips are vectors of a serious disease. Tomato Spotted Wilt Virus (TMSV) and Impatiens Necrotic Wilt Virus (INSV) can have devastating consequences in susceptible crops.

Biology and life history They tend to prefer very tight spaces and are particularly attracted to flowers with pollen.

Scouting and thresholds Thrips can be very difficult insects to detect. Use blue or yellow sticky traps to assess infestation and control efforts. An aggregation pheromone for thrips, Thripline ams, is available for monitoring.

Management—biological control
When there is potential for vectoring disease and/or low tolerance for direct damage from thrips, biological control may be inappropriate as a tactic. There must be some tolerance for a pest in order to sustain biological control organisms. Where viruses are not a factor or damage tolerance higher, biological control may provide several benefits, including pesticide resistance management, improved worker safety, and reduced re-entry intervals.

Management—chemical control
Natural enemies include:
- minute pirate bug, Orius insidiosus
- predatory mites, Typhlodromips (Amblyseius) swirskii; Iphoesis degenerans; Neoseiulus (Amblyseius) cucumeris; Neoseiulus barkeri
- predatory thrips, Thripobius semiluteus
- soil-dwelling predatory mite, Hypoaspis miles—Feeds on pupal stage in soil.

Greenhouse ornamentals—Predatory mites

Natural enemies include:
- minute pirate bug, Orius insidiosus
- predatory mite, Typhlodromips (Amblyseius) swirskii; Iphoesis degenerans; Neoseiulus (Amblyseius) cucumeris; Neoseiulus barkeri

Management—chemical control
When there is potential for vectoring disease and/or low tolerance for direct damage from thrips, biological control may be inappropriate as a tactic. There must be some tolerance for a pest in order to sustain biological control organisms. Where viruses are not a factor or damage tolerance higher, biological control may provide several benefits, including pesticide resistance management, improved worker safety, and reduced re-entry intervals.

Management—chemical control
Natural enemies include:
- minute pirate bug, Orius insidiosus
- predatory mites, Typhlodromips (Amblyseius) swirskii; Iphoesis degenerans; Neoseiulus (Amblyseius) cucumeris; Neoseiulus barkeri
- predatory thrips, Thripobius semiluteus
- soil-dwelling predatory mite, Hypoaspis miles—Feeds on pupal stage in soil.
azadirachtin (Azahar)—Some formulations are OMRI-listed for organic use.

Beauveria bassiana (BotaniGard, Mycotrol, Naturalis L)—Some formulations are OMRI-listed for organic use.

bifenthrin (Talstar) at 0.168 to 0.335 lb ai/1,000 sq ft. REI 12 hr. Restricted use pesticide.

canola/pyrethrins (EB Stone, Earth-tone, Worryfree)—Some formulations are OMRI-listed for organic use.

cypermethrin (Pylon) at 0.08 to 0.16 lb ai/100 gal. REI 12 hr.

cyanothricin (Mainspring) at 0.013 to 0.1 lb ai/100 gal. REI 4 hr.

cyfluthrin (Decathlon) at 1.9 oz/100 gal. REI 12 hr.

dinofuran (Safari 20SG) at 0.1 to 0.2 lb ai/1,000 sq ft; 0.05 to 0.1 lb ai/100 gal. REI 12 hr.

flonicamid (Aria) at 0.067 to 0.09 lb ai/100 gal. REI 12 hr.

flupyridafurone (Altus) at 10.5 to 14 fl oz/a. REI 4 hr.

garlic oil/powder (Allitin)—Some formulations are OMRI-listed for organic use.

GS-omega/kappa (Spear Biological Insecticide) at 0.138 to 1 lb ai/a. PHI 0 days. REI 4 hr. Do not exceed 2 lb ai/a per year.

imidacloprid (Marathon II) at 0.027 oz ai /100 gal foliar. REI 12 hr. Drench and irrigation permitted.

Isaria fumosoroseus (PFR 97) at 0.175 to 3.5 lb ai/100 gal foliar. REI 4 hr.

kaolin (Surround WP)—Some formulations are OMRI-listed for organic use.

lambda-cyhalothrin (Scimitar GC) at 0.013 to 0.043 lb ai /100 gal. REI 24 hr.

Metarhizium anisopliae strain F52 (Met52 EC)

methiocarb (Mesurol 75W) at 0.375 to 0.5 lb ai/100 gal. REI 12 hr. Restricted use pesticide.

mineral oil/petroleum distillate (Biocover LS)—Some formulations are OMRI-listed for organic use.

novaluron (Pedestal) at 0.039 to 0.052 oz ai/100 gal REI 12 hr.

oil of rosemary/peppermint (Ecotec for WA only)—Some formulations are OMRI-listed for organic use.

pyrethrins/piperonyl butoxide

pyridalyl (Overture 35) at 0.175 lb ai/100 gallonsgal. REI 12 hr.

pyriflusquinozazon (Rycar) at 0.034 to 0.045 lb ai/100 gal. REI 12 hr. Limit 2 treatments per crop.

pyriproxifen (Distance) at 0.041 to 0.054 lb ai/100 gal (6 to 8 fl oz) foliar. REI 12 hr.

s-kinoprene (Enstar AQ) at 0.012 to 0.024 lb ai/10,000 sq ft. REI 4 hr.

soybean oil (Golden Oil Spray)—Some formulations are OMRI-listed for organic use.

spinosad (Entrust) at 0.047 to 0.078 lb ai/100 gal. OMRI-listed for organic use.

spirotetramat (Kontos) at 0.027 to 0.053 lb ai /100 gal. REI 24 hr.

tau-fluvalinate (Mavrik Aquaflow) at 0.063 to 0.156 lb ai/100 gal. REI 12 hr.

tolfenpyrad (Hachi-Hachi) at 0.14 to 0.33 lb ai /100 gal. REI 12 hr.

various systemic neonicotinoids (via soil treatments)

Beauveria bassiana

Bifenthrin (Talstar S) at 0.168 to 0.335 lb ai/1,000 sq ft. REI 12 hr. Restricted use pesticide.

dinofuran (Safari 20SG) at 0.1 to 0.2 lb ai/1,000 sq ft; 0.05 to 0.1 lb ai/100 gal. REI 12 hr.

cyfluthrin/imidacloprid (Discus N/G) at 0.063 lb ai/100 gal foliar; 0.009 to 0.014 lb ai/1,000 ft soil. REI 12 hr.

imidacloprid (Marathon) at 0.027 oz ai /100 gal foliar. REI 12 hr. Drench and irrigation permitted.

Isaria fumosoroseus (PFR 97) at 4 to 8 fl oz per pot as soil treatment. REI 4 hr. Some formulations are OMRI-listed for organic use.

permethrin (Permethrin 3.2 AG)—Restricted use pesticide.

Greenhouse ornamenals—Weevil (adults)

Including

Black vine weevil (Otiorhynchus sulcatus)

Pest description and crop damage Adult weevils are black, 0.4 inch long, and appear May through July. Larvae are C-shaped, legless, and white with tan heads, up to 0.5 inch in size. Adult weevils cause a characteristic notching in the leaves of host plants. This feeding damage is relatively minor. The real damage is done by the larvae, which feed through the winter and spring on the root systems of host plants. Infested plants are stunted, grow poorly, and may die.

Biology and life history Weevils overwinter as larvae in the soil. Feeding may occur throughout mild winters. In April to June, larvae pupate, and adult emergence occurs. Adults are night feeders that remain in the soil or in debris at the base of the plant during the day, then climb up to feed on leaves. Adult weevils cannot fly, but walk or are carried from one location to another. Also, all adults are females capable of laying eggs. Adults are slow moving and should not be confused with swifter predacious ground beetles. Eggs are laid in clusters in or on the soil from June to September. The eggs hatch, and the larvae immediately wriggle through the soil to begin feeding. There is one generation per year.

Scouting and thresholds Observe leaves for first signs of notching in early summer (primroses are an inexpensive preferred host and can be used as an indicator plant for conifer field production. Confirm presence of adults by night inspection of foliage on warm, still evenings. Or, look for adults by day in debris at the base of the plant. Laying a small piece of cardboard at the base of the plant provides a refuge that you can check easily in the early morning. Commercial root weevil traps are available.

Management—biological control (larvae)

Natural enemies include:

carabid (ground) beetles several species

pathogenic nematodes (Heterorhabditis heliothidis, H. medidis, Steinernema carpocapsae, S. feltiae, S. kraussei, S. riobravis)—Adequate soil moisture and temperature are necessary for success.

Management—chemical control

acephate (Orthene TR, Precise) at 0.024 lb ai/1,000 sq ft broadcast (0.6 oz). REI 24 hr.

acetamiprid (Tristar 30SG) at 0.81 to 1.59 oz ai/100 gal. REI 12 hr.

azadirachtin (Azahar, Azatin XL)—Some formulations are OMRI-listed for organic use.

Beauveria bassiana (BotaniGard, Mycotrol, Naturalis L)—Some formulations are OMRI-listed for organic use.

bifenthrin (Talstar) at 0.168 to 0.335 lb ai/1,000 sq ft. REI 12 hr. Restricted use pesticide.

dinofuran (Safari 20SG) at 0.1 to 0.2 lb ai/1,000 sq ft; 0.05 to 0.1 lb ai/100 gal. REI 12 hr.

cyfluthrin/imidacloprid (Discus N/G) at 0.063 lb ai/100 gal foliar; 0.009 to 0.014 lb ai/1,000 ft soil. REI 12 hr.

imidacloprid (Marathon) at 0.027 oz ai /100 gal foliar. REI 12 hr. Drench and irrigation permitted.

Isaria fumosoroseus (PFR 97) at 4 to 8 fl oz per pot as soil treatment. REI 4 hr. Some formulations are OMRI-listed for organic use.

permethrin (Permethrin 3.2 AG)—Restricted use pesticide.
Greenhouse ornamentals—Whitefly

Greenhouse whitefly (Trialeurodes vaporarium)
Silverleaf whitefly (Bemisia argentifolia)
Sweet potato whitefly (Bemisia tabaci)

**Pest description and crop damage**
Whitefly outbreaks are often associated with warm temperatures and susceptible plant material. The small football-shaped eggs are laid on the leaf underside with white wax deposits. Small, clear-to-beige, flat scales are evidence of immature whiteflies. The adult whitefly are tiny yellow-bodied insects with white wings that fly when disturbed.

**Biology and life history**
The eggs are generally laid in clusters on the underside of leaves. The eggs hatch in about 9-12 days (70°F), and move to feeding sites, where they remain throughout the rest of the juvenile stages. The nymphs go through several instars or molts, than a final pupal stage from which the adult emerges. Egg to adult development takes about 32-39 days.

**Scouting and thresholds**
Scout for whiteflies on incoming transplants. Look for the adults on leaf undersides and yellow sticky cards. The eggs can be seen near white wax deposits with a hand lens.

**Management—biological control**
Natural enemies include:
- lady beetle (Delphastus pusillus)
- parasitic wasp (Encarsia formosa; Eretmocerus mundus)—Encarsia has been very successful in some greenhouses.
- pathogenic fungi (Beauveria bassiana; Paecilomyces fumosoroseus)

**Management—chemical control**
Direct control efforts at larvae feeding on leaf surfaces.
- abamectin (Avid 0.15) at 0.009 lb ai/100 gal (8 fl oz). REI 12 hr. Suppression.
- acephate (Precise, Orthene TR) at 0.024 lb ai/1,000 sq ft broadcast (0.6 oz). REI 24 hr.
- acephate/fenpropathrin (Valent Tame/Orthene)
- acetamiprid (Tristar 30SG) at 0.5 to 0.1 lb ai/100 gal (2.7 to 5.3 oz). REI 12 hr.
- azadirachtin (Azahar, Azatin XL)—Some formulations are OMRI-listed for organic use.
- Beauveria bassiana (Botanigard, Mycotrol, Naturalis L)—Some formulations are OMRI-listed for organic use.
- bifenthrin (Talstar) at 0.168 to 0.335 lb ai/1,000 sq ft. REI 12 hr. Restricted use pesticide.
- buprofezin (Talus 70DF) at 0.38 lb ai/a. REI 12 hr.
- canola oil/pyrethrins (E.B. Stone, Earth-tone, Worryfree)—Some formulations are OMRI-listed for organic use.
- chlorpyrifos (Quali-Pro Chlorpyrifos) at 0.25 to 0.5 lb ai/100 gal. REI 24 hr. Restricted use pesticide.
- clarified hydrophobic extract of neem oil (Triact50)—Some formulations are OMRI-listed for organic use.
- clothianidin (Arena 0.25G) at 0.45 to 0.63 oz ai/100 gal. REI 12 hr. Soil treatment refer label.
- cytantraniliprole (Mainspring) at 0.013 to 0.1 lb ai/100 gal foliar or 0.16 lb ai/100 gal drench. REI 4 hr.
- cyfluthrin (Decathlon) at 1.9 oz/100 gal. REI 12 hr.
- cyfluthrin/imidacloprid (Discus N/G) at 0.063 lb ai/100 gal foliar; 0.009 to 0.014 lb ai/1,000 ft soil. REI 12 hr.
- diflubenzuron (Adept) at 0.5 oz ai/100 gal.
- dinotefuran (Safari 20SG) at 0.1 to 0.2 lb ai/1,000 ft sq; 0.05 to 0.1 lb ai/100 gal. REI 12 hr.
- fenazaquin (Magus Miticide) at 0.15 to 0.3 lb ai/a. REI 12 hr.
- fenpropathrin (Akari 5SC) at 0.079 lb ai/100 gal. REI 12 hr.
- flocianid (Aria) at 0.09 to 0.13 lb ai/100 gal. REI 12 hr.
- flupyradifurone (Altus) at 10.5 to 14 fl oz/a. REI 4 hr.
- garlic oil/powder (Allitin)—Some formulations are OMRI-listed for organic use.
- imidacloprid (Marathon II) at 0.027 oz ai/100 gal foliar. REI 12 hr. Drench and irrigation permitted.
- Isaria fumosoroseus (PFR 97) at 0.175 to 3.5 lb ai/100 gal foliar. REI 4 hr. Some formulations are OMRI-listed for organic use.
- lambda-cyhalothrin (Scimitar GC) at 0.023 to 0.043 lb ai/100 gal. REI 24 hr.
- Metarhizium anisopliae strain F52 (Met52 EC)
- naled (Dibrom 8) as vapor treatment
- novaluron (Pedestal) at 0.039 to 0.052 oz ai/100 gal. REI 12 hr.
- oil of rosemary/peppermint (Ecotec for WA only)—Some formulations are OMRI-listed for organic use.
- potassium laurate (several labels)—Some formulations are OMRI-listed for organic use.
- pymetrozine (Endeavor) at 1.25 to 2.5 oz ai/100 gal. REI 12 hr.
- pyrethrum/piperonyl butoxide
- pyridaben (Sanmite) at 4 to 6 oz/100 gal. REI 12 hr.
- pyrifluquinazon (Rycar) at 0.023 to 0.045 lb ai/100 gal. REI 12 hr. Limit 2 treatments per crop.
- pyriproxyfen (Distance) at 0.041 to 0.054 lb ai/100 gal (6 to 8 fl oz) foliar. REI 12 hr.
- s-kinoprene (Enstar AQ) at 0.012 to 0.024 lb ai/10,000 sq ft. REI 4 hr.
- spromesifen (Judo) at 1 to 4 fl oz/100 gal. REI 12 hr.
- tau-fluvalinate (Mavrik Aquaflow) at 0.063 to 0.156 lb ai/100 gal. REI 12 hr.
- thiamethoxam (Flagship 25WG) as fogger. REI 12 or 24 hr.
- tolfenpyrad (Hachi-Hachi) at 0.14 to 0.33 lb ai/100 gal. REI 12 hr.
Landscape
Michael R. Bush and Sharon J. Collman
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INCLUDES MANAGEMENT OPTIONS FOR COMMERCIAL AND HOME USE

In all cases, follow the instructions on the pesticide label. The PNW Insect Management Handbook has no legal status, whereas the pesticide label is a legal document. Read the product label before making any pesticide applications.

Not all users of the PNW Insect Management Handbook are from the states of Washington, Oregon or Idaho. Every effort has been made to ensure that the active ingredients listed here are currently registered for the host/pest in these three states. While many pesticides are registered in all states, check the resources in your own state to ensure the product is registered and legal for the same uses there.

The pesticides are arranged alphabetically by common name of the ingredient and are not listed in order of preference or superiority of pest control. These products are registered to control pests found in ornamentals and home landscapes. However, not all products are registered for all the plants that these pests attack; some products may be phytotoxic to certain plants. Check the label to be certain the product you select is registered for the plant and pest that you plan to treat.

Protect Pollinators:
See: How to Reduce Bee Poisoning from Pesticides in this handbook or at https://catalog.extension.oregonstate.edu/sites/catalog.extension.oregonstate.edu/files/project/pdf/pnw591.pdf
See: Neonicotinoid Pesticides and Honey Bees
http://cru.cahe.wsu.edu/CEPublications/FS122E/FS122E.pdf

Many insecticides are highly toxic to honey bees, bumble bees and other insect pollinators. Some should not be applied any time during bloom, while many others should be applied only in the early morning hours and/or late in the evening. Avoid spraying insecticides on plants surrounded by blooming flowers or weeds. Always take simple steps like removing (mowing) blooming clover from lawns adjacent to garden areas before applying materials that are hazardous to bees. In all cases, when given the choice, select the least hazardous material when plants in the infested vicinity are in bloom. Avoid using dusts wherever possible as dusts will adhere to the bee hairs (like pollen), so liquid spray formulations are preferred for bee safety. Some pesticides have seemed safe for bees, but new research is looking at sub-lethal effects on pollinators such as failure to produce new queens.

In Washington, it is illegal for homeowners to spray plants (or pests) at heights greater than ten feet. Applications at these heights greatly increase the risk of pesticides drifting into non-target areas such as streams or neighboring yards. Where a pest is located at greater heights, a professional pesticide applicator should be called, or a non-pesticide option should be chosen. Check local regulations in your state. For more detailed information on toxicity of pesticides to humans or animals, environmental fate, breakdown products and half-life and other information, consult the Characteristics of Insecticides section in this handbook or the National Pesticide Information Center at http://npic.orst.edu/.

Resources
Books


Websites


National Pesticide Information Center (NPIC) has both a website and people trained to answer specific questions about pesticides. Information is available in several languages. See http://npic.orst.edu/ or call 1-800-858-7378.

Pesticide Information Center Online (PICOL) is a database for searching currently registered products in Washington and Oregon. http://cru66.cahe.wsu.edu/LabelTolerance.html

PNW Insect Management Handbook online This publication is also available on line at http://pnwhandbooks.org/insect. The website includes pictures of most pests. (See also: PNW Disease Management Handbook online. http://pnwhandbooks.org/plantdisease).

The PNW Nursery IPM website includes many landscape plants. The site includes insects, diseases, weeds, slugs, and other pests with photographs and references. http://oregonstate.edu/dept/nurspest/
Common Landscape Pests

A list of the arthropod pests and pesticides for each landscape plant would be lengthy and repetitive. To conserve space, we have generated a list of common pests that can plague a range of ornamental plants, shrubs, and trees (both deciduous and coniferous) in PNW landscapes. Since this is a subset of plants found in home landscapes, the homeowner and applicator must refer to the pesticide label to determine whether any pesticide product can be legally and safely applied to specific plants in their home landscape.

Landscape pests—Aphid

Order Hemiptera; Family Aphididae

Pest description and damage Several species of aphids may feed on the foliage stem, flower, bud, bark or root tissues of conifer and deciduous trees, shrubs as well as other plants in landscapes. Aphids tend to be small (0.0625 to 0.125 inch long), oval to pear-shaped, soft-bodied insects with piercing–sucking mouthparts. Color varies (black, green, pink, yellow, mottled, striped, etc.), but most aphids tend to match host plant coloration. Aphids tend to feed in colonies and are often found on the new or most succulent plant tissues. Feeding damage to shrubs, trees and mature plants is usually minor, but can compromise the vigor of the host. When aphid populations are high, leaf and shoot distortion can occur. Aphids produce honeydew, a sweet, sticky secretion that collects on underlying plant tissues and encourages growth of a black sooty mold. In addition to cosmetics, honeydew may become a sticky nuisance when it falls on decks, cars, or other landscape surfaces. Some aphids are vectors of plant diseases, particularly viruses.

Biology and life history Most aphid species have similar complicated life cycles. They tend to overwinter in the egg stage on perennial host plants and the eggs hatch early in the spring. Newly-hatched aphids are found around and on the emerging leaf and flower tissues. Later in the spring, they are found as aphid colonies on the underside of leaves or near flower and fruit clusters. During the growing season, some aphids give birth to live offspring without mating, undergo multiple generations, and can build up high densities quickly. There may be as few as two generations or as many as 16 generations each year, depending on the species and climate. Some aphids are host plant specific, while others live on a wide variety of plants and weeds, and still others switch to different hosts. Aphids produce winged females and males. The winged aphids disperse to the winter hosts, mate and produce eggs that survive the winter on trees, shrubs or weeds.

Pest monitoring Use yellow sticky traps, or other devices to detect aphids when they fly in from weedy or alternate hosts. Aphids tend to coincide with new growth flushes that may occur after a rain event or irrigation. Begin observing shoots for aphids prior to bud break or new growth flushes, as management is best done early while the aphids are less abundant. A dark plate or upside-down cup placed under the branches will show spatters of honeydew indicating the first activity and severity of the infestation. Also, check the upper surfaces of the lower leaves for honeydew. Check host plant for presence of natural enemies as well.

Management—cultural control

Wash aphids from plants with a strong stream of water or by hand-wiping. Aphid populations tend to be higher in plants that are fertilized liberally with nitrogen and heavily watered, as these practices produce flushes of succulent growth. Avoid excessive watering and use slow-release or organic sources of nitrogen.

Management—biological control

Aphids have many natural enemies, including lady beetles, syrphid fly larvae, green lacewings and parasitoid wasps. Check host plant closely for evidence of predators and avoid broad-spectrum insecticide applications that would disrupt these natural enemy populations. Braconid wasps are especially important parasitoids. Look for large swollen, hardened aphid “mummies” indicative of an aphid inhabited by a braconid larva. These pupate within the host and cut a semicircular “door” in the host’s abdomen, through which the adult wasps exit the host. If the mummies are intact (without circular parasite exit holes), then cut the leaf pieces and move the mummies to areas where aphids are still a problem. The parasitoid wasp is a tiny black gnat-sized insect and may be seen searching leaves for aphids to parasitize. Control ants, which “farm” aphids to harvest honeydew and protect aphids from natural enemies.

Management—chemical control:

See Table 1 in:
Chemical Control of Landscape Pests

For more information


Landscape pests—Bark beetle

Includes elm bark beetle (Scolytus scolytus), shothole borer (Scolytus rugulosus), Ips spp., Dendroctonus spp.

Pest description and damage Bark beetles are small cylindrical beetles that attack and bore into weakened branches of landscape trees and shrubs. They are pests of forest trees, ornamental shade and fruit trees, and shrubs. These beetles are primarily a problem on injured or stressed plants, but healthy plants growing adjacent to infested plants may be attacked. Adult bark beetles are brownish-black and measure from 0.2 to 0.25 inch long. Mature larvae are white, legless, 0.125 to 0.25 inch long and may be found tunneling and feeding within the inner bark of trees. Larvae and adults of these species bore into the cambial and vascular tissues of trees, weakening them and causing wilting and dieback of individual stems and branches. Trunks and branches can be completely riddled with galleries. In worst cases, bark beetles can transmit diseases that then colonize and kill the host tree while the beetle feeds on the fungus.

Biology and life history Most bark beetles overwinter as mature larvae, pupae or as adults in wood galleries or ‘engravings’ beneath the bark of infested trees. In response to warming spring temperatures, bark beetles emerge as adults, fly to susceptible hosts, and bore into buds, twigs and trunks of host trees. After mating, female bark beetles lay small, oval whitish eggs along freshly made
tunnels beneath the outer bark. As the eggs hatch, the larvae mine galleries that branch out from the egg-laying tunnel. These galleries are filled with frass and increase in diameter as the larva grow. When mature, the larvae will pupate in the galleries. The adult beetles will tunnel their way out leaving circular holes in the bark, giving an infested branch or trunk a shothole appearance as multiple beetles exit from the host. Most bark beetles have two generations per season, but a few complete only one generation each year.

**Pest monitoring** Examine branches in late spring for holes that are 0.08 inch in diameter, oozing sap, and sawdust. In stone fruits, these holes often are sealed with gummy ooze accompanied by a sawdust-like frass created by the larva. Beetles are particularly attracted to unhealthy trees. Check for a small hole at the node or base of a bud or bud scar on sickly branches. Bark beetles can be monitored by hanging pheromone traps. However there also is some potential to draw adult bark beetles into an area with the pheromone traps, so they should be placed away from the potential hosts.

**Management—cultural control**
The best management tool is to keep trees healthy with proper pruning, adequate water, and fertilizer. Healthy trees repel the beetles by plugging bore holes with sap and resin. Remove and destroy any infested wood on the tree or piles of infested green wood nearby, especially cherry wood. Once the bark dries and sloughs off, cut wood is no longer a host for the beetles.

**Management—biological control**
There are a number or parasitoid wasps, predatory beetles and other insects that prey on bark beetles. Birds such as woodpeckers and small birds move up and down the bark to feed on arriving or emerging beetles.

**Management—chemical control**

**See Table 4 in:**
Chemical Control of Landscape Pests

For more information


**Landscape pests—Cricket and katydid**

**Includes**

True cricket (Gryllidae)

Katydid (Tettigoniidae) including Mormon cricket (Anabrus simplex, a shield-backed katydid)

**Pest description and damage** Most crickets, Mormon crickets and katydids have a leathery pair of front wings and membranous pair of hind wings; females have a sword-like ovipositor. Camel crickets are wingless and, in some cases, have caused damage to seedlings. The true crickets have a more flattened back than grasshoppers or katydids. Males stridulate using various structures, e.g., crickets rub their forewings together and lift their wings to amplify the sound. Crickets are omnivorous scavengers and will eat seeds, organic detritus or dead insects including their own kind. They are rarely a problem in landscapes other than providing a pleasant nocturnal sound. Rarely in the northwest, more commonly in east coast states, crickets may enter houses and feed on clothing or other materials. Mormon crickets are technically katydids. Their colors are variable, and their wings reduced so they are flightless. Their populations occasionally become epidemic. They migrate by crawling and can move more than one mile per day. Crossing roads, their crushed bodies form slick masses that become a safety hazard for motorists. Katydids, or long-horn grasshoppers, are generally green with oval, leathery wings. Their body is flattened from side to side and the wings are leaf-shaped, even bearing veins, fungal leaf spots and holes similar to damaged leaves. They feed on tender leaves of deciduous plants (especially oaks), and occasionally on other insects.

PNW Insect Management Handbook
Biology and life history The true crickets lay their eggs by pushing their ovipositor into the soil and inserting the eggs. The overwintering eggs hatch in spring. The young look like mini-adults. Older instars develop visible wing buds. Some species of crickets can lay eggs almost continuously through the summer. Katydids lay their flat eggs overlapping like shingles on the bark of twigs in autumn.

Pest monitoring This group is mostly nocturnal; small numbers rarely warrant control measures. Most people may find the cricket sounds to be enjoyable. It is difficult to locate crickets or katydids by sound.

Management—cultural control Usually none needed.

Management—biological control Grasshoppers, crickets and katydids are eaten by many animals, birds, and insectivores. There are commercially packaged micro-organisms for bio-control of these insects.

Management—chemical control Not recommended for home landscapes

Landscape pests—Cutworm, fruitworm and armyworm Order Lepidoptera: Family Noctuidae

Pest description and damage The variegated cutworm is commonly found in gardens. The larvae are black with brown and white markings. A new invading species is the large yellow underwing moth, Noctua pronuba, with a black stripe along the rear edge of the hind wing. Damage includes above-ground feeding on leaves and cutting plants off at the soil line. Cutworm larvae are nocturnal, and their damage easily might be attributed to slugs, but cutworms make clean cuts, while slugs rasp from the side of the plant leaving a ragged damage. Cutworms leave pellet-shaped droppings, while slug excreta are deposited as an S-shaped sludge wrapped in slime.

Biology and life cycle Cutworms may be found at various times of year. In the Puget Sound region, small cutworms are consistently found feeding at night in mid-December and January. Larvae, or the shiny red-brown, bullet-shaped pupa case, also may be unearthed while weeding in spring and early summer. Eggs are laid in patches on plants or nearby grasses.

Pest monitoring Watch plants for fecal pellets on leaves by day or search plants for larvae at night in mid-winter in milder climates.

Management—biological control Several predators including ground beetles feed on cutworms and it is likely parasitoids also feed on them. Encourage natural enemies of cutworms like birds, ground beetles, and spiders. Ground scratching birds may also play a role in keeping numbers low.

Management—cultural control Control weeds, grasses, and debris in the vegetable garden that provide cover. Using a flashlight at night, remove cutworm larvae by hand picking. Scratch the soil at the base of plants to find larvae in the daytime.

Management—chemical control:

See Table 2 in: Chemical Control of Landscape Pests

For more information
Peterson, Merrill. 2012. PNW Moths (http://pnwmoths.biol.wwu.edu/browse/)

Landscape pests—Earwig Primarily European earwig (Forficula auricularia)

Pest description and damage This introduced, nocturnal insect can devastate seedlings, flowers, leaves and fruit. Easily recognized by the hind pinchers, called cerci, they are reviled by gardeners. However, earwigs also can be beneficial by feeding on aphids and other small insects. They also scavenge dead bugs and plant debris, or feed on live plant tissue. Earwigs chew irregular, variable-sized holes in leaves. Earwigs are often worse in dry eastern climates or in dry years.

Biology and life cycle Females carefully tend clusters of up to 30 eggs, in small nests under rocks in the soil in winter. They clean fungi from the eggs and guard and protect eggs and young. In spring, the earwig “family” moves out to gardens to feed together; as the young mature, they tend go their separate ways. There is one generation a year. Earwigs are nocturnal and seek moist, dark places, under stones, debris and even flowers and damaged fruit.

Pest monitoring Search with flashlight at night. Earwigs are omnivorous and easily attracted to fish oils and cat food in traps. Vigorously shake flowers over a box lid to knock earwigs off plants.

Management—cultural control Remove debris and hiding places in gardens. Commercial earwig traps are available.

Management—biological control Frogs, toads, predator beetles and duff-scratching birds are listed among predators. Fungi may attack eggs in winter nests.

Management—chemical control:

See Table 2 in: Chemical Control of Landscape Pests

For more information

Landscape pests—Eriophyid mite

Includes rust mites and gall mites (Family: Eriophyidae)

Pest description and damage The tiny body of the eriophyid mite is translucent and elongated, with numerous narrow rings; they have four legs at the head end. Different species are fairly host specific, but as a group they attack a wide array of plants. They attack stems, flowers, buds, leaves and needles, or they feed within needle sheaths. They look like little slivers and are best viewed with a 20x hand lens or scope. Damage varies with the host and includes leafy and woody galls of various shapes and sizes, stunting, erineum (felt-like patches), blister, leaf curl, rusts, silvering, russetting of fruit, witch’s brooms, twisting and chlorosis of needles, big buds on some hosts, stunting and deformities of seedlings and transmission of plant viruses. There are also several other less common eriophyid mites that damage plants. See specific hosts for more descriptive information. Despite these symptoms, mite numbers often drop substantially without human intervention. When mite populations are high, the plant creates an abscission layer and drops infested leaves. The mites perish as the leafy tissue dries out.
Biology and life history  These mites are unusual: they are cigar-shaped tapering to the hind end, with only four legs at the front end. The fertilized females overwinter and emerge as the buds expand in spring. There are only two nymphal instars, the second instar molts into an adult after a brief resting period. The eriophyds reproduce almost continuously through the season. They can complete their life cycle in as little as ten days or every two to three weeks. Mites living on leaves, flowers and fruit must migrate back onto the plant before the plant parts are shed. At that time, they are more exposed and vulnerable to weather and natural enemies. The mites spend winter in permanent tissues on the plant such as needle sheaths, or cracks and crevices on bark or buds and other protected sites.

Pest monitoring  Start by looking for silver or bronzed leaves, galls, or other symptoms. Then examine the symptoms for signs of eriophyid mites. Because eriophyid mites are so small, it takes close examination to uncover them in needle sheaths, or beneath bud scales, among the erineum, or within galls. Sometimes mites can be dislodged by striking a branch over a dark paper. At other times, it takes perseverance and a good scope to finally locate mites in galls or affected plants. Wrap double-stick tape around twigs where mites are suspected, and where they can be easily inspected for trapped mites.

Management—cultural control
♦ When eriophyid mites move between sites (galls, buds, needles, etc.) they are more vulnerable to weather factors such as very high or low temperatures, wind, rain, irrigation, ultra violet, etc.
♦ Tolerate symptoms; generally, they are not a significant problem for the plant.

Management—mechanical control
♦ Prune out the worst branches if it doesn’t affect the shape of the plant.
♦ Pick off leaves when the symptoms are objectionable.

Management—biological control
♦ During migration, the eriophyid mites are more exposed and vulnerable to natural controls such as predatory mites, mite destroyer ladybugs, cecidomyids, and other predators.
♦ Avoid using pesticides that kill predatory mites and other natural enemies.
♦ Tolerance: eriophyid mite populations often collapse on their own due to natural enemies and possibly plant defense mechanisms (extra hairs on leaves or buds, thicker plant cell walls, or plant chemicals).

Management—chemical control
See Table 3 in:  Chemical Control of Landscape Pests

For more information

Landscape pests—Gallmakers
Includes aphids, adelgids, eriophyid mites, flies, gall wasps, midges, psyllids and sawflies

Pest description and damage  Plant galls are formed in response to an interaction with insects, mites, (or nematodes, viruses or fungi) and the plant tissues. Egg-laying, salivary secretions or mechanical injury initiate production of localized plant hormones which cause accelerated growth (larger plant cells or increased number of cells) of the growing tissue. The plant tissue grows around the insect or mite protecting it from weather and natural enemies. Galls can form in the developing tissues of any plant structure such as leaf, buds, stems, flowers, shoots or roots. Generally, damage is not significant to the plant, but may be considered unsightly by homeowners, or may be excessive in some years. Occasionally, infestations flare up to significant numbers and the plant will form abscission cells which cause infested leaves to drop from the host along with the insects or mites inside. Insect galls rarely kill plants and they are heavily parasitized in most years. Low numbers are not harmful to trees.

Several orders of insects have adopted this life style: methods of control will vary with the general group of insects.
♦ Eriophyid mites such as maple bladder gall mite or linden nipple gall.
♦ Psyllids or jumping plant lice which cause tip leaves to curl over the psyllid on boxwood.
♦ Aphids that form the petiole galls on cottonwood or the reddish galls on kinnikinnik.
♦ Adelgids such as the Cooley spruce gall adelgid which forms cone galls on spruce (but not on the alternate host of Douglas-fir).
♦ Flies and midges such as honeylocust pod gall midge, beaked willow gall and willow pine cone gall.
♦ Gall wasps, tiny members of the order Hymenoptera (not stinging wasps) that form oak apple galls, thimbleberry galls or other galls.
♦ Sawflies (Hymenoptera) commonly forming willow pea galls and willow bean galls.

Biology and Life History  Biology is variable depending on the insect or mite initiating the gall by ovipositing, feeding, or other means. Generally, there are two kinds of galls: closed and open. Closed galls form around and enclose the eggs or developing chewing insects such as tiny flies of the willow pine cone gall, pea gall, or honeylocust pod gall midge or rose galls. The insects must chew their way out of the closed gall. Open galls are formed by the salivary juices of sucking insects or mites. These galls have small openings that allow the mites or insects to move in and out of the galls, or the gall crack open on drying and free the insects inside. Removing green galls before adults emerge may break the life cycle. A few of these galls (removed before the insects have emerged) can be placed in baggies and tacked to a shaded wall under approximate natural conditions. When the first adults (and/or parasitoids) emerge, it’s time to initiate controls if it appears the tiny adults are abundant. In some cases, the emerging insects may be parasitoids, so it may be wise to get them identified.

Pest monitoring  Some species with the habit of causing significant damage to hosts, such as the honeylocust pod gall midge, can only be controlled when control measures target the adult stage. Thus, monitoring adult insect flight activity with sticky traps and repeated inspection is recommended. Degree-day or phenology models to predict adult flight can be found for some gall insect species.

Management—cultural control
Most galls can be viewed as an interesting partnership between plant and gall maker. Rarely are they numerous enough to warrant control. Most homeowners find they can tolerate gall insects once they know the plant is not going to die. Prune out or remove galls on infested twigs, buds or leaves if they are found to be objectionable.

Management—biological control
Many gall insects are heavily parasitized once they become numerous enough for parasitoids to locate them. Pick galls and place in a sealed plastic bag with a bit of tissue to absorb moisture and wait for emergence of gall maker and parasitoids to determine the level of parasitoid activity.
Management—chemical control

See Table 3 in:
Chemical Control of Landscape Pests

For more information


Landscape pests—Grasshopper

Includes Many species in the family Acrididae

Pest description and damage Grasshoppers or short-horned grasshoppers are related to crickets and katydids. They feed on plants with their chewing mouthparts. They are most abundant in hot dry climates east of the Cascade Range but do occur on the west side as well. The immature grasshoppers look like small adults but without wings. Later instars have rudimentary wing buds that become fully functioning wings in the final molt to adult. The forewings are leathery and meet in a straight line down the back. They are used in a gliding flight. The membranous hindwings are for gliding and flying. The hind wings may be clear or have red, yellow or black bands. Body markings and colors may be brown or green, or have ornate patterns of bright colors that vary with the species. Many species make a clicking sound with their wings as they fly. In some areas, especially east of the Cascades, grasshopper numbers can increase to epidemic proportions and when preferred foods are exhausted, grasshoppers move to landscapes to feed. Some species can change to a migratory phase and fly long distances to new feeding areas.

Biology and life history Grasshopper life cycles vary with the species involved. Eggs are deposited when the female pushes her ovipositor into the sand or soil in the autumn. The eggs overwinter in the soil and begin hatching in the spring. There is one generation per year. Spring temperature, excessive moisture, natural enemies and other factors naturally reduce grasshopper numbers.

Pest monitoring Scouting for grasshoppers is based on the number of grasshoppers present in the previous fall, the number that successfully hatch, weather, temperature and presence of natural enemies. In dryland areas, assessments are conducted by range managers and government agencies responsible for specific jurisdictions (i.e. BLM, State Departments of Agriculture, USDA-APHIS and PPQ). Landscape professionals in areas of traditionally high grasshopper infestations should consult with these agencies or land grant university Extension offices in the area for forecasts on grasshopper populations.

Management—cultural control

Often the sources of grasshopper infestation occur in ditches, surrounding grasslands, pastures and rangeland where soil cultivation prior to grasshopper egg hatch can greatly reduce population outbreaks, but if the commercial producer or homeowner does not own these adjacent areas, this control strategy is not possible. Physical barriers (netting, floating row covers and other crop protective covers) can provide some protection from grasshoppers. In home landscapes, adults can be netted or squashed when encountered. Placing trap crops in the home landscape can serve as a barrier to trap and intercept localized grasshopper infestations.

Management—biological control

Natural biological controls of grasshoppers include sage grouse and other wild birds, insectivorous mammals, and protozoans such as Nosema locustae. The larvae of blister beetles prey on grasshopper eggs. Some studies have shown that guinea hens, geese, duck, and turkeys have reduced grasshopper populations in home landscapes, but they can also can damage desirable plants.

Management—chemical control

See Table 2 in:
Chemical Control of Landscape Pests

For more information


Landscape pests—Leafhopper

Family Chrysomelidae includes many species of leaf beetle on many hosts

Pest description and damage This family of beetles includes many small, often brightly colored and damaging beetles that feed on many plants. The eggs hatch into dark alligator-like larvae with tapered bodies. The young larvae scrape the tissue from the leaves until only the veins (or skeleton of the leaf) remain. When abundant, some species can skeletonize all the leaves on large trees. At other times, they may only cause minor damage. Adults chew holes in leaves while larvae skeletonize leaves.

Biological life history Biology varies with the many species of leaf beetle in the PNW. Adults usually emerge from hibernation in spring, mate and lay clusters of colored eggs on leaves. Larvae feed through the spring or summer. The number of generations per season depends on the species of beetle. Larvae often puate on the host or may drop to the ground to puate.

Pest monitoring Watch for beetles or holes to appear in leaves, when adults emerge from hibernation in spring. Sticky traps may be helpful.

Management—cultural control

Select less favored species or cultivars. In some cases, a handheld vacuum may be helpful to remove adults or pupae on the ground.

Management—biological control

For established or native pests, natural enemies such as parasitoids or predators may have some effect. Pheromones or traps may be available for some pests. Review more detailed biology for specific pests to determine if biological organisms (insect, fungi, nematodes) are available.

Management—chemical control

See Table 2 in:
Chemical Control of Landscape Pests

Landscape pests—Leafhopper

Includes Cicadomorpha spp.

Pest description and damage Several species of leafhopper may attack ornamental plants. Leafhoppers are slender, delicate sucking insects about 0.125 inch or less in length. They are distinguished by the adult hopping or flying to escape danger, and by the ability of nymphs and adults to run forwards, backwards, or sideways easily. Leafhopper feeding damage to leaves includes small white to yellow stippled, yellowing, or leaf curling. Some leafhoppers transmit virus diseases. Sometimes the tips of host plant leaves
die and turn brown. Leafhoppers often exude copious amounts of honeydew. Commonly attacked ornamental plants include aster, calendula, gladiolus, dahlia, hollyhock, marigold, rhododendron, rose, and zinnia. Small amounts of stippling are not injurious to the plants.

**Biology and life history**  Varies with the species. Leafhoppers may overwinter as adults, nymphs, or eggs. There may be two or three generations per year.

**Pest monitoring**  Yellow sticky cards or double-sided tape wrapped around small branches or twigs can be used to monitor for leafhoppers.

**Management—cultural control**
Row cover fabric in early summer can be used to exclude leafhoppers from small shrubs. Yellow sticky traps are attractive to, and entangle, leafhoppers and other insect pests.

**Management—biological control**
Leafhoppers have many natural enemies, including lady beetles, lacewings, damsel bugs, and spiders. They are also subject to diseases and parasites that keep their numbers low under most circumstances.

**Management—chemical control**
See Table 1 in:
Chemical Control of Landscape Pests

**For More Information**

**Landscape pests—Leafminer**
Insects from several orders including Coleoptera, Lepidoptera, Diptera and Hymenoptera

**Pest description and damage**  Leafminer larvae feed between the upper and lower surfaces of leaves, or under the epidermis of stems or leaf petioles. Mines may appear as surface blotches, or serpentine (winding) trails. Some leafminers are solitary, others feed gregariously, and the mines may coalesce to form one large mine. For some species, the insect first mines a needle or leaf, but then shifts to tunneling down the petiole, under bark and then enter bud or stem tissues. Larval identification is based on host, type of mine, and the pattern of the frass within the mine. To get a positive identification, it may be necessary to rear some to the adult stage and send them to a taxonomist specializing in that order or group. The damage that the leafminers do is variable and ranges from minor cosmetic damage to total defoliation. There are several orders of insects that have developed the leaf mining lifestyle; control products may vary with the order of insects causing the mines. See specific host-leafminers in the Landscape pests section.

- Beetle and weevil larvae include some flat-headed borers, weevils and leaf beetles.
- Fly larvae are generally maggot-shaped without a head capsule. Examples include cumbline leafminer, holly leafminer and boxwood leafminer.
- Moth larvae have a distinctive head capsule are commonly found on madrona, including the serpentine and madrona blotch miner, as well as laburnum leaf miner, and tentiform leafminers.
- Sawfly larvae include the elm leaf miner, birch leafminer and alder leafminer.

**Biology and life history**  Mines are often scattered and the leafminers controlled by parasitoids, so leafminers are usually inconsequential to plant health. Occasionally plants become heavily infested, but the plants generally recover. Other leaf miners have two to five generations in a year. Most adults emerge from soil and lay eggs in spring, although some may winter over as larvae in the mine.

**Pest monitoring**  Watch for the adults or the occurrence of the first mines early in the spring as the leaves unfold. This is most critical for leafminers with multiple generations. If early leaf mining activity is minimal, no action need be taken, but the plants should be inspected when the next generation is due again. Pheromone traps have been developed for some leafminers and will help determine if a pesticide will be needed. In the case of the elm leafminer, there is a degree day model for predicting egg-laying by adult sawflies.

**Management—cultural control**
Low numbers of leafminers provide food for the parasitoids that, in turn, keep number of mines low. Handpick and remove mined leaves or squish larvae within mines. Select cultivars that are less susceptible to leafminers. There is evidence that leafminers thrive when plants are stressed, so ensure that landscape plants are planted in the right place and receive water adequate for their needs.

**Management—biological control**
Many of the leafminers, even those that occasionally build to large populations, have natural enemies, such as parasitoids, that attack them. Often, about the time damage is intolerable, parasitoids readily find prey in which to lay eggs and by the next generation the leafminer population collapses. Healthy plants can recover from heavy defoliation. A plant under heavy attack will “dump” its leaves by forming a premature abscission layer dropping the leaf from the plant. The leafminer will perish unless it is already nearing pupation. Parasitoids sometimes can be seen in or on the leaf mining larvae.

**Management—chemical control**
See Table 3 in:
Chemical Control of Landscape Pests

**For more information**


**Landscape pests—Leafroller and leaftier**
Numerous species

**Pest description and damage**  There are many species of moth larvae, including leafrollers and leaftiers, that roll, tie or fold together leaves of ornamental trees, shrubs and other perennials. Leafrollers, when found on native species such as willow, cottonwood, poplar and alder, rarely warrant control since damage is usually cosmetic and short-lived. The leafrolling pests can be divided into single-generation moths, such as the fruit tree leafroller and the European leafroller, and two-generation moths, such as the oblique-halled leafroller and three lined leafroller. The larvae are mostly green or brown caterpillars with a light brown to black head. Adults have distinctive bands or motting on the wings but are not commonly seen. Some are noted for their violent backward wriggling – a means of escape. Newly hatched larvae also may work into blossoms and damage developing fruit, which then abort and fall off the plant. The larvae web the leaves and flowers together beginning in late April, and then feed on the developing fruit or flowers. Feeding on the
growing points of young plants can promote undesirable branching. Larvae also feed on the surface of ornamental fruit or berries. Leaffiers are similar in appearance, although larvae are up to 0.5 inch long, dirty white, with a brownish head.

See also
Oblique-banded leafroller
Carnation tortrix

**Biology and life history** The moths appear in June and July and lay eggs. There are one or two generations per year, most occur in spring. The single-generation leaffletters overwinter as egg masses on twigs and branches. Eggs hatch in spring as buds are opening and hatch is completed by petal fall. The larvae feed for 4 to 6 weeks, then pupate in the rolled leaves and emerge as moths in early summer. The overwintering eggs are laid in July. Two-generation leaffectors overwinter as immature larvae under the bark on scaffold branches of a variety of host plants. Larvae may feed during warm periods in winter but are most active in spring with onset of new growth. They feed for several weeks, and then pupate in rolled leaves. Adult moths emerge in late April–May and lay eggs for the next generation. This next generation hatches in early summer and does the most damage.

**Pest monitoring** Start sampling for leaffletters in mid-April. Examine the new spring leaf growth and terminal clusters for tightly rolled leaves and feeding damage. Look for light-colored clusters of eggs in patches, laid in rows like fish scales, on the bark. Pheromone traps are useful for monitoring adult emergence.

**Management—cultural control** Hand-pick rolled leaves containing larvae or pupae. Removal of overwintering sites, such as rolled leaves on the ground or plastered to tree trunks, can reduce next year’s population. Very low temperatures in winter significantly reduce overwintering larvae.

**Management—biological control** Spiders and parasitic wasps, as well as predators, like the brown lacewing, greatly reduce leaffletter populations throughout the year. There are ichneumonid wasps with special adaptations for parasitizing leaffletters.

**Management—chemical control**

See Table 3 in:
Chemical Control of Landscape Pests

**For more information**
Bentley W. J. 2010. Leafrollers on Ornamental and Fruit Trees. UC Statewide IPM Program, University of California, Davis (http://www.ipm.ucdavis.edu/PMG/PESTNOTES/pn7437.html)


Rosetta, R. Caterpillars. PNW Nursery IPM (http://oregonstate.edu/dept/nurspest/caterpillars.htm)

**Landscape pests—Mealybug**

Order Hemiptera: Family Pseudococcidae

**Pest description and damage** Mealybugs are small (less than 0.125 inch) oblong insects that are often dusted with a coarse white flour-like substance or powdery wax. The insect body color under the white wax may vary from yellowish or clear to pink, even striped, depending on species. They may have long or short filaments on the hind end and/or around the sides. Some species are completely covered with clear filaments like fiberglass. Mealybugs are most commonly encountered in greenhouses but do occur in landscape plantings. Plantings from the greenhouse should be inspected for mealybugs hiding in branch angles, or even tucked in buds. Infested plants may look chlorotic, stunted or have tightly curled leaves. Plants may wilt or die before natural enemies can gain affect control. Mealybugs may feed on various plant parts; some species even feed on root hairs and roots. Wilting perennials should also be inspected above and below the soil surface for traces of mealybugs.

**Biology and life cycle** This insect has a quick turn-around and can grow from egg to adult in as little as two months under the right conditions. The duration of the life cycle may fluctuate with higher or lower temperatures and should be factored into timing of any pesticide applications. Hosts include foliage of greenhouse plants, herbaceous shrubs and perennials, grapes, fruit trees and some landscape trees.

**Pest monitoring** Mealybugs suck plant sap, and then excrete the excess sugars and water that become a nutritious substrate for sooty mold fungi. Look for shiny, sticky, honeydew or sooty mold, as well as the presence of natural enemies or ants.

**Management—cultural control** Remove mealybugs by gloved hand or use Q-tips to scrape them off; control ants that move them around or remove heavily infested and damaged twigs. Ensure good cultural care of the plants.

**Management—biological control** There are several predators and parasitoids that prey on this pest and some such as the mealybug destroyer can be purchased and released. The larvae of this beetle are also covered in wax. Selection of pesticides that are less toxic to these beneficial insects is advisable.

**Management—chemical control**

See Table 1 in:
Chemical Control of Landscape Pests

**For more information**
Osborne, L.S. 2010. “Mealybugs.” Mid-Florida Research and Extension Center (http://mrec.ifas.ufl.edu/lso/Mealybugs.htm)

**Landscape pests—Psylla**

Includes Many species in the family Psyllidae

**Pest description and damage** Psylla (or jumping plant lice) are soft-bodied, sucking insects which can produce copious honeydew, or form pseudo-galls. Adult psyllids look like a cross between an aphid and a cicada, about 0.1 inch long and an ability to jump and fly away. Their wings are held roof-like over their body. Adult female psylla attach eggs to the host plant by a small “handlebar”. Immature psyllids are oval, flat and scale-like, with conspicuous wing buds, and sometimes with a waxy fringe and/or red eyes. They often live in colonies of mixed life stages. They are most closely related to aphids and scale. There are two groups of psyllids: free-living psyllids and lerps (specialized psylla that live under structures of crystallized honeydew). Free-living and lerp psylla are fairly host specific, and attack only one host from which they get their common name: e.g. boxwood psylla, laurel psylla, hawthorn psylla, and pear psylla are the most common in landscapes. Eucalyptus is host to many species of psyllid.

**Biology and Life History** Life cycles vary with the species. They have incomplete metamorphosis consisting of eggs, nymphs and adults all feeding together. Females can lay between 45 and 700 eggs depending on the species. The nymphs molt five times before becoming an adult. At each molt, the wing buds become more visible.
Damage varies with the species. Some species cause pseudo-galls, leaf distortion, leaf color change from red to brown, and abundant honeydew on which sooty mold can grow and defoliation, while others (lerps) live under a covering of crystallized honeydew for protection. There can be one or many generations per year. Psylla populations may be high in one year and nearly non-existent the next.

Pest monitoring Adult psylla and lerps and their natural enemies are attracted to yellow sticky cards. The proportion of pest psyllids to beneficial insects may govern whether pesticides are applied. Branches may also be struck and jarred to dislodge psyllids onto a beating sheet. Also, look for the presence of honeydew or a sugary material.

Management—cultural control
Psyllids and lerps favor new succulent plant growth. Avoid excess watering, fertilizing or shearing as these practices promote new growth. Avoid using plants known to have serious psylla problems.

Management—biological control
There are many natural enemies of psyllids and lerps including minute pirate bugs and other predaceous bugs, green and brown lacewings, ladybeetle adults and larvae, and parasitic wasps. Since these can be very effective controls, it is important that any pesticides that are applied are less toxic to beneficials.

Management—chemical control
See Table 1 in:
Chemical Control of Landscape Pests

For more information

Landscape pests—Root weevil
Numerous species
Pest description and damage Species identification is important as root weevil species differ in susceptibility to pesticides and have different life cycles. Adult weevils are small dark beetles with a snout (rostrum) and elbowed antennae. They cannot fly so distribution is through migration or movement of infested plants, soil or debris. The adults of most of the species are all females and capable of laying eggs. They are slow moving and should not be confused with swifter predacious ground beetles. Adult weevils are night feeders that mostly remain in the soil in or near debris at the base of the plant during the day, then climb up to feed on leaves at night. Look for ragged notches on the edges of leaves, or flower petals. Twigs of plants may die beyond where weevils have girdled the twig (salal, rockrose, yew, juniper, etc.). Larvae, found around roots, are C-shaped, legless, and white, or slightly reddish, with tan heads, up to 0.5 inch in size. All species are quite similar in appearance and habits of feeding on root hairs, larger roots and root crown. Check the base of unthrifty shrubs for symptoms of girdling by larvae.

Biology and life history Adult root weevils are present in every month of the year in mild climates. Most species are abundant from May through September. Other species emerge in late summer and may be active through the winter and very early in spring in milder climates. Larvae of most species overwinter in the soil around the roots; larvae of the fall emerging species are likely to be present during the summer months. There is only one generation per year.

Pest monitoring Observe leaves for fresh notching in early spring (for early weevil species). Start with visual inspection of damaged plants by day, and then concentrate nocturnal flashlight searches, just after dusk, in those areas. Weevils can also be dislodged onto a beating sheet, or pizza box, at night or captured in pitfall traps. Several newly developed traps for trapping adult root weevils are available as a monitoring tool. Inspect unthrifty plants for missing roots, root hairs or for small white, C-shaped grubs.

Management—cultural control
Root weevils are inconsistent in their damage to landscape plants: there appear to be sun/shade influences, host and cultivar preferences, based on physical and chemical characteristics of plant genera, species and cultivars. (See Antonelli for list of susceptible and resistant cultivars). Cultivation of the soil in April-May can eliminate overwintering larvae before planting. Use a cereal cover crop to disrupt weevil numbers, as small grains are not a recorded host for root weevils. Hand-pick adults when found.

Management—biological control
Several parasitoids have been reared from some of the species of root weevils: at least two tachinid flies and one braconid wasp. Good control was obtained by placing shredded oak leaves under plants to encourage ground foraging birds. Beneficial nematodes have shown some effectiveness in controlling larvae when applied as a drench as the label directs. Nematodes must be placed in the root zone where weevil larvae are; the soil must be moist and the soil temperature above 55°F. Nematodes are available at some garden and nursery stores and through mail order.

Management—chemical control
See Tables 2 and 5 in:
Chemical Control of Landscape Pests

For more information

Landscape pests—Sawfly
Several families in the Order Hymenoptera
Pest description and damage Sawflies are members of the Symphyla (horntails and sawflies), a subgroup of the Hymenoptera (ants, bees and wasps). The adults are small, black, fly-like insects that swarm in considerable numbers around host plants in the sun, but the adults do not harm plants. These larvae are caterpillars that are fairly host specific and many get their name from the host plant (i.e. willow sawfly). Some caterpillars feed gregariously along the edges of leaves. There are solitary feeders that chew a hole in a leaf and literally march around feeding inside the hole as they walk. Sawflies differ from moth and butterfly caterpillars in that they have seven or more pairs of prolegs, and many carry their hind end curled back over the body in the shape of an “S”. Many sawfly larvae are often quite visible, while others match the edge of the leaf so closely that they seem invisible. There are also sawflies that bore into fruit and wood as well as those that mine leaves or live within plant galls. Adult female sawflies have a small saw-like ovipositor that is used to insert eggs into leaf or stem tissue. Eggs, inserted into small slits in leaves are visible as little raised welts or blisters. Some members are called slugs because they are covered in a slime which protects the larva. These slug-like caterpillars skeletonize leaves by removing the surface leafy tissues and leaving
behind leafless stems with only the petiole and midrib remaining.

**Biology and life cycle** Sawflies have complete metamorphosis (egg, larva, pupa and adult). Adults are the mobile stage for dispersing and meeting mates. Often the larvae eat fast and drop to the soil before they’ve even been noticed. There may be one or five or more generations in a season. Most species of sawflies overwinter as pupae in soil.

**Pest monitoring** Use yellow sticky traps to monitor adult sawflies. Watch for the appearance of the eggs clustered in little “pita pocket” slits in the leaves or for droppings on underlying leaves. Look for the gregarious larvae lining the leaf edge, or leaf damage along the margin. Leaves, chewed so thoroughly that only the midribs remain, are diagnostic for sawfly damage. Watch for future generations.

**Management—cultural control**
Pick off larvae or possibly hose plants with a strong stream of water.

**Management—biological control**
Common predators include general bug predators.

**Management—chemical control**
See Table 2 in:
Chemical Control of Landscape Pests

**For more information**

### Landscape pests—Scale insect

**Order Hemiptera: Families Coccidae, Diaspididae and others**

**Pest description and damage** Scale insects are common on many ornamental trees and shrubs, groundcovers and herbaceous plants. Adult female scale live under a shell-like covering that resemble “volcanoes,” “barnacles,” “hemispherical bumps,” “cotton puffs,” “oysters” or may appear to be flat, soft and naked, with various dull colors and markings. They are often found attached along the branches, twigs, leaves or needles or even fruit. Most scale insects are from 0.0625 to 0.25 inch long. These insects have piercing-sucking mouthparts that they inject into plant tissues to feed on plant juices. Occasionally, large populations of scale can devitalize plants and retard growth, as well as discolor the foliage. Severe infestations can kill twigs. In many cases, a large quantity of honeydew is produced that makes leaves and fruit shiny and sticky. Honeydew can collect on decks, lawn chairs and other landscape surfaces and retard growth, as well as discolor the foliage. Severe infestations can kill twigs. In many cases, a large quantity of honeydew is produced that makes leaves and fruit shiny and sticky. Honeydew can collect on decks, lawn chairs and other landscape surfaces and become an intolerable nuisance to homeowners. Sooty mold fungus may grow on the honeydew giving the plants a dirty, sooty appearance.

**Biology and life history** The life history varies with species, so accurate species identification is needed. Generally, scale insects overwinter as eggs concealed beneath the female parent’s scale, or as immature scale on twigs and branches. When scale insects overwinter as immatures, they resume feeding in the spring, and eggs are laid later in spring. When scale overwinter as eggs under the protective scale, they hatch from spring to late June. Young scales are called “crawlers.” The crawlers are highly mobile and disperse through the foliage to find a new feeding site. Occasionally, these crawlers can be dispersed from plant to a new host plant by wind or air currents, rain, birds, irrigation or by the movement of people and machinery. When they find a suitable site, many insert their mouthparts, molt and lose their legs, and become non-mobile. They then form the wax or cottony scale that conceals them. Scales feeding on the leaves of deciduous plants can move back onto the branches in late summer or fall. Adult males may be winged or wingless and seek out the non-mobile adult females. There will be one or two generations per year for most scale species.

**Pest monitoring** Inspect twigs and tissues during the dormant season for scale insects. Pay attention to sickly plants and those with low vigor. The scale crawler stage is most susceptible to chemical control measures. Monitor the movement of newly hatched crawlers by wrapping a piece of sticky tape around an infested branch with the sticky side out. The crawlers are very small and best observed with a 10X magnifying glass. Check beneath scale for live females or eggs, or for predator mites or parasitoid wasp grubs. Fluff beneath scale indicate parasitoid activity or that the eggs have hatched. Holes in scale indicate parasitoids have emerged.

**Management—cultural control**
Scrape scale off plants by hand with fingernail or toothbrush. Prune off major infestations in trees and shrubs if possible. Apply tape, sticky side out or use a similar adhesive near infestations of adult scale to intercept and catch the crawler stage. Water landscape plants and trees properly, as drought-stressed plants are more susceptible to scale insects. Avoid excessive nitrogen applications as this encourages growth in scale insect populations. Generally, pesticide applications are applied to the vulnerable crawler stage before the scale covering is formed.

**Management—biological control**
The waxy scale cover of these insects tends to conceal and protect them from generalized predators and from some pesticides. Even so, there are numerous predators that specialize in feeding on scale insects including birds, lady beetle adults and larvae, mites and green lacewing larvae. There are also numerous species of minute wasps that lay eggs in and parasitize scale insects. Biological control may prevent significant scale infestations. Avoid broad-spectrum insecticide applications that would disrupt these natural enemy populations allowing the scale to reproduce.

**Management—chemical control**
See Table 1 in:
Chemical Control of Landscape Pests

**For more information**

### Landscape pests—Spider mite

**Spruce spider mite** (Oligonychus ununguis)
Twospotted spider mite (Tetranychus articae)

**Pest description and damage** Several species of spider mites can cause damage to deciduous, evergreen and coniferous ornamental plants. Appearance of these mites varies with the species, although all are 0.02 inches or smaller. Adults and nymphs can be yellowish, greenish, or reddish brown, depending on species. Female European red mites are round with red bodies; males are yellowish-red. Twospotted spider mites are oval and yellowish-brown or green with distinctive black spots on the body. Plants may be covered with fine silk webbing at branch axils or leaf mid-veins, small plants may be engulfed in webbing under heavy infestations.
Biology and life history Most mite species share a similar life cycle. Most species overwinter as eggs on host plants, although some may overwinter as adult females. Mites become active in the spring. There may be eight to ten overlapping generations per year.

Pest monitoring Observe the leaves for mites and/or mite eggs, stippling, or webbing and check for the presence of predator mites. Sufficient biological control usually is achieved by midsummer. Using a stick, hit a branch over a white paper to see if mites (moving dust specks) or natural enemies are present.

Management—biological control
The keys to the successful use of predator mites are identifying the appropriate mite for the pest mite to be controlled, good scouting, and releasing the mites at the proper threshold. The predator mite Neoseiulus fallacis has been used successfully to control many mite species including bamboo and spider mites if broad-spectrum insecticide applications are avoided. If one mite is found per five leaves inspected, it is time to release the predator mites (check with supplier). These low levels of pests are not usually noticed without a rigorous scouting program. N. fallacis in particular requires 80% humidity, easily found in the canopy of plants grown in the Northwest. Insect predators of mites include lady beetle adults and larvae, lacewing larvae, thrips, and minute pirate bugs. Hold a clipboard with white paper under branches, then give the branch a sharp rap with a stick to dislodge mites. The black specks on the paper that begin to walk away are mites. Also check to ensure you know the difference between pest and predator mites.

Management—cultural control
Severe infestations can be treated by removing infested leaves on plants (where practical) and burning or otherwise disposing of the foliage. Then the remaining foliage can then be treated more effectively for mites. This treatment may be the only practical solution for heavily infested sites, where chemical application presents difficulties (proximity to surface water, food crops or on indoor plants). Heavy rain and cold weather suppresses mite numbers; while hot dry conditions seem to increase the numbers. Suppression of broadleaf weeds such as mallow, bindweed, white clover, and knotweed or grasses with cultivation may reduce mite numbers; while hot dry conditions seem to increase the numbers. Water trees properly, as drought-stressed trees are more susceptible. This dislodges dust and dirt that favor an increase in mite numbers. Water trees properly, as drought-stressed trees are more susceptible. Avoid excessive nitrogen applications, as this encourages mites. Since mites thrive under hot dry conditions, increasing humidity with periodic short bursts of water to foliage may help. Monitor before and after to evaluate the effectiveness of management strategies.

Management—chemical control
See Table 1 in: Chemical Control of Landscape Pests

For more information
Rosetta, R. 2010. When Mite Makes Right: Biological Control of Two-spotted spider mites (http://oregonstate.edu/dept/nurspest/two-spottedmite.htm)

Landscape pests—Spittlebug and froghopper
Order Hemiptera: Family Cercopidae

Pest description and damage Spittlebugs are first noticed in late spring within white frothy masses of bubbles on grasses, herbaceous plants, shrubs and conifers. Small nymphs of the spittlebug are mostly greenish with conspicuous red eyes; different species may have different coloration. In most landscape gardens, there may be some wrinkling of the leaf or stem where the young spittlebugs are feeding. Froghopper adults are found later in spring and summer. They look like leafhopper adults, but froghoppers are shorter and wider. One diagnostic feature is that the hind legs of froghoppers lack spines. Damage from adults is slight.

Biology and life cycle Eggs are laid in late summer in the axils of plants and hatch in spring. According to one set of theories, the young spittlebugs begin to suck plant juices and excrete the liquids along with air resulting in a froth of bubbles covering the bug. The spittle protects the nymphs from drying out and from predators and parasitoids. Adults emerge in mid- to late-summer.

Pest monitoring The obvious indicator is the white frothy “spittle” especially on field grasses and flowers. Most people object more to the spittle than the spittlebug or the slight puckering of leaves.

Management—cultural control
It is easy to hose off the plants if the spittle becomes too objectionable. Since most spittlebugs in the PNW cause little significant damage to plant, they can be ignored.

Management—biological control
Several wasp species have been reported to parasitize spittle bug eggs as well as a pipunculid fly that can cause 50-60% parasitism of adults.

Management—chemical control
Not recommended for home landscapes

For more information

Landscape pests—Stink bug
Includes Numerous species in the family Pentatomidae

Pest description and damage Stink bugs are true bugs with a distinctive, triangular area (scutellum) that extends between the hemi-elytra or forewings of stink bugs. The forewings are partly leathery at the base and partly membranous toward the tip. Stink bugs have straw-like sucking mouthparts, through which they can inject a digestive fluid and suck back the digested contents. Stink bugs have incomplete metamorphosis (eggs, nymphs that look like adults without wings, and adults). Stink bugs are found on weeds and native and ornamental plants that have abundant seeds pods, berries, or other fruit; also, they can feed on plant cells or sap. Some stink bugs are predators on other insects, including other stink bugs. Generally, stink bugs do little damage to landscape plants, but they can harm the fruit, berries and pods. They are commonly found on weed pods, raspberries, and berries. The brown marmorated stink bug (BMSB) is a newly introduced invasive species that has proliferated and become a major pest of all plants where it has established.

Biology and life history Stink bugs lay barrel-shaped eggs in clusters on or near food plants or seeds. The young larvae are often brightly colored, very rounded, and they cluster on the eggs when they first hatch. They change to their adult colors as they molt toward maturity. Then they disperse to feed on nearby fruit or seeds. As the BMSB seeks shelter in homes, or protected places in the landscapes, they can be easily moved around the country with
household belongings so they have spread rapidly across the US. The first detection of this Asian invasive species in the PNW was in Oregon in 2004 and it is now a major pest here. It has been found in WA and ID, but only in small numbers.

**Pest monitoring** A thorough list of monitoring tools, attract-and-kill devices, natural enemies, and organic options for control can be found under “managing BMSB” at http://stopbsmb.org.

**Management—cultural control**
Reduce overwintering sites in buildings by caulking and filling cracks to potential entry areas. Remove weeds with abundant seed pods, especially those close to buildings.

**Management—biological control**
Stink bugs have natural enemies, including predaceous stink bugs. Some native parasitoids and predators may be able to adapt to BMSB and there is promise of finding parasitoids in its native Asian countries. Researchers have identified a group of tiny parasitic wasps and a naturally occurring fungus that attacks BMSB in Japan.

**Management—chemical control**
See Table 1 in: Chemical Control of Landscape Pests

**For more information**
Leskey, T. 2013. Stop brown marmorated stink bug. (http://www.stopbsmb.org/)

**Landscape pests—Thrips**
Includes *Frankliniella* spp.

**Pest description and damage** Several species of thrips cause injury to a number of woody ornamentals. Thrips are very tiny, skinny, insects, less than 0.05 inch long. Color varies from reddish-yellow to mid-dark brown. Winter populations are darker in color. Thrips have rasping mouthparts and damage plants by sucking out the contents of plant cells and depositing tiny specks of honeydew. Damaged leaves look bleached and/or silvered and speckled with shiny “tar-spot” excreted by thrips during feeding. They can damage flower buds, opened flowers, leaf buds and leaves. Damage to flowers appears as streaking in the blossoms, there may be yellow pollen on petals where thrips were feeding on the stamens. Flower life may be reduced. Damage to foliage is particularly noticeable if it occurs in the bud stage. In this case, leaves typically are distorted and may be flecked with thrips, tar-spots or feeding damage. Thrips are particularly common on gladiolus and dandelion flowers.

**Biology and life history** In spring, the adults fly to host plants and enter flower blossoms to feed on pollen, nectar, and flower parts. Eggs are laid in the flower parts, and the immatures emerge to feed. Several generations pass each summer, and adults may feed on adjacent flowering plants as well. Thrips also migrate into landscapes and greenhouses when adjacent infested fields are mowed.

**Pest monitoring** Watch for small specks of glistening frass on the surface of lilac and privet leaves; thrips look like tiny, wood slivers slinking about leaves or among blossoms. Thrips feed on pollen and may scatter pollen on the petals.

**Management—cultural control**
Cold, wet weather during bloom reduces thrips damage. Hosing plants with water in the morning may discourage thrips.

**Management—biological control**
Predatory thrips species and mites can reduce populations on host plants while parasitic nematodes can kill off thrips that move to the soil to pupate.

**Management—chemical control**
See Table 1 in: Chemical Control of Landscape Pests

**For more information**

**Landscape pests—Whitefly**
Order Hemiptera: Family Aleyrodidae

**Pest description and damage** Whiteflies are tiny, pure white, moth-like sucking insects that prefer to feed and lay eggs on the undersides of leaves. The nymphs are yellowish and before becoming adults the third instar molts to the fourth and last instar, an immobile stage that is thickened like a small, round, layered birthday cake. Male and female whitefly adults emerge to mate and lay eggs. Tiny black eggs are laid in small circles, half circles or scattered singles. Small circles that appear dusted with a white powder may be noted. Damage varies by species but the whitefly sucks plant sap from the phloem or plant cells. Leaves may turn yellow or dry and fall, or leaves may be covered by honeydew followed by the sooty mold fungus. Some can transmit viruses. Hosts are various and include rhododendron and azalea, Indian plum, ceanothus, fuchsia, and many other plants. The presence of whiteflies on the undersides of evergreen broadleaf plants in fall and winter may not be predictive of summer problems. Fuchsias can be severely damaged by high populations of whiteflies.

**Biology and life cycle** This insect has four instars: nearly invisible 1st instars, yellowish flat 2nd and 3rd instars and the 4th thickened instar before molting to the adult stage. Tiny, black, oval eggs are laid in little circles or scattered singly across the leaf surface. In warm weather populations can build quickly to cause considerable damage. It is often the adults that overwinter.

**Pest monitoring** Ruffle plants to get whiteflies flying. If the adult whiteflies are present, check the undersides of leaves to verify young, feeding stages are present or check for honeydew and sooty mold. The presence of small dusty white circular areas may not mean whiteflies are a problem. Note whether the level of damage is worth control efforts.

**Management—cultural control**
Keep plants healthy and watered according to their needs. Whitefly populations increase with high nitrogen levels: do not over-fertilize plants. Wash plants with a gentle stream of water directed to the underside of plants. Prune back and encourage host plant refoliation. A combination of disturbing the foliage, vacuuming flying adults and using sticky yellow cards attractive to whiteflies provides some measure of control, but stay vigilant.

**Management—biological control**
The most noted biological control is *Encarsia formosa*, but there are several Encarsia species that can be purchased for release. These consist of small cards which can be clipped on plants. Make sure to put one card in a jar to observe hatch date and to determine if
parasitoids are alive. Other predators and parasitoids are also active and together they often bring high populations back into check. See Flint reference for extensive biological and cultural discussion.

Management—chemical control
See Table 1 in: Chemical Control of Landscape Pests

For more information
Rosetta, R. 2016. Whiteflies. PNW Nursery IPM (http://oregonstate.edu/dept/nurspest/whiteflies.htm)

Landscape pests—Woodborer
Several orders including:
Coleoptera: longhorned beetle (roundheaded borer), metallic buprestid (flatheaded borer); Lepidoptera: clearwing moth, carpenterworm

Pest description and damage Adult buprestid woodborers are oval beetles of various sizes, often with an iridescent sheen to their wing covers. Adults may feed on flowers or pollen. Adult longhorned woodborers are beetles of variable size and colorful markings that can be found on flowers where they graze on the pollen. Both families of beetles are attracted to dying and dead trees. In general, damage is secondary, and the wood borers help breakdown the wood products. These borers, as larvae or grubs, may spend several years in the wood before emerging as adult beetles. Weevils such as the poplar- and willow borer can be destructive to willow and poplars. Willow trees can be severely weakened by the internal galleries. Many of the borers allow fungus to enter when the adult lays eggs, further assisting decomposition. Lepidopteran woodborers include carpenterworms and clearwing moths whose larvae tunnel in wood as well. Occasionally woodboring adults may emerge from firewood brought indoors. The larvae and adults also serve as food to birds such as woodpeckers, raccoons and other animals. In forestry, these insects are considered serious pests as they can cause considerable damage to timber waiting to be milled. Larvae damage the wood by tunneling through the wood leaving large rounded or flattened holes that destroy the integrity of the wood and reduces its usefulness and value as lumber.

Biology and life history The moment a tree is cut, it is a valuable food source for these insects. Depending on time of year and temperature, these insects will arrive within hours of a tree being cut down or while it is dying. Life cycles are variable with the species of insect. Some insects spend many years inside the wood environment. The golden buprestid may feed for up to 15 years in wood. Adult emergence occurs when the larvae have eaten enough nutrients to develop fully and can transform to the pupal stage. The quality of wood influences that timing. In some cases, live trees are infested, but usually they are in a weakened state and unable to pitch out the insects.

Pest monitoring Look for cracks or irregularities in bark, water soaked areas, holes with running sap or sawdust frass oozing out. Base of tree may be covered with sawdust. Limb breakages may occur because of weakened wood strength. To determine which species of insects are attacking the trees, the simplest method is to place sections of infested wood, or branches, in a garbage can modified to be an emergence chamber. Holes the size of pint canning jars are cut with a keyhole saw and the jar ring is pushed into the hole. The jar is then screwed in place. When the insects emerge, they usually go to the light in the jar and are held there until the jar is removed and the insects are taken to be identified. This method also traps parasitoids that may have been living in, on or with the pest.

Management—cultural control
Remove the bark to reduce egg laying sites for those species that lay eggs in bark crevices. Remove dead and dying wood so populations do not build up and spread to healthier trees. Keep trees watered during drought and reduce soil compaction by foot traffic and autos. Whitewash trunks of young trees to prevent sunburn and reduce potential hazard of attack from flathead borers. Check buried roots on unthrifty perennials for damage due to construction, landscaping and bulldozing.

Management—biological control
There are several predators and parasitoids that can reduce survival of woodborers. Reduce pesticide use that may kill off beneficial insects. Pheromone traps may be deployed to draw in woodborers adults.

Management—chemical control
Not recommended for home landscapes

For more information
Chemical Control of Landscape Pests

Michael R. Bush

Latest revision—March 2019

How to use these tables. Choose from the five general types of insect and mite damage to landscape plants. Scan through the column on the left to find the general group of insect/mites identified causing this damage. Then follow the table from left to right to find monitoring, scouting and pesticide management strategies. Biology and management recommendations are provided for specific plant pests. Additional examples that may cause damage due to sucking pests may be found in the next section of Hosts and Pests of Landscape Plants. Common pest names often refer to multiple species, and taxonomic groupings, so examples of the species covered under each common name are provided. Occasionally pests sharing a common name may cause several types of damage to landscape plants, so be sure to make sure that you select the table that best fits the damage type. Note that in some cases, damage to a plant may be of no concern to the homeowner.

Home landscape products are those pesticides that can be purchased at local retail stores and can be used without a pesticide license. These products are listed by active ingredient; products based on the same active ingredient may be comparable and effective. Restricted-use products may be used only by applicators with the appropriate pesticide license. For all products, the applicator must review the pesticide label as some products may negatively impact some species of ornamental plants and some products may only be applied to specific areas within the home landscape. In the case of any discrepancy between these recommendations and the product label, ALWAYS follow the product label. Remember pollinators, such as honeybees, are often susceptible to insecticide products. Unless otherwise specified on the label, DO NOT spray insecticides on plants (including weeds as well as garden crops) that are in bloom.

Table 1. Plant damage due to sucking pests

This damage type is caused by pests that insert piercing-sucking mouthparts into the above ground plant tissues including stems, buds, petioles, needles and leaves. Often this damage results in plant surface stickiness from honeydew production, surface discoloration (sooty mold, tar spots), low plant vigor, canopy yellowing, leaf stippling, premature leaf drop, leaf and shoot distortion and overall plant stunting. A few of these pests can vector plant diseases.

<table>
<thead>
<tr>
<th>Target pest examples</th>
<th>Monitoring &amp; scouting strategies</th>
<th>Home landscape chemical products</th>
<th>Restricted-use chemical products</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Adelgid</strong> (Hemiptera: Adelgidae) includes: Balsam woolly adelgid Hemlock woolly adelgid Pine bark adelgid</td>
<td>Monitor the crawler stage with double-sided tape. Best spray timing is early spring or near bud break. Most products are contact insecticides and thorough coverage is essential. Systemic products (circulated within the plant’s vascular system) are better suited for tall trees and shrubs.</td>
<td>clothianidin dinofuran esfenvalerate fluvinate horticultural oils imidacloprid insecticidal soap pyrethrins pyrethroids spinosad</td>
<td>abamectin acephate acetamiprid azadirachtin carbaryl chlorpyrifos cyrantraniliprole spirotetramat thiamethoxam</td>
</tr>
<tr>
<td><strong>Aphid</strong> (Hemiptera: Aphididae) includes: Alder aphid Apple aphid Bamboo aphid Beech blight aphid Black cherry aphid Black citrus aphid Common birch aphid Foxglove aphid Geranium aphid Giant conifer aphid Giant willow aphid Hop aphid Leafcurl ash aphid Norway maple aphid Pine aphid Potato aphid Rhododendron aphid Rose aphid Sycamore aphid</td>
<td>Timing critical as many species have complex life cycles that alternate between asexual &amp; sexual reproduction as well as summer and winter plant hosts. Adults, nymphs and winged adults found on succulent plant tissues. Monitor winged adults with yellow sticky traps Scout landscape plants for honeydew and sooty mold. Dormant applications of horticultural oils are effective on managing the non-mobile life stages. Target the rapidly-increasing aphid populations early in the growing season, before leaves curl about and protect aphids from sprays. Most products are contact and thorough coverage is essential. Systemic products (circulated within the plant’s vascular system) are better suited for tall trees and shrubs.</td>
<td>acetamiprid azadirachtin Beavaria bassiana carbayl clothianidin esfenvalerate fluvinate horticultural oils imidacloprid insecticidal soaps kaolin clay malathion pyrethrins pyrethroids spinosad</td>
<td>abamectin acephate bifenazole chlorantraniliprole chlorpyrifos cyrantraniliprole diazinon dimethoate dinofuran fenpropatrin flupyradifurone Isaria fumosorosea lime sulfur calcium methiocarb polyoxinide pyriproxyfen spirotetramat thiamethoxam tolfenpyrad</td>
</tr>
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<tr>
<td><strong>Lace Bug</strong> (Hemiptera: Tingidae) includes: Azalea lace bug Rhododendron lace bug</td>
<td>Scout landscape plants for yellow leaf stippling Check underside of stippled leaves for varnish-like tar spots, and lace bugs. Damage is most pronounced early to mid-July. Most products are contact and thorough coverage on the underside of foliage is essential.</td>
<td>azadirachtin carbaryl clothianidin dinotefuran esfenvalerate flualinate horticultural oils imidacloprid insecticidal soap malathion pyrethrins pyrethroids spinosad</td>
<td>acephate Beauvaria bassiana chlorpyrifos dimethoate fenpropatrin flupyradifurone thiamethoxam</td>
</tr>
<tr>
<td><strong>Leafhopper</strong> (Hemiptera: Cicadellidae) includes: Rose leafhopper</td>
<td>Scout for leaf stippling, honeydew, and tar spots. Monitor adults with yellow sticky traps. Monitor nymphs with double-sided tape wrapped around branches or twigs. Most products are contact and thorough coverage is essential. Systemic products (circulated within the plant’s vascular system) are better suited for tall trees and shrubs.</td>
<td>acetamiprid azadirachtin Beauvaria bassiana carbaryl clothianidin dinotefuran esfenvalerate flualinate horticultural oils imidacloprid insecticidal soap kaolin clay malathion pyrethrins pyrethroids spinosad</td>
<td>acephate buprofezin chlorpyrifos dimethoate diazinon fenpropatrin flupyradifurone phosmet pyridaben spirotetramat thiamethoxam tolenpyrad</td>
</tr>
<tr>
<td><strong>Mealybug</strong> - (Hemiptera: Pseudococcidae) includes: Grape mealybug</td>
<td>Scout for mealybugs; they may be covered with powdery wax. Examine narrow branch angles, leaf petioles, bud scars for mealybugs. Mealybugs and psyllids produce of honeydew as well as crystallized honeydew. Psyllids may cause gall-like structures and leaf distortion on some plant species. Monitor adult psyllids with yellow sticky traps. Most products are contact and thorough coverage is essential. Some products are systemic and are better suited for tall trees and shrubs.</td>
<td>acetamiprid azadirachtin Beauvaria bassiana carbaryl clothianidin dinotefuran esfenvalerate flualinate horticultural oils imidacloprid insecticidal soap kaolin clay malathion pyrethrins pyrethroids spinosad</td>
<td>acephate buprofezin chlorpyrifos clothianidin dimethoate dinotefuran flupyradifurone Isaria fumosorosea</td>
</tr>
<tr>
<td><strong>Psyllid</strong> (Hemiptera: Psyllidae) includes: Boxwood psyllid</td>
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<tr>
<td><strong>Phylloxera</strong> (Hemiptera: Philoxeridae) includes: Oak phylloxera</td>
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</tbody>
</table>
## Target pest examples

**Scale Insect**  
(Hemiptera: Coccidae) includes:  
Brown soft scale  
Cottony cushion scale  
European fruit lecanium  
Sycamore scale  
(Hemiptera: Diaspididae) includes:  
Black pine leaf scale  
Holly scale  
Juniper scale  
Pine needle scale  
Oystershell scale  
Eriococcidae includes:  
Azalea bark scale  
European elm scale

**Spider mite**  
(Trombidiiformes: Tetranychidae) includes:  
Bamboo spider mite  
Brown mite  
Boxwood spider mite  
Citrus red mite  
European red mite  
Spruce spider mite  
Two-spotted spider mite  
False spider mite

**Thrips**  
(Thysanoptera: Thripidae) includes:  
Gladiolus thrips  
Western flower thrips

## Monitoring & scouting strategies

**Scale Insect**  
Scout for non-mobile stages concealed beneath bumps, cotton balls, barnacles, oyster shells.  
Double-sided tape, adhesive barriers intercept mobile crawler stage.  
Mobile stages include the newly hatched crawler stage.  
Pesticide applications timed to target mobile crawler stage.  
Most products are contact and thorough coverage is essential.  
Some products are systemic and are better suited for tall trees and shrubs.

**Spider mite**  
Scout for mite feeding damage to the plant foliage; damage includes leaf stippling, leaf bronzing and premature leaf drop.  
Often a 10- to 20X hand lens is needed to see these mite pests that are often on the underside of the leaf along the midrib.  
Spider mite webbing may also be detected along the leaf midrib.  
Many of these products are contact insecticides that target mobile mite stages.  
Thorough plant coverage with the spray is key to success and often two or more applications may be necessary.  
Horticultural oils and some insecticides target mite eggs

**Thrips**  
Scout the newest tissues of landscape plants for thrips damage, which appears as plant rasping that discolors the surface leaving minute white or ghosting spots.  
Tap or beat these plant tissues over a dark flat surface to reveal tiny, thin insects that quickly fly or run to escape.  
The presence of tar spots (frass) may also serve as a sign of thrips activity.  
Most chemical products are contact insecticides that target thrips larvae or adults and timing of sprays coincides with their presence.  
Thorough plant coverage with the spray is key to success

## Home landscape chemical products

- acetamiprid
- azadirachtin
- carbaryl
- clothianidin
- dinofuran
- fenvalerate
- fluvinate
- horticultural oils
- imidacloprid
- insecticidal soap
- malathion
- pyrethrins
- pyrethroids
- spinosad

## Restricted-use chemical products

- abamectin
- acephate
- buprofezin
- chloropyrifos
- Chromobacterium subsugae
- cyrantraniliprole
- diazinon
- dimethoate
- flupyradifurone
- lime sulfur/calium
- polysulfide
- spirotetramat
- thiamethoxam
- tolenpyrad

## Acetamiprid

- azadirachtin
- clothianidin
- dinofuran
- fenvalerate
- fluvinate
- horticultural oils
- imidacloprid
- insecticidal soap
- malathion
- pyrethrins
- pyrethroids
- spinosad
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<td><strong>True Bug</strong></td>
<td>Scout for the presence of these bugs in landscape plants. Damage to the plant’s reproductive structures reduce seed viability. These insects are rarely considered landscape plant pests that require treatment to protect overall health. Often these are nuisance pest congregate in large numbers on homes.</td>
<td>acetamiprid carbaryl esfenvalerate imidacloprid pyrethrins&lt;sup&gt;o&lt;/sup&gt; pyrethroids&lt;sup&gt;p&lt;/sup&gt;</td>
<td>acephate Beauvaria bassiana chlorpyrifos malathion novaluron thiamethoxam</td>
</tr>
<tr>
<td>(Hemiptera: numerous families) include: Honeylocust plant bug Stink bug Western boxelder bug</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Whitefly</strong></td>
<td>Infected leaves may start to turn yellow appear wilted, or prematurely drop from plant. Look for honeydew and sooty molds. Clouds of adults fly away from infested plants when approached. Monitor adults with yellow sticky traps. Most products are contact and thorough coverage is essential. Some products are systemic and are better suited for tall trees and shrubs.</td>
<td>acetamiprid azadirachtin&lt;sup&gt;o&lt;/sup&gt; Beauvaria bassiana&lt;sup&gt;o&lt;/sup&gt; clothianidin dinotefuran esfenvalerate fluvalinate horticultural oils&lt;sup&gt;o&lt;/sup&gt; imidacloprid insecticidal soap&lt;sup&gt;o&lt;/sup&gt; kaolin clay&lt;sup&gt;o&lt;/sup&gt; malathion pyrethrins&lt;sup&gt;o&lt;/sup&gt; pyrethroids&lt;sup&gt;p&lt;/sup&gt; spinosad&lt;sup&gt;o&lt;/sup&gt;</td>
<td>abamectin acephate bifenazate bifenthrin carbaryl chlorpyrifos Chromobacterium subtsugae cyantraniliprole diazinon dimethoate fenazaquin fenpropathrin fenpyroximate flupyradifurone Isaria fumosorosea novaluron pymetrozine pyridaben pyriproxyfen spiromesifen spirotetramat thiamethoxam tolfenpyrad</td>
</tr>
<tr>
<td>(Hemiptera :Aleyrodidae) includes: Glasshouse whitefly Rhododendron whitefly</td>
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</table>

<sup>O</sup> = Some formulations may be OMRI-listed for organic use  
<sup>P</sup> = The synthetic pyrethroids are general insecticides that include products with the active ingredients including bifenthrin, cyhalothrin, cyfluthrin, cypermethrin, deltamethrin and permethrin
### Table 2. Plant damage by tissue-feeding pests

Damage is caused by pests with chewing mouthparts that feed on primarily leaf, bud and flower and fruit tissues reducing plant canopy in the form of leaf holes, leaf rolling, skeletonization, and defoliation. While this damage is often considered cosmetic and plants can regenerate these tissues, repeated damage over multiple season can impact overall plant health.

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<td><strong>Caterpillar</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>(Lepidoptera: Erebidae) includes:</td>
<td>Scout for the webbing and silk tents that can contain numerous caterpillars.</td>
<td>azadirachtin&lt;sup&gt;0&lt;/sup&gt; Bacillus thuringiensis kurstaki&lt;sup&gt;0&lt;/sup&gt; carbaryl clothianidin emamectin benzoate esfenvalerate fluvinate horticultural oils&lt;sup&gt;0&lt;/sup&gt; imidacloprid pyrethrins&lt;sup&gt;0&lt;/sup&gt; pyrethroids&lt;sup&gt;p&lt;/sup&gt; spinosad&lt;sup&gt;0&lt;/sup&gt;</td>
<td>acethate Bacillus thuringiensis aizawai&lt;sup&gt;0&lt;/sup&gt; chlorantraniliprole chlorfenapyr diflubenzuron indoxacarb malathion methoxyfenozide novaluron thiamethoxam</td>
</tr>
<tr>
<td>Douglas-fir tussock moth</td>
<td>Scout the foliage of landscape plants for signs of chewing insect damage, or in extreme cases, plant defoliation.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall webworm</td>
<td>Most chemical products are contact insecticides and target the caterpillars as they feed on foliage outside their webbing or tents. Bacillus thuringiensis must be ingested by the caterpillar to be effective.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spruce webworm</td>
<td>Some products are systemic and are better suited for tall trees and shrubs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Lepidoptera: Gelechiidae) includes:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crotoneaster webworm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Lepidoptera: Lasiocampidae) includes:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forest tent caterpillar</td>
<td></td>
<td></td>
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<tr>
<td>Western tent caterpillar</td>
<td></td>
<td></td>
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<tr>
<td><strong>Caterpillar</strong></td>
<td>Scout landscape plants for signs of chewing insect damage including leaves, buds, or flower holes, skeletonization, leaf-rolling, or in extreme cases, plant defoliation.</td>
<td>acethate acetamiprid azadirachtin&lt;sup&gt;0&lt;/sup&gt; Bacillus thuringiensis kurstaki&lt;sup&gt;0&lt;/sup&gt; carbaryl clothianidin esfenvalerate fluvalinate horticultural oils&lt;sup&gt;0&lt;/sup&gt; imidacloprid pyrethrins&lt;sup&gt;0&lt;/sup&gt; pyrethroids&lt;sup&gt;p&lt;/sup&gt; spinosad&lt;sup&gt;0&lt;/sup&gt;</td>
<td>acethate Bacillus thuringiensis aizawai&lt;sup&gt;0&lt;/sup&gt; chlorantraniliprole chlorfenapyr diflubenzuron indoxacarb malathion methoxyfenozide novaluron thiamethoxam</td>
</tr>
<tr>
<td>(Lepidoptera: Choreutidae) includes:</td>
<td>Thromerom traps may be available to monitor some adult moth species.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apple-and-thorn skeletonizer</td>
<td>Most chemical products are contact insecticides that target the youngest caterpillars and timing of sprays coincides with their presence. Thorough plant coverage with the spray is key to success. Bacillus thuringiensis must be ingested by the caterpillars to be effective. Some products are systemic and are better suited for tall trees and shrubs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Lepidoptera: Erebidae) includes:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Satin moth</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Silver-spotted tiger moth</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Lepidoptera: Geometeridae) includes:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Western oak looper</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>(Lepidoptera: Noctuidae) includes:</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Black cutworm</td>
<td></td>
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<tr>
<td>Large yellow underwing Variegated cutworm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Lepidoptera: Notodontidae) includes:</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Redhumped caterpillar</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>(Lepidoptera: Tortricidae) includes:</td>
<td></td>
<td></td>
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<tr>
<td>Spruce budworm</td>
<td></td>
<td></td>
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<tr>
<td><strong>Earwig</strong></td>
<td>Scout for damage caused by earwigs; earwigs tend to chew irregular variable-sized hole in plant tissues.</td>
<td>azadirachtin&lt;sup&gt;0&lt;/sup&gt; carbaryl imidacloprid esfenvalerate fluvalinate malathion pyrethrins&lt;sup&gt;0&lt;/sup&gt; pyrethroids&lt;sup&gt;p&lt;/sup&gt; spinosad&lt;sup&gt;0&lt;/sup&gt;</td>
<td>acethate Beauvaria bassiana&lt;sup&gt;0&lt;/sup&gt; chlorpyrifos fipronil thiamethoxam</td>
</tr>
<tr>
<td>(Dermaptera: Forficulidae) includes:</td>
<td>Scout for earwig presence and activity at night with a flashlight.</td>
<td></td>
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<tr>
<td>European earwig</td>
<td>Most chemical products are contact insecticides that target earwig populations early in the spring before they reproduce.</td>
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<td></td>
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<tr>
<td>Target pest examples</td>
<td>Monitoring &amp; scouting strategies</td>
<td>Home landscape chemical products</td>
<td>Restricted-use chemical products</td>
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<tr>
<td>--------------------------</td>
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<tr>
<td><strong>Grasshopper</strong></td>
<td>Scout for fresh damage caused by grasshopper and cricket adults and nymphs that appears as general chewing damage to plant leaves, stems and fruit. Scout for the presence of grasshoppers or crickets; since some species have wings and jumping legs, they may take flight as you approach plant. In some regions of the state, these insects periodically become pests when their populations explode, and they deplete preferred hosts in rangelands. Most of these products are contact insecticides that intercept invading pests.</td>
<td>azadirachtin(^0) carbaryl imidacloprid esfenvalerate fluvalinate pyrethrins(^0) pyrethroids(^2)</td>
<td>acephate chlorpyrifos diflubenzuron dimethoate indoxacarb malathion phosmet</td>
</tr>
<tr>
<td>(Orthoptera: Acrididae)</td>
<td></td>
<td>acetaloprid azadirachtin(^0) carbaryl imidacloprid esfenvalerate fluvalinate pyrethrins(^0) pyrethroids(^2) spinosad(^3)</td>
<td>acephate <em>Bacillus thuringiensis tenebrionus</em> (^0) chlorpyrifos clothianidin dinofuran malathion phosmet thiamethoxam</td>
</tr>
<tr>
<td>includes:</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Grasshopper</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Orthoptera: Gryllidae)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>includes:</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>True cricket</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>(Orthoptera: Tettigoniidae)</td>
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<td></td>
<td></td>
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<tr>
<td>includes:</td>
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<tr>
<td>Mormon cricket</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Katydid</td>
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<tr>
<td><strong>Leaf feeding beetle</strong></td>
<td>Scout landscape plant foliage for chewing damage in the form of scalloped holes, general leaf holes, and leaf skeletonization. When damage is found examine plant for signs of beetle adult or larvae. Adult flea beetles do jump and may escape detection. Most chemical products are contact insecticides. Timing of sprays coincides with target pest activity/presence. Thorough plant coverage with the spray is key to success. <em>Bacillus thuringiensis</em> must be ingested by the beetles to be effective. Some products are systemic and are better suited for tall trees and shrubs.</td>
<td>acetamiprid azadirachtin(^0) carbaryl esfenvalerate fluvalinate imidacloprid pyrethrins(^0) pyrethroids(^2)</td>
<td>acephate chlorpyrifos diazinon diflubenzuron dinofuran indoxacarb malathion phosmet thiamethoxam</td>
</tr>
<tr>
<td>(Coleoptera: Chrysomelidae)</td>
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<tr>
<td>includes:</td>
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<tr>
<td>Alder flea beetle</td>
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<tr>
<td>Dogwood flea beetle</td>
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<tr>
<td>Elm leaf beetle</td>
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<tr>
<td>Lily leaf beetle</td>
<td></td>
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<tr>
<td>Viburnum leaf</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Western spotted cucumber</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>beetle</td>
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<td></td>
<td></td>
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<tr>
<td>Willow flea beetle</td>
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<tr>
<td><strong>Sawfly</strong></td>
<td>Scout landscape plants for signs of chewing damage caused by larvae. Examine fresh damage for the presence of caterpillar-like or slug-like sawfly larvae. Some species of larvae are gregarious while others are solitary. Most chemical products are contact insecticides that target the youngest larvae and timing of sprays coincides with their presence. Thorough plant coverage with the spray is key to success. Some products are systemic and are better suited for tall trees and shrubs.</td>
<td>acetamiprid azadirachtin(^0) carbaryl esfenvalerate fluvalinate horticultural oils(^0) imidacloprid insecticidal soap(^0) pyrethrins(^0) pyrethroids(^2) spinosad(^3)</td>
<td>acephate chlorpyrifos diazinon diflubenzuron dinofuran indoxacarb malathion phosmet thiamethoxam</td>
</tr>
<tr>
<td>(Hymenoptera: Argidae)</td>
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<td></td>
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<tr>
<td>includes:</td>
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<tr>
<td>Birch sawfly</td>
<td></td>
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<td></td>
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<tr>
<td>(Hymenoptera:</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Tenthredinidae)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>includes:</td>
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<td></td>
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<tr>
<td>Azalea sawfly</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Birch leafminer</td>
<td></td>
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<tr>
<td>Bristly roseslug</td>
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<tr>
<td>Curled rose sawfly</td>
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<td></td>
<td></td>
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<tr>
<td>Dogwood sawfly</td>
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<tr>
<td>Elm leafminer</td>
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<tr>
<td>European alder leafminer</td>
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<tr>
<td>Green alder sawfly</td>
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<tr>
<td>Mountain ash sawfly</td>
<td></td>
<td></td>
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<tr>
<td>Pear slug</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Roseslug</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Striped alder sawfly</td>
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<tr>
<td>Target pest examples</td>
<td>Monitoring &amp; scouting strategies</td>
<td>Home landscape chemical products</td>
<td>Restricted-use chemical products</td>
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</tr>
<tr>
<td><strong>Weevil</strong> (Coleoptera: Curculionidae)</td>
<td>Scout for damaged foliage with notched leaf margins. Foliar damage is often cosmetic only and rarely impacts overall health of landscape plant. For any unthrifty shrub, tree or plant, search the soil in the plant’s root zone for c-shaped weevil grubs. The poplar-and-willow borer larvae feed along plant stems and trunks. Most chemical products are contact insecticides and target the adult weevils before they lay eggs. Timing of sprays coincides with adult weevil activity/presence. Adult activity can be done at night by jarring and capturing adults. Adults of most species are active in late May and June. Scout for the adult beetles as they feed on and oviposit in buds. Rose curculio emerge in early spring. Hollyhock weevil is active in July and August. Damage is limited to flower buds and reproduction and does not affect the overall health of the infested plants.</td>
<td>acetamiprid azadirachtin&lt;sup&gt;0&lt;/sup&gt; <em>Beauvaria bassiana</em>&lt;sup&gt;0&lt;/sup&gt; carbaryl clothianidin esfenvalerate fluvalinate imidacloprid kaolin clay&lt;sup&gt;0&lt;/sup&gt; malathion pyrethrins&lt;sup&gt;0&lt;/sup&gt; pyrethroids&lt;sup&gt;p&lt;/sup&gt; spinosad&lt;sup&gt;0&lt;/sup&gt;</td>
<td>acephate <em>Bacillus thuringiensis galleriae</em>&lt;sup&gt;0&lt;/sup&gt; chlorantraniliprole chlorpyrifos cryolite cyantraniliprole diazinon diflubenzuron dimethoate dinofeturon indoxacarb phosphet thiamethoxam trichlorfon</td>
</tr>
<tr>
<td>Leaf-feeders include: Black vine weevil Clay-colored weevil Douglas-fir twig weevil Lilac root weevil, Obscure root weevil Strawberry root weevil Poplar-and-willow borer &lt;br&gt;Woods weevil</td>
<td>Bud (seed)-feeders include: Hollyhock weevil Rose curculio</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<sup>O</sup> = Some formulations may be OMRI-listed for organic use.

<sup>P</sup> = The synthetic pyrethroids are general insecticides that include products with the active ingredients including bifenthrin, cyhalothrin, cyfluthrin, cypermethrin, deltamethrin and permethrin
Table 3. Landscape plant deformation

Plant deformation is caused by pests that often live within plant tissues and their feeding damage brings about tissue deformations such as leaf galls, leaf mines, and leaf blistering. This damage can cause plant stunting and undesirable plant growth habits.

<table>
<thead>
<tr>
<th>Target pest examples</th>
<th>Monitoring &amp; scouting strategies</th>
<th>Home landscape chemical products</th>
<th>Restricted-use chemical products</th>
</tr>
</thead>
</table>
| **Blister & rust mite** *(Trombidiformes: Eriophyidae)* includes:  
Cyclamen mite  
Fuchsia gall mite  
Lime nail gall mite  
Linden gall mite  
Maple bladder gall mite  
Pearleaf blister mite  
Peach silver mite  
Pine mite | Scout home landscape plants for unusual growth habits such as galls, leaf blisters, big buds, twisting needles, or curling leaves. Also scout for leaf or needle discoloration, (silvering, chlorosis). These mites can also cause fruit russetting. Often a 10- to 20X hand lens is needed to see these mite pests. In general, the damage caused by these pests is cosmetic and not detrimental to the overall health of the plant. When annual damage threatens plant health or growth form, this product targets the mites when they are active and before they are established in plant tissues; timing is key. | ccarbaryl  
horticultural oils  
insecticidal soap  
kaolin clay  
pyrethrin  
pyrethroids  
sulfur | abamectin  
carbaryl  
chlorfenapyr  
diazinon  
diflubenzuron  
fenbutatin-oxide  
pyridaben  
spiromesifen  
spirotetramat |
| **Gall Aphid** *(Hemiptera: Aphididae)* includes:  
Lettuce root aphid  
Manzanita leaf gall aphid  
Poplar petiole gall aphid  
(Hemiptera: Adelgidae) includes:  
Cooley spruce gall adelgid | Scout landscape plants for the formation of galls on the leaves, needles or stems. Most products are contact and thorough coverage is essential. Pest species identification is important as these products must be applied before the pest gets into plant tissues. | carbaryl  
pyrethrin  
pyrethroids | chlorpyrifos  
pyrethroid |
| **Gall wasp** *(Hymenoptera: Cynipidae)* includes:  
Bassettia gall wasp  
California jumping gall wasp  
Mossy rose gall wasp  
Oregon oak gall wasp  
Spiny rose gall wasp | Scout landscape plants for the presence of galls. Make sure these abnormal plant growths have active wasp larvae in them. Most products are contact and thorough coverage is essential. These products typically target the adult wasp before eggs are laid in leaf tissues. Some products are systemic and are better suited for tall trees and shrubs. Damage is primarily cosmetic. Damage can lead to premature defoliation, but healthy plants can recover unless this becomes an annual infestation. | carbaryl  
clothianidin  
enamectin benzoate  
fluvinate  
imidacloprid  
insecticidal soap  
pyrethrin  
pyrethroids | No additional products |
### Target pest examples

<table>
<thead>
<tr>
<th>Pest</th>
<th>Description</th>
<th>Monitoring &amp; scouting strategies</th>
<th>Home landscape chemical products</th>
<th>Restricted-use chemical products</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Leafminer</strong>&lt;br&gt;(Diptera numerous families)</td>
<td>Include: Boxwood leafminer, California gallfly, Douglas-fir needle midge, Poplar twig gall fly, Rose midge, Rose stem miner, Willow beaked-gall midge</td>
<td>Scout landscape plants for the presence of galls, leaf mines, and rolled leaves. Make sure these abnormal plant growths have active maggots in them. Most products are contact and thorough coverage is essential. These products typically target the adult fly before eggs are laid in leaf tissues. Some products are systemic and are better suited for tall trees and shrubs. Damage is primarily cosmetic. Damage can lead to premature defoliation, but healthy plants can recover unless this becomes an annual infestation.</td>
<td>Acetamiprid, Azadirachtin, Carbaryl, Clothianidin, Dinofuran, Esfenvalerate, Horticultural Oils, Malathion, Pyrethrins, Pyrethroids, Spinosad</td>
<td>Abamectin, Acephate, Chlorpyrifos, Cyrantraniliprole, Diazinon, Diflubenzuron, Dimethoate, Emamectin Benzoate, Fenpropatrin, Flupyradifurone, Methoxyfenozide, Phosmet, Novaluron, Thiamethoxam</td>
</tr>
<tr>
<td><strong>Leafminer</strong>&lt;br&gt;(Lepidoptera: numerous families)</td>
<td>Include: Aspen blotchminer, Azalea leafminer, Ceanothus leafminer, Cypress tip moth, Holly leafminer, Lilac leafminer, Madrona shield bearer, Spotted tentiform leafminer, Spruce needleminer</td>
<td>Scout for leaf- or needle-mining activity early in the season as leaves unfurl. Pheromone traps are available for some moth species. Most products are contact and thorough coverage is essential. These products typically target the adult pest before eggs are laid in leaf tissues. Some products are systemic and are better suited for tall trees and shrubs. Damage is primarily cosmetic. Damage can lead to premature defoliation, but healthy plants can recover unless this becomes an annual infestation.</td>
<td>Acetamiprid, Azadirachtin, Carbaryl, Clothianidin, Dinofuran, Imidacloprid, Insecticidal Soap, Malathion, Pyrethrins, Pyrethroids, Spinosad</td>
<td>Abamectin, Acephate, Chlorantraniliprole, Chlorpyrifos, Cyrantraniliprole, Diazinon, Diflubenzuron, Dimethoate, Emamectin Benzoate, Fenpropatrin, Flupyradifurone, Methoxyfenozide, Novaluron, Pyriproxyfen, Thiamethoxam</td>
</tr>
<tr>
<td><strong>Leafroller</strong>&lt;br&gt;(Lepidoptera: Tortricidae)</td>
<td>Include: Carnation tortrix, European leafroller, Fruittree leafroller, Holly bud moth, Oblique-banded leafroller, Orange tortrix, Pine shoot moth, Three-lined leafroller</td>
<td>Scout for and examine rolled leaves near branch tips for caterpillars. Pheromone traps are available for many of these moth species. Most products are contact and thorough coverage is essential.</td>
<td>Acetamiprid, Azadirachtin, Bacillus thuringiensis kurstaki, Carbaryl, Clothianidin, Esfenvalerate, Horticultural Oils, Kaolin Clay, Malathion, Pyrethrins, Pyrethroids, Spinosad</td>
<td>Acephate, Bacillus thuringiensis aizawai, Beauvaria bassiana, Chlorpyrifos, Cryolite, Cyrantraniliprole, Diazinon, Diflubenzuron, Emamectin Benzoate, Methoxyfenozide, Novaluron, Phosmet</td>
</tr>
</tbody>
</table>

O = Some formulations may be OMRI-listed for organic use.
P = The synthetic pyrethroids are general insecticides that include products with the active ingredients including bifenthrin, cyhalothrin, cyfluthrin, cypermethrin, deltamethrin and permethrin
Table 4. Landscape plant damage by stem and trunk borers

This damage is caused by pests that bore into and feed on the plant stem, trunk, scaffold branches of perennial plants. Damage can girdle plant causing death to tissue above the damage and/or weaken the structural integrity of the plant leading to lodging, breaking and limb drop.

<table>
<thead>
<tr>
<th>Target pests examples</th>
<th>Monitoring &amp; scouting strategies</th>
<th>Home landscape chemical products</th>
<th>Restricted-use chemical products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bark Beetle (Coleoptera: Scolytidae) includes: Elm bark beetle European elm bark beetle European shothole borer Mountain pine beetle Shothole borer</td>
<td>Scout any weakened trees/shrubs. Examine branches, twigs and trunks in late spring for small holes made by adult beetles. Examine inner bark of unhealthy trees or shrubs for larval galleries. Pesticides are generally not recommended because trees and shrubs are already in decline. These products intercept bark beetles before they bore into the host. Insect pheromones are available to monitor some bark beetle species. Some beetle species transmit plant diseases.</td>
<td>azadirachtin(^O) clothianidin imidacloprid pyrethrins(^O) pyrethroids(^P)</td>
<td>carbaryl chlorpyrifos thiamethoxam</td>
</tr>
<tr>
<td>Wood or Trunk Borer (Coleoptera: Buprestidae) includes: Flatheaded cedar borer Locust borer (Coleoptera: Cerambycidae) includes: Bronze birch borer Mountain pine beetle</td>
<td>Scout any weakened trees/shrubs. Examine any dead branches, twigs and trunks for beetle larvae galleries and adult exit holes. Pesticides are generally not recommended because trees and shrubs are already in decline. However, some products are labeled for specific borers. These products intercept adult beetles as they exit the host to visit another</td>
<td>acetamiprid pyrethrins(^O) pyrethroids(^P)</td>
<td>chlorpyrifos fipronil thiamethoxam</td>
</tr>
<tr>
<td>Stem &amp; Twig Borer (Diptera: Cecidomyiidae) includes: Raspberry cane maggot Rose midge (Lepidoptera: Sessidae) includes: Ash borer Douglas-fir pitch moth Peachtree borer Sequoia pitch moth Other Lepidoptera includes: Carpenterworm Cherry bark tortrix Coneworm Cypress tip moth Maple tip moth Peach twig borer Snapdragon plume moth</td>
<td>Immature stages bore into or feed within plant stems, trunks or twigs. Most of these products target adults or intercept the pest before they enter plant. Proper application timing is key to product efficacy. Insect pheromones are available to monitor some borer species. When feasible cut off infested twigs, branches and terminals. When feasible, physically remove or kill borers with a pointed instrument or remove infested soil, debris, and pitch</td>
<td>pyrethroids(^P) pyrethrins(^O)</td>
<td>acephate chlorpyrifos cyantraniliprole cyantraniliprole emamectin benzoate</td>
</tr>
</tbody>
</table>

\(^O\) = Some formulations may be OMRI-listed for organic use.

\(^P\) = The synthetic pyrethroids are general insecticides that include products with the active ingredients including bifenthrin, cyhalothrin, cyfluthrin, cypermethrin, deltamethrin and permethrin.
Table 5. Landscape plant damage by root feeders and root borers

Subterranean pests that feed on or bore into the roots and crowns of plants can damage, deform or weaken plants reducing the plants ability to stand upright or to absorb the necessary water and soil nutrients to feed the aboveground portion of the plant.

<table>
<thead>
<tr>
<th>Target pest examples</th>
<th>Monitoring &amp; scouting strategies</th>
<th>Home landscape chemical products</th>
<th>Restricted-use chemical products</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Beetle</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>(Coleoptera:Cuculionidae) includes:</td>
<td></td>
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<tr>
<td>Black vine weevil</td>
<td>Beetle larvae with chewing mouthparts. Tend to be plant generalists and may impact only the newly planted ornamentals. Roots may appear damaged, missing tissues, bored or hollowed out. Some beetles can gradually build up high populations in perennial crops where crop or soil rotations are not a management option. Effective products either intercept adult beetles as they oviposit eggs or specially formulated for soil application</td>
<td>Beauvaria bassiana&lt;sup&gt;o&lt;/sup&gt; carbaryl clothianidin dinotefuran imidacloprid pyrethroids&lt;sup&gt;p&lt;/sup&gt; pyrethrins&lt;sup&gt;o&lt;/sup&gt;</td>
<td>acethate Bacillus thuringiensis galleriae beneficial nematodes&lt;sup&gt;o&lt;/sup&gt; chlorantraniliprole chlorpyrifos cyantraniliprole dinotefuran ethoprop phosmet thiamethoxam</td>
</tr>
<tr>
<td>Clay-colored weevil</td>
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<tr>
<td>Woods weevil</td>
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<tr>
<td>(Coleoptera: Elateridae) includes:</td>
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<tr>
<td>Wireworms, various</td>
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<td></td>
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<tr>
<td>(Coleoptera: Scarabaeidae) includes:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White grubs, various</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>Root aphid</strong></td>
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<td></td>
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</tr>
<tr>
<td>(Hemiptera:Aphididae) includes:</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Beech blight aphid</td>
<td>Root feeders with piercing sucking mouthparts. Root deformation and plant stunting. Often just a nuisance or cosmetic pest problem when life stages migrate to the above ground portion of the plant. These products target only the above-ground population of these aphids. Most products are contact and thorough coverage is essential.</td>
<td>azadirachtin&lt;sup&gt;o&lt;/sup&gt; pyrethrins&lt;sup&gt;o&lt;/sup&gt; pyrethroids&lt;sup&gt;p&lt;/sup&gt;</td>
<td>chlorpyrifos</td>
</tr>
<tr>
<td>Leafcurl ash aphid</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Woolly alder aphid</td>
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<tr>
<td>Woolly elm aphid</td>
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</tr>
</tbody>
</table>

<sup>O</sup> = Some formulations may be OMRI-listed for organic use

<sup>P</sup> = The synthetic pyrethroids are general insecticides that include products with the active ingredients including bifenthrin, cyhalothrin, cyfluthrin, cypermethrin, deltamethrin and permethrin
Hosts and Pests of Landscape Plants

Alder (Alnus)—Aphid
Includes
Alder aphid (Pterocallis alni)
Hop aphid (Phorodon humuli)
Woolly alder aphid (Prociphilus tessellatus)

Pest description and damage  Alder aphids are pale yellow with dark brown cornicles and markings and are somewhat woolly. The nymphs of the hop aphid are pale yellow-green and may nearly cover the undersides of leaves. Feeding by the woolly alder aphid causes leaves to fold downward over blue-black aphids in masses covered by a woolly waxy material. Each species has a portion of adults that develop wings to disperse to alternate seasonal hosts, although the alder aphid does not alternate hosts.

Biology and life history  The hop aphid is one of the aphids common on plum. They overwinter in the egg stage on plum, alder and other trees. In spring, they migrate to hops. The winged form of the woolly alder aphid (small orange females and blue-black males) migrates from alder to maple where they mate and lay eggs on the bark of maple. Simultaneously, a small wingless form crawls down the alder trunk to overwinter under leaf litter at the base of the tree. They crawl back up in spring or fly back to the alder from maple.

See “Aphid” in:
Common Landscape Pests

Management—chemical control
See Table 3 in:
Chemical Control of Landscape Pests

Alder (Alnus)—Fall webworm
Hyphantria cunea

Pest description and damage  Large silken tents filled with caterpillars, frass and dead leaves, eventually engulf entire branches of deciduous trees. Young caterpillars are pale greenish or yellow with a dark stripe down the back and a yellow stripe along the sides. Long silky hairs arise from yellow and black tubercles. When mature, the caterpillars are covered with yellow or rusty- to black-colored silky hairs. Adults are bright white with orange and black markings on the underside of the abdomen. Woolly scales cover masses of 200 to 500 greenish eggs.

For biology, life history, monitoring, and management
See:
Cottonwood (Populus)—Fall webworm

Management—chemical control
See Table 2 in:
Chemical Control of Landscape Pests

Alder (Alnus)—Flea beetle

Alder flea beetle (Macrohaltica ambiens)
Willow flea beetle (Altica subplicata)

Pest description and damage  Adults are dark, shiny blue, and about 0.25 inch long. Larvae are black and about 0.25 inch long at maturity. Adults chew holes in leaves while the larvae feed in groups and skeletonize foliage of alder, poplar, willow dogwood and other hosts. They are capable of defoliating trees, but only rarely do. More often they are found in smaller numbers scattered throughout the canopy.

Biology and life history  The insects overwinter as adults and become active in spring. They may be seen in large aggregations in spring as they emerge from hibernation. Adults feed on foliage before laying dull yellow eggs on leaves. Larvae usually are present in June and July and pupate in August. There is one generation per year.

Pest monitoring  Watch for dark, metallic adults that emerge in the spring. If the number of adults is low, damage will be minimal. Later in the season, check abundance of the larvae. Control is not usually warranted in landscapes.

Management—biological control
This insect is generally under effective biological control since it is not commonly found in abundance. The fungus Sporotrichium globuliferum, a tachinid fly, and predatory stink bugs are reported to be natural enemies. As willow and red osier dogwoods are planted in riparian zones, there is a potential for predator populations to build up in these settings.

Management—chemical control
See Table 2 in:
Chemical Control of Landscape Pests

For more information
See “Flea beetle” in:
Common Landscape Pests


Alder (Alnus)—Leafminer
European alder leafminer (Fenusa dohrnii)

Pest description and damage  The adult insect is a black sawfly about 0.25 inch long. The larvae are small, and light colored. The larvae feed between epidermal layers, creating large dark blotches on the surface of leaves. After the insects mature and leave, the affected areas turn light brown and crinkle. Aside from the effects on the appearance of the foliage, some defoliation and weakening of the tree can occur if leafminer larvae are present in large numbers.

Biology and life history  The insect overwinters in the soil as a pupa. Adults first appear in spring, when leaves are partly formed. The females lay eggs on upper leaves. After the eggs hatch, the larvae mine between the upper and lower epidermis of leaves. Several mines may coalesce to form a large blotch visible on leaves. After 2 to 3 weeks, the larvae drop to the ground and pupate. There are normally two generations per year.

Pest monitoring  Observe leafminer populations in spring and late summer to determine that they will remain at low levels.

Management—cultural control
Periodically remove infested leaves to prevent leafminer increase.
Management—biological control
An increase in the number of leafminers is often followed by an increase in the number of natural enemies.

Management—chemical control
See Table 3 in: Chemical Control of Landscape Pests

For more information
See “Leafminer” in: Common Landscape Pests

Alder (Alnus)—Sawfly
Birch sawfly (Arge pectoralis)
Green alder sawfly (Monsoma pulveratum)
Striped alder sawfly (Hemichroa crocea)
Woolly alder sawfly (Eriocampa ovata)

Pest description and damage These sawflies are sporadic pests of alder in the PNW. The larvae of the green alder sawfly, a recent introduction to the PNW, have a light green head with dark eye-spots and a light green body with faint darker dorsal and side lines that help them blend with the leaf veins on the undersides of the leaves. Only one or two larvae will be found on a leaf and they lie straight rather than curled. Larvae chew holes in leaves that are delimited by major veins. Striped alder sawfly lays eggs in slits in the leaf petiole or main vein. Larvae hatch and begin chewing tiny erratic channels in the leaves; these coalesce and expand out to the margin, leaving only the tougher veins. Larvae have a black head; the body has a dorsal green stripe and light sides with broken black lines along the sides. They line up along the edge of the leaf damage with their hind end curled up and out of the way. The woolly alder sawfly is found scattered in small groups on the undersides of newest leaves at branch tips. White wax covers the larvae; they rest in a U-shape and chew holes from the undersides of leaves. Birch sawfly also feeds on alder. Larvae are a pale, green with abundant black spots along the dorsal and two broken lateral stripes. It has an orange head with yellow or orange overtones in the posterior end. All these sawflies are capable of defoliating trees but more often damage is limited to large numbers of holes or localized defoliation scattered throughout the canopy.

Biology and life history Larvae overwinter as prepupae or in cocoons in the soil until spring. However, some can remain in the soil through the summer and do not emerge until the next spring. Sawflies that emerge in spring mate and lay eggs in or on leaves. Striped alder sawfly lays eggs in slits in the leaf petiole or main veins in spring when leaves are fully expanded and may have several generations in a year. Research is ongoing to define the number of generations in Washington.

Pest monitoring Yellow sticky traps can be hung in alders in spring just as leaves are starting to unfurl. This removes the adults and limits the number of eggs but also helps determine the level of potential infestation. Egg slits are visible in the petiole and main veins if the plant is small. Look into the canopy and watch for a leaf with squiggly channels in the leaves or for early holes in the leaves indicating larvae are present. On native plants in wooded settings damage may be more tolerable than in a landscape setting. Damage rarely kills plants.

Management—cultural control
Removing larvae on small plants early in the season will reduce subsequent generations. For reasons unknown, sawflies can delay adult emergence for a year or more. They may be responding to environmental cues such as soil temperature, soil moisture or other factors.

Management—biological control
Little is known about biological control of sawfly larvae. Potential natural enemies include yellowjackets later in the season, and true bugs have been seen feeding on larvae. Parasitoids may also regulate the frequency of heavy infestations.

Management—chemical control
See Table 2 in: Chemical Control of Landscape Pests

For more information
See “Sawfly” in: Common Landscape Pests


Green alder sawfly (http://www.fs.usda.gov/detail/r6/forest-grasslandhealth/invasivespecies/?cid=stelprdb5303925)


Alder (Alnus)—Tent caterpillar
Forest tent caterpillar (Malacosoma disstria)
Western tent caterpillar (Malacosoma californicum pluviale)

Pest description and damage The western tent caterpillar attacks a wide variety of plants including alder, apple, ash, birch, cherry, cottonwood, and willow, as well as fruit trees and roses. The adult moths are stout, light to darker brown, and are active in early- to mid-summer. Adults are attracted to lights at night. Western tent caterpillars are hairy, dull yellow-brown, with rows of blue and orange spots on the body. Forest tent caterpillars are black and blue with dorsal white “footprints.” Eggs of these moths are laid on twigs or buildings in masses and may be especially numerous around lights. The eggs are brown to gray in color, about 0.0625 inch long, and look like bits of gray, hardened foam. The larvae of both species construct unsightly nests or “tents” in the crotches and branches of host trees. The larvae leave the tent by day to feed on foliage of host plants and can do significant damage by defoliation. The larvae usually return to the tent in the evening. Tent caterpillars can defoliate small trees. Defoliation can hinder plant growth, make the plants more susceptible to competition, diseases or poor weather and defoliation over consecutive years may weaken or kill unthriftily hosts.

Biology and life history Tent caterpillars overwinter as egg masses on twigs (or buildings). The eggs hatch as buds break in April or May. The young larvae feed in groups for 5 to 6 weeks, growing larger and molting (shedding skins) four times. As they mature, they split into smaller groups and move to new feeding sites in the tree returning to the tent most evenings. In mid-June, the mature larval congregate in large clusters on dense mats of webbing on the tree trunk and then begin to migrate in search of sheltered sites where they can spin their cocoons and pupate. Adults emerge 7 to 10 days later and fly in large numbers around lights at night. They mate and females lay the overwintering egg masses. There is one generation per year.

Pest monitoring Watch for egg hatch and the glisten of the first white webbing of the tents early in the spring. A few tents do not threaten the health of the tree. The earlier the intervention, the more environmentally friendly options can be employed.
Management—cultural control

Trees that have been defoliated need additional, but not excessive, irrigation during dry summers to help them refoliate. Healthy trees will withstand defoliation better than closely spaced, drought-stressed trees. Remove egg masses from twigs or other sites. Cut out infested twigs and discard.

Management—biological control

Heavy infestations of tent caterpillars occur from time to time as the populations of the caterpillars and their predators rise and fall. Tent caterpillars have many natural enemies. Some birds eat the caterpillars, and small mammals and birds will consume the pupa inside the cocoons. A tachinid fly parasitizes the caterpillars by laying a white egg on the caterpillar; the hatching fly larva then burrows into and feeds within the caterpillar. A Trichogramma wasp will also parasitize eggs. When pruning out tent caterpillar egg masses, discard the masses in a protected area away from a host plant so these parasitoids can emerge naturally.

Management—chemical control

See Table 2 in:
Chemical Control of Landscape Pests

For more information

See “Caterpillar” in:
Common Landscape Pests


Murray, T. Western Tent Caterpillar Update (http://whatcom.wsu.edu/ag/homehort/pest/tent_caterpillar_biology.htm)

Andromeda (Pieris japonica)—Azalea bark scale

Eriococcus azaleae

Pest description and damage This scale insect resembles mealybugs in appearance. Mature female scale is about 0.13 inch long and appear as tiny white cottony sacs, located on twigs, stems and branch axes of host plants. Females cover themselves with wax and eggs, crawlers and females beneath the wax are reddish. Hosts include andromeda, azalea, rhododendron, hawthorn, poplar, willow, and most recently blueberries.

For biology, life history, monitoring and management

See:
Azalea (Rhododendron)—Azalea bark scale

See “Scale insect” in:
Common Landscape Pests

Management—chemical control

See Table 1 in:
Chemical Control of Landscape Pests

Andromeda (Pieris japonica)—Azalea and rhododendron lace bug

Azalea lace bug (Stephanitis pyrioides)
Rhododendron lace bug (Stephanitis rhododendri)

Pest description and damage These insects use piercing–sucking mouthparts to feed on individual plant cells on the lower leaf surface, so the upper leaf surface appears stippled. These stippled areas eventually turn yellow. The undersides of leaves are peppered with varnish-like “tar” spots. Infestations are more severe on plants in the sun. Damage is apparent by early to mid-July. Repeated infestations of rhododendron lace bugs may result in yellowed, sickly plants. Adult insects are whitish-tan and approximately 0.13 inch long with lacy-looking wings. Nymphs grow to about 0.13 inch and are spiny.

For biology, life history, monitoring and management

See:
Azalea (Rhododendron)—Azalea and rhododendron lace bug

Management—chemical control

See Table 1 in:
Chemical Control of Landscape Pests

Andromeda (Pieris japonica)—Root weevil

Numerous species

Pest description and damage Species identification is important as root weevil species differ in their susceptibility to pesticides and seasonal appearance of life stages. Adult weevils are small dark nocturnal beetles with a snout (rostrum) and elbowed antennae. They cannot fly, so distribution is generally through movement of infested plants, soil or debris. The larvae are C-shaped, legless, and white or slightly reddish with tan heads, up to 0.5 inch in size. The larvae of all species are similar in appearance and feed on root hairs, larger roots and on the root crown. Look for ragged notches on the edges of leaves, or flower petals. Check the base of unthrifty shrubs for evidence of girdling by the larvae.

For biology, life history, monitoring and management

See “Root weevil” in:
Common Landscape Pests

Management—chemical control

See Table 5 in:
Chemical Control of Landscape Pests

Apricot, flowering (Prunus)—Fall webworm

Hyphantria cunea

Pest description and damage Large silken tents filled with caterpillars, frass and dead leaves, eventually engulf entire branches of deciduous trees. Young caterpillars are pale greenish or yellow with a dark stripe down the back and a yellow stripe along the sides. Long silky hairs arise from yellow and black tubercles. When mature, the caterpillars are covered with yellow to rusty- to black-colored silky hairs. Adults are bright white with orange and black markings on the underside of the abdomen. Woolly scales cover masses of 200 to 500 greenish eggs.

For biology, life history, monitoring and management

See:
Cottonwood (Populus)—Fall webworm

Management—chemical control

See Table 2 in:
Chemical Control of Landscape Pests
Apricot, flowering (*Prunus*)—Peachtree borer

*Synanthedon exitiosa*

**Pest description and damage** Peach tree borer is native to North America and common in the Pacific Northwest. The adult is a metallic blue-black, clearing moth. The male moth may have bands of light yellow scales on the abdomen, and resemble a wasp. The female has an orange band around the abdomen. Full-grown larvae are 1 inch long and whitish with a brown head. The larvae burrow into the bark of the crown and feed on the cambium. Feeding is restricted to an area a few inches above and below the soil line. Young trees can be completely girdled and killed. Older trees rarely are girdled, but the feeding reduces vigor and makes them vulnerable to other pests and diseases. Infested trees “bleed” a reddish amber frass and gum mixture during the growing season.

**For biology, life history, monitoring and management**

[See: Peach, flowering (*Prunus*)—Peachtree borer](#)

**Management—chemical control**

[See Table 4 in: Chemical Control of Landscape Pests](#)

Apricot, flowering (*Prunus*)—Peach twig borer

*Anarsia lineatella*

**Pest description and damage** Peach twig borer is a European insect first found in California in the 1880s. It is a major pest of apricots, peaches, plums, and prunes. There are no native hosts outside the orchard. The adult is a steel-gray moth with white and dark scales, about 0.33 to 0.5 inch long. The larva is approximately 0.5 inch long, with a dark brown head and distinctive, alternating light and dark bands on the body. The pupa is smooth and brown. The larva of the borer causes injury to both fruit and twigs. Feeding on the buds and twigs occurs early in the season; later the larva bores into the shoots, causing a characteristic “flagging” or wilting of the new growth. Later generations of larvae feed on shoots or fruit causing blemishes.

**For biology, life history, monitoring and management**

[See: Peach, flowering (*Prunus*)—Peach twig borer](#)

**Management—chemical control**

[See Table 4 in: Chemical Control of Landscape Pests](#)

Apricot, flowering (*Prunus*)—Spider mite

*Tetranychus* spp.

**Pest description and damage** Several species of spider mites can cause damage to apricot. Appearance of these mites varies with the species, although all are 0.02 inch or smaller. Adults and nymphs can be yellowish, greenish, or reddish brown, depending on species. Female European red mites are round with red bodies; males are yellowish-red. Two-eyed spider mites are oval and yellowish-brown or greenish with distinctive black spots on the body. Plants may be covered with fine silk webbing at branch axils or small branches may be engulfed in webbing under very heavy infestations. Mites damage leaves by sucking the contents of epidermal plant cells causing leaf stippling, bronzing, and possibly leaf drop. The reduction in photosynthesis causes loss of tree vigor and fruit yield.

**For biology, life history, monitoring and management**

See “Spider mite” in: Common Landscape Pests

Management—chemical control

[See Table 1 in: Chemical Control of Landscape Pests](#)

Apricot, flowering (*Prunus*)—Western tiger swallowtail

*Papilio rutulus*

**Pest description and damage** Tiger swallowtail larvae feed on leaves of cherry family plants, willows and a few other species. Generally limited to isolated numbers on single trees. Larvae spin a silken pad on which they rest. Initially larvae look like small bird droppings molting into bigger black and white bird droppings. The last molt is a thick green larva with black and yellow bands and conspicuous eyespots behind the head which is tucked under the body of the caterpillar. When disturbed the larvae may evert orange “horns” with a peculiar smell to deter predators. The chrysalis is a 1 inch long tan, marbled capsule with visible outlines of legs, antennae, eyes and proboscis. The benefit of the large yellow and black butterfly in the garden outweighs the minimal damage inflicted by a caterpillar.

**For biology, life history, monitoring and management**

See: Cherry, flowering (*Prunus*)—Western tiger swallowtail

**Management—chemical control**

[See Table 2 in: Chemical Control of Landscape Pests](#)

Arborvitae (*Thuja*)—Cypress tip moth

*Argyresthia cupressella*

**Pest description and damage** There are nine different *Argyresthia* species that attack different conifers (pine, hemlock, etc.) in the Pacific Northwest. One of them, the adult cypress tip moth (cypress tip miner) is common enough to merit attention in many books. The moth is silver-tan and approximately 0.13 inch long. The larvae are green, about 0.13 inch long. The larvae mine in the growing points of the 1- and 2-year-old shoot tips. The cocoon is white and visible as a papery structure in the axils of leaf scales. Damage typically is limited to the tips of twigs. The exit holes are dark and may resemble symptoms of leaf blight, a fungal disease. Affected foliage does not discolor until late winter. After this, the brown dead twigs break off readily. Cultivars of *Juniperus chinensis*, *J. virginiana*, and *J. sabina* also are affected. The entire plant can appear brown in a severe infestation, and repeated infestations cause dieback. Failure to gain control may require taxonomic identification to ensure the species is properly identified.

**For biology, life history, monitoring and management**

See: Juniper (*Juniperus*)—Cypress tip moth

**Management—chemical control**

[See Table 3 in: Chemical Control of Landscape Pests](#)
Arborvitae (Thuja)—Borer
Bark beetle (Phloeosinus punctatus)
Flatheaded cedar borer (Chrysobothris nixa)
Shothole borer (Scolytus rugulosus)

Pest description and damage  Borers are pests of many different trees and shrubs. The 0.5 inch cedar borer adults are either brown to metallic gray or black with red or orange markings, depending on species. The larvae are whitish to pale yellow grubs about 0.5 inch long when fully developed and bore within the wood and bark of host plants. Just back of the larval head is a broad, flat enlargement giving the larvae a flat-headed appearance. Bark beetle adults are brown beetles less than 0.08 inch long. Bark beetle larvae feed just beneath the bark on the trunk leaving characteristic engravings. The damage may girdle the trunks and branches of trees leading to death of tissues distal to the damage. Larval feeding also may be associated with weeping sap on the trunk. Young, recently planted trees are most susceptible as are trees that are stressed due to drought or other plant stresses.

Pest monitoring  Watch for water soaked areas, depressions in the bark or cracks through which frass may be seen.

Management—biological control  Birds peck the larvae from under the bark. Some wasp parasites attack the borer. Carpenter ants eat both larvae and pupae from the wood but may in turn construct galleries for their nest.

Management—cultural control  As the borer is attracted to weakened trees, the best control is to keep trees healthy. Larvae cannot thrive in trees that are vigorous and full of sap. Avoid wounding plants, and follow good pruning, watering, and fertilization practices. To prevent sunburn, paint the trunk with white latex paint. Keep weeds, grass, and trash from the base of the trees to make it easier to detect and remove borers.

Management—chemical control  See Table 4 in:  Chemical Control of Landscape Pests

For more information  Rosetta, R. 2007. Flatheaded cedar borer (http://oregonstate.edu/dept/nurspest/Flatheaded_cedar_borer.htm)

Arborvitae (Thuja)—Leafminer

Argyresthia thuiella; other similar species of Argyresthia are reported in other states

Pest description and damage  Moths are tiny, silvery to gray, with black and brown markings on forewings and tan underbelly and legs. They lay pinkish eggs on branch tips. Larvae are yellow-green and hairy. Tiny larvae tunnel into leaf scale and mine within the foliage, causing tips to turn brown. Occasional outbreaks may turn trees totally brown. Despite how dead the trees look, carefully timed pesticides can interrupt the cycle and the trees will green up. The C-shaped, legless larvae are white or slightly reddish with tan heads, up to 0.5 inch in size. Check base of shrubs for girdling by larvae resulting in unthrift appearance or death of the plant.

Management—cultural control  See “Root weevil” in:  Common Landscape Pests

Management—chemical control  See Table 5 in:  Chemical Control of Landscape Pests

Arborvitae (Thuja)—Scale insect

Includes  Black pine leaf scale (Nuculaspis californica)  Juniper scale (Carulaspis juniperi)  Pine needle scale (Chionaspis pinifoliae)

Pest description and damage  Pine needle scale are elongate, pure white scales with a cast larval skin at the narrow end. Males are smaller and more elongate. Red eggs are laid beneath the female scale cover. Crawlers are yellow and flat. Nymphs and adults feed on the needles. Heavily infested trees may appear crusty white or “flocked.” Infested needles turn yellow, then brown. Twigs and branches may be killed. Repeated infestations eventually may kill plants. Pine needle scale is often found with the black pine leaf scale, which is convex, black with gray margins and a central yellow area. Pine needle scale is most serious on ornamental pines that are under stress or along dusty roads. This insect may infest arborvitae, cedar, hemlock, spruce and Douglas-fir. The female juniper scale is shaped like a small round volcano with a yellow top (cast off crawler “skin”), while the males are elongate with the cast skin at the narrow end. Crawlers are bright
yellow but fade to tan as they begin to form the scale cover. There are
two generations per year.

**Biology and life history** The pine needle scale overwinters as red
eggs under the female scale covering. Eggs hatch in spring and
reddish crawlers move along needles and molt, becoming yellow
with a dark central spot. A second generation occurs in mid-summer
(July). Black pine leaf scale eggs are laid in June and hatch into
crawlers in July and spend winter feeding on foliage. There is one
generation per year in Oregon. Juniper scale overwinters as eggs
beneath the female scale cover. Eggs hatch in spring and the pale
yellow crawlers move to the last season’s needles. Once females
settle, they remain in that spot.

**For biology, life history, monitoring and management**

See “Scale insect” in:
Common Landscape Pests

**Management—chemical control**

See Table 1 in:
Chemical Control of Landscape Pests

**For more information**

Anon. Juniper scale in Pests of Trees and Shrubs. IPM of Midwest
entomology.umn.edu/cues/Web/159JuniperScale.pdf)

Anon. Pine needle scale in Pests of Trees and Shrubs. IPM of
www.entomology.umn.edu/cues/Web/181PineNeedleScale.pdf)

(http://www.oregon.gov/odf/privateforests/docs/fh/
blackpineleafscale.pdf)

**Arborvitae (Thuja)—Spider mite**

Includes spruce spider mite (*Oligonychus ununguis*)

**Pest description and damage** Several species of spider mites can
cause damage in deciduous, evergreen and coniferous ornamentals.
Mites are all 0.02 inch or smaller. Adults and nymphs can be
yellowish, greenish, or reddish brown, depending on species.
Female European red mites are round with red bodies; males are
yellowish-red. Spider mites are oval and yellowish-brown or green
with distinctive black spots on the body. Mites damage leaf scales
and fruit indirectly by feeding on leaves causing leaf stippling and
bronzing that later turns brown. The reduction in photosynthesis
causes loss of vigor.

**For biology, life history, monitoring and management**

See “Spider Mite” in:
Common Landscape Pests

**Management—chemical control**

See Table 1 in:
Chemical Control of Landscape Pests

**Ash (Fraxinus)—Aphid**

Includes
Leafcurl ash aphid (*Prociphilus fraxinfolii*)

**Pest description and damage** Leafcurl ash aphids cause
significant curling and twisting of leaves which provide protection
for the white waxy aphids inside. The woolly ash aphid is woolly
and curls ash leaves. The consensus is that damage substantially
disfigures leaves but does no lasting damage as the leaves continue
to photosynthesize sugars for the plant.

**For biology, life history, monitoring and management**

See “Aphid” in:
Common Landscape Pests

**Management—chemical control**

See Table 1 in:
Chemical Control of Landscape Pests

**For more information**

Rosetta, R. Woolly ash aphid. PNW Nursery IPM (http://
oregonstate.edu/dept/nurspest/woolyashaphid/introduction.htm)

**Ash (Fraxinus)—Ash borer**

Ash borer (*Podosesia syringae*)

**Pest description and damage** The ash borer, also known as the
lilac borer, is a clearwing moth that attacks ash as well as lilac,
privet and other members of the olive family. The adult moth
resembles a paper wasp, with orange and yellowish markings on a
black body. A thin wet stain is followed by a mix of frass and sap.
Areas around the entry site may become sunken, and frass and
sawdust may accumulate around the base of plants. Eventually,
plants show branch dieback, weaken or die.

**For biology and life history** Adult clearwing moths emerge in
spring from a round hole at the top of their gallery. They mate and
lay eggs on the bark at the base of plants and the young larvae
tunnel under the bark.

**Pest monitoring** Deploy pheromone traps in spring to determine
when the moths emerge. Watch for wet sunken areas in the bark at
the base of the tree/bush. Often the pupal case will still protrude
from the exit hole indicating adult emergence. Spotting even old
damage will provide some indication of how heavy the infestation
is and inform the next season’s strategy.

**Management—cultural control**

Entomopathogenic nematodes are available. They are to be sprayed
at the base of trees near entry wounds so the nematodes can find
their way into the galleries.

**Management—biological control**

Pheromone traps are available for this pest and will attract males to
the trap preventing males from reaching females. Properly prune out
infested branches during fall or winter when moths are not active as
the moths often seek out injured areas on the bark. Do not compost as
moths may still emerge. Insert a knife or wire into the borer hole to
kill larvae and pupae. Prune properly for a faster sealing wound.

**Management—chemical control**

See Table 4:
Chemical Control of Landscape Pests

**For more information**

missouribotanicalgarden.org/gardens-gardening/your-garden/help-
for-the-home-gardener/advice-tips-resources/pests-and-problems/
insects/caterpillars/lilac-borer-and-ash-borer.aspx)
Ash (Fraxinus)—Carpenterworm

Prionoxystus robiniae

Pest description and damage The carpenterworm larvae bore in the trunk and main branches. Discolored or bleeding limbs, branch dieback, and lumpy or gnarled trunks may be indications of carpenterworm infestation. Sawdust-like material (frass) and wood chips mixed with loose webbing on or around infested trees is typical. Trees with severe carpenterworm infestations are susceptible to wind breakage and may need to be removed.

For biology, life history, monitoring and management

See: Cottonwood (Populus)—Carpenterworm

Management—chemical control

See Table 1 in: Chemical Control of Landscape Pests

Ash (Fraxinus)—Fall webworm

Hyphantria cunea

Pest description and damage Large silken tents filled with caterpillars, frass and dead leaves, eventually engulf entire branches of deciduous trees. Young caterpillars are pale greenish or yellow with a dark stripe down the back and a yellow stripe along the sides. Long silky hairs arise from yellow and black tubercles. When mature, the caterpillars are covered with yellow to rusty- to black-colored silky hairs. Adults are bright white with orange and black markings on the underside of the abdomen. Woolly scales cover masses of 200 to 500 greenish eggs.

For biology, life history, monitoring and management

See: Cottonwood (Populus)—Fall webworm

See “Caterpillar” in: Common Landscape Pests

Management—chemical control

See Table 2 in: Chemical Control of Landscape Pests

Ash (Fraxinus)—Lecanium scale

Lecanium spp.

Pest description and damage Lecanium scale are most noticed as they expand in spring. As female scale swell and feed, they produce considerable honeydew. The female lecanium scale are about 0.13 inch in diameter and vary from red to dark brown in color. They are oval and resemble small “helmets,” “turtles,” or bumps on branches and stems. Male scale are smaller, fairly flat, and oblong. Crawlers are pale yellow and overwinter on stems.

Biology and life history Lecanium scale overwinter as immatures on twigs and branches. They resume feeding in the spring and begin to swell; the males, when mature, split the scale cover and fly to find females. The fertilized female swells to a hemispherical shape and eggs are laid underneath the scale covering in May–June. The females are initially soft and exude honeydew, then harden. The eggs remain under the scale until hatching in early summer. Newly hatched yellowish-brown crawlers congregate on small branches, twigs and the undersides of leaves. When infestations are heavy, crawlers may be found on the upper surface of leaves, and on the fruit. Young scale can be dispersed by wind, rain, irrigation, or by people and machinery. After 4 to 6 weeks on the leaves, the young return to the stems and twigs to feed and overwinter. There is one generation per year.

Pest monitoring Inspect twigs during the dormant season for flat pale yellow scale crawlers on twigs. Pay attention to weak plants. In late spring, examine the hemispherical females to determine if eggs are still present (tiny beads roll out of the scale) or have hatched (white fluff in the scale). The new crawlers are easily detected using black tape with sticky side out, on twigs near females in May, or observed through a 10X magnifying glass.

Management—cultural control

Remove or squash swelling scale in the spring when they are just starting to mature or prune out heavily infested branches.

Management—biological control

A number of predatory mites and parasitoid wasps feed on these scale insects. Check beneath scale for predator mites or wasp grubs to determine scale mortality. Holes in scale bodies indicate that parasitoids have emerged from the scale.

Management—chemical control

See Table 3 in: Chemical Control of Landscape Pests

Ash (Fraxinus)—Lilac leafminer

Caloptilia syringella

Pest description and damage The adult insect is a golden yellow moth about 0.5 inch long. The larvae that mine within the leaf tissues are small, pale yellow to green caterpillars, 0.125 to 0.25 inch long. The larvae mine leaves during the early part of their development. Later, the larvae leave the mine, roll and tie together leaf tips to feed on the tissues within the rolled leaf.

For biology, life history, monitoring and management

See “Leafminer” in: Common Landscape Pests

Management—chemical control

See Table 4 in: Chemical Control of Landscape Pests

Ash (Fraxinus)—Oystershell scale

Lepidosaphes ulmi

Pest description and damage The mature oystershell scale is approximately 0.13 inch long, hard-shelled, brownish or gray in color, and usually elongated and slightly curved like an oyster or mussel shell. Oystershell scale are found on trunks, branches, and twigs of many broad-leaved deciduous plants. They occur less frequently on the leaves and other plant parts like fruit and seed pods. Scale infestations often are initially limited to isolated colonies on single branches or twigs. Newly emerged crawlers look like minute, bright white pimplies on the bark.

Biology and life history Oystershell scale overwinters in the egg stage beneath the scale cover and doesn’t hatch until late June in the Puget Sound area. The new crawlers are white and only crawl about for a few hours before settling in place and beginning to build the
shell. Initially, the scale cover is a loose lattice of white wax that remains vulnerable to any pesticide applications until late summer when it forms a more solid scale covering. Once the scale covering is in place they are less vulnerable to pesticides but still vulnerable to predators and parasitoids.

**Pest monitoring**  Use double stick tape to trap crawlers or inspect around infestations for the bright white crawlers in mid to late June. New scale have a fresh pinkish look to them, while old dead scale become gray. Since the waxy scale remains after scale insects have died, it is important to sample the patches of scale to determine if this is a live infestation or if the scale has been controlled by natural enemies.

**Management—cultural control**
For small infestations, scrape away the scale with fingernail or stiff brush. Hang a bird feeder in the tree to attract insectivorous birds to the area.

**Management—biological control**
Oystershell scale are preyed upon by parasitoid wasps and mites that feed on eggs under the scale cover. There is a definite reduction in the number of eggs produced when mites are present. Predators include ladybeetles and birds such as chickadees, nuthatches and brown creepers. Search for smooth round holes (parasitoid exit holes), ragged holes (beetle predation) or a white area where the scale have been removed (bird predation) to determine the level of natural enemies and surviving scale.

**Management—chemical control**
See Table 1 in:
Chemical Control of Landscape Pests

For more information
See “Scale insect” in:
Common Landscape Pests

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**Aspen (Populus tremuloides)—Poplar twig gall fly**

*Hexomyza schineri*

**Pest description and damage**  Adults are stout, shiny, dark flies about 0.16 inch long. The developing gall fly is a greenish-yellow maggot that causes galls to form on the current season’s twigs. Obscured by leaves, the original galls rarely are noticed until leaves fall in autumn. However, the galled tissues continue to grow and swell. Ultimately, galls become large knots on trunks and larger branches, giving the plants a gnarled, bonsai-like appearance. During subsequent years, the galled area is incorporated into the growing twigs and branches and ultimately may appear as large swollen bands on trunks and branches. Although these old injuries produce a permanent disfigurement, they do not seem to threaten tree health. Serious galling has been limited to aspen. However, small numbers of galls sometimes can be seen on other Populus species. Gall is most common on younger trees that produce a lot of succulent new growth.

**Biology and life history**  The poplar twig gall fly overwinters within the gall as a full-grown, yellow-green maggot. Pupation occurs within the gall in late winter or early spring. Most of the pupae then drop to the ground. As new leaf growth begins, the adult flies emerge from the pupae and become active. During the day, they rest and sun themselves on leaves. After mating, females move to developing twigs and insert eggs into the stems. The larvae hatch from these eggs and produce the distinctive swelling in response to their feeding. Areas below buds appear to be particularly favored sites for galls. As the stems continue to grow, the area where eggs were laid becomes increasingly swollen. At first, the swelling involves a fairly indistinct enlargement. However, within 2 months, the full-sized gall is usually present. The developing gall fly maggot grows slowly within the gall all summer. It is difficult to find until late summer and fall, when it grows rapidly, filling a small cavity within the swollen area of the twig. Individual galls typically contain two to three larvae. There is one generation per year.

**Management—cultural control**
Removal of galls has limited potential for control. Pruning often requires substantial branch destruction and creates wounds that can allow pathogens to enter. Furthermore, this practice can be counterproductive if it is done after flies emerge in late winter or early spring. Late pruning may remove only those galls that contain the natural enemies (including parasitic wasps) of the poplar twig gall fly. Because problems with poplar twig gall fly are most severe in succulent aspen, do not over-water or fertilize plantings. If aspen growth can be moderated, then gall production can be slowed.

**Management—biological control**
Parasitic wasps may give some control. Also, birds feed on the larvae.

**Management—chemical control**
No effective chemical controls have been developed.

For more information
See “Gallmakers” in:
Common Landscape Pests

Aspen (*Populus tremuloides*)—Oystershell scale

*Lepidosaphes ulmi*

**Pest description and damage** The mature scale is approximately 0.125 inch long, hard-shelled, pinkish (alive) or gray (dead) in color, and usually elongated and slightly curved like an oyster or mussel shell. Oystershell scale are found on trunks, branches, and twigs. They occur less frequently on the leaves and other plant parts. Scale infestations often are limited initially to isolated colonies on single branches or twigs. Newly emerged crawlers look like bright white pimples on the bark.

**For biology, life history, monitoring and management**

See:
- Ash (*Fraxinus*)—Oystershell scale

See “Scale insect” in:
- Common Landscape Pests

**Management—chemical control**

See Table 1 in:
- Chemical Control of Landscape Pests

**Aucuba (*Aucuba japonica*)—Aphid**

*Foxglove aphid* (*Aulacorthum solani*) and others

**Pest description and damage** The foxglove aphid has been reported on Aucuba. This aphid is pale green with dark green patches at the base of the cornicle. The antennae are banded black and pale green. Clusters of green aphids feed on the undersides of leaves making it difficult to detect. Leaves may pucker in response to feeding and sooty mold develops on underlying leaves.

**Biology and life history** This is an aphid that thrives in the cool of winter. As the weather warms in spring, winged forms are produced and it flies to any of its many alternate hosts.

**Pest monitoring** Watch for the first signs of honeydew as you pass by plants. Yellow sticky traps may catch incoming aphids, and water sensitive paper can be used for monitoring honeydew.

**Management—chemical control**

See Table 1:
- Chemical Control of Landscape Pests

**For more information**

See “Aphid” in:
- Common Landscape Pests

Rosetta, R. 2006. Azalea bark scale (http://oregonstate.edu/dept/nurspest/azalea_bark_scale.htm)


**Azalea (*Rhododendron*)—Azalea and rhododendron lace bug**

Azalea lace bug (*Stephanitis pyrioides*)

Rhododendron lace bug (*Stephanitis rhododendri*)

**Pest description and damage** Lace bugs are tiny true bugs which cause significant feeding damage to broadleaf evergreens including andromeda, laurel, pyracantha, and rhododendron. Adult insects are whitish-tan and approximately 0.13 inch long with lacy-looking wings. Nymphs grow to about 0.13 inch and are spiny. Leafhopper damage is similar but lacks the tar spots. The insects use piercing–sucking mouthparts to feed on individual cells, so the upper leaf surface is yellow and stippled. The underside of leaves is covered with dark varnish-like “tar” spots. Infestations are more severe on plants in the sun. Damage is usually apparent by early to mid-July. While almost never fatal, repeated infestations of rhododendron lace bugs may result in yellowed, sickly plants. Identification is based on the dark markings on the thorax and wings.

**Biology and life history** Eggs overwinter in crusty brown patches along the midribs of leaves. These hatch into spiny nymphs which begin to feed on the undersides of leaves. The lacy winged adults may be present through late summer and fall. There are several species attacking ornamentals and these may have different life cycles. The pattern on the wing can be diagnostic, as well as spines on the larvae. There is probably one generation a year in Oregon.

**Pest monitoring** In winter, look for crusty brown patches of eggs along the midrib. This will provide some early warning regarding the numbers likely to hatch in the spring. Watch for the appearance of first instar nymphs, the most vulnerable stage if control is needed.

**Management—cultural control**

Maintain plant health by providing proper water and nutrition. Stressed plants are more susceptible to insect damage. Grow those with low vigor. The scale insect crawler is the stage most susceptible to chemical control. Monitor for crawlers by wrapping a piece of sticky tape around an infested branch with the sticky side out. The red crawlers are very small and best observed with a 10X magnifying glass.

**Management—biological control**

Several species of beetles and parasitic wasps help control scale populations. Check beneath the waxy scales to determine if there is a live population. Avoid use of broad-spectrum insecticides, which can kill these predators.

**Management—cultural control**

Scrape scale off plants by hand with fingernail or toothbrush. Prune off major infestations. Apply double-stick tape near infestations of adult scale to catch the crawler stage. As with aphids, avoid excessive nitrogen fertilizer, as this favors population increase.

**Management—chemical control**

Scrape scale off plants by hand with fingernail or toothbrush. Prune off major infestations. Apply double-stick tape near infestations of adult scale to catch the crawler stage. As with aphids, avoid excessive nitrogen fertilizer, as this favors population increase.

**Management—biological**

Release of lacewing larvae have proven successful in one experimental test. Select insecticides to preserve populations of beneficial predators which will help control lace bugs.

**Management—chemical control**

*See Table 1 in: Chemical Control of Landscape Pests*

**For more information**


### Azalea (Rhododendron)—Azalea leafminer

*Caloptilia azaleella*

**Pest description and damage** The adult insect is a golden yellow moth about 0.5 inch long. The larvae are small, pale yellow to green caterpillars, 0.125 to 0.25 inch long. The larvae mine leaves during the early part of their development. During later stages of their development, they also roll the leaves and skeletonize them.

**Biology and life history** The insect overwinters as a pupa in rolled leaves, or possibly as a larva in a mined leaf. After the adult moth emerges, eggs are laid singly on the underside of leaves. The larvae emerge and mine into the leaf, causing the mined tissue to turn brown. They then emerge from the leaf and roll it over their bodies with silk for protection as they feed. Later, they select an undamaged leaf, roll it up, and pupate in it. The adult moth emerges about a week later. There may be two to three generations per year.

**Pest monitoring** Observe early spring growth for rolled leaves and feeding damage.

**Management—biological control**

Very low temperatures in winter significantly reduce overwintering populations. Spiders and parasitic/predatory insects greatly reduce populations throughout the year.

**Management—cultural control**

Hand-pick larvae if found. Removing rolled leaves in winter can reduce next year’s population.

**Management—chemical control**

*See Table 3 in: Chemical Control of Landscape Pests*

**For more information**

*See “Leafminer” in: Common Landscape Pests*

Baker, J.R. Azalea leafminer (https://content.ces.ncsu.edu/azalea-leafminer)

### Azalea (Rhododendron)—Oblique-banded leafroller

*Choristoneura rosaceana*

**Pest description and damage** The oblique-banded leafroller larvae roll and tie leaves together for shelter and feeding. The newly hatched larvae first mine leaves, then roll and tie the leaves together. They are often first detected by the abundant holes in leaves. The larvae are green caterpillars with a light brown to black head. When disturbed, they thrash about violently, wriggle backwards, and may drop from the leaf suspended by a silken thread. Their feeding on growing points on young plants can promote undesirable branching.

**For biology, life history, monitoring and management**

*See: Cherry, flowering (Prunus)—Oblique-banded leafroller*

*See “Leafroller” in: Common Landscape Pests*

**Management—chemical control**

*See Table 3 in: Chemical Control of Landscape Pests*

**For more information**


### Azalea (Rhododendron)—Root weevil

Numerous species in several genera, including Nemocestes, Sciapophilus, Scioptides, Strophosoma, and Trachyphloeus

**Pest description and damage** Identification is important: species differ in susceptibility to pesticides. Adult weevils are small dark beetles with a snout (rostrum) and elbowed antennae. They cannot fly so distribution is generally through movement of infested plants, soil or debris. Also, the adults of most of the species are all females and capable of laying eggs after a period of feeding to mature their ovaries. They are slow moving and should not be confused with swifter predacious ground beetles. Larvae, found around roots, are C-shaped, legless, and white, or slightly reddish, with tan heads, up to 0.5 inch in size. All species are quite similar in appearance and habits of feeding on root hairs, then larger roots and finally the root crown. Adult weevils are night feeders that mostly remain in the soil or in debris at the base of the plant during the day. At night, they may climb up to feed on leaves. Look for ragged notches on the edges of leaves, or flower petals or dead tips of plants where weevils have girdled the twig (yew, juniper, rockrose, etc.).

**For biology, life history, monitoring and management**

*See “Root weevil” in: Common Landscape Pests*

**Management—chemical control**

*See Table 5 in: Chemical Control of Landscape Pests*
Azalea (Rhododendron)—Azalea sawfly
Amauronematus azalae or Nematus lipsky

**Pest description and damage** Azalea sawfly adults are small black fly-like insects. The larvae are green and closely match the leaf color of their host plants. They feed only on Rhododendron mollis and R. occidentalis azaleas. The larvae feed on leaves at the tips of twigs and branches. Generally, one or two larvae per leaf feed along the edge up to the midrib leaving only the midribs. Damage is restricted to the tips of branches but occasionally plants can be entirely defoliated.

**Biology and life history** Sawflies overwinter in cocoons in the soil, and emerge just as the new leaves emerge. Adults may be found swarming when the sun is shining on the plants. Eggs are laid singly along the leaf edge and the small larvae begin to feed along the leaf edge. There is only one generation in a year.

**Pest monitoring** Larvae are so well matched to the color of the leaf edge that they are very difficult to see. Look for tiny dark specks of frass on leaf surfaces below feeding larvae, then look up to find the larvae. Start looking for flying larvae, or use yellow sticky traps to trap flying adults as the first leaves open; or watch for frass on leaves shortly after flowering.

**Management—cultural control**
Handpicking of insects is possible on small plants but more difficult on large species. The larvae are so cryptic that they are hard to see so continuously watch for fresh brown specks of frass. Use a beating sheet to dislodge larvae.

**Management—biological control**
Little is known of biological controls.

**Management—chemical control**
See Table 2 in: Chemical Control of Landscape Pests

**For more information**
See “Sawfly” in: Common Landscape Pests


Azalea (Rhododendron)—Spider mite
Tetranychus spp.

**Pest description and damage** Several species of spider mites can cause damage in deciduous or particularly evergreen azaleas. Appearance of these mites varies with the species, although all are 0.02 inches or smaller. Adults and nymphs can be yellowish, greenish, or reddish brown, depending on species. Female European red mites are round with red bodies; males are yellowish-red. Spider mites are oval and yellowish-brown or green with distinctive black spots on the body. Mites damage leaves and fruit indirectly by feeding on leaves that causes stippling, bronzing, and sometimes leaf drop. The reduction in photosynthesis causes loss of vigor.

**For biology, life history, monitoring and management**
See “Spider mite” in: Common Landscape Pests

**Management—chemical control**
See Table 1 in: Chemical Control of Landscape Pests

**For more information**
See Table 1 in: Chemical Control of Landscape Pests

Bamboo (Bambusa and others)—Aphid
Takecallis arundinariae

**Pest description and damage** The bamboo aphid is yellow with black markings. Aphids tend to be small (.0625 to 0.125 inch long), oval to pear-shaped, soft-bodied insects with piercing–sucking mouthparts. They feed in colonies and are often found on the most succulent plant tissues. Feeding damage to bamboo is usually minor, but can compromise the vigor of the plant, and may result in some leaf and shoot distortion if aphid populations are high. Aphids produce honeydew, a sweet, sticky secretion that collects on plant tissues and encourages growth of a black sooty mold.

**For biology, life history, monitoring and management**
See “Aphid” in: Common Landscape Pests

**Management—biological control**
See Table 1 in: Chemical Control of Landscape Pests

**For more information**
Hortense Bamboo Aphid (http://pep.wsu.edu/hortsense/scripts/query/displayProblem.asp?tableName=plant&problemID=321&categoryID=1)

Bamboo (Bambusa and others)—Bamboo mite
Bamboo mite (Stigmaeopsis = Schizotetranychus longus)

**Pest description and damage** Bamboo mites have a flattened body which is a straw- to greenish-yellow color with small blackish green spots. First impression is that leaves are under attack by a leafminer or virus. The mite feeding on the plant cell contents leaves a distinct damage pattern of long rectangular yellow patches visible on both sides of the leaf. Preferred bamboo hosts for this mite include the genera Sasa, Indocalamus, Phyllostachys, and Pleioblastus.

**Biology and life cycle** These mites form colonies on the underside of the leaves and live under a densely woven web. Generally, the mites remain under the web to feed and lay eggs, leaving to defecate in black fecal piles slightly removed from the nest. Adults and nymphs sometimes can be found outside the webbing, particularly as they begin to form new nests. Multiple males and females can be found in the web nests, and often many webbed nests form alongside each other running down the underside of the bamboo leaves. There are many generations per year.

**For biology, life history, monitoring and management**
See “Spider mite” in: Common Landscape Pests

**Management—chemical control**
See Table 1 in: Chemical Control of Landscape Pests

**For more information**
Barberry (Berberis)—Lecanium scale
Parthenolecanium corni

Pest description and damage Lecanium scale are most noticed as they expand in spring. As females swell, they produce considerable honeydew. The female lecanium scale are about 0.13 inch in diameter and vary from red to dark brown in color. They are oval and raised, resembling small “helmets,” “turtles,” or bumps on branches, and stems. Male scale are smaller, fairly flat, and oblong. Crawlers are pale yellow, overwinter on stems.

For biology, life history, monitoring and management
See: Ash (Fraxinus)—Lecanium scale
See “Scale insect” in: Common Landscape Pests

Management—chemical control
See Table 1 in: Chemical Control of Landscape Pests

For more information:

Beech (Fagus)—Aphid
Beech blight aphid (Porciphilus imbricator)
Woolly beech aphid (Phyllaphis fagi)

Pest description and damage Several species of aphids can become problems on beech. Both species are woolly aphids. Beech blight aphid forms masses of bluish-white woolly aphids on the undersides of stems, sometimes causing the death of twigs, small branches, and even young trees. The woolly beech aphid is especially common on the undersides of purple leaf beeches. The aphid is greenish with prominent long waxy strands. It is said to be under control of natural enemies, but if pesticide practices have upset the balance, aphid populations may soar.

For biology, life history, monitoring and management
See “Aphid” in: Common Landscape Pests

Management—chemical control
See Table 1 in: Chemical Control of Landscape Pests

Bergenia (Bergenia)—Root weevil
Includes black vine weevil (Otiorhynchus sulcatus)

Description and damage Adults are small rounded weevils with a broad snout and elbowed antennae. They are visible by flashlight at night straddling the leaf as they feed. Feeding results in ragged leaf edges. Because leaves are “evergreen,” damage accumulates over time.

For biology, life history, monitoring and management
See “Root weevil” in: Common Landscape Pests

Management—chemical control
See Table 5 in: Chemical Control of Landscape Pests

Birch (Betula)—Aphid
Includes Common birch aphid (Calaphis betulaeolens)
European birch aphid (Euceraphis betulae)

Pest description and damage The common birch aphid is a large green aphid and the European birch aphid is a large green and black species dusted with a powdery wax. They both feed on the undersides of leaves and produce copious amounts of honeydew. Sometimes birch begins to lose its leaves by late summer; excessive aphid feeding may compromise the vigor of the host. Aphid honeydew is a sweet, sticky secretion that collects on underlying plant tissues and encourages growth of a black sooty mold. In addition to cosmetics, honeydew may become a sticky nuisance when it falls on decks, cars, or other landscape surfaces.

For biology, life history, monitoring and management
See “Aphid” in: Common Landscape Pests

Management—cultural control
Insure that the plant receives enough water through the season. Place birch away from driveways, patios and decks to minimize the nuisance of honeydew.

Management—biological control
Check the tree trunk for ladybeetle adults, eggs, larvae and pupae. Also, check for swollen tan or gray aphids stuck to leaves as they are a sign of parasitoids.

Management—chemical control
See Table 1 in: Chemical Control of Landscape Pests
**Birch (Betula)—Apple-and-thorn skeletonizer**

*Choreutis pariana*

**Pest description and damage** Adult moths are reddish brown, with a wingspread less than 0.5 inch, and irregular light and dark bands on the wings. Larvae are 0.5 inch long, yellowish to greenish, with black spots and a yellow-brown head. Pupae are yellow to brown with a white silken cocoon. The larvae skeletonize and roll leaves usually from the sides and tip. Damaged leaves are brown and papery and drop prematurely. Damage varies from inconsequential to serious, so monitoring is an important management tool.

**For biology, life history, monitoring and management**

See:
- Crabapple (*Malus*)—Apple-and-thorn skeletonizer

**Management—chemical control**

See Table 2 in:
- Chemical Control of Landscape Pests

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**Birch (Betula)—Birch leafminer**

*Fenusa pusilla*

**Pest description and damage** The adult insects are a small (0.125 to 0.375 inch) black sawfly. Mature larvae are flattened and up to 0.5 inch long. The larvae feed between the leaf surfaces, leaving blotch-shaped or winding brown mines. Repeated severe infestations may result in decline of trees. Vigorous gray, white, and paper birches are attacked most commonly. In some years infestations are heavy.

**Biology and life history** The adult sawfly lays eggs in new leaves. When fully developed, the larvae drop to the ground and pupate in the soil for 2 to 3 weeks before emerging as adults. There may be up to four generations per year, depending on length of growing season.

**Pest monitoring** Check leaves once they are fully formed to assess the numbers starting in spring. Revisit trees to check on the population of subsequent generations.

**Management—cultural control**

Pinch leaves to kill larvae in minor infestations in small trees. Plant resistant species and cultivars that include *Betula costata*, *B. maximowicziana*, *B. utilis var. jacquemontii*, *B. nigra*, *B. schmidtii*, and the varieties ‘Crimson Frost’ and ‘Purple Rain.’

**Management—biological control**

Severe infestations but are soon brought under control by natural enemies. Monitor to determine if parasites or predators are active before initiating controls.

**Management—chemical control**

See Table 2 in:
- Chemical Control of Landscape Pests

For more information

Murray, T. Birch leafminer. WSU Whatcom IPM (http://whatcom.wsu.edu/ag/homehort/pest/birch_leaf_miner.htm)

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**Birch (Betula)—Bronze birch borer**

*Agrius anxius*

**Pest description and damage** Adult is an olive-brown beetle with a blunt head and a tapering body about 0.5 inch long. Larvae of flatheaded borers grow to about 1 inch long and are creamy to white in color with a head wider than the body. The larvae bore into the branches or trunk after hatching and bore winding galleries along the cambial layer (between the wood and the bark). The galleries may heal, with swelling showing on the outside of the tree (lumpy bark), or they may girdle and kill distal branches or canopy. Leaves distal to the girdling may become yellow (chlorotic) and wilt. The adult beetles may feed on leaves, but cause relatively little damage. Bronze birch borers attack trees weakened by age, environmental stresses, or previous insect attacks.

**Biology and life history** The insect overlinters as a larva in the tree. As the weather warms in spring, the larvae resume feeding. They pupate in the tree. In late spring the adult insect chews a D-shaped hole in the bark to emerge. They lay their eggs in bark cracks or under bark flaps. The larvae hatch and bore immediately through the bark to feed on the vascular tissues. The life cycle takes 1 to 2 years to complete.

**Pest Monitoring**

See “Woodborers” in:
- Common Landscape Pests

**Management—biological control**

Woodpeckers feed on the larvae during the winter months. Several larval and egg parasitoids have been reported.

**Management—cultural control**

Birch typically grows in shady, moist environments. When planted in hot, dry environments, the trees can become drought stressed and susceptible to beetle attack. Birch trees that are planted in full sun need more frequent irrigation. Borers are unable to survive in healthy trees. Keep trees vigorous with proper watering, fertilizing, and other cultural practices. In the drier regions of the PNW, plant the more resistant birch varieties and species. Susceptible birch species include *Jacquemontii* birch, Whitebarked Himalayan birch (*Betula jacquemontii*), European white birch, silver birch (*B. pendula*), European white weeping birch, Young’s weeping birch (*B. pendula* ‘Youngii’), and ornamental cutleaf varieties of birch. Moderately susceptible birch includes gray birch (*B. populifolia*), whitebarked birch (*B. platypylla japonica* ‘Whitespire’), yellow birch (*B. alleghaniensis*), sweet birch, black birch, cherry birch (*B. lenta*), paper birch, white birch and canoe birch (*B. papyrifer*). Those with low susceptibility (more resistant) include heritage birch, heritage river birch (*B. nigra* ‘Heritage’), river birch and red birch (*B. nigra*). Do not prune when adults emerge and seek oviposition sites (late April to mid-July) as the females are attracted to fresh cuts.

**Management—chemical control**

See Table 4 in:
- Chemical Control of Landscape Pests

For more information


Birch (*Betula*)—Carpenterworm

*Prionoxystus robiniae*

**Pest description and damage** Carpenterworms are the larvae of a large mottled gray and black moth. The caterpillars are white to pinkish-red with a dark head and are 1 to 3 inches long when mature. The caterpillars bore in the trunk and main branches. Discolored or bleeding limbs, branch dieback, and lumpy or gnarled trunks may be indications of carpenterworm infestation. Sawdust-like material (frass) and wood chips mixed with loose webbing on or around infested trees is typical. Trees with severe carpenterworm infestations are susceptible to wind breakage and may need to be removed.

**For biology, life history, monitoring and management**

See:
- Cottonwood (*Populus*)—Carpenterworm

**Management—chemical control**

See Table 4 in: *Chemical Control of Landscape Pests*

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Birch (*Betula*)—Fall webworm

*Hyphantria cunea*

**Pest description and damage** Large silken tents filled with caterpillars, frass and dead leaves, eventually engulf entire branches of deciduous trees. Young caterpillars are pale greenish or yellow with a dark stripe down the back and a yellow stripe along the sides. Long silky hairs arise from yellow and black tubercles. When mature, the caterpillars are covered with yellow, rusty or black colored silky hairs. Adults are bright white with orange and black markings on the underside of the abdomen. Woolly scales cover masses of 200 to 500 greenish eggs.

**For biology, life history, monitoring and management**

See:
- Cottonwood (*Populus*)—Fall webworm

See “Caterpillar” in: *Common Landscape Pests*

**Management—chemical control**

See Table 2 in: *Chemical Control of Landscape Pests*

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Birch (*Betula*)—Oystershell scale

*Lepidosaphes ulmi*

**Pest description and damage** The mature scale is approximately 0.125 inch long, hard-shelled, brownish or gray in color, and usually elongated and slightly curved like an oyster or mussel shell. Oystershell scale are found on trunks, branches, and twigs of many broad-leaved deciduous plants. They occur less frequently on the leaves and other plant parts. Scale infestations often are limited initially to isolated colonies on single branches or twigs. Newly emerged crawlers look like bright white pimplies on the bark.

**For biology, life history, monitoring and management**

See:
- Ash (*Fraxinus*)—Oystershell scale

See “Scale insect” in: *Common Landscape Pests*

**Management—chemical control**

See Table 1 in: *Chemical Control of Landscape Pests*

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Birch (*Betula*)—Carpenterworm

*Prionoxystus robiniae*

**Pest description and damage** Carpenterworms are the larvae of a large mottled gray and black moth. The caterpillars are white to pinkish-red with a dark head and are 1 to 3 inches long when mature. The caterpillars bore in the trunk and main branches. Discolored or bleeding limbs, branch dieback, and lumpy or gnarled trunks may be indications of carpenterworm infestation. Sawdust-like material (frass) and wood chips mixed with loose webbing on or around infested trees is typical. Trees with severe carpenterworm infestations are susceptible to wind breakage and may need to be removed.

**For biology, life history, monitoring and management**

See:
- Cottonwood (*Populus*)—Carpenterworm

**Management—chemical control**

See Table 4 in: *Chemical Control of Landscape Pests*

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Birch (*Betula*)—Sawfly

**Birch sawfly**

*Arge pectoralis*

**Dusky birch sawfly**

*Croesus latitarsus*

**Pest description and damage** Mature birch sawfly larvae are yellowish with rows of black spots along the abdomen and 0.75 inch long. The head is reddish yellow with black eyespots. Adults have 3-segmented antennae and lay eggs in rows in the edges of leaves. Larvae feed on birch, alder and willow. Damage is usually localized and rarely do they cause significant defoliation. Dusky birch sawfly is a darker yellowish-green with 3 dark spots on each segment. They also feed on birch but usually cause only localized damage. Larvae feed gregariously along the leaf edge holding with their abdomen flipped upside down over their back. There are two generations of dusky birch sawfly; spring and fall. However, they overwinter in the soil as pupae with adults emerging in spring.

**Management—cultural control**

Watch for small larvae along the leaf edge in spring. Prune out leaf or area with larvae.

**Management—biological control**

Stink bugs and other predator bugs have been known to prey upon the larvae.

**Management—chemical control**

See Table 2 in: *Chemical Control of Landscape Pests*

**For more information**

See “Sawfly” in: *Common Landscape Pests*


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Birch (*Betula*)—Tent caterpillar

**Western tent caterpillar**

*Malacosoma disstria*

**Fall webworm**

*C. californicum pluviale*

**Pest description and damage** The western tent caterpillar attacks birch and a wide variety of other plants including alder, apple, ash, birch, cherry, cottonwood, and willow. Western tent caterpillars are hairy, dull yellow-brown, with rows of blue and orange spots on the body. Forest tent caterpillars are black and blue with dorsal white footprints. Eggs of these moths are laid on twigs or buildings in masses and may be especially numerous around lights. The eggs are brown to gray in color, about 0.0625 inch long, and look like bits of gray, hardened foam. The larvae feed in large groups on foliage of host plants and can do significant damage by defoliation. Larvae of western tent caterpillars build moderate silken tents over leaves, but leave the tent to feed in new areas. They usually return in the evening. Both can defoliate small trees which may weaken or kill them; defoliation can reduce growth and make the trees more susceptible to competition, diseases or poor weather. Healthy trees usually will grow new leaves by midsummer.

**For biology, life history, monitoring and management**

See:
- Alder (*Alnus*)—Tent caterpillar

See “Caterpillar” in: *Common Landscape Pests*

**Management—chemical control**

See Table 2 in: *Chemical Control of Landscape Pests*
Black locust (Robinia)—Aphid
Black legume aphid (Aphis craccivora)

**Pest description and damage** These aphids vary in color progressing from light greenish-gray through darkening shades of green to shiny black as they molt. The four molts leave abundant white cast skins among the living aphids and honeydew. Feeding results in puckering, stunting, and curling leaves and pods, covered with copious sticky honeydew and sooty mold.

**Biology and life history** Overwintering eggs hatch on alternate hosts such as alfalfa in spring. Shortly alates (winged females) fly to black locust and other hosts. Parthenogenetic females lay over 100 eggs and there may be up to 20 generations.

**For biology, life history, monitoring and management**
See “Aphid” in:
- Common Landscape Pests

**Management—chemical control**
See Table 1 in:
- Chemical Control of Landscape Pests

**Black locust (Robinia)—Locust borer**
*Megacyllene robiniae*

**Pest description and damage** The adult locust borer is a conspicuous and brightly colored beetle. Its jet-black body is encircled in yellow bands, with a distinctive W-shaped band extending across the wing covers. The adult is about 0.75 inch long with reddish legs and black antennae. Locust borer larvae are white and legless, reaching a maximum length of about 1 inch. Locust borer larvae weaken trees, rendering them susceptible to wind breakage and retarding growth. Severe infestations of locust borer result in many dead and broken limbs, along with swollen areas on the tree trunks.

**Biological and life history** Mature adult beetles emerge through the holes of host trees. They lay eggs under the tree bark scales and around wounds. Eggs hatch in a week and the larvae prepare a hibernaculum in which they spend winter. In the spring, larvae bore into the woody parts of trees, frequently penetrating the heartwood. Throughout the spring and summer, larvae enlarge their feeding tunnels to 3 to 4 inches long and about 0.25 inch diameter. Tunnels initially are formed in an upward and inward direction from the point of entrance, then angle sharply straight down the trunk, resulting in an L-shaped tunnel.

**Pest monitoring** Look for branch breakage during winds or branches with knotty swellings. In spring when buds swell, look for wet bark and sap flow as larvae tunnel under the bark. By midsummer, white sawdust-like frass is pushed out through holes in the bark as the larvae tunnel in the sapwood, and later, as they bore into the heartwood, the frass is a yellow sawdust. Sawdust frass may accumulate at the base of infested trees.

**Management—cultural control**
Keep trees vigorous. Remove infested trees that harbor the larvae. Water-stressed trees also may be highly susceptible to attack; thus, watering trees during times of drought may increase their resistance.

**Management—biological control**
This is an introduced species; no information on biocontrol is listed but birds and parasitoids are likely possibilities.

**Management—chemical control**
See Table 4 in:
- Chemical Control of Landscape Pests

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Black walnut (Juglans)—Fall webworm
*Hyphantria cunea*

**Pest description and damage** Large silken tents filled with caterpillars, frass and dead leaves, eventually engulf entire branches of deciduous trees. Young caterpillars are pale greenish or yellow with a dark stripe down the back and a yellow stripe along the sides. Long silky hairs arise from yellow and black tubercles. When mature, the caterpillars are covered with yellow, rusty, then black colored silky hairs. Adults are bright white with orange and black markings on the underside of the abdomen. Woolly scales cover masses of 200 to 500 greenish eggs.

**For biology, life history, monitoring and management**
See:
- Cottonwood (Populus)—Fall webworm

**Management—chemical control**
See Table 2 in:
- Chemical Control of Landscape Pests

Boxelder (Acer negundo)—Western boxelder bug
*Boisea rubrolineatus*

**Pest description and damage** The adult boxelder bug is a red, flat, and elongate bug about 0.5 inch long. The front wings and thorax are gray-black to black with thin bright red markings. The eggs are red and the bright red nymphs look like the adult without wings. Damage to host plant seed is minimal since seeds are shed. The major objection to these bugs is that they congregate in clusters on the outside walls, and then invade the home in fall and spring. They are often found in large aggregations on the seeds of boxelder, and to a lesser extent maple and ash. They are also known to feed on developing apples, pears, grapes, peaches, plums and cherries when their populations are high (see home tree fruit section).

**Biological and life history** The boxelder bug adults overwinter in cracks and crevices, or under siding of houses or in other protected sites. They may emerge on sunny days in winter. In spring, the boxelder bugs adults move from their protected areas and lay red eggs in bark crevices of host trees. The nymphs hatch and both adults and nymphs feed on leaves, flowers, fruit and small twigs until seeds are produced. There is only one generation per year.

**Pest monitoring** Check new growth on trees or use a beating sheet and dislodge the boxelder bugs.

**Management—cultural controls**
Remove female boxelder bugs where they congregate. Seal cracks and crevices on houses.

**Management—chemical control**
See Table 1 in:
- Chemical Control of Landscape Pests

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For more information

**Boxwood (Buxus)—Boxwood leafminer**

*Monarthropalpus buxi*

**Pest description and damage** The adult is a small (0.1 inch) orange to yellow fly which emerges in early May. Eggs are laid and the larval stage begins to mine the tissue of leaves. The boxwood leafminer is a small yellow to orange maggot found inside the mined leaves. Leafminers feed by removing green tissue from between the upper and lower leaf surfaces. Feeding by leafminers can be detected by the presence of yellow to brownish blotchlike mines or by a blistered, thickened appearance to the upper surface of leaves. Damage is mainly aesthetic, but repeated severe infestations may damage shrubs.

**Biology and life history** The insect overwinters as larvae in the mined leaves. In spring, they become active and grow rapidly. The orange pupae can be seen clinging to the leaf before the adult flies emerge. Female flies lay eggs on the upper surface of the current season’s growth. The larvae hatch and mine the leaves through the summer. There is one generation per year.

**Management—cultural controls**

Pick off infested leaves or shear infested terminals before the flies emerge. Remove and destroy the clippings. Plant resistant varieties include ‘Suffruticosa,’ ‘Pendula,’ and ‘Argenteo-variegata.’

**Management—chemical control**

See Table 3 in:  
Chemical Control of Landscape Pests

For more information

See “Leafminer” in:  
Common Landscape Pests

PNW Nursery IPM (http://oregonstate.edu/dept/nurspest/boxwood_leafminer.htm)

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**Boxwood (Buxus)—Boxwood psyllid**

*Psylla buxi*

**Pest description and damage** The greenish, aphid-like adult psyllids are about 0.125 inch long. The adults jump, and can even bite, although this is not serious. The immature psyllids (nymphs) are covered with a white, waxy secretion that gives them a cottony look. The nymphs feed on the developing buds and new growth. The presence of the boxwood psyllid is indicated by the cupping of leaves at the tips of terminals. Buds in cupped leaves often are dead.

**Biology and life history** The insect overwinters as larvae in the orange eggs under bud scales on boxwood. As the buds open in early April, the eggs hatch and the nymphs begin to feed. Adults can be found by late May. There is only one generation per year.

**Management—biological control**

Lady beetles, lacewings, and parasitic wasps are all effective controls for this pest. Avoid the use of broad-spectrum sprays which would disrupt these controls.

**Management—cultural control**

English boxwood (*Buxus sempervirens*) is reportedly less susceptible.

**Management—chemical control**

See Table 1 in:  
Chemical Control of Landscape Pests

For more information


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**Boxwood (Buxus)—Boxwood spider mite**

*Eurytetranychus buxi*

**Pest description and damage** The adult is a small greenish to brown mite. Their feeding causes small whitish, yellowish, or bronze streaks that look like pin point stippling on the upper leaf surface. Heavy infestations can cause premature leaf drop. Damage is common throughout the Willamette Valley and in the hotter, drier areas of the PNW.

**For biology, life history, monitoring and management**

See “Spider mite” in:  
Common Landscape Pests

**Management—chemical control**

See Table 1 in:  
Chemical Control of Landscape Pests

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**Boxwood (Buxus)—Holly scale**

*Dynaspidiotus buxi*

**Pest description and damage** This scale insect’s covering is a small (0.0125 inch) oval shell, light brown to tan in color. The adult female is lemon yellow. Scale feeding can cause the upper surface of the leaves to become mottled and plant defoliation may occur. Heavily infested plants can be coated with honeydew on which black sooty mold develops. Heavy infestations can weaken plants and make the holly useless as holiday greens.

**Biology and life cycle** This insect overwinters as an immature scale. In spring, the nymphs mature and begin feeding in late March or early April. The adult males emerge from under the scale and fly to find the adult females in May. Eggs are laid in early- to mid-summer. Around 2 weeks later the eggs hatch and begin to disperse to foliage throughout the tree. There is only one generation per year.

**For monitoring and management**

See “Scale insect” in:  
Common Landscape Pests

**Management—chemical control**

See Table 1 in:  
Chemical Control of Landscape Pests

For more information


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**Butterfly bush (Buddleja)—Earwig**

*Primarily European earwig (Forficula auricularia)*

**Pest description and damage** This introduced, nocturnal insect can devastate seedlings, flowers, leaves and fruit. Easily recognized by the hind pinchers, called cerci, they are reviled by gardeners. However, earwigs also can be beneficial by feeding on aphids and other small insects. They also scavenge dead bugs and plant debris, or feed on live plant tissue. Earwigs chew irregular, variable-sized holes in leaves. Earwigs are often worse in dry eastern climates or in dry years.

**For biology, life history, monitoring and management**

See “Earwig” in:  
Common Landscape Pests

**Management—chemical control**

See Table 2 in:  
Chemical Control of Landscape Pests
Butterfly bush (Buddleja)—Root weevil

Numerous species

**Pest description and damage** Identification is important: species differ in susceptibility to pesticides. Adult weevils are small dark nocturnal beetles with a snout (rostrum) and elbowed antennae. Look for ragged notches on the edges of leaves. Larvae are C-shaped, legless, and white, sometimes reddish, with tan heads, up to 0.5 inch in size. They rarely damage plants in established landscapes.

For biology, life history, monitoring and management

See “Root weevil” in:
Common Landscape Pests

Management—chemical control

See Table 5 in:
Chemical Control of Landscape Pests

California lilac (Ceanothus)—Ceanothus leafminer

*Tischeria immaculata*

**Pest description and damage** Tiny drab moths may be seen flying in clouds around plants. They lay eggs on leaves. The tiny leafminer eats into the leaves and feeds between the upper and lower leaf surfaces. Damage can be rather inconspicuous when damage is light. Occasionally all the leaves turn brown and the plant appears to have died, however, new leaves will eventually emerge.

**Biology and life history** Moths emerge in May, and immediately mate and lay eggs on leaves. Larvae feed inside the leaf; and from time to time the larvae open a small hole in the leaf and eliminate the frass from the mine. There may be more than one generation per year.

**Pest monitoring** Watch for clouds of adults in May to minimize damage to plants. Check plants to monitor for damage. If some damage is noted, check more frequently. This is a fairly rare insect.

Management—cultural control

Shear back plants to remove leaves when larvae are in the mines. Do not compost or they may still emerge.

Management—biological control

Outbreaks are rare but do occur. Usually by the time there are large numbers of leafminers, the natural enemies build up, and the population crashes. Fasoranti observed that the principal enemy is a eulophid, *Pnigalio flavipes*. Various species of spiders, *Araneus diadematus*, *Philodromus dispar*, *Metaphidippus manni*, and a bird, the dark eyed junco, prey on adults. Emerging adults were also trapped and killed in spittle-bug (*Clastopera spp.*) froth.

Management—chemical control

See Table 3 in:
Chemical Control of Landscape Pests

For more information


California lilac (Ceanothus)—Whitefly

Family: Aleyrodidae

**Pest description and damage** Whitefly occasionally develop large populations on ceanothus yet damage is surprisingly insignificant. When the whitefly numbers build it is often on the south side of plants. Depending on conditions the population may crash without intervention.

For biology, life history, monitoring and management

See “Whitefly” in:
Common Landscape Pests

Management—chemical control

See Table 1 in:
Chemical Control of Landscape Pests

For more information


Camellia (Camellia)—Black citrus aphid

*Toxoptera auranti*

**Pest description and damage** This aphid is 0.1 inch long, usually shiny black, but also may be dull black to mahogany. It can be found on new growth or on winter buds. Infestations may be severe in any season and are often a problem on plants growing in protected places. Aphids tend to feed in colonies and are often found on the most succulent plant tissues. Feeding damage to shrubs, trees and mature plants is usually minor, but can compromise the vigor of the bud and expanding tissue.

For biology, life history, monitoring and management

See “Aphid” in:
Common Landscape Pests

Management—chemical control

See Table 1 in:
Chemical Control of Landscape Pests
Camellia (Camellia)—Brown soft scale

*Coccus hesperidum*

**Pest description and damage** Brown soft scale are flat, yellowish to dark brown, somewhat mottled insects. They are found mainly on twigs, although young scale also may be found on the foliage, typically on the underside of leaves and along veins. Scale suck plant sap and produce copious honeydew on which sooty mold may grow. Brown soft scale has a wide host range. There are multiple generations per year.

**Management—biological control**

There are numerous parasitoids that often control this scale if left alone. Occasionally an outbreak occurs, but at that point it is likely that the parasitoids will easily find it and the population will crash.

**For biology, life history, monitoring and management**

See “Scale insect” in:

Common Landscape Pests

**Management—chemical control**

See Table 1 in:

Chemical Control of Landscape Pests

For more information


Camellia (Camellia)—Cottony camellia scale

*Pulvinaria floccifera*

**Pest description and damage** The cottony camellia scale crawlers are flat brownish or yellowish sucking insects. Females create a distinctive oblong cottony sac for the eggs. Pale yellow crawlers (young scale) feed on the undersides of leaves and along veins. Foliage with scale infestations may turn yellowish or pale in color. Due to copious honeydew, leaves below become covered with a crust of black sooty mold. The cottony camellia scale also is found on English ivy, yew, euonymus, holly, hydrangea, maple, mulberry, pittosporum, rhododendron and yew, the host by which it is also known as the cottony yew scale. It is possible to have low numbers of this insect for years without an outbreak.

**Biology and life cycle** The scale overwinter as nymphs on twigs of the leaves. In the spring, adult females lay cottony egg masses about 0.25 inch long on the underside of leaves. The eggs hatch, and the crawlers settle on the leaves along the veins to feed. There is one generation per year.

**Pest monitoring** Look at the undersides of leaves where black sooty mold develops. Host plants may have continuous low numbers of scale or be patchy in distribution on the plant. Check for natural enemies, or evidence of parasitized scale.

**Management—biological control**

Small birds and parasitoids feed on the scale, but there is little written on the natural controls of this pest. It is likely that natural enemies account for the low number of scale year after year on observed plants. Low numbers of cottony camellia scale do little harm to plants and provide parasitoids with a steady source of prey. Periodically, there is an outbreak that may require control.

**Management—chemical control**

See Table 1 in:

Chemical Control of Landscape Pests

For more information

See “Scale insect” in:

Common Landscape Pests


Camellia (Camellia)—Root weevil

Numerous species

**Pest description and damage** Identification is important: species differ in susceptibility to pesticides. Adult weevils are small dark nocturnal beetles with a snout (rostrum) and elbowed antennae. Look for ragged notches on the edges of leaves, or flower petals. Larvae are C-shaped, legless, and white, sometimes reddish, with tan heads, up to 0.5 inch in size.

**For biology, life history, monitoring and management**

See “Root weevil” in:

Common Landscape Pests

**Management—chemical control**

See Table 1 in:

Chemical Control of Landscape Pests

**References**


Cherry, flowering (Prunus)—Aphid

Black cherry aphid (*Myzus cerasi*)

Rusty plum aphid (*Hysteroneura setariae*)

**Pest description and damage** The black cherry aphid is a shiny black aphid species. This species produces winged adults that migrate to summer hosts in the mustard family. The rusty plum aphid is rusty brown or deep purple with white bands on the legs. Winged adults of this species migrate to corn, grasses and Virginia creeper during the summer. Many other aphid species may infest cherry. Aphid feeding can cause the host leaves to become curled and distorted.

**For biology, life history, monitoring and management**

See “Aphid” in:

Common Landscape Pests

**Management—chemical control**

See Table 1 in:

Chemical Control of Landscape Pests

Cherry, flowering (Prunus)—Apple-and-thorn skeletonizer

*Choreutis pariana*

**Pest description and damage** Adult moth is reddish brown, with a wingspread less than 0.5 inch, and irregular light and dark bands on the wings. Larvae are 0.5 inch long, yellowish to greenish, with black spots and a yellow-brown head. Pupae are yellow to brown with a white silken cocoon. The larvae skeletonize and roll leaves from the edge and tip. Damaged leaves are brown and papery and drop prematurely. Damage varies from inconsequential to serious, so monitoring is an important management tool.
Cherry, flowering (*Prunus*)—Cherry bark tortrix
*Enarmonia formosana*

**Pest description and damage** Cherry bark tortrix (CBT) occurs in Eurasia, Africa, and North America. CBT was first discovered in North America in 1989. By 1998, CBT was found in the Pacific Northwest as far south as Centralia, WA. It is slowly moving in surges southward. Eastern movement has yet to be seen due to the barrier of the Cascade Mountain range. Conditions in eastern Washington may not be favorable for CBT to survive except in protected riparian areas. CBT is a pest of most woody ornamental trees and shrubs in the family Rosaceae. The larvae are 0.33 to 0.4 inch long; pale gray to flesh-color with small, pale gray spines scattered on the surface, with a yellowish-brown head. Larvae feed directly on the cambium under the bark of the tree and may cause death of the tree. Otherwise, the feeding activity decreases the supply of nutrients to the tree and increases susceptibility to disease, insect attack, and environmental stress, including cold injury. The first indication of attack is the exuding of reddish-brown gum-like resin, which often is mixed with fecal pellets and silk. The trunk and larger limbs of bearing fruit trees are affected, usually at pruning wounds.

**Biology and life history** CBT larvae overwinter under bark. During spring, they resume feeding and eventually pupate in a silken tube that protrudes beyond the bark surface where they were feeding. Adults fly from late April to September and are most active in the early morning; some may be attracted to lights at night. Eggs are laid on tree bark, in crevices, or under loose bark, primarily at wounds (mechanical or old infestations). Eggs are placed singly or in overlapping groups of two or three and hatch in 2 or 3 weeks. Hatching larvae penetrate the bark through openings (natural and mechanical wounds) and feed on the living tissue of the tree's bark. Graft unions of ornamental trees are preferred sites for attack. Larvae do not penetrate the hardwood of the tree. During feeding, CBT larvae construct a frass tube consisting of fecal pellets and webbing. The tubes are about 0.25 inch long and look soft, as if they are made from sawdust. The frass tubes of the larvae and pupae are usually concentrated around the base of the trunk or where a branch and trunk meet and at graft unions.

**Scouting and thresholds** Frass tubes are an excellent indication of CBT infestations, and susceptible trees should be monitored regularly. Since other insects can cause similar damage, inspection of the larvae is required for confirmation.

**Management—biological control**
Although some wasp species parasitize the larvae, effective biological control does not occur at present. Avoid sprays which will disrupt whatever control does occur.

**Management—cultural control**
Avoid unnecessary pruning cuts or injuries to the tree. Like most wood-boring insects, CBT is attracted to stressed trees. Keep trees as healthy as possible with appropriate watering, fertilizer applications, and pruning. Remove heavily infested branches or trees.
Cherry, flowering (Prunus)—Oblique-banded leafroller
Choristoneura rosaceana

Pest description and damage The oblique-banded leafroller larvae roll and tie leaves together for shelter and feeding. The newly hatched larva first mines the leaves, then rolls and ties leaves together. Often, they are first detected by the abundant holes in leaves. The larvae are green caterpillars with a light brown to black head. When disturbed, they thrash about violently, wriggle backwards and, and may drop from the leaf suspended by a silken thread. Their feeding on growing points on young plants can promote undesirable branching. Adults of the oblique-banded leafroller are bell-shaped, up to 1 inch long, tan to brown, with broad bands on the wings. Females lay overlapping masses of green eggs on the bark.

Biology and life history The oblique-banded leafroller overwinters as immature larvae under the bark on scaffold branches of a variety of host plants. Larvae may feed during warm periods in winter, but become active with warming spring weather and the onset of new growth. They feed for several weeks, and then pupate in rolled leaves. Adult moths emerge in late June or early July. These lay eggs for the second generation. The second generation hatches in early July and does the most damage.

Pest monitoring Start sampling for leafrollers in mid-April. Examine the terminal clusters for tightly rolled leaves and feeding damage on new growth. Watch for the first holes to appear and search nearby folded leaves for larvae, moth exit holes or evidence of larval silk that was used to hold the rolled leaf together.

Management—cultural control Hand-pick rolled leaves containing larvae or pupae. Removal of overwintering sites, such as rolled leaves on the ground or plastered to plants, can reduce next year’s population.

Management—biological control Very low temperatures in winter significantly reduce overwintering populations of larvae. Spiders and parasitic wasps, as well as predators like birds and the brown lacewing, greatly reduce leafroller populations throughout the year. There is a parasitoid wasp that specializes in leafrollers.

Management—chemical control See Table 3: Chemical Control of Landscape Pests

For more information See “Leafroller” in: Common Landscape Pests


Cherry, flowering (Prunus)—Redhumped caterpillar
Schizura concinia

Pest description and damage The redhumped caterpillar is the larva of a 1-inch, gray-brown moth. The mature larvae are yellow with a red head and the fourth segment is humped. The body has orange, black, and white lengthwise stripes with dark fleshy “spikes.” Young redhumped caterpillars are found in clustered colonies which disperse as they mature. They eat entire leaves (except the major veins) and can cause considerable defoliation. This insect has been a problem on cherry, rose, and other hosts east of the Cascade Mountains.

Management—cultural control Individual larvae may be picked off, and entire colonies can be cut out.

Management—chemical control See Table 2 in: Chemical Control of Landscape Pests

For more information See “Caterpillar” in: Common Landscape Pests

Cherry, flowering (Prunus)—Root weevil
Various species

Pest description and damage Identification is important; species differ in susceptibility to pesticides. Adult weevils are small dark nocturnal beetles with a snout (rostrum) and elbowed antennae. Look for ragged notches on the edges of leaves, or flower petals. Larvae are C-shaped, legless, and white, sometimes reddish, with tan heads, up to 0.5 inch in size. The larvae are rarely a significant problem in established landscapes.

For biology, life history, monitoring and management See “Root weevil” in: Common Landscape Pests

Management—chemical control See Table 5 in: Chemical Control of Landscape Pests
Cherry, flowering (Prunus)—Rose leafhopper
Includes Edwardsiana rosae

**Pest description and damage** Rose leafhoppers are small, active, whitish-green insects which hop when disturbed. The nymphs (immatures) are white with red eyes. Rose leafhoppers feed on the surface of leaves, causing white or pale blotches of dead cells that resemble spider mite stippling. Injured leaves may drop prematurely. Eggs are laid in the fall, which also wounds the canes, providing entry points for fungal pathogens. Cast skins can be found on the underside of leaves. Leafhopper damage is mainly aesthetic. They are distinguished by their ability to run quickly forwards, backwards, or sideways to escape danger. Some leafhoppers transmit disease. Sometimes leafhopper damage will cause the tips of leaves die and turn brown. Some leafhoppers exude copious amounts of honeydew which can result in sooty mold.

**For biology, life history, monitoring and management**

See:  
Rose (Rosa)—Rose leafhopper
See “Leafhopper” in:  
Common Landscape Pests

**Management—chemical control**

See Table 1 in:  
Chemical Control of Landscape Pests

Cherry, flowering (Prunus)—San Jose scale
Quadraspispidiotus perniciosus

**Pest description and damage** San Jose scale was introduced to the U.S. on flowering peach in the 1870s. It is now a pest of all fruit trees and many ornamental and wild trees and shrubs throughout the U.S., particularly in hot, dry climates. San Jose scale can be differentiated from other scale insects by the scale (shell) that covers the adult females. The scale is hard, gray to black, and cone-shaped, with a tiny white knob in the center. There is a series of grooves or rings around the scale, and a purple halo to the bark around the scale.

**Biology and life history** San Jose scale overwinters in an immature state under a black shell. In spring, the tiny winged males emerge and mate with wingless females. Females give birth to live young about a month later (no eggs are seen). The young scale, or “crawlers,” are very small, flattened, and yellow, and move around on bark and foliage before settling down to feed. A few days later, they secrete a waxy coating over their body for protection. From this point, female scale will not move. Crawlers are present during June and July and again in August to September; there are two generations per year.

**Pest monitoring** Inspect twigs during the dormant season when bark is more visible for these scale. Pay attention to weak plants. Observe the young bark for purplish-red halos, which indicate infestation. (In cherry orchards, leaves of infested trees do not drop in fall, making detection straightforward.) Bark of infested trees becomes rough in texture (healthy bark even on older trees is smooth). The crawlers are best observed during June to July with a 10X magnifying glass. Crawlers can be monitored by wrapping a piece of black sticky tape around an infested branch with the sticky side out. Pheromone traps will trap males to provide early warning and there is a degree-day model for predicting when crawlers will emerge.

**Management—cultural control**

Ensure ample water and cultural care with proper pruning cuts and management.

**Management—biological control**

Several parasitoids are known to attack this scale but in fruit growing regions they have not kept the San Jose scale population in check. In home orchards, where pesticides are precisely targeted, the parasitoid has been more effective.

**Management—chemical control**

See Table 1 in:  
Chemical Control of Landscape Pests

For more information
See “Scale insect” in:  
Common Landscape Pests


Smith, T. 2011. San Jose Scale. WSU Extension (http://county.wsu.edu/chelan-douglas/agriculture/treefruit/Pages/San_Jose_Scale.aspx)

Cherry, flowering (Prunus)—Shothole borer
Scolytus rugulosus

**Pest description and damage** The adult shothole borer is a brownish-black beetle about 0.08 inch long. The larvae are white, legless, and about 0.16 inch long. When the numerous beetles emerge, the bark looks like it had been hit by buckshot. These beetles are primarily a problem on injured or stressed plants, but healthy trees growing adjacent to blocks of neglected trees also may be attacked.

**For biology, life history, monitoring and management**

See “Bark beetle” in:  
Common Landscape Pests

**Management—chemical control**

See Table 4 in:  
Chemical Control of Landscape Pests

For more information


Cherry, flowering (Prunus)—Spider mite
European red mite (Panonychus ulmi)
Twospotted spider mite (Tetranychus urticae)

**Pest description and damage** Several species of spider mites can cause damage to flowering cherries. Appearance of these mites varies with the species, although all are 0.02 inch or smaller. Adults and nymphs can be yellowish, greenish, or reddish brown, depending on species. Female European red mites are round with red bodies; males are yellowish-red. Twospotted mites are oval and yellowish-brown or green with distinctive black spots on the body. Mites damage leaves and fruit indirectly by feeding on leaves,
which causes leaf stippling, bronzing, and possibly drop. The reduction in photosynthesis causes loss of vigor and yield.

For biology, life history, monitoring and management

See “Spider mite” in:
Common Landscape Pests

Management—chemical control

See Table 1 in:
Chemical Control of Landscape Pests

Cherry, flowering (Prunus)—Tent caterpillar

Forest tent caterpillar (Malacosoma disstria)
Western tent caterpillar (Malacosoma californicum pluviale)

Pest description and damage The western tent caterpillar attacks cherry plus a wide variety of other plants including alder, apple, ash, birch, cherry, cottonwood, and willow, as well as fruit trees and roses. Western tent caterpillars are hairy, dull yellow-brown, with rows of blue and orange spots on the body. Forest tent caterpillars are black and blue with dorsal white footprints. Eggs of these moths are laid on twigs or buildings in masses and may be especially numerous around lights. Eggs are brown to gray in color, about 0.0625 inch long, and look like bits of gray, hardened foam. The larvae feed in large groups on foliage of host plants and can do significant damage by defoliation. Larvae of western tent caterpillars build moderate silken tents over leaves, but leave the tent to feed in new areas. They usually return in the evening. Both can defoliate small trees which may weaken or kill them; defoliation can reduce growth and make the trees more susceptible to competition, diseases or poor weather. Healthy trees usually will grow new leaves by midsummer.

For biology, life history, monitoring and management

See:
Alder (Alnus)—Tent caterpillar

See “Caterpillar” in:
Common Landscape Pests

Management—chemical control

See Table 2 in:
Chemical Control of Landscape Pests

Cherry, flowering (Prunus)—Western tiger swallowtail

Western tiger swallowtail (Papilio rutulus)

Pest description and damage Tiger swallowtail larvae feed on leaves of cherry family plants, particularly native cherry, (Prunus emarginata), willows, cottonwood and aspen, ash and a few other species. Generally limited to isolated numbers on single trees. Larvae spin a silken pad on which they rest. Initially larvae look like small bird droppings molting into bigger black and white bird droppings. The last molt is a thick green larva with black and yellow bands and conspicuous yellow eyespots on the thorax. The head is tucked under the body of the caterpillar. When disturbed the larvae may evert orange “horns” with a peculiar smell to deter predators. The chrysalis is a 1 inch long tan and marbled capsule with visible outlines of legs, antennae, eyes and proboscis. The joy of the large yellow and black butterfly in the garden outweighs the minimal damage inflicted by the caterpillar.

Biology and life history Adult butterflies emerge in June, mate and lay a single egg on a leaf of host plants, then move on to other leaves. Eggs hatch and the caterpillar spends summer feeding on host leaves. In fall the larvae crawl away to pupate. They spend winter in the chrysalis. There is a single generation in a year.

Pest monitoring Watch for damage in spring. Look for a shiny patch of silk on leaves, leaves that have been chewed from the tip in a squared pattern along the vein or from tip to base.

Management—cultural control
Relocate larvae onto less visible hosts or ignore these insects. Significant damage is rare.

Management—biological control
These insects are heavily parasitized and rarely become major pests.

Management—chemical control

See Table 2 in:
Chemical Control of Landscape Pests

For more information
See “Caterpillar” in:
Common Landscape Pests

Chestnut (Castanea)—Shothole borer

European shothole borer (Xyleborus dispar Fabricius)

Pest description and damage Shothole borers are small bark beetles that often attack weakened branches. Xyleborus dispar is the primary shothole borer infesting chestnut in the PNW. When the numerous beetles emerge, the bark looks like it had been hit by buckshot. These beetles are primarily a problem on injured or stressed plants, but healthy trees growing adjacent to blocks of neglected trees also may be attacked. The adult shothole borer is a brownish-black beetle about 0.08 inch long. The larvae are white, legless, and about 0.16 inch long.

For biology, life history, monitoring and management

See “Bark beetle” in:
Common Landscape Pests

Management—chemical control

See Table 4 in:
Chemical Control of Landscape Pests

For more information

Cotoneaster (Cotoneaster)—Aphid

Includes
Apple aphid (Aphis pomi)
Potato aphid (Macrosiphum euphorbiae)

Pest description and damage Several species of aphids may feed on the foliage, stem, and flower clusters. They have piercing–sucking mouthparts and generally exude honeydew. The potato aphid is green, yellow or pink in color and has long cornicles (“dual exhaust pipes”). The winged adults are yellowish with whitish wings. These potato aphids cause the leaves toward the tips of the twigs to turn yellow and twist. They also are a serious pest in the vegetable garden so controlling the aphids on cotoneaster may reduce problems elsewhere. The apple aphid (often called the green apple aphid) is primarily a pest of apples but affects other rosaceous hosts. Green apple aphid is a tiny green aphid with visible cornicles. The winged form has a darker thorax, greenish abdomen, and whitish wings. This aphid feeds in clusters on leaves and around the
developing fruit. It is nearly indistinguishable from the spirea aphid and is often treated the same. Aphids produce copious amounts of honeydew that gardeners find objectionable.

**For biology, life history, monitoring and management**

Both aphids appear in the spring when cotoneaster is blooming, so take care to choose a pesticide that is harmless to bees.

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**Cotoneaster (Cotoneaster)—Cotoneaster webworm**

*Athrips rancidella*

**Pest description and damage** The cotoneaster webworm is a dark brown caterpillar, 0.25 to 0.5 inch long. It typically webs clumps of leaves together and feeds within tubes snaking along the branches. Besides unsightly webbing, larvae skeletonize leaves. Death of branches can occur. The webworm is primarily a problem on *Cotoneaster horizontalis* (rock cotoneaster) and only in some years.

**Biology and life history** The caterpillars feed during the summer and fall, overwintering in nests on the plant. They pupate in the spring giving rise to dark gray, night-flying adult moths. Eggs are laid in spring.

**Pest monitoring** Search for webbing that follows along the main branches among the leaves.

**Management—cultural control**

Hand-pick and destroy larvae; prune out nests.

**Management—biological control**

The fact that populations rise and fall indicate that natural enemies are present in most years.

**Management—chemical control**

*See Table 2 in:* Chemical Control of Landscape Pests

**For more information**

*See “Caterpillar” in:* Common Landscape Pests

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**Cotoneaster (Cotoneaster)—Spider mite**

**Includes** twospotted spider mite (*Tetranychus urticae*)

**Pest description and damage** Several species of spider mites can cause damage in deciduous, evergreen and coniferous ornamentals. Appearance of these mites varies with the species, although all are 0.02 inches or smaller. Adults and nymphs can be yellowish, greenish, or reddish brown, depending on species. Twospotted mites are oval and yellowish-brown or green with distinctive black spots on the body. Mites damage leaves and fruit indirectly by feeding on leaves, which causes stippling, bronzing, and possibly leaf drop. The reduction in photosynthesis causes loss of vigor.

**For biology, life history, monitoring and management**

*See “Spider mite” in:* Common Landscape Pests

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**Cottonwood (Populus)—Aphid**

**Includes**

- Lettuce root aphid (*Pemphigus bursarius*)
- Poplar petiole gall aphid (*Pemphigus populitantransversus*)

**Pest description, damage, biology, and life history** There are numerous aphid species on cottonwood. Some cause galls on the midrib or petiole, others feed on leaves. Some of the aphids have alternate hosts on crops such as lettuce or on weeds. Lettuce root aphids can be distinguished from other aphids by their short antennae (less than one-third body length) and undeveloped cornicles. Aphid-feeding on leaf petioles cause the petioles to enlarge and enclose the insects. Hard, pale green, rounded galls form along the petiole or at the base of the leaf. Aphids found inside the galls look grayish and waxy. The leaves are not damaged but may twist at right angles to the petiole. The aphid causes little damage to poplars but may be a serious pest on alternate hosts such as lettuce. Where lettuce or related weeds are not available, this aphid overwinters in the egg stage on the bark of Lombardy poplar. They develop into adults and reproduce once on poplar before migrating to summer hosts in the Brassica or Aster families. In late summer, winged forms reappear, and these migrate back to poplar to mate and lay eggs.

**For biology, life history, monitoring and management**

*See “Aphid” in:* Common Landscape Pests

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**For more information**

*See “Aphid” in:* Common Landscape Pests
Cottonwood (Populus)—Azalea bark scale

Eriococcus azaleae

Pest description and damage This scale superficially resembles mealybugs in appearance. Mature female scales are about 0.125 inch long and appear like white cottony sacs, often located on twigs and stems of azalea, especially in branch axils. Eggs, crawlers and adults beneath the wax are red. Hosts include andromeda, azalea, rhododendron, hawthorn, poplar, willow, and most recently, blueberry in the Pacific Northwest.

For biology, life history, scouting, and management options

See:
Azalea (Rhododendron)—Azalea bark scale

See “Scale insect” in:
Common Landscape Pests

Management—chemical control

See Table 1 in:
Chemical Control of Landscape Pests

Cottonwood (Populus)—Carpenterworm

Prionoxystus robiniae

Pest description and damage Carpenterworms are the larvae of a large mottled gray and black moth. The caterpillars are greenish-white to pinkish with a dark head and are 1 to 3 inches long when mature. The caterpillars bore in the trunk and main branches of cottonwood, ash, birch, black locust, poplar, willow, elm, oak, locust, maple, pear and other deciduous trees and shrubs. Discolored or bleeding limbs, branch dieback, and lumpy or gnarled trunks may be indications of carpenterworm infestation.

Biology and life history Adults emerge in late spring and early summer and begin laying eggs. Females lay between 200 to 1000 olive brown eggs during her life, mostly in groups of 2-6 eggs. Eggs are found in sticky masses in cracks and crevices of the bark of host plants. After hatching, the larvae bore into the sapwood where they tunnel and feed for up to 2-4 years before they are mature.

Management—cultural control

Keep trees vigorous, as healthy trees are better able to tolerate some damage. Prevent injuries which may attract carpenterworm moths to trees. Poke a wire into tunnels to kill larvae. Prune trees in late fall and winter so that moths aren’t attracted to fresh wounds. Remove infested branches.

Management—biological control

Apply beneficial nematodes (Steinernema carpocapsae or S. feltiae) into tunnels to kill larvae. Fill tunnels with nematodes in water, then plug holes and wait about a week. It may be necessary to treat tunnels again if plugged holes are reopened by surviving larvae. Natural enemies recorded for this pest include downy woodpeckers, ichneumonid wasps, and fungi.

Management—chemical control

See Table 4 in:
Chemical Control of Landscape Pests

For more information


Cottonwood (Populus)—Fall webworm

Hyphantria cunea

Pest description and damage Large silken tents filled with caterpillars, frass and dead leaves, eventually engulf entire branches of deciduous trees including apple, cherry, peach, pecan, English walnut, black walnut, ash, boxelder, birch, chokecherry, elm, hickory, linden, poplar, sycamore, white oak and willow and sometimes roses and some shrubs. Young caterpillars are pale greenish or yellow with a dark stripe down the back and a yellow stripe along the sides. Long silky hairs arise from yellow and black tubercles. When mature the caterpillars are covered with rusty colored silky hairs. Adults are bright white with orange and black markings on the underside of the abdomen. Woolly scales cover masses of 200 to 500 greenish eggs.

Biology and life history Adults emerge over a long period in spring and lay eggs on leaves. Eggs don’t hatch until late summer (late July or August). Larvae feed for 4 to 6 weeks and then drop to the ground to pupate in the duff and litter, or cells in the soil.

Pest monitoring Look for small first tents in late summer and control before significant damage is done. Early detection will also provide early indication of whether it is a bumper year for this pest. One or two nests can be ignored on healthy trees, but many nests may require early intervention with biological or other control options.

Management—cultural control

Remove tents as soon as first noticed, place in a bag and squash the nest. (Do not burn tents in trees with torches, as this practice has led to house and field fires and burns to humans). Disrupt the integrity of the web by blasting it with a hose or breaking it with a long pole. Keep trees vigorous to reduce impacts.

Management—biological control

There are several natural enemies including yellowjacket, paperwasp, egg parasites and others.

Management—chemical control

See Table 2 in:
Common Landscape Pests

Cottonwood (Populus)—Tent caterpillar

Forest tent caterpillar (Malacosoma disstria)
Western tent caterpillar (Malacosoma californicum pluviale)

Pest description and damage The western tent caterpillar and forest tent caterpillars form tents as soon as they hatch from the eggs and immediately begin to build a small tent. Watch for the white glint of the small tents about when apples bloom. Western tent caterpillars are hairy, dull yellow-brown, with rows of blue and orange spots on the body. Forest tent caterpillars are black and blue with dorsal white footprints.

For biology, life history, monitoring and management

See:
Alder (Alnus)—Tent caterpillar

See “Caterpillar” in:
Common Landscape Pests

Management—chemical control

See Table 2 in:
Chemical Control of Landscape Pests


**Cottonwood (Populus)—Satin moth**

*Leucoma salicis*

**Pest description and damage** The adult moth is satiny white with black markings on the legs. The attractive caterpillars are approximately 2 inches long when grown and reddish brown with double white dorsal patches and tufts of hairs along the sides. They can seriously skeletonize then defoliate cottonwood, poplar, and willow. They occasionally attack other hosts.

**For biology, life history, monitoring and management**

*See:* Poplar (Populus)—Satin moth

*See “Caterpillar” in:* Common Landscape Pests

**Management—chemical control**

*See Table 2 in:* Chemical Control of Landscape Pests

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**Crabapple, flowering (Malus)—Aphid**

Several species

**Pest description and damage** Several species of aphids may feed on the leaves, stems, flower buds, bark or root tissues of conifer and deciduous trees, shrubs, as well as other plants in landscapes. Aphids tend to be small (0.0625 to 0.125 inch long), oval to pear-shaped, soft-bodied insects with piercing–sucking mouthparts. Color varies (black, green, pink, yellow, mottled, striped, etc.), but most aphids tend to match host plant coloration. Aphids tend to feed in colonies and are often found on the new or most succulent plant tissues. Feeding damage to shrubs, trees and mature plants is usually minor, but can compromise the vigor of the host. When aphid populations are high, leaf and shoot distortion can occur. Aphids produce honeydew, a sweet, sticky secretion that collects on underlying plant tissues and encourages growth of a black sooty mold.

**For biology, life history, monitoring and management**

*See “Aphid” in:* Common Landscape Pests

**Management—chemical control**

*See Table 1 in:* Chemical Control of Landscape Pests

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**Crabapple, flowering (Malus)—Apple-and-thorn skeletonizer**

*Choreutis pariana*

**Pest description and damage** The adult moth is reddish brown, with a wingspread less than 0.5 inch, and irregular light and dark bands on the wings. Larvae are 0.5 inch long, yellowish to greenish, with black spots and a yellow-brown head. Pupae are yellow to brown with a white silken cocoon. The larvae skeletonize and roll leaves from the sides. Damaged leaves are brown and papery and drop prematurely. They feed on apple, crabapple, cherry, pear, mountain ash, birch, plum, hawthorn and possibly willow, but apple seems to be the preferred host. Damage varies from inconsequential to serious, so early tree monitoring to assess larval numbers is an important management tool.

**Biological and life history** Adult moths overwinter in crevices in the tree. They lay eggs in small bunches on the undersides of leaves. The larvae emerge and feed on the underside of the leaves, then move to the top surface and feed there. There is often more than one caterpillar in the roll. After 3 to 4 weeks, they pupate in the rolled leaf. Adults emerge after about 2 weeks to start a new generation. There are at least two generations per year.

**Pest monitoring** Watch for signs of skeletonizing that, from a distance, looks like the leaf tips have been burned. Early scouting will provide adequate time for control if numbers are high.

**Management—biological control**

There are many natural enemies of this pest. Avoid broad-spectrum sprays that would disrupt this system.

**Management—cultural control**

Larvae and pupae are removed easily from rolled leaves. Rolled leaves can be pinched to kill larvae on small trees. Remove heavily infested twigs.

**Management—chemical control**

*See Table 2 in:* Chemical Control of Landscape Pests

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**Crabapple, flowering (Malus)—Cherry bark tortrix**

*Enarmonia formosana*

**Pest description and damage** Cherry bark tortrix is a pest of most woody ornamental trees and shrubs in the family Rosaceae, but cherry is the preferred host. The larvae are 0.33 to 0.4 inch long, pale gray to flesh-color with small, pale gray spines scattered on the surface, with a yellowish-brown head. Larvae feed directly on the cambium beneath the bark of the tree. Extensive feeding may cause death of the tree. Otherwise, the feeding activity decreases the supply of nutrients to the tree and increases tree susceptibility to disease, insect attack, and environmental stress, including cold injury. The first indication of attack is the reddish-brown gum-like resin, mixed with fecal pellets and silk, that flows from the bark. The trunk and larger limbs of bearing fruit trees are affected, usually at pruning wounds and graft unions.

**For biology, life history, monitoring and management**

*See:* Cherry (Prunus)—Cherry bark tortrix

**Management—chemical control**

*See Table 4 in:* Chemical Control of Landscape Pests

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**Crabapple, flowering (Malus)—Fall webworm**

*Hyphantria cunea*

**Pest description and damage** Large silken tents filled with caterpillars, frass and dead leaves, eventually engulf entire branches of deciduous trees. Young caterpillars are pale greenish or yellow with a dark stripe down the back and a yellow stripe along the sides. Long silky hairs arise from yellow and black tubercles. When mature, the caterpillars are covered with yellow, rusty and black silky hairs. Adults are bright white with orange and black markings on the underside of the abdomen. Woolly scales cover masses of 200 to 500 greenish eggs.
Crabapple, flowering (Malus)—Leafroller
Includes
Fruittree leafroller (Archips argyrospila)
Oblique-banded leafroller (Choristoneura rosaceana)

Pest description and damage  The leafroller pests can be divided into single-generation moths, such as the fruit tree leafroller and the European leafroller, and two-generation moths, such as the oblique-banded leafroller and three-lined leafroller. The larvae are mostly green caterpillars with a light brown to black head. Adults have distinctive bands or motting on the wings but are rarely seen. Leaftiers are similar in appearance, although larvae are up to 0.5 inch long, dirty white, with a brownish head. The tortricid moth larvae are noted for their violent backward wriggling—a means of escape. Newly hatched larvae also may work into blossoms. The larvae web the leaves and flowers together beginning in late April, and then feed on the developing fruit or flowers. Larvae may also feed on the surface of ornamental fruits or berries.

For biology, life history, monitoring and management
See:
Cherry, flowering (Prunus)—Oblique-banded leafroller

See “Leafroller” or “Caterpillars” in:
Common Landscape Pests

Management—chemical control
See Table 2 in:
Chemical Control of Landscape Pests

Crabapple, flowering (Malus)—Oystershell scale
Lepidosaphes ulmi

Pest description and damage  The mature scale insect is approximately 0.125 inch long, hard-shelled, brownish or gray in color, and usually elongated and slightly curved like an oyster or mussel shell. Oystershell scale are found on trunks, branches, and twigs of many broad-leaved deciduous plants. They occur less frequently on the surface of leaves and fruit. Scale infestations often are limited initially to isolated colonies on single branches or twigs. Newly emerged crawlers look like bright white pimples on the bark.

For biology, life history, monitoring and management
See:
Ash (Fraxinus)—Oystershell scale

See “Scale insect” in:
Common Landscape Pests

Management—chemical control
See Table 1 in:
Chemical Control of Landscape Pests

Crabapple, flowering (Malus)—Rose leafhopper
Includes Edwardsiana rosae

Pest description and damage  Rose leafhoppers are small, active, whitish-green insects which run forward, sideways or backward when disturbed. The nymphs (immature) are white with red eyes. Rose leafhoppers feed on the leaves, causing white or pale blotches that resemble, but are larger than, spider mite stippling. Injured leaves may drop prematurely. The egg-laying in the fall also wounds the twigs, providing entry points for fungal pathogens. Cast skins can be found on the underside of leaves. Leafhopper damage is mainly aesthetic, but occasionally severe enough to impact the health of the crabapple tree.

For biology, life history, monitoring and management
See:
Rose (Rosa)—Rose leafhopper

See “Leafhopper” in:
Common Landscape Pests

Management—chemical control
See Table 1 in:
Chemical Control of Landscape Pests

Crabapple (Malus)—San Jose scale
Quadraspidiotus perniciosus

Pest description and damage  San Jose scale is a pest of many ornamental and wild trees in the PNW, particularly in hot, dry climates. San Jose scale can be differentiated from other scale insects by the hard, gray to black, and cone-shaped scale covering the insect. The scale has a tiny white knob in the center with a series of grooves or rings around it. Twigs with infested bark are roughened, rather than smooth, and twig death may occur. Often there is a purple halo on the bark around the scale. Fruit is also infested. Crawlers are flat and yellow and common in June and again in August to September.

For biology, life history, monitoring and management
See:
Cherry, flowering (Prunus)—San Jose scale

See “Scale insect” in:
Common Landscape Pests

Management—chemical control
See Table 1 in:
Chemical Control of Landscape Pests

Crabapple (Malus)—Spider mite
Tetranychus spp.

Pest description and damage  Several species of spider mites can cause damage in deciduous, evergreen and coniferous ornamentals. Appearance of these mites varies with the species, although all are 0.02 inch or smaller. Adults and nymphs can be yellowish, greenish, or reddish brown, depending on species. Female European red mites are round with red bodies; males are yellowish-red. Two-spotted mites are oval and yellowish-brown or green with distinctive black spots on the body. Plants may be covered with fine silk webbing at branch axils or over sections, small plants may be engulfed in webbing under very heavy infestations. Mites damage leaves and fruit indirectly by feeding on leaves, which causes stippling, bronzing, and possibly leaf drop. The reduction in photosynthesis causes loss of vigor and yield.
Daffodil (Narcissus)—Bulb fly
Lesser bulb fly (Eumerus tuberculatus)
Narcissus bulb fly (Merodon equestris)

Pest description and damage The adult narcissus bulb fly is about 0.5 inch long and closely resembles a small bumblebee; it can be recognized by its aggressive behavior of bumping into other bees and female bulb flies. The larva is a fat, yellowish-white, wrinkled maggot about 0.75 inch long. The lesser bulb fly adults are blackish green with white markings on the abdomen; the larvae are smaller and more numerous in the bulbs. The maggots of the narcissus bulb fly burrow into the bulbs near the basal plate and feed inside the bulbs, destroying bulb scale and flower parts while maggots of the lesser bulb fly are thought to be scavengers. Infested bulbs may develop a few, grassy-looking leaves if the bulb is not too badly damaged. Severely damaged bulbs are soft, brown, and decayed. The narcissus bulb fly attacks amaryllis, galtonia, hyacinth, iris, lily, leucojum, narcissus, scilla, tulip, and vallota. The lesser bulb fly also attacks and may be a primary pest on onions and shallots and other bulbs.

Biology and life history The life history of the two pests are similar. The females lay eggs near the bulbs during May or early June. The eggs hatch into grubs that move down into the soil and burrow into the base of the bulb to feed there, reducing the bulb’s center to a rotten mass. In the process, the embryonic flowers that would have unfolded the following spring are destroyed. After feeding, larvae pupate in the bulb or soil. In the spring, they emerge as adult flies to mate and lay eggs. Lesser bulb fly may have a second generation.

Pest monitoring Check daffodil plantings for spindly, grassy leaves and no flower. Dig up bulbs to inspect for hollowed out bulbs, decay followed by scavengers such as millipedes and sowbugs.

Management—cultural control
Narcissus fly can be evaded by deep planting (10 inches). Plant in open areas exposed to wind. Bulb flies are usually less of a problem in such sites. Covering foliage of plants with a row cover after bloom prevents egg-laying. Plant only firm, healthy daffodil bulbs. Soft bulbs may be infested from the previous season. Destroy any soft bulbs to prevent emergence of adult bulb flies. Dig and store bulbs after foliage dries to prevent the bulb fly from laying eggs. A hot water bath has also been found to be effective in killing maggots in infested bulbs. Maggots can be killed if bulbs are submerged in water kept at about 110°F for 40 minutes. Care must be taken to avoid overheating the bulbs even for a short time as the bulbs may be adversely affected by high temperatures.

For more information

Dahlia (Dahlia)—Aphid
Bean aphid (Aphis fabae)
Green peach aphid (Myzus persicae)
Leaf curl plum aphid (Brachyc Davis helichrysis)

Pest description and damage The aphids tend to be small (.0625 to 0.125 inch long), oval to pear-shaped, soft-bodied insects with piercing–sucking mouthparts. Color varies: bean aphid is a dull black gregarious aphid; green peach aphid is yellowish-green with dark lines; and the leaf curl plum aphid has both green and reddish forms. Aphids tend to feed in colonies and are often found on the most succulent plant tissues. Feeding damage is usually minor, but
can compromise the vigor of the host if aphid populations are high. Aphids produce honeydew that encourages growth of a black sooty mold. Some aphids, such as the green peach aphid, are vectors of plant diseases, particularly viruses. Damage ranges from yellowing and shriveling of leaves to severely and tightly curls leaves, or mottled yellowing of virus symptoms.

**For biology, life history, monitoring and management**

See “Aphid” in:

Common Landscape Pests

**Management—chemical control**

See Table 1 in:

Chemical Control of Landscape Pests

**For more information**


Washington State University. http://dahlia.wsu.edu/

**Dahlia (Dahlia)—Cutworm**

**Includes**

Large yellow underwing (*Noctua pronuba*)

Variegated cutworm (*Peridroma saucia*)

**Pest description and damage** Several species of cutworms attack dahlias. These are green, reddish, or black caterpillars up to 0.75 to 1.0 inches long. Some cutworms feed mostly at the soil line and may cut off emerging shoots at ground level. Others cut C-shaped swaths from the edges of the leaves. Cutworms are caterpillars in the Noctuid family in the order Lepidoptera (butterflies and moths). The variegated cutworm is commonly found in gardens. The larvae are black and brown with white markings. A new invading species is the large yellow underwing, *Noctua pronuba*, with a black stripe along the edge of the yellow hind wing. Cutworm larvae are nocturnal and their feeding will leave the plant with a ragged appearance. Cutworms leave pellet-shaped droppings on underlying leaves.

**For biology, life history, monitoring and management**

See “Cutworm” and “Caterpillar” in:

Common Landscape Pests

**Management—chemical control**

See Table 2 in:

Chemical Control of Landscape Pests

**Dahlia (Dahlia)—Earwig**

Primarily European earwig (*Forficula auricularia*)

**Pest description and damage** This introduced, nocturnal insect can devastate seedlings, flowers, leaves and fruit. Earwigs are recognized by the pinchers and are reviled by gardeners when they drop out of cut flowers onto a table. However, earwigs are also beneficial feeding on aphids and other small insects, scavenging dead bugs and plant debris. Unfortunately, earwigs can chew irregular holes in leaves at the base of flower petals and other plant tissues. Earwigs are often worse in dry climates or dry years west of the Cascades.

**For biology, life history, monitoring and management**

See “Earwig” in:

Common Landscape Pests

**Management—chemical control**

See Table 2 in:

Chemical Control of Landscape Pests

**Dahlia (Dahlia)—Western spotted cucumber beetle**

*Diabrotica undecimpunctata*

**Pest description and damage** The adult western spotted cucumber beetle is yellowish green, 0.25 inch long, and has 11 black spots on its wing covers. Mature larvae are white, except for the head and last abdominal segment, which are brown giving the appearance that larvae have two “heads.” The larvae are about 0.63 inch long. The adult beetles eat small holes in the leaves. Larvae feed on roots and bore into the base of stems, killing small plants and reducing root mass in mature plants so plants may be stunted.

**Biology and life history** Cucumber beetles overwinter as fertilized females and are active beginning in early spring. Adults lay eggs at the base of plants. Eggs hatch in 7 to 10 days, and larvae feed in roots for about 3 weeks before pupating in the soil. Adults emerge 2 weeks later and feed on pollen, foliage, flowers, and pods. There are two generations per year.

**Management—cultural control**

In most years, beetle populations diminish after egg laying and before the emergence of the summer population. Planting can be delayed until after the beetles have dispersed and deposited most of their eggs. Individual beetles can be picked off.

**Management—biological control**

Entomopathogenic nematodes directed towards the larvae are effective when soil temperatures are warmer than 53°F.

**Management—chemical control**

See Table 2 in:

Chemical Control of Landscape Pests

**For more information**


**Daphne (Daphne)—Aphid**

Several species

**Pest description and damage** Aphids appear in large numbers on *Daphne laureola* in spring and seem to disappear by June. Aphids feed in colonies and are often found on the new or most succulent plant tissues. Feeding damage is usually minor, but can compromise the vigor of the host. When aphid populations are high, leaf and shoot distortion can occur. Aphids produce honeydew, a sweet, sticky secretion that collects on underlying plant tissues and encourages growth of a black sooty mold. In addition to cosmetics, honeydew may become a sticky nuisance.

**For biology, life history, monitoring and management**

See “Aphid” in:

Common Landscape Pests

**Management—chemical control**

See Table 1 in:

Chemical Control of Landscape Pests
Daphne (Daphne)—Lecanium scale

*Lecanium spp.*

**Pest description and damage** Lecanium scale are most noticed as they expand in spring. As females swell in the spring they produce considerable honeydew. The female lecanium scale are about 0.13 inch in diameter and vary from red to dark brown in color. They are oval and raised, resembling small “helmets,” “turtles,” or bumps on branches and stems. Male scale are smaller, fairly flat, and oblong. Crawlers are pale yellow and found on the undersides of leaves.

For biology, life history, monitoring and management

*See:*  
Ash (Fraxinus)—San Jose scale

See “Scale insect” in:  
Common Landscape Pests

Management—chemical control

*See Table 1 in:*  
Chemical Control of Landscape Pests

Dogwood (Cornus)—Lecanium scale

*Lecanium spp.*

**Pest description and damage** Lecanium scale are most noticed as they expand in spring. The female lecanium scale are about 0.13 inch in diameter and vary from reddish-brown to dark brown in color. The adults are oval and raised, resembling small “helmets,” “turtles,” or bumps on branches and stems. Male scale are smaller, fairly flat, and oblong. Pale yellow crawlers feed mostly on the underside of leaves.

For biology, life history, monitoring and management

*See:*  
Ash (Fraxinus)—San Jose scale

See “Scale insect” in:  
Common Landscape Pests

Management—chemical control

*See Table 1 in:*  
Chemical Control of Landscape Pests

Dogwood (Cornus)—Brown soft scale

*Coccus hesperidum*

**Pest description and damage** Brown soft scale are yellowish to dark brown insects (adults are usually darker). They are found mainly on twigs, and young scale also may be found on the foliage, typically on the underside of leaves along the leaf midveins. Scale suck plant sap and produce copious honeydew on which sooty mold may grow.

For biology, life history, monitoring and management

*See “Scale insect” in:*  
Common Landscape Pests

Management—chemical control

*See Table 1 in:*  
Chemical Control of Landscape Pests

Dogwood (Cornus)—Flea beetle

Dogwood flea beetle (*Altica corni*)

**Pest description and damage** Adults of this pest of red osier dogwood are dark, shiny blue, and about 0.25 inch long. Larvae are black and about 0.25 inch long at maturity. Adults chew holes in leaves while the larvae feed in groups and skeletonize foliage of red osier dogwood. They are capable of defoliating shrubs but more often they are found in smaller numbers throughout the shrubs. Because red osier dogwood is abundantly planted in riparian zones there is a potential for buildup in these settings.

For biology, life history, monitoring and management

*See:*  
Alder (*Alnus*)—Alder flea beetle

Management—chemical control

*See Table 2 in:*  
Chemical Control of Landscape Pests

Dogwood (Cornus)—Rose leafhopper

*Edwardsiana rosae* and other leafhoppers

**Pest description and damage** Rose leafhoppers are small, active, whitish-green insects that run backward, forward or sideways when disturbed. The nymphs (immature) are white with red eyes. Rose leafhoppers feed on the leaves, causing white or pale blotches that resemble, but are larger than, spider mite stippling. Injured leaves may drop prematurely. Oviposition in the fall also wounds the twigs, providing entry points for fungal pathogens. Cast skins can be found on the underside of leaves.

For biology, life history, monitoring and management

*See:*  
Rose (*Rosa*)—Rose leafhopper

See “Leafhopper” in:  
Common Landscape Pests

Management—chemical control

*See Table 1 in:*  
Chemical Control of Landscape Pests
Dogwood (Cornus)—Dogwood sawfly
Macremphytus tarsatus or M. varianus

Pest description and damage  Dogwood sawfly is a recent introduction to the Pacific Northwest. The species is presumed to be M. tarsatus but has not been verified by experts as adults have been difficult to find/rear. They have only been found feeding on red osier dogwood, Cornus stolonifera. Eggs are small bumps under the epidermis of leaves. Newly hatched larvae are yellow-green. The next instar is covered with a white waxy material which is shed with the final molt; third instars are yellowish-green with rows of bold square dark spots along the body. Entire large red osier dogwoods have been defoliated by summer’s end. Larvae cause further damage when they burrow into wood—including nearby siding on buildings—to pupe.

Biology and life history  Eggs hatch from the underside of the leaf and small larvae cluster together to begin feeding in July. Larger instars begin to defoliate trees in late summer, often in late August. Larvae pupe in rotting wood, house siding or soil in fall and emerge in late spring to lay eggs.

Pest monitoring  Newly hatched larvae congregate in clusters in leaves at the tops of trees. From below, the clusters of larvae are visible as sunlight penetrates the thin leaves, revealing dark clumps.

Management—cultural control  Prune out infested branch tips at the tops of trees when larvae are first noticed.

Management—biological control  It is likely that native predators and parasitoids will find this food source but no records have been noted.

Management—chemical control  See Table 1 in: Chemical Control of Landscape Pests

For more information  See “Sawfly” in: Common Landscape Pests


Douglas-fir (Pseudotsuga)—Aphid
Giant conifer aphid (Cinara spp.)

Pest description, and damage  These aphids infesting Douglas-fir are large insects, up to 0.2 inch long. They range in color from gray to brownish to black. Aphids establish large colonies on the twigs, but rarely are found feeding on needles. Feeding produces a honeydew that promotes sooty mold on foliage and underlying surfaces. Yellowjackets and ants may be found in tree canopy foraging for honeydew.

For biology, life history, monitoring and management  See “Aphid” in: Common Landscape Pests

Management—chemical control  See Table 1 in: Chemical Control of Landscape Pests

Douglas-fir (Pseudotsuga)—Brown soft scale
Coccus hesperidum

Pest description and damage  Brown soft scale are yellowish to dark brown insects (adults are usually darker). They are found mainly on twigs, although young scale also may be found on the foliage, typically on the underside of needles. Scale suck plant sap and produce copious honeydew on which sooty mold may grow.

For biology, life history, monitoring and management  See “Scale insect” in: Common Landscape Pests

Management—chemical control  See Table 1 in: Chemical Control of Landscape Pests

Douglas-fir (Pseudotsuga)—Coneworm
Dioryctria spp.

Pest description and damage  Adult coneworms are mottled gray snout moths banded with subtle color. Coneworm larvae are small and cream-colored or light brown with a darker head. Coneworms attack true firs by boring into shoot tips or stems, especially around wounds, and feeding on the soft bark tissues. The portion of the branch beyond the injured point may die back. Coneworms also may bore into green cones, feed on the soft bark of young growth or on graft unions, or feed inside the bark on the trunk cambium. Coneworms also attack hemlock and spruce. There are many species of Dioryctria which feed on different parts of small plants, trunk and shoots as well as cones. Confounding the issue are insects of other orders that attack cones and a number of other small moths that bore into shoots. This damage can be a serious problem in Douglas-fir grown for seed.

Management—cultural control  Plant resistant conifers where this pest is a problem. Remove and destroy infested cones and twigs when possible.

Management—biological control  Natural enemies of the coneworm are likely, but not listed.

Management—chemical control  See Table 4 in: Chemical Control of Landscape Pests


Douglas-fir (Pseudotsuga)—Cooley spruce gall adelgid
Adelges cooleyi

Pest description and damage  This aphid-like insect feeds on new needle growth of Douglas-fir. Adelgids appear as woolly or cottony tufts on the undersides of needles; heavily infested trees appear to be flocked. Small purplish insects are found underneath the cottony tufts. Adelgid feeding can cause needles of Douglas-fir to become distorted or bent and yellow. Infested needles turn brown and sometimes drop prematurely. This pest is a serious concern in Christmas tree plantations, but is less important in the landscape. Cooley spruce gall adelgids also infest spruces, but the distinctive galls on spruce do not occur on Douglas-fir.
There are a number of species of adelgids that form galls on spruce. If control is not obtained, it may be that these less studied species have slightly different life cycles, life histories, behaviors and/or susceptibility to pesticides.

**Biology and life history** The biology of this pest is complex with the insect alternating between Douglas-fir and spruce and also cycling on the Douglas-fir.

**Management—cultural control**
Plant Douglas-fir and spruce as far apart as possible. Hand-wipe small infestations.

**Management—chemical control**
See Table 1 in: Chemical Control of Landscape Pests

For more information
See “Douglas-fir” in: Christmas Tree Plantation Pests


**Douglas-fir (Pseudotsuga)—Douglas-fir needle midge**
*Contarinia* spp.

**Pest description and damage** The adult Douglas-fir needle midge is a tiny fly. Three different midges infest Douglas-fir: one species feeds near the needle base, one feeds near the tip of the needle, and the third feeds near the middle. The tiny white larvae of the Douglas-fir needle midge mine the inside of needles, which become yellowed and distorted. Infested needles often bend sharply at the injury site. Damaged needles often drop from the tree, and heavy midge infestations can cause severe defoliation. This pest is more significant in Christmas tree plantations and less of a problem in landscapes or wooded stands.

**Biology and life history** The midges pupate in the ground, with the adults emerging around budbreak in the spring. They lay eggs on the new growth, and the newly hatched larvae mine the needles and feed through the summer. At the end of the summer, they drop to the ground to pupate. There is one generation per year.

**Management—cultural control**
Prune out heavily infested twigs and branches.

**Management—chemical control**
See Table 3 in: Chemical Control of Landscape Pests

For more information
See “Caterpillar” in: Common Landscape Pests


**Douglas-fir (Pseudotsuga)—Douglas-fir twig weevil**
*Cylindrocopturus furnissi*

**Pest description and damage** The Douglas-fir twig weevil is a small, wingless, grayish-black beetle with white markings and sometimes pinkish spots. The larvae mine under the bark or inside twigs. Infested twigs and small branches often turn a reddish-brown and die back. Small, stressed trees, and those in Christmas tree plantations, are especially susceptible to attack by the weevils, particularly in dry years. There are several related species on pine and true fir.

**Biology and life history** The weevil overwinters as egg masses deposited on or near the cocoons of the wingless female. The larvae emerge in the spring as buds break and begin feeding on the new growth. The insect pupates in cocoons on the host plant, and adults emerge in summer. Males seek out the flightless females which look like a grayish bag with legs. There is one generation per year.

**Management—biological control**
A variety of predators and parasitoids keep this pest under control most of the time. Severe tussock moth outbreaks are sporadic and tend to last about three years before subsiding.

**Management—cultural control**
Prune off and burn infested branches. Do not touch caterpillars with bare hands as some people are sensitive to their irritating hairs. Hand-pick caterpillars preferably while wearing gloves. Avoid rubbing your eyes as hairs can penetrate the eyeball causing intense pain.

**Management—chemical control**
See Table 2 in: Chemical Control of Landscape Pests

For more information
See “Caterpillar” in: Common Landscape Pests

Douglas-fir (Pseudotsuga)—Pine needle scale

Includes
Pine needle scale (Chionaspis pinifolii) and Matsucoccus spp.

Pest description and damage Pine needle scale are elongate, pure white scale that feed on the needles. Heavily infested trees may appear crusted with white. Infested needles turn yellow, then brown. Twigs and branches may be killed. Repeated infestations may kill trees eventually. Pine needle scale often are found with the black pine leaf scale, which is gray to black instead of white. Pine needle scale is a serious pest of ornamental pines and also may infest arborvitae, cedar, hemlock, and spruce.

For biology, life history, monitoring and management
See: Pine (Pinus)—Pine needle scale

Management—chemical control
See Table 1 in: Chemical Control of Landscape Pests

Douglas-fir (Pseudotsuga)—Pitch moth

Douglas-fir pitch moth (Synanthedon navaronesis)
Sequoia pitch moth (Synanthedon sequoiae)

Pest description and damage These adult are clearwing moths with either yellow and black markings (sequoia) or orange and black markings (Douglas-fir) resembling yellow-jacket wasps. The larvae are about 1 inch long, yellowish, with a reddish-brown head (sequoia) or naked ivory-white with brown marks on the thorax (Douglas-fir). The larvae of the sequoia pitch moth feed by boring into branches or trunks. At the point where the larva enters the wood, small to large masses of creamy yellow to pinkish pitch accumulate. The larva feeds locally underneath the pitch mass. This pest causes mainly aesthetic damage because of the dripping pitch and pitch masses. These moths have a wide range of pine tree hosts, but the sequoia pitch moth does not attack sequoia, the coast redwood.

Biology and life history Eggs are laid on the bark of host trees. The larvae bore into the inner bark and establish a feeding site. The feeding site can be distinguished easily by the large accumulation of pitch and frass on the exterior of the bark. Pupation takes place within this mass. When adults emerge, the pupae wriggle to the surface and protrude from the pitch mass. The adult moths fly in summer. About half the population completes its life cycle in 1 year; the other half requires 2 years.

Pest monitoring Pheromone traps are available to time adult activity and entrap males.

Management—cultural control
Healthy trees are not commonly attacked. Infestations often are associated with pruning wounds or mechanical damage to the tree. Trees which are wounded in the spring and summer when adult moths are flying are far more likely to be attacked than those pruned or injured in the fall and winter. The moths also may be attracted to trees undergoing stresses associated with drought or saturated soil. Remove pitch masses and caterpillars by hand before pupal cases protrude.
Douglas-fir (*Pseudotsuga*)—Spruce spider mite

*Oligonychus ununguis*

**Pest description and damage** Several species of spider mites can cause damage in coniferous ornamentals. Appearance of these mites varies with the species, although all are 0.02 inch or smaller. The spruce spider mite is dark green to nearly black with salmon-pink legs. The spherical eggs are laid at the base of needles and hatch in April and May. They can complete a generation in 17 days and build up particularly high populations during hot, dry weather. Plants may be covered with fine silk webbing at branch axils or over sections under very heavy infestations. Mites damage leaves by sucking cell contents, which causes stippling, bronzing, and possibly needle drop. The reduction in photosynthesis causes loss of vigor and yield. Trees under continuous attack may look dingy brown, or die from the bottom up.

**For biology, life history, scouting, and management options**

See “Spider mite” in: Common Landscape Pests

**Management—chemical control**

See Table 1 in: Chemical Control of Landscape Pests

**For more information**


Elderberry (*Sambucus*)—Borer

Unidentified roundheaded borer (*Cerambycid*)

**Pest description and damage** A reddish cerambycid beetle has been found on elderberry in Washington and is associated with round exit holes surrounded by shattered bark of the stems of this shrub. With the increase of ornamental elderberry cultivars, there are more reports of wilting canes and even death of shrubs. Canes are reported to start to wilt at the tips with damage continuing down the canes. Infested canes are lumpy and round exit holes with shattered bark are visible. (So far, the usual orange and blue elderberry borer has not been found in the PNW. An exploration of local entomological collections has not been conducted.)

**Biology and life history** Little is known of this beetle. It has been collected from elderberry in the Cascade mountains and along Puget Sound and Willapa Bay in Washington. One observant horticulturist said that damage begins with wilting tips, suggesting eggs are laid at the tips of canes and as the larva burrows downward, the cane wilts further.

**Pest monitoring** Watch for the first signs of wilted tips in spring. Cut well below the wilted area and inspect for the larva by splitting the cane.

**Management—cultural control**

To control larvae boring through the cane, remove the cane just below the wilted portion when symptoms are first noticed.

**Management—biological control**

None known

**Management—chemical control**

See Table 4 in: Chemical Control of Landscape Pests

**For more information**

See “Wood borers” in: Common Landscape Pests

Elderberry (*Sambucus*)—Leafcutting bee

*Megachile* spp.

**Description and crop damage** Leafcutting bee activity is noted by the uniform oval and round pieces cut from the edges of leaves. The adult bee uses these little oval pieces to line the sides of an old beetle gallery or hole in the ground. She then gathers pollen to form a ball of food, and lays one egg, then seals the apartment with a wall made of a round leaf piece. Damage is transitory while leaves are pliable enough to be rolled up (but not so soft as to decay in the tunnel). Once leaves have hardened off, the leaf cutters will find other suitable hosts.

**Management—cultural control**

If the missing leaf portions are objectionable, try laying a light sheet or fine curtain netting over the plant until the leaves have hardened off, or the bees have found another suitable leaf donor. The trade-off between pollination services provided by the leafcutting bees and the damage can be a beneficial one. Plants are rarely harmed by the loss of some leaves.

Elm (*Ulmus*)—Aphid

Wooly apple aphid (*Eriosoma lanigerum*)

Woolly elm aphid (*Eriosoma americanum*)

Woolly elm bark aphid (*Eriosoma rileyi*)

**Pest description and damage** Several species of aphids can become problems as foliar, twig or stem, or root feeding pests on elms. Some of the aphids have a summer alternate host where they infest roots, stems, lower trunk or leaves of *Amelanchier*, hawthorn, apple, pear, currant or other rosaceous plants. Some of the aphids form galls on elm while others distort tissue or cause leaves to pucker and roll tightly. Woolly elm aphids are tiny and dusted with a light gray wax. They cause leaves to roll under from the edge of the leaf toward the midrib. Their alternate summer host is serviceberry. Woolly apple aphids form clusters on galls on elm. On apple they produce long, white, waxy filaments and form noticeable white patches on bark, water sprouts and the roots. They also form lumpy galls on *Malus* branches and roots; heavy root galling can kill small trees. Feeding damage on elm leaves is aesthetically displeasing but usually doesn’t cause significant tree damage. If abundant on elm, they produce galled and distorted leaves and honeydew and can compromise the vigor of small trees.

**Biology and life history** The *Eriosoma* species all winter over on elm, in bark crevices. In spring, they produce young which feed on the elm leaves, then become mature winged adults, which migrate to their alternate hosts. They spend summer on these alternate hosts until fall when winged adults are produced again and migrate back to elm. Woolly apple aphid has adapted to overwinter on apple even in the absence of elms.

**Pest monitoring** Woolly elm bark aphids are best observed on bark before budbreak. Observe trees as they leaf out in spring to determine infestation levels, so that if pesticides are needed they can be applied before damage is significant. Once leaves are distorted, the damage can’t be undone.

**Management—cultural control**

The woolly apple aphid prefers to infest wounds, callus tissue or other damaged areas on trees. Keep trees in good health and watered during periods of drought.

**Management—biological control**

Woolly apple aphids and other *Eriosoma* spp. are heavily regulated by predators and parasitoids. Syrphid fly larvae, lacewing larvae, and lady beetles are common predators on the aphids. Often by the time the aphids are noticed, predators are already on site and
feeding. The wasp parasitoid *Aphelinus mali* also is reported to control woolly apple aphid.

**Management—chemical control**

*See Table 1 in:*
Chemical Control of Landscape Pests

**For more information**

*See “Aphid” in:*
Common Landscape Pests


**Elm (*Ulmus*)—Bark beetle**

**Includes**

Elm bark beetle (*Hylurgopinus rufipes*)

European elm bark beetle (*Scolytus multistriatus*)

**Pest description and damage**

Elm bark beetles are about 0.13 inch long and shiny brown or black. The larvae are white, legless, and about 0.16 inch long. Larvae and adults of both these species bore into the cambial and vascular tissues of trees, weakening them and causing wilting and dieback of individual stems and branches. Trunks and branches can be completely riddled with galleries. Beetles emerging from trees infected with Dutch elm disease infect the trees they attack next. Borers are primarily a problem on injured or stressed trees also may be attacked. *Scolytus schevyrewi* was introduced to California in 2008, and may have extended its range into the PNW.

*For biology, life history, monitoring and management*

*See “Bark Beetle” in:*
Common Landscape Pests

**Elm (*Ulmus*)—Carpenterworm**

*Prionoxystus robiniae*

**Pest description and damage**

Carpenterworms are the larvae of a large mottled gray and black moth. The caterpillars are white to pinkish-red with a dark head and are 1 to 3 inches long when mature. The caterpillars bore in the trunk and main branches. Discolored or bleeding limbs, branch dieback, and lumpy or gnarled trunks may be indications of carpenterworm infestation. Sawdust-like material (frass) and wood chips mixed with loose webbing on or around infested trees is typical. Trees with severe carpenterworm infestations are susceptible to wind breakage and may need to be removed. Infestations may kill trees eventually.

*For biology, life history, monitoring and management*

*See:*
Cottonwood (*Populus*)—Carpenterworm

**Elm (*Ulmus*)—Elm leaf beetle**

*Pyrrhalta luteola*

**Pest description and damage**

Adult elm leaf beetles are approximately 0.25 inch long and yellow to greenish with two dark stripes. Older adults are darker. The 0.25 inch larvae are greenish or yellowish with black lateral stripes and spots. Elm leaf beetles feed on the leaves both as larvae and as adults. As larvae, they skeletonize leaves, feeding on the underside and eating all parts except the veins and upper cuticle, which then turn brown. Adult feeding causes small holes in the leaves. Severe infestations may result in severe premature leaf loss. Trees may releaf in late summer. Weakened trees are also more susceptible to attack by elm bark beetles, which can carry the Dutch elm disease fungus.

**Biology and life history**

The insect overwinters as adults in protected places both indoors (often invading houses) and outdoors. In spring, the adults fly to trees as the leaves are expanding and chew circular holes in them. Clusters of pointed yellow eggs are laid on the leaves, and the larvae hatch in late spring (typically May–June) and begin skeletonizing leaves. They feed for a period, then migrate to the lower parts of the tree and pupate on the ground or in crevices near the base of the tree. The second generation emerges 1 or 2 weeks later. There are two generations per year.

**Pest monitoring**

Watch for emerging adults in spring then watch for small circular holes or skeletonizing of the tender new leaves as larvae feed. Best control is achieved when larvae are small and before damage is severe.

**Management—cultural control**

Plant resistant cultivars of American elm (*Ulmus americana*). These include ‘Dynasty,’ ‘Princeton,’ ‘Prospector,’ ‘Frontier,’ and ‘Pathfinder.’ (Note: Many American elm cultivars are highly susceptible to Dutch elm disease). Other elms reported to be somewhat resistant to elm leaf beetle feeding include Chinese elm (*U. parvifolia*) and the elm-like zelkovas (*Zelkova* spp.). Provide proper culture to maintain plant health. Healthy plants are more tolerant of insect damage. Prune dead and dying branches in late fall or winter. A shopvac or mower with catch bag may be able to remove larvae that drop to the ground to pupate.

**Management—chemical control**

*See Table 2 in:*
Chemical Control of Landscape Pests

**For more information**


**Elm (*Ulmus*)—Elm leafminer**

*Fenusa ulmi*

**Description and crop damage**

Adults are tiny, black, fly-like sawflies which can be seen on new foliage on sunny days. Small, legless leafminer larva feed between the layers of leaf epidermis, resulting in large brown blotches that gradually coalesce into one large mine consuming the entire leaf. Large trees may be completely defoliated; however, as new growth continues in May, the trees begin to refoliate out at the branch tips and fill in with little apparent effect. On Camperdown elm, however, the mines don’t coalesce and the dark blotches are visible on the leaves that remain on the tree.

**Biology and life history**

These sawflies overwinter as pupae in the soil. As trees begin to leaf out, adults emerge from the soil and can be seen as black specks on the leaves. They begin to lay eggs, at first, in the angles where the secondary vein meets the midrib. As the larvae
feed and grow, the mines appear to coalesce. Mature larvae drop to the soil to pupate. There is only one generation per year.

Pest monitoring Look for the small black adults as leaves unfold in the spring. They are most active when it is sunny within the tree canopy. The little black adults are easily visible on the upper leaf surface. Sticky cards can be placed on the sunny side of the plant in early April to provide early warning that monitoring should begin. Degree day models are available.

Management—cultural control
As leaves drop larvae are found on the soil and underlying pavement. Use of a shredding leaf blower in reverse, may remove a number of larvae, and dispatch them while making useful mulch.

Management—chemical control
See Table 3 in: Chemical Control of Landscape Pests

For more information
See “Leafminer” in: Common Landscape Pests

Rosetta, R. 2004. Elm leafminer. PNW Nursery IPM (http://oregonstate.edu/dept/nurspest/elm_leafminer.htm)

Elm (Ulmus)—European elm scale
Gossyparia spuria

Pest description and damage The European elm scale is a reddish-brown to purplish scale surrounded by a conspicuous fringe of white, waxy material. They sometimes resemble mealybugs. The mature females are about 0.13 inch in diameter. The crawlers emerge in late spring and summer and are yellowish to dark brown. The scale feed on twigs and branches as well as leaves. Feeding scale produce honeydew, a sweet, sticky material which attracts honeydew-feeding ants and honeydew becomes covered with a growth of black sooty mold. Infested trees may show yellowing leaves and early leaf drop, followed by death of twigs and branches. Severe infestations may cause extensive damage.

Biology and life history The scale overwinter as immature crawlers in dark crevices of small branches and branch axils. In spring, the females lay eggs and by June, the crawlers are active. They move to the undersides of leaves to feed, remaining there all summer. Often, the scale drop to the ground with the normal leaf-fall and are killed. There is one generation per year.

Management—cultural control
Asiatic elms such as Chinese elm (Ulmus parvifolia) apparently are not infested. Siberian elm (U. pumila) is also resistant but is a poor shade tree. Provide proper culture to maintain plant health. Healthy trees are more able to tolerate scale infestations. Prune and destroy twigs to help control isolated infestations, when practical. Apply adhesive tape, double-stick or sticky side out, near infestations of adult scale to catch the crawler stage. As with aphids, avoid excessive nitrogen fertilizer, as this favors population increase.

Management—biological control
Natural enemies such as lady beetles, green lacewings and wasp parasitoids help control scale populations.

Management—chemical control
Avoid use of broad-spectrum insecticides which kill beneficial insects.

Dormant-season spray—Apply with enough water to cover the entire tree thoroughly.

Growing-season spray—Apply to control the immature crawler stage, usually in late spring to early summer. Scout for crawlers and gather life history data.

See Table 1 in: Chemical Control of Landscape Pests

For more information
See “Scale insect” in: Common Landscape Pests


Cranshaw, W.S., D. Leatherman, B. Kondratieff. 1996. European elm scale (http://www.coopext.colostate.edu/TRA/PLANTS/elm_scale.shtml)

Elm (Ulmus)—Fall webworm
Hyphantria cunea

Pest description and damage Large silken tents filled with caterpillars, frass and dead leaves, eventually engulf entire branches of deciduous trees including apple, ash, boxelder, birch, cherry, black walnut, chokecherry, European elm, hickory, linden peach, pecan, poplar, sycamore, white oak and willow and sometimes roses and some shrubs. Young caterpillars are pale greenish or yellow with a dark stripe down the back and a yellow stripe along the sides. Long silky hairs arise from yellow and black tubercles. When mature, the caterpillars are covered with yellow, rusty then black colored silky hairs. Adults are bright white with orange and black markings on the underside of the abdomen. Woolly scales cover masses of 200 to 500 greenish eggs.

For biology, life history, monitoring and management
See: Cottonwood (Populus)—Fall webworm

See “Caterpillar” in: Common Landscape Pests

Management—chemical control
See Table 2 in: Chemical Control of Landscape Pests

Elm (Ulmus)—Oystershell scale
Lepidosaphes ulmi

Pest description and damage The mature scale is approximately 0.125 inch long, hard-shelled, brownish or gray in color, and usually elongated and slightly curved like an oyster or mussel shell. Oystershell scale are found on trunks, branches, and twigs of many broad-leaved deciduous plants. They occur less frequently on the leaves and other plant parts including fruit and seed pods. Scale infestations often are limited initially to isolated colonies on single branches or twigs.

For biology, life history, monitoring and management
See: Ash (Fraxinus)—Oystershell Scale

See “Scale insect” in: Common Landscape Pests

Management—chemical control
See Table 1 in: Chemical Control of Landscape Pests
Elm (Ulmus)—Spiny elm caterpillar (mourning cloak butterfly)

*Nymphalis antiopa*

**Pest description and damage** The spiny elm caterpillar is the larval stage of the mourning cloak butterfly. The adult butterfly is approximately 2.5 inches across, with purplish-brown to black wings bordered by a creamy yellow stripe and a row of blue spots. The larvae are purplish-black with white specks and have a row of orange to red spots along the back. They have brownish prolegs and are clothed with long, forked spines. The caterpillars often feed in large groups and eat all the leaves on a branch before moving. Their feeding results in raggedly chewed leaves. Spiny elm caterpillars also feed on willow and poplar trees. They usually are not a serious pest.

**Biology and life history** The adult butterfly overwinters in protected places, and is found flying on warm spring days coinciding with budbreak. The females lay eggs in masses on twigs, and the larvae hatch and feed in large groups. After feeding, the mature larva pupates by suspending itself in a chrysalis from a leaf. The second generation, if there is one, emerges in August.

**Management—biological control**

There are several wasp parasites of the larvae. Birds will pursue and eat the adult butterfly.

**Management—cultural control**

Hand-pick larvae or remove heavily infested branches.

**Management—chemical control**

*See Table 2 in:*

Chemical Control of Landscape Pests

**For more information**

*See “Caterpillar” in:*

Common Landscape Pests


Euonymus (Euonymus)—Cottony camellia scale

*Pulvinaria floccifera*

**Pest description and damage** The cottony camellia scale are flat brownish or yellowish sucking insects. Females create a distinctive oblong cottony egg sac. On hatching, the pale yellow crawlers (young scale) feed on the undersides of leaves and along veins. Foliage with scale infestations may turn yellowish or pale in color. Due to copious honeydew, leaves below become covered with a crust of black sooty mold. It is possible to have low numbers of this insect for years without an outbreak.

**For biology, life history, monitoring and management**

*See:*

*Camellia (Camellia)—Cottony camellia scale*

*See “Scale insect” in:*

Common Landscape Pests

**Management—chemical control**

*See Table 1 in:*

Chemical Control of Landscape Pests

Euonymus (Euonymus)—Euonymus scale

*Unaspis euonymi*

**Pest description and damage** Euonymus scale females are dark, 0.063 inch long, and mussel-shaped. The males are narrow, elongated, and white. Crawlers are orange. Euonymus scale are found on both leaves and stems. Infested leaves develop yellow to white spots from scale feeding, and in severe cases significant defoliation can occur. Euonymus scale infests a wide range of ornamental genera that include *Camellia, Buxus, Daphne, Hedera, Ilex, Jasminum, Ligustrum, Lonicera, Pachysandra,* and *Prunus.*

**Biology and life history** The scale overwinters as fertilized females. In the spring, these females lay eggs and the crawlers emerge from beneath the shells to begin feeding. There may be two to three generations per year.

**Management—cultural control**

Evergreen euonymus (*E. japonica*) is extremely susceptible to scale infestations, as is spindle tree (*E. europaeus*). *Euonymus alata* (especially ‘Compacta’) and *E. fortunei* ‘Acutus’ are seldom infested. Several other species, including *E. kiautschovicus,* will tolerate scale feeding. Hand-wipe to help control small infestations, when practical. Prune out heavily infested branches. Apply doublestick tape around or near infestations of adult scale to catch the crawler stage. As with aphid, avoid excessive nitrogen fertilizer, as this favors population increase.

**Management—chemical control**

*See Table 1 in:*

Chemical Control of Landscape Pests

**For more information**

*See “Scale insect” in:*

Common Landscape Pests

Euonymus (Euonymus)—Root weevil

Numerous species

**Pest description and damage** Identification is important: species differ in susceptibility to pesticides. Adult weevils are small dark nocturnal beetles with a snout (rostrum) and elbowed antennae. Look for ragged notches on the edges of leaves, or flower petals. Larvae are C-shaped, legless, and white, sometimes reddish, with tan heads, up to 0.5 inch in size.

**For biology, life history, monitoring and management**

*See “Root weevil” in:*

Common Landscape Pests

**Management—chemical control**

*See Table 2 in:*

Chemical Control of Landscape Pests

Euphorbia (Euphorbia)—Aphid

Spurge aphid (*Aphis euphorbiae*) and others

**Pest description and damage** Clusters of slate gray aphids can congregate in prodigious numbers along stems and under flowers of euphorbia. Aphids may vary in color depending on species from greenish to dark grey.

**For biology, life history, monitoring and management**

*See “Aphid” in:*

Common Landscape Pests

**Management—chemical control**

*See Table 1 in:*

Chemical Control of Landscape Pests
Fir (Abies)—Balsam twig aphid

Mindarus abietetinus

**Pest description and damage** Balsam twig aphids feed on needles and buds of firs. Three distinct forms of the balsam twig aphid occur. Aphid may be (1) small and yellow-green, (2) large and bluish-gray, or (3) have woolly white secretions which make them appear powdery. The aphids mat needles together as though coated with sugar, and cause new growth to be deformed and stunted. Some needles are killed and drop from the tree, leaving rough twigs.

**Biology and life history** Unlike other aphid species, there is only one generation per year. The aphid overwinters as eggs on host trees. The eggs hatch and the nymphs molt into “stem mothers,” which are large and blue-gray, and capable of giving birth to live young. These aphids are covered with a white waxy coating and feed on new flushes of growth, doing most of the damage. They mature into the final, winged form, the females of which lay the overwintering eggs in bark crevices.

**For biology, life history, monitoring and management**

See “Aphid” in:

Common Landscape Pests

Management—chemical control

See Table 1 in:

Chemical Control of Landscape Pests

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Fir (Abies)—Balsam woolly adelgid

Adelges piceae

**Pest description and damage** The balsam woolly adelgid feeds on the stems of true firs. White or grayish cottonlike masses of eggs or newly hatched purplish-black insects can be found on the twigs, branches, or trunk. Heavy adelgid infestations may cover the entire trunk. The feeding insects cause the tree to form swollen, knoblike areas at nodes and tips of infested branches. Adelgid infestations weaken trees, cause foliage to become sparse, and can kill trees. This is a serious pest in the forest and common to the landscape on balsam, grand, subalpine, Pacific silver, and Fraser firs. Balsam fir and subalpine fir are particularly susceptible.

**Biology and life history** The entire population consists of female insects, which are wingless. They are immobile except for a crawler stage. Crawlers can be carried from tree to tree by wind. Eggs are laid on the bark, from which the crawlers emerge. There are two to four generations per year.

**Management—biological control**

Examine adelgid colonies for small lady beetles or their wax-covered black larvae. Syrphid fly larvae also help control adelgid populations. Avoid use of broad-spectrum insecticides which will kill these important predators.

**Management—cultural control**

Hand-wipe or use stiff brush to remove minor infestations on smaller trees when possible. Hose infested trees with a strong stream of water to wash off these insects.

**Management—chemical control**

See Table 1 in:

Chemical Control of Landscape Pests

**For more information**


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Fir (Abies)—Bow-legged fir aphid

Cinara curvipes

**Pest description and damage** This large, brownish-black aphid congregates in large colonies on branches (especially the undersides). Aphids dropping onto underlying foliage or decks look somewhat like spiders. They secrete honeydew and promote sooty mold and their feeding can cause needles to turn yellow and drop prematurely resulting in defoliated branches. The aphids also produce copious honeydew, which attracts yellowjackets and other wasps. Black sooty mold may also develop on the honeydew, blocking light to the needles.

**Biology and life history** Eggs overwintor on needles and bark in the trees. The large black stem mothers hatch in early spring and gives birth to young aphid nymphs that grow and soon begin giving birth to more aphids. Each stem mother produces live young that cluster in conspicuous aggregations of aphids among needles or on the undersides of larger branches. There may be multiple generations through the summer months.

**For biology, life history, monitoring and management**

See “Aphid” in:

Common Landscape Pests

Management—chemical control

See Table 1 in:

Chemical Control of Landscape Pests

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Fir (Abies)—Giant conifer aphid

Cinara spp.

**Pest description and damage** About 200 species of Cinara attack pine, spruce, fir and cypress throughout the United States. Many of these species are large (up to 0.2 inch), dark brown to black, and almost spider-like. The aphids congregate in large colonies to feed on the bark of twigs and even the main stem of small trees. The feeding causes yellowing of foliage, leaf drop and can cause limbs to die. These aphids can cause serious damage to young trees. These aphids overwinter as eggs on twigs or branches. Adults and nymphs begin feeding on stems in the spring.
Fir (Abies)—Spruce budworm (Western)  Choristoneura occidentalis

Pest description and damage  Adult moths are mottled orange-brown and have a wingspan up to 1 inch. The larvae are typically green to brown with a darker head and white tubercles in later stages. They grow to approximately 1 inch in length. These larvae feed on the buds and foliage and may tie shoot tips together with webbing to make a nest. Spruce budworms are mainly pests of balsam and subalpine firs. They also attack spruce and Douglas-fir adjacent to infested fir trees. Although a significant problem in forestry situations, this insect is an infrequent pest in the landscape.

Biology and life history  The larvae overwinter in small silken cocoons which are hard to locate. The following spring, larvae emerge and spin long silken threads that aid in their dispersal. Eggs are light green and laid in shingle-like masses on the underside of needles in mid-July. A needle with a layer of green eggs looks thicker than others.

Management—cultural control  Hand-pick and destroy larvae when found.

Management—biological control  Budworm populations are usually regulated by combinations of several natural factors such as insect parasites, vertebrate and invertebrate predators, and adverse weather conditions.

Management—chemical control  See Table 2 in:  Chemical Control of Landscape Pests


Firethorn (Pyracantha)—Azalea and rhododendron lace bug

Azalea lace bug (Stephanitis pyrioides)  Rhododendron lace bug (Stephanitis rhododendri)

Pest description and damage  These insects use piercing–sucking mouthparts to feed on individual cells, so the upper leaf surface is yellow and stippled. The underside of leaves is covered with black tar-like spots. Infestations are more severe on plants in the sun. Damage is usually apparent by early to mid-July. While almost never fatal, repeated infestations of rhododendron lace bugs may result in yellowed, sickly plants. Adult insects are whitish-tan and approximately 0.13 inch long with lacy-looking wings. Nymphs grow to about 0.13 inch and are spiny. The damage the insects cause is similar on first inspection to that of leafhoppers but with tar-spots. Identification is based on the dark markings on the thorax and forewings.

For biology, life history, monitoring and management  See:  Azalea (Rhododendron)—Azalea and rhododendron lace bug

Management—chemical control  See Table 4 in:  Chemical Control of Landscape Pests


Firethorn (Pyracantha)—Cherry bark tortrix

Enarmonia formosana

Pest description and damage  Cherry bark tortrix is a pest of most woody ornamental trees and shrubs in the family Rosaceae. The larvae are 0.33 to 0.4 inch long, pale gray to flesh-color with small, pale gray spines scattered on the surface, with a yellowish-brown head. Larvae feed directly on the cambium under the tree bark and may cause death of the tree in sufficient numbers. Otherwise, the feeding activity decreases the supply of nutrients to the tree and increases susceptibility to disease, insect attack, and environmental stress, including cold injury. The first indication of attack is the exuding of reddish-brown gum-like resin, mixed with fecal pellets and silk. The trunk and larger limbs of plants are affected, usually at pruning wounds on larger limbs or around graft unions.

For biology, life history, monitoring and management  See:  Cherry (Malus)—Cherry bark tortrix

Management—chemical control  See Table 4 in:  Chemical Control of Landscape Pests
**Firethorn (Pyracantha)—Root weevil**

Many species

**Pest description and damage** Species identification is important as root weevil species differ in susceptibility to pesticides and have different life cycles. Adult weevils are small dark beetles with a snout (rostrum) and elbowed antennae. Look for regular U-shaped notches along the leaf edges. This is species is unusual because males are common and adults are often found in tandem. These nocturnal adults are nearly black and shiny with a snout (rostrum) and elbowed antennae. Larval feeding on roots is rarely a problem in established landscapes.

**For biology, life history, monitoring and management**

See “Root weevil” in:
Common Landscape Pests

**Management—chemical control**

See Table 2 in:
Chemical Control of Landscape Pests

**Forsythia (Forsythia)—Root weevil**

Lilac root weevil (Otiorthynchus meridionalis) and numerous other species

**Pest description and damage** Identification is important as root weevil species differ in susceptibility to pesticides and may have different life cycles. East of the Cascades, the lilac weevil is especially common. Look for regular U-shaped notches along the leaf edges. This is species is unusual because males are common and adults are often found in tandem. These nocturnal adults are nearly black and shiny with a snout (rostrum) and elbowed antennae. Larval feeding on roots is rarely a problem in established landscapes.

**For biology, life history, monitoring and management**

See “Root weevil” in:
Common Landscape Pests

**Management—chemical control**

See Table 2 in:
Chemical Control of Landscape Pests

**Fuchsia (Fuchsia)—Aphid**

Includes potato aphid (Macrostephum euphorbiae)

**Pest description and damage** Several species of aphid may infest fuchsia. The aphids feed initially on the shoot tips, which can cause stunting and malformation of the tips. The feeding and honeydew production can cause sooty mold problems. Aphids tend to be small (0.625 to 0.125 inch long), oval to pear-shaped, soft-bodied insects with piercing–sucking mouthparts. Color varies but most aphids tend to match host plant coloration. Aphids tend to feed in colonies and are often found on the new or most succulent plant tissues. When aphid populations are high, damage can be severe. Aphids produce honeydew, a sweet, sticky secretion that collects on underlying plant tissues and encourages growth of a black sooty mold. In addition to cosmetics, honeydew may become a sticky nuisance when it falls on decks, cars, or other landscape surfaces.

**For biology, life history, monitoring and management**

See “Aphid” in:
Common Landscape Pests

**Management—chemical control**

See Table 1 in:
Chemical Control of Landscape Pests

**Fuchsia (Fuchsia)—Cyclamen mite**

Steneotarsonemus pallidus

**Pest description and damage** The cyclamen mite is extremely tiny and only visible with high magnification. When mature, it measures only about 0.001 inch. Mature mites are pinkish-orange and shiny. The hind legs are threadlike in the female and grasping or pincerlike in the male. At low population densities, cyclamen mites usually are found along the midvein of young unfolded leaves and under the calyx of newly emerged flower buds. At high population densities, these mites can be found anywhere on nonexpanded plant tissue. The mites infest growing tips, young leaves, and blooms and cause distorted, twisted, and blistered growth. They are spread by wind and by movement of infested stock.

**Biology and life history** Cyclamen mites overwinter as adult females. Eggs are translucent and comparatively large. Adult females lay about 90 eggs, 80% of which develop into females. During summer, newly hatched mites develop into mature adults within 2 weeks. Populations build rapidly soon after they begin to infest a planting.

**Pest monitoring** Look for tightly curled and distorted leaves.

**Management—biological control**

Predatory mites are important biological control agents of these mites.

**Management—cultural control**

Avoid planting, or propagating from, infested plants. Eliminating cyclamen mites from infested plants is very difficult. Cyclamen and broad mites are sensitive to heat and thus thrive in the cooler temperatures of early spring and fall (winter in the greenhouse). Hot water dips (100°F for 30 minutes; or 111°F for 15 minutes) have been used to control cyclamen mites. This can be done prior to planting, or to disinfect cuttings prior to propagation to clean new stock.

**Management—chemical control**

See Table 3 in:
Chemical Control of Landscape Pests

For more information


**Fuchsia (Fuchsia)—Fuchsia gall mite**

Aculops fuchsiae

**Pest description and damage** Tiny, elongated, eriophyid mites infest the growing tips, young leaves, and blooms and cause distorted, twisted, and blistered growth. They are primarily a problem in coastal areas. They are spread by wind, pollinating insects and birds, and by movement of infested stock.

**Biology and life cycle** This eriophyid mite develops in the unopened leaves and buds. They leave those tissues and move outward when new leaves and buds are forming

**Pest monitoring** Look for the gall symptoms and distortions on leaves and buds. Confirm with hand lens if practical.

**Management—biological controls**

Predatory mites are important biological control agents of these mites.
Management—cultural control
Fuchsia species and cultivars differ widely in susceptibility to these mites. Some control may be gained by removing infested plant parts. It is extremely easy to spread these mites to other plants after handling infested plants; thorough handwashing is advised. Mites can also be carried on clothing.

Management—chemical control
See Table 3 in:
Chemical Control of Landscape Pests

For more information
See “Gallmakers” in:
Common Landscape Pests


Anon. Susceptibility of Fuchsia Species or Cultivars to Fuchsia Gall Mite Damage in California. UC-IPM (http://www.ipm.ucdavis.edu/PMG/GARDEN/PLANTS/INVERT/vrfuchsiagall.html)

Fuchsia (Fuchsia)—Root weevil
Numerous species

Pest description and damage Species identification is important as root weevil species differ in susceptibility to pesticides and have different life cycles. Adult weevils are small dark beetles with a snout (rostrum) and elbowed antennae. Look for ragged notches on the edges of leaves, or flower petals. Damage by C-shaped larvae may cause plants to wilt and die. Larval damage is most often noticed in containers where successive generations of weevils and limited room for a healthy root system favors damage.

For biology, life history, monitoring and management
See “Root weevil” in:
Common Landscape Pests

Management—chemical control
See Table 2 in:
Chemical Control of Landscape Pests

Fuchsia (Fuchsia)—Whitefly
Numerous species

Pest description and damage Whiteflies are tiny, pure white, moth-like plant sucking insects. They lay tiny black eggs inserted on the undersides of leaves. The nymphs are yellowish and will also feed by sucking plant sap from the host. Leaves may turn yellow or dry and fall, or leaves may be covered by honeydew followed by the sooty mold fungus. Some whiteflies can transmit viruses. Fuchsias can be severely damaged by high populations of whiteflies.

For biology, life history, monitoring and management
See “Whitefly” in:
Common Landscape Pests

Management—chemical control
See Table 1 in:
Chemical Control of Landscape Pests

Geranium (Pelargonium)—Aphid
Geranium aphid (Acrithosiphon pelargonii)
Green peach aphid (Myzus persicae)

Pest description and damage Several species of aphids may feed on the foliar, stem, flower, bud, bark or root tissues of geraniums. Aphids tend to be small (0.0625 to 0.125 inch long), oval to pear-shaped, soft-bodied insects with piercing-sucking mouthparts. Color varies (black, green, pink, yellow, mottled, striped, etc.), but most aphids tend to match host plant coloration. Aphids tend to feed in colonies and are often found on the new or most succulent plant tissues. Feeding damage to mature plants is usually minor, but can compromise the vigor of the host. When aphid populations are high, leaf and shoot distortion can occur. Aphids produce honeydew, a sweet, sticky secretion that collects on underlying plant tissues and encourages growth of a black sooty mold. In addition to cosmetics, honeydew may become a sticky nuisance when it falls on decks, or landscape surfaces. Some aphids are vectors of plant diseases, particularly viruses.

For biology, life history, monitoring and management
See “Aphid” in:
Common Landscape Pests

Management—chemical control
See Table 1 in:
Chemical Control of Landscape Pests

Geranium (Pelargonium)—Leafroller and leaftier
Numerous species

Pest description and damage The larvae of the orange tortrix are light cream to green with light brown heads, and are up to 0.5 inch long at maturity. Oblique-banded larvae are similar in size but are darker green with dark brown to black heads. Both roll leaves and tie them with silk.

For biology, life history, monitoring and management
See:
Cherry, flowering (Prunus)—Oblique-banded leafroller

See “Leaftroller” in:
Common Landscape Pests

Management—chemical control
See Table 3 in:
Chemical Control of Landscape Pests

Gladiolus (Gladiolus)—Thrips
Gladiolus thrips (Thrips simplex)

Pest description and damage Adult thrips emerge milky-white but soon turn brown and begin feeding. The female is approximately 0.06 inch (1.65 mm) long and slightly larger than the male. The egg is about 0.0125 inch (0.3 mm) long, opaque white, smooth, and bean-shaped. Eggs are deposited in the leaf tissue and corns. Thrips feed by rasping the surface of the leaves or corns, which causes plant juices to flow. The affected leaf surfaces turn a whitish-gray and eventually dry out and turn brown. Infested flowers are discolored and spotted, and entire spikes may fail to bloom. Affected corns are discolored and deformed, and are prone to decay. Plants do not develop normally from such corns.

Biological and life history These thrips are native to Africa and cannot overwinter outdoors where temperatures consistently drop below 50°F. The thrips are brought into previously uninfestated gardens or greenhouses on infested corns. These thrips can
overwinter at any stage on stored corms or on plants growing in greenhouses. The life cycle consists of six stages: the egg, two larval instars, two pupal instars and the adult stage. Females deposit 100 to 200 eggs. During the warm growing season, the development of the gladiolus thrips can occur in about 2 weeks. With such rapid development, the thrips can have nine or more generations outside during the growing season. The eggs are deposited in the leaves of gladioli or in the corms in storage. Larvae and pupae can be found in the buds or leaf sheaths, although the larvae often drop to the ground to transform into the quiescent pupae. Adult gladiolus thrips live 35 to 40 days.

**Pest monitoring** Observe growth for spotting or bleaching of foliage, or for plants that fail to grow vigorously. Bloom stalks may shrivel as though dry.

**Management—biological control**
Some control of thrips by predatory mites is possible. *Hypoaspis miles* and *Amblyseius cucumeris* are both considered to be effective predators of mites and possibly thrips.

**Management—cultural control**
Storing corms at cool temperatures will eliminate all life stages of the thrips from the corms. After being kept in cold storage for a minimum period of 6 weeks at 35.6°F or 8 weeks at 41°F, larvae, pupae, and adult specimens died and eggs were no longer viable. Hence, the corms were damaged no further. Storage of corms at these low temperatures, provided they were well dried, proved not to be harmful to emergence and growth. Prompt removal of infested plants and corms once symptoms are noted helps arrest spread within a planting to uninfested plants.

**Management—chemical control**
See Table 1 in: Chemical Control of Landscape Pests

**For more information**
See “Thrips” in: Common Landscape Pests


### Golden chain (Laburnum)—Aphid

Several species

**Pest description and damage** Several species of aphids may infest Laburnum. Initially, these aphids feed on the shoot tips, which on young trees can cause stunting and malformation of the tips. They also infest the seed pods making them unsightly with honeydew, sooty mold and aphid exoskeletons. Aphids tend to be small (.0625 to 0.125 inch long), oval to pear-shaped, soft-bodied insects with piercing–sucking mouthparts. Color varies but most aphids tend to match host plant coloration. Aphids tend to feed in colonies and are often found on the new or most succulent plant tissues. When aphid populations are high, leaf and shoot distortion can occur. Aphids produce honeydew, a sweet, sticky secretion that collects on underlying plant tissues and encourages growth of a black sooty mold. In addition to cosmetics, honeydew may become a sticky nuisance when it falls on decks, cars, or other landscape surfaces. Some aphids are vectors of plant diseases, particularly viruses.

**For biology, life history, monitoring and management**
See “Aphid” in: Common Landscape Pests

### Golden chain (Laburnum)—Leafminer

*Leucoptera* (probably *laburnella*)

**Pest description and damage** This leafminer forms blotch mines in leaves and can defoliate trees. Adult moths are slender with white wings with a small black spot at the rear end. The larva is white with parallel, undulating segments. The leafmine begins as brown spot, then a slender winding mine forms which suddenly widens to form a blotch mine with swirls of green or black frass. Larvae leave the mine, weave parallel strands of silk across the leaf, then pupate suspended among the silk.

**Management—chemical control**
See “Leafminer” in: Common Landscape Pests

**Management—chemical control**
See Table 3 in: Chemical Control of Landscape Pests

### Golden chain (Laburnum)—Spider mite

*Tetranychus* spp.

**Pest description and damage** Several species of spider mites can cause damage in deciduous, evergreen and coniferous ornamentals. Appearance of these mites varies with the species, although all are 0.02 inch or smaller. Adults and nymphs can be yellowish, greenish, or reddish brown, depending on species. Female European red mites are round with red bodies; males are yellowish-red. Other spider mites are oval and yellowish-brown or green with distinctive black spots on the body. Plants may be covered with fine silk webbing at branch axils or over sections, small plants may be engulfed in webbing under very heavy infestations. Mites damage leaves and fruit indirectly by feeding on leaves, which causes stippling, bronzing, and possibly leaf drop. The reduction in photosynthesis causes loss of vigor and yield.

**For biology, life history, monitoring and management**
See “Spider mite” in: Common Landscape Pests

**Management—chemical control**
See Table 1 in: Chemical Control of Landscape Pests

### Hawthorn (Crataegus)—Apple-and-thorn skeletonizer

*Choreutis pariana*

**Pest description and damage** Adult moth is reddish brown, with a wingspread less than 0.5 inch, and irregular light and dark bands on the wings. Larvae are 0.5 inch long, yellowish to greenish, with black spots and a yellow-brown head. Pupae are yellow to brown with a white silken cocoon. The larvae skeletonize and roll leaves from the sides. Damaged leaves are brown and papery and drop prematurely. Damage varies from inconsequential to serious, so monitoring is an important management tool. Damage is rarely lethal to the tree.
Hawthorn (Crataegus)—Azalea bark scale
Eriococcus azaleae

**Pest description and damage** This scale superficially resembles mealybugs in appearance. Mature female scale are about 0.13 inch long and appear like white cottony sacs, often located on twigs and stems of azalea, especially in branch axils. Eggs, crawlers and adults under the wax are red.

**For biology, life history, monitoring and management**

See:
- Azalea (Rhododendron)—Azalea bark scale

See “Scale insect” in:
- Common Landscape Pests

**Management—chemical control**

See Table 1 in:
- Chemical Control of Landscape Pests

Hawthorn (Crataegus)—Cherry bark tortrix
Enarmonia formosana

**Pest description and damage** Cherry bark tortrix is a pest of most woody ornamental trees and shrubs in the family Rosaceae. The larvae are 0.33 to 0.4 inch long, pale gray to flesh-color with small, pale gray spines scattered on the surface, with a yellowish-brown head. Larvae feed directly on the cambium under the tree bark and may cause death of the tree over time. Otherwise, the feeding activity decreases the supply of nutrients to the tree and increases susceptibility to disease, insect attack, and environmental stress, including cold injury. The first indication of attack is the exuding of a reddish-brown, gum-like resin, mixed with fecal pellets and silk. The trunk and larger limbs of bearing fruit trees are affected, usually at pruning wounds and graft unions.

**For biology, life history, monitoring and management**

See:
- Cherry (Malus)—Cherry bark tortrix

**Management—chemical control**

See Table 4 in:
- Chemical Control of Landscape Pests

Hawthorn (Crataegus)—Fall webworm
Hyphantria cunea

**Pest description and damage** Large silken tents filled with caterpillars, frass and dead leaves, eventually engulf entire branches of deciduous trees including apple ash, boxelder, birch, cherry, black walnut, chokecherry, English walnut, elm, hickory, linden peach, pecan, poplar, sycamore, white oak and willow and sometimes roses and some shrubs. Young caterpillars are pale greenish or yellow with a dark stripe down the back and a yellow stripe along the sides. Long silky hairs arise from yellow and black tubercles. When mature the caterpillars are covered with yellow, rusty then black colored silky hairs. Adults are bright white with orange and black markings on the underside of the abdomen. Woolly scales cover masses of 200 to 500 greenish eggs.

**For biology, life history, monitoring and management**

See:
- Cherry, flowering (Prunus)—Oblique-banded leafroller

See “Leafroller” in:
- Common Landscape Pests

**Management—chemical control**

See Table 3 in:
- Chemical Control of Landscape Pests

Hawthorn (Crataegus)—Hawthorn aphid
Anuraphis craetaegifoliae

**Pest description and damage** Hawthorn aphids are yellow-green to pinkish, soft-bodied insects typically found on the leaves in the spring. Aphid feeding causes young leaves to curl tightly and turn purplish. Older leaves are crinkled and deformed. Aphid feeding produces large amounts of honeydew, a sweet, sticky material that may attract ants or become covered with a dark growth of sooty mold.

**For biology, life history, monitoring and management**

See “Aphid” in:
- Common Landscape Pests

**Management—chemical control**

See Table 2 in:
- Chemical Control of Landscape Pests

Hawthorn (Crataegus)—Leafroller and leaftier

Several species

**Pest description and damage** Leafrollers and leaftiers cause similar damage to host trees but differ in their appearance and, more importantly, in their life cycle. The leafroller pests on hawthorn can be divided into single-generation moths, such as the fruit tree leafroller and the European leafroller, and two-generation moths, such as the oblique-banded leafroller and three-lined leafroller. The leafroller larvae are mostly green caterpillars with a light brown to black head. Adults have distinctive bands or motting on the wings but are rarely seen. Leaftiers are similar in appearance, although larvae are up to 0.5 inch long, dirty white, with a brownish head. The tortricid moth larvae are noted for their violent backward wriggling—a means of escape. Newly hatched larvae also may work into blossoms and damage developing fruit, which then abort and fall off the tree. The larvae web the leaves and flowers together beginning in late April, and then feed on the developing fruit or flowers. Larvae also feed on the surface of ornamental fruits or berries.

**For biology, life history, monitoring and management**

See:
- Cherry, flowering (Prunus)—Oblique-banded leafroller

See “Leafroller” in:
- Common Landscape Pests

**Management—chemical control**

See Table 1 in:
- Chemical Control of Landscape Pests
Hawthorn (Crataegus)—Pear sawfly (pear slug)
California pear sawfly (Pristographa abbreviata)
Pear slug (Calliroa cerasi)

**Pest description and damage**  Pear slug is a European insect now found in most areas of the U.S. It attacks both pear and cherry and also is found on mountain ash, hawthorn, and ornamental Prunus. The adult is a glossy black fly-like insect, about 0.2 inch long. The larva initially resembles a small tadpole due to the olive-green slime that covers the body, and the head being wider than the rest of the body. Mature larvae are 0.375 inch long and orange-yellow. Larvae feed on the upper surface of leaves, skeletonizing them. Heavy feeding causes leaf drop, with reduction in vigor and yield, particularly on young trees. California pear sawfly has been found occasionally defoliating pear trees. Larvae eat and expand on round holes in leaves that can result in a leaf with only the midrib remaining. These bright green larvae match the host leaf color and rest along edges of feeding area. While considered a minor pest on hawthorn and in orchards, these pests can potentially defoliate ornamental pears.

**For biology, life history, monitoring and management**
See:  
Pear (Pyrus)—Pear sawfly (pear slug)

**Management—chemical control**
See Table 2 in:
Chemical Control of Landscape Pests

Hawthorn (Crataegus)—Scale insect
Several species

**Pest description and damage**  Scale insects are common on many ornamental trees and shrubs as well as landscape plants. Adult female scale live under a shell-like covering that may resemble a “volcano,” “barnacle,” “hemispherical bump,” “cotton puffs,” “oyster” or even flat, soft and naked, and with various dull colors and markings. They are often found attached along the branches, twigs, leaves or needles or even fruit. Most scale insects measure from 0.0625 to .25 inch long. Occasionally scale build up large enough numbers to cause damage to the host plant. These insects have piercing–sucking mouthparts that they inject into plant tissues to feed on plant juices. Large populations of scale can devitalize plants and retard growth, as well as discolor the foliage. Severe infestations can kill twigs. In many cases, large quantities of honeydew are produced, which makes leaves and underlying plants shiny and sticky. Sooty mold fungus may grow on the honeydew giving the plants a dirty, sooty appearance.

**For biology, life history, monitoring and management**
See “Scale insect” in:
Common Landscape Pests

**Management—chemical control**
See Table 1 in:
Chemical Control of Landscape Pests

Hawthorn (Crataegus)—Spider mite
Tetranychus spp.

**Pest description and damage**  Several species of spider mites can cause damage to hawthorn leaves. Appearance of these mites varies with the species, although all are 0.02 inch or smaller. Adults and nymphs can be yellowish, greenish, or reddish brown, depending on species. Female European red mites are round with red bodies; males are yellowish-red. Spider mites are oval and yellowish-brown or green with distinctive black spots on the body. Plants may be covered with fine silk webbing at branch axils or over sections, small plants may be engulfed in webbing under very heavy infestations. Mites feed on leaves, which results in stippling, bronzing, and possibly leaf drop. The reduction in photosynthesis causes loss of vigor and yield.

**For biology, life history, monitoring and management**
See “Spider mite” in:
Common Landscape Pests

**Management—chemical control**
See Table 1 in:
Chemical Control of Landscape Pests

Hawthorn (Crataegus)—Tent caterpillar
Forest tent caterpillar (Malacosoma disstria)
Western tent caterpillar (Malacosoma californicum pluviale)

**Pest description and damage**  The western tent caterpillar attacks a wide variety of plants including hawthorn, alder, apple, ash, birch, cherry, cottonwood, and willow, as well as fruit trees and roses. The adult moths are stout, light to darker brown, and are active in early- to mid-summer. Adults are attracted to lights at night. Western tent caterpillars are hairy, dull yellow-brown, with rows of blue and orange spots on the body. Forest tent caterpillars are black and blue with dorsal white footprints. Eggs of these moths are laid on twigs or buildings in masses and may be especially numerous around lights. The eggs are brown to gray in color, about 0.0625 inch long, and look like bits of gray, hardened foam. The larvae feed in large groups on foliage of host plants and can do significant damage by defoliation. Larvae of western tent caterpillars build moderate silken tents over leaves, but leave the tent to feed in new areas. They usually return in the evening. Both species can defoliate small trees which may weaken or kill them; defoliation can reduce growth and make the trees more susceptible to competition, diseases or poor weather. Healthy trees usually will grow new leaves by midsummer.

**For biology, life history, monitoring and management**
See:
Alder (Alnus)—Tent caterpillar

**Management—chemical control**
See “Caterpillar” in:
Common Landscape Pests

**Management—chemical control**
See Table 2 in:
Chemical Control of Landscape Pests
Hellebore (Helleborus)—Aphid  
*Includes* hellebore aphid (*Macrosiphum hellebore*)

**Pest description and damage** Several species of aphid are reported from hellebore. The most common is hellebore aphid, a whitish-green aphid that forms dense clusters on the leaves, stems, or flowers, sometimes forming dense colonies. Aphids are often visible but sometimes are on the undersides of the leaves so plants should be checked from time to time. Damage includes abundant honeydew and sooty mold or blackening of leaves, or viruses transmitted when the aphids feed.

**Biology and life cycle** The aphids are reported to overwinter as eggs, or as adults, and hatch in early spring. When the egg hatches, the aphid is called a stem mother. After maturing, she gives live birth to the young. They in turn mature and birth more live young. In this way, there may be waves of aphids of different sizes.

**Monitoring** Watch for signs of aphids: honeydew, sooty mold and the white shriveled caste off aphid exoskeletons, or for ants that are harvesting the honeydew. Syrphid fly larvae are often found munching on the aphids in the spring. Often natural enemies and ants are noticed even before the aphids are seen. Aphids are partial to succulent new growth. They are common in spring but have been reported in fall and winter as well.

**Management—Cultural**

Hosing off aphids with plain water can work where plants are potted or isolated in the landscape.

**Management—Biological**

Releases of lacewing larvae may have some success depending on the size of the aphid population.

**Management—chemical control**

*See Table 1 in:*

Chemical Control of Landscape Pests

**For more information**

*See “Aphid” in:*

Common Landscape Pests

Hemlock (Tsuga)—Coneworm and shoot moth  
*Diorctria* spp.

**Pest description and damage** Adult coneworms are mottled gray snout moths banded with subtle colors. The coneworm larvae are small and cream-colored or light brown with a darker head. Coneworms attack true firs by boring into shoot tips or stems, especially around wounds, and feeding on the soft bark tissues. The portion of the branch beyond the injured point may die back. Coneworms also may bore into green cones, feed on the soft bark of young growth, or feed inside the bark on the trunk cambium. There are many species of Diorctria which feed on different parts of small plants, trunk and shoots as well as cones. Confounding the issue, other orders of insects also attack cones and small moths that bore into shoots.

**For biology, life history, monitoring and management**

*See:*

Douglas-fir (*Pseudotsuga*)—Coneworm

**Management—chemical control**

*See Table 4 in:*

Chemical Control of Landscape Pests

Hemlock (Tsuga)—Hemlock woolly adelgid  
*Adelges tsugae*

**Pest description and damage** Hemlock woolly adelgids are aphid-like insects. They appear as white, woolly tufts on the bark, branches and needles of twigs. Adults are black beneath the woolly waxy material. While needles may drop prematurely, weakening the tree and sometimes leading to death of branches, more often in landscapes infestations are limited to single branches without dire consequences. A few adelgids usually do not require action. Trees with severe infestations may be stressed, predisposing them to other insect and disease problems. The hemlock adelgid is especially a problem on hemlock hedges.

**Biology and life history** The adelgid overwinters as woolly adults. Reddish-brown crawlers, similar to scale crawlers, appear in spring and early summer. Hemlock adelgids are sometimes known as “hemlock chermes.”

**Pest monitoring** Inspect woolly areas for the presence of live adults or tiny black dots on the needles which indicate the scale crawlers are alive and active. Also, check for evidence of natural enemies.

**Management—cultural control**

Western hemlock (*Tsuga heterophylla*), mountain hemlock (*T. mertensifolia*), and Northern Japanese hemlock (*T. diversifolia*) are reported to be resistant to infestation. Eastern or Canadian hemlock is very susceptible. Wipe off minor infestations and prune out larger infestations if possible.

**Management—biological control**

Often the woolly material will appear dirty and disturbed. Look for syrphid larvae, white waxy ladybug larvae, lacewing larvae and other predators.

**Management—chemical control**

*See Table 1 in:*

Chemical Control of Landscape Pests
Hemlock (*Tsuga*)—Pine needle scale

*Chionaspis pinifoliae*

**Pest description and damage** Pine needle scale are elongate, pure white scale which feed on the needles. Heavily infested trees may appear “flocked.” Infested needles turn yellow, then brown. Twigs and branches may be killed. Repeated infestations may kill trees eventually. Pine needle scale often are found with the black pineleaf scale, which is gray to black instead of white. While pine needle scale is a serious pest of ornamental pines, it infests arborvitae, cedar, hemlock, spruce and Douglas-fir.

**For biology, life history, monitoring and management**

See: Pine (*Pinus*)—Pine needle scale

See “Scale insect” in: Common Landscape Pests

**Management—chemical control**

See Table 1 in: Chemical Control of Landscape Pests

Hemlock (*Tsuga*)—Root weevil

Many species

**Pest description and damage** Species identification is important as root weevil species differ in susceptibility to pesticides and have different life cycles. Adult weevils are small dark beetles with a snout (rostrum) and elbowed antennae. Look for ragged notches on the edges of needles. Tips may die beyond the point where weevils have girdled the twig. C-shaped white larvae may be a problem in forestry seedlings.

**For biology, life history, monitoring and management**

See “Root weevil” in: Common Landscape Pests

**Management—chemical control**

See Table 2 in: Chemical Control of Landscape Pests

Holly (*Ilex*)—Aphid

Several species of aphids can become problems as foliar, stem, flower, bud bark or root feeding pests. Aphids tend to be small (.0625 to 0.125 inch long), oval to pear-shaped, soft-bodied insects with piercing–sucking mouthparts. Color varies but most aphids tend to match host plant coloration. Aphids tend to feed in colonies and are often found on the most succulent plant tissues. Feeding damage to shrubs, trees and mature plants is usually minor, but can compromise the vigor of the host, and some leaf and shoot distortion on new growth can occur if aphid populations are high. Aphids produce honeydew that encourages growth of a black sooty mold.

**For biology, life history, monitoring and management**

See “Aphid” in: Common Landscape Pests

**Management—chemical control**

See Table 1 in: Chemical Control of Landscape Pests

Holly (*Ilex*)—Brown soft scale

*Coccus hesperidum*

**Pest description and damage** Brown soft scale are yellowish to dark brown insects (adults are usually darker). They are found mainly on twigs, although young scale also may be found on the foliage, typically on the underside of leaves along the leaf veins.

**For biology, life history, monitoring and management**

See “Scale insect” in: Common Landscape Pests

**Management—chemical control**

See Table 1 in: Chemical Control of Landscape Pests

Holly (*Ilex*)—Cottony camellia scale

*Pulvinaria floccifera*

**Pest description and damage** The cottony camellia scale are flat brownish or yellowish sucking insects. Females create a distinctive oblong cottony egg sac. Pale yellow crawlers (young scale) feed on the undersides of leaves and along veins. Foliage with scale infestations may turn yellowish or pale in color. It is possible to have low numbers of this insect for years without an outbreak.

**For biology, life history, monitoring and management**

See: Camellia (*Camellia*)—Cottony camellia scale

See “Scale insect” in: Common Landscape Pests

**Management—chemical control**

See Table 1 in: Chemical Control of Landscape Pests

Holly (*Ilex*)—Holly bud moth

*Rhopobota naevana ilicifoliana*

**Pest description and damage** The adult holly bud moth is a mottled brown and black insect with a wingspan of approximately 0.5 inch. The larvae are greenish-brown with dark heads and about 0.5 inch long. The larvae roll and web leaves resulting in distorted leaf tip growth. Another name for the holly bud moth is blackheaded fireworm which also feeds on cranberry, blueberry, apple, and cherry.

**Biology and life history** Overwintering eggs hatch in the spring. The larvae begin feeding on buds but soon move to leaves, which they roll and hold in place with webbing. Mature larvae drop from the plant and pupate in the duff. The second-generation females lay eggs singly on the underside of leaves, and larvae from these eggs emerge by the end of July. There are two generations per year.

**Pest monitoring** Thresholds for ornamental trees differ from those in commercial holly orchards and nursery settings. In landscape settings, damage is often kept to a minimum by natural enemies and leaf distortion is hardly noticed. Watch for the first sign of new growth, when holly budmoth larvae start tying leaves together.

**Management—cultural control**

Hand pick larvae when they are found in rolled leaves. When the budmoths are well established and before they pupate, shear trees and hedges to remove the larvae and infested tips. Collect and destroy the debris.
Management—biological control
Little is known about natural enemies, but the low number of infested leaves in most years suggests they exist.

Management—chemical control
Do not spray holly in bloom. Apply listed insecticides (see: “Caterpillar” in Common Landscape Pests) when new growth is about 0.25 inch long and before blossoms open.

See Table 2 in:
Chemical Control of Landscape Pests

For more information
See “Caterpillar” in:
Common Landscape Pests

Holly (Ilex)—Holly leafminer
Holly leafminer (Phytomyza ilicis)
Native holly leafminer (Phytomyza illicola)

Pest description and damage These species of holly leafminer feed only on English holly (Ilex aquifolium) and American holly (Ilex opaca). Adults are small, grayish black flies that emerge throughout May. Larvae are yellowish and about 0.063 inch long. Characteristic damage by larvae includes the presence of yellow, brown, or reddish mines on the leaves. Initially, the mines are fairly narrow and winding, but become large blotches as the larvae continue to mine. They overwinter in the mine as mature larvae or pupae. The upper and lower leaf surfaces are easily separated where the larvae have consumed the inner tissues.

Biology and life history These insects overwinter as larvae in the mined leaves, and pupate in early spring. The adult flies emerge in May and the females poke the leaves with their ovipositor and feed on oozing liquid. This results in small yellow pits in the leaves. A few days later, females begin laying eggs on the undersides of leaves in the midvein. The eggs hatch, and the larva burrows into the leaf and commences making the mine. They continue mining through the late fall. There is one generation per year.

Pest monitoring With the first flush of the new growth, watch for small sunken spots where the female fly pokes the leaf with her ovipositor then turns and feeds on the juices. Initiate control to reduce the egg-laying adults.

For more information
See “Caterpillar” in:
Common Landscape Pests

Management—cultural control
Hand pick and destroy infested leaves in the fall.

Management—chemical control
See Table 3 in:
Chemical Control of Landscape Pests

For more information
See “Leafminer” in:
Common Landscape Pests

Holly (Ilex)—Leafroller (orange tortrix)
Orange tortrix (Argyrotaenia citrana)

Pest description and damage The orange tortrix is a pest of many woody plants, including holly. Adults are buff-color moths with wing spans of 0.5 to 0.75 inch. The larvae of the orange tortrix are light cream to green with light brown heads, and are up to 0.5 inch long at maturity. The feeding caterpillars typically roll or twist individual leaves or clusters of leaves at shoot tips and tie them into loose nests with webbing. They thrash about violently when disturbed. They seldom are abundant.

For biology, life history, monitoring and management
See “Leafroller and leaftier” in:
Common Landscape Pests

See “Caterpillar” in:
Common Landscape Pests

Management—chemical control
See Table 3 in:
Chemical Control of Landscape Pests

Holly (Ilex)—Lecanium scale
Lecanium spp.

Pest description and damage Lecanium scale are most noticed as they expand in spring. The female lecanium scale are about 0.125 inch in diameter and vary from red to dark brown in color. They are oval and raised, resembling small “helmets,” “turtles,” or bumps on branches, stems, and the underside of leaves. Male scale are smaller, fairly flat, and oblong. Crawlers are present on stems and leaves in summer and through fall and winter.

For biology, life history, monitoring and management
See:
Ash (Fraxinus)—San Jose scale

See “Scale insect” in:
Common Landscape Pests

Management—chemical control
See Table 1 in:
Chemical Control of Landscape Pests

Holly (Ilex)—Root weevil
Numerous species

Pest description and damage Identification is important: species differ in susceptibility to pesticides. Adult weevils are small dark nocturnal beetles with a snout (rostrum) and elbowed antennae. Look for ragged notches on the edges of leaves, or flower petals. Larvae are C-shaped, legless, and white, sometimes reddish, with tan heads, up to 0.5 inch in size.

For biology, life history, monitoring and management
See “Root weevil” in:
Common Landscape Pests

Management—chemical control
See Table 2 in:
Chemical Control of Landscape Pests
Hollyhock (Alcea rosea)—Hollyhock weevil

Hollyhock weevil (Apion longirostre)

Pest description and damage The hollyhock weevil is native to southern-southeastern Europe and Asia Minor. It was first found in Georgia in 1914 and is now well distributed throughout the U.S. This tiny long snouted weevil relative (Apionidae) is now removed from Curculionidae) is gray, and slightly hairy with orangish legs. Adults feed on leaves, causing small holes in the tissue. The long snout is adapted for feeding on seeds and buds. Look for slightly holy leaves and the paired weevils will likely be found around flowers and buds. Weevils reduce flower production and may also reduce natural re-seeding in the garden. Weevil feeding damage is relatively minor in hollyhock.

Biology and life history The adult weevils mate in July and August. The female drills deep into the developing bud and lays eggs. Larvae develop in 4 to 6 weeks. They pupate in August and overwinter in the duff and litter, mostly as adults.

Pest monitoring Watch for either the first holes in leaves or the adults (often in pairs) around the flowers and buds. Holes in seed pods are also indicative of this insect.

Management—cultural control

Bend flower heads over a box and sharply strike the stem to knock adults off the plants. Pick off the adults, though they do cling tenaciously. Remove (and destroy) buds before adults emerge in late summer or through the winter to catch late (spring) emerging adults.

Management—chemical control

See Table 2 in: Chemical Control of Landscape Pests

For more information


Hollyhock (Alcea rosea)—Leafhopper

Several species

Pest description and damage Leafhoppers are slender, delicate sucking insects about 0.125 inch or less in length. They are distinguished by the ability of adults and nymphs to run forwards, backwards and sideways to escape danger. Leafhopper feeding on leaves results in damage that resembles small white to yellow stippling in leaves, leaf curling or virus symptoms, as some leafhoppers transmit virus diseases. Sometimes, the tips of hollyhock leaves may die and turn brown. Some leafhoppers exude copious honeydew. Normally, leaf stippling is not injurious to the plants unless the leafhopper carries a virus.

For biology, life history, monitoring and management

See “Leafhopper” in: Common Landscape Pests

Hollyhock (Alcea rosea)—Spider mite

Twospotted spider mite (Tetranychus urticae)

Pest description and damage Several species of spider mites can cause damage in deciduous, evergreen and coniferous ornamentals. Appearance of these mites varies with the species, although all are 0.02 inch or smaller. Adults and nymphs can be yellowish, greenish, or reddish brown, depending on species. Female European red mites are round with red bodies; males are yellowish-red. Twospotted mites are oval and yellowish-brown or green with distinctive black spots on the body. Plants may be covered with fine silk webbing at branch axils or over sections, small plants may be engulfed in webbing under very heavy infestations. Mites damage leaves and fruit indirectly by feeding on leaves, which causes stippling, bronzing, and possibly leaf drop.

For biology, life history, monitoring and management

See “Spider mite” in: Common Landscape Pests

Management—chemical control

See Table 1 in: Chemical Control of Landscape Pests

Honeylocust (Gleditsia triacanthos)—Honeylocust pod gall midge

Blepharidopterus (Diaphnocoris) chlorionis

Description and crop damage These small green plant bugs overwinter in the egg stage. As honeylocust buds expand, eggs hatch and nymphs feed on new growth. Adults can be found a month after nymphs first appear; they too feed on new growth. Feeding can cause stippling and growth distortion. Heavy feeding can cause defoliation. There is one generation per year.

Management—physical control

Nymphs can be knocked off leaves with a high-pressure spray of water.

Management—chemical control

See Table 1 in: Chemical Control of Landscape Pests

Honeylocust (Gleditsia triacanthos)—Honeylocust pod gall midge

Dasineura gleditchiae

Pest description and damage The honeylocust pod gall midge is a tiny orange gnat. The small bright pink maggots feed within the galls which are leaves that have become deformed, thickened, and podlike. The larvae are sheltered inside the deformed leaves. Infested leaves may dry and drop from the tree. Small shoots may be killed. Although trees are unlikely to be killed, the ornamental quality of the tree may be lost. Thornless varieties of honeylocust are especially subject to damage. Damage from this gall maker is most noticeable in nurseries, but less objectionable in landscapes, especially if the tree is viewed from a distance.

Biology and life history The midge overwinters as pupae in cocoons in the upper 2 inches of soil near the base of the tree trunks (generally within 1 foot of the trunk). The adults emerge and form small swarms around the tips of leaves, as the trees are just beginning to leaf out. Adult midges deposit eggs on new foliage along the rachis or on the edges of developing leaf buds. The first pod gall midge eggs generally are found during the last week of March through the first week of April. The eggs usually hatch in 2-3 days. The young larvae crawl along the leaf and begin feeding.
Only one larva is required to initiate galling of the leaf. Soon after this initial generation, the populations appear continuous with many life stages present. There are multiple generations each year, as little as 3 to 4 weeks apart.

**Management—cultural control**

Prune out infested growths.

**Management—chemical control**

*See Table 3:*

Chemical Control of Landscape Pests

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**Honeysuckle (Lonicera)—Aphid**

*Honeysuckle aphid (Hyadaphis tataricae)*

**Pest description and damage**

This tiny grayish-green aphid has a white abdomen dusted with a fine light powder. The head and thorax are slightly darker. Not the usual pear shape, these aphids have very short cornicles and are shaped more like a manatee. The aphids suck on tender new growth and flowers which can result in stunted leaf and stem growth then witches' brooms and brown dead tips.

**Biology and life history**

This aphid is reported to overwinter as eggs near the damaged tips of infested plants. With the onset of new growth, the first of several generations of aphids hatch and begin feeding. Where the can the feed within the protection of curled leaves and flower clusters. These aphids spend their entire life on honeysuckle, littering the tips with cast off aphid exoskeletons. In fall, winged males mate with wingless female that lay eggs for the next season.

**For monitoring and management**

*See “Aphid” in:*

Common Landscape Pests

**Management—chemical control**

*See Table 1 in:*

Chemical Control of Landscape Pests

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**Hydrangea (Hydrangea)—Root weevil**

*Various species*

**Pest description and damage**

Identification is important: species differ in susceptibility to pesticides. Adult weevils are small dark nocturnal beetles with a snout (rostrum) and elbowed antennae. Look for ragged notches on the edges of leaves, or flower petals. Larvae are C-shaped, legless, and white, sometimes reddish, with tan heads, up to 0.5 inch in size. The larvae are rarely a significant problem in established landscapes.

**For biology, life history, monitoring and management**

*See “Root weevil” in:*

Common Landscape Pests

**Management—chemical control**

*See Table 2 in:*

Chemical Control of Landscape Pests

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**Ivy (Hedera)—Bulb mite**

*Rhizoglyphus echinopus*

**Pest description and damage**

Mature bulb mites vary from about 0.02 to 0.03 inch (0.5 to 0.9 mm) long and have four pairs of legs. Their bodies are shiny, white, somewhat transparent, and smooth with reddish brown appendages. They are usually found in colonies. Their oval shape and sluggish behavior can deceive the human eye into identifying them as eggs. They avoid the light and hide under damaged or diseased tissue. Rhizomes infested with bulb mites may rot and fail to produce new growth, or new growth may be off-color, stunted, and distorted. Although the bulb mite is not considered a primary pest of rhizomes, it is often responsible for serious losses; the slightest injury to the rhizome will allow bulb mites to enter and become established. Once the mites are inside, they rapidly turn the rhizomes into rotten pulp. Injured or bruised rhizomes are the most susceptible to damage. Not only do mites destroy tissue, but they also carry fungi and bacteria which often spur additional damage. Millipedes may move into the rotting rhizomes which confuses the diagnosis.

**For biology, life history, monitoring and management**

*See:*

Tulip (Tulipa)—Bulb mite

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**Ivy (Hedera)—Root weevil**

Numerous species

**Pest description and damage**

Identification is important: species differ in susceptibility to pesticides. Adult weevils are small dark nocturnal beetles with a snout (rostrum) and elbowed antennae. Look for ragged notches on the edges of leaves, or flower petals. Larvae are C-shaped, legless, and white, sometimes reddish, with tan heads, up to 0.5 inch in size.

**For biology, life history, monitoring and management**

*See “Root weevil” in:*

Common Landscape Pests

**Management—chemical control**

*See Table 2 in:*

Chemical Control of Landscape Pests
Ivy (Hedera)—Spider mite

Includes twospotted spider mite (Tetranychus urticae)

Pest description and damage Appearance of these mites varies with the species, although all are 0.02 inch or smaller. Adults and nymphs can be yellowish, greenish, or reddish brown, depending on species. Female European red mites are round with red bodies; males are yellowish-red. Twospotted mites are oval and yellowish-brown or green with distinctive black spots on the body. Plants may be covered with fine silk webbing at branch axils or over sections, small plants may be engulfed in webbing under very heavy infestations. Mites damage leaves and fruit indirectly by feeding on leaves, which causes stippling, bronzing, and possibly leaf drop. The reduction in photosynthesis causes loss of vigor and yield.

For biology, life history, monitoring and management
See “Spider mite” in:
Common Landscape Pests

Management—chemical control
See Table 1 in:
Chemical Control of Landscape Pests

Japanese holly (Ilex)—Root weevil
Numerous species

Pest description and damage Identification is important: species differ in susceptibility to pesticides. Adult weevils are small dark nocturnal beetles with a snout (rostrum) and elbowed antennae. Look for ragged notches on the edges of leaves, or flower petals. Larvae are C-shaped, legless, and white, sometimes reddish, with tan heads, up to 0.5 inch in size.

For biology, life history, monitoring and management
See “Root weevil” in:
Common Landscape Pests

Management—chemical control
See Table 2 in:
Chemical Control of Landscape Pests

Japanese holly (Ilex)—Spider mite
Includes twospotted spider mite (Tetranychus urticae)

Pest description and damage Several species of spider mites can cause damage in Japanese holly especially in dry sites. Appearance of these mites varies with the species, although all are 0.02 inch or smaller. Adults and nymphs can be yellowish, greenish, or reddish brown, depending on species. Female European red mites are round with red bodies; males are yellowish-red. Twospotted mites are oval and yellowish-brown or green with distinctive black spots on the body. Plants may be covered with fine silk webbing at branch axils or over sections, small plants may be engulfed in webbing under very heavy infestations. Mites damage leaves feeding on plant cells, which causes stippling, bronzing, and possibly leaf drop. The reduction in photosynthesis causes loss of vigor and yield.

For biology, life history, monitoring and management
See “Spider mite” in:
Common Landscape Pests

Management—chemical control
See Table 1 in:
Chemical Control of Landscape Pests

Juniper (Juniperus)—Aphid
Giant conifer aphid (Cinara spp.)

Pest description and damage These are large aphids, up to 0.2 inch long. Their color may range from gray to brownish to dark. Aphids establish large colonies on the twigs but rarely are found feeding on leaf scales. Their feeding and honeydew production can cause sooty mold problems on foliage and nearby surfaces and reduce the ability of plants to produce sugars.

For biology, life history, monitoring and management
See “Aphid” in:
Common Landscape Pests

Management—chemical control
See Table 1 in:
Chemical Control of Landscape Pests

Juniper (Juniperus)—Cypress tip moth
Argyresthia spp.

Pest description and damage There are nine Argyresthia species that attack different conifers (pine, hemlock, etc.) in the Pacific Northwest. One of them, the adult cypress tip moth (cypress tip miner) is common enough to merit attention in many books. The moth is silver-tan and approximately 0.13 inch long. The larvae are green, about 0.13 inch long. The larval tunnel in the growing points of the 1- and 2-year-old shoot tips. The cocoon is a white, somewhat papery structure made in dead or living foliage. Damage typically is limited to the tips of twigs. The exit holes are dark and may resemble symptoms of Didymacella leaf blight, a fungal disease. Foliage does not discolor in the affected areas until late winter. After this, the brown, dead twigs break off readily. Cultivars of Juniperus chinensis, J. virginiana, and J. sabina also are affected. The entire plant can appear brown in a severe infestation, and repeated infestations cause dieback. Failure to gain control may require taxonomic identification to ensure the right species is identified. Juniper can recover from extensive feeding damage from these moth larvae.

Biological and life history Adult moths appear on plants around May–June. Eggs are laid on the shoot tips of host plants. The larva tunnel under the leaf scale and feed in the foliage until the following spring. Larvae leave the mines in spring and spin a white cocoon in which they pupate. After several weeks, the adult moths emerge. There is one generation per year.

Pest monitoring Watch for larvae ballooning from the plant on a silk thread or moths flying around the plants. A sticky coated plate hung horizontally provides easy means of monitoring for small “worms” when they exit.

Management—cultural control
Resistant cultivars are available.

Management—chemical control
See Table 3 in:
Chemical Control of Landscape Pests

For more information
Rosetta, R. 2008. Cypress tip moth. PNW Nursery IPM (http://oregonstate.edu/dept/nurspest/cypress_tip_moth.htm)
Juniper (Juniperus)—Juniper scale
*Carulaspis juniperi*

**Pest description and damage** The female scale is approximately 0.05 to 0.1 inch in diameter and white in color with a notable, central yellow spot. The male scale has a more elongated appearance. Crawlers are pale yellow. This insect feeds on the sap within the stem or leaf. Leaves, twigs, branches, and cones may be attacked. Their feeding can reduce the vigor of the foliage supported by that stem. Symptoms of scale feeding include loss of normal color and luster of foliage, no new growth, and yellowing and death of branches. Severe infestations may kill entire plants. Juniper (Juniperus), Leyland cypress (Cupressocyparis), Lawson cypress (Chamaecyparis), western red cedar (Thuja), and all members of the Cupressaceae family are attacked.

**For biology, life history, monitoring and management**
See “Scale insect” in: Common Landscape Pests

**Management—chemical control**
See Table 1 in: Chemical Control of Landscape Pests

Juniper (Juniperus)—Juniper tip midge
*Oligotrophus betheli*

**Pest description and damage** The adult is a tiny, yellow, mosquito-like fly. The larva is a maggot which lacks legs or a definite head. Juniper tip midge larvae feed in the tips of shoots, causing them to swell and form tiny green galls. After the larvae have left, the galls turn brown (sometimes reddish) and the tips die back. Symptoms of mining and exit holes may be found at the junction between living and dead tissue or at the base of the swollen portion. The damage may appear very similar to that caused by fungal pathogens in the genus *Phomopsis*.

**Management—cultural control**
Remove green galls and damaged tips while larvae are still in the galls.

**Management—chemical control**
See Table 3 in: Chemical Control of Landscape Pests

For more management options
See “Gallmakers” in: Common Landscape Pests

Juniper (Juniperus)—Juniper webworm
*Dichomeris marginella*

**Pest description and damage** The adult juniper webworm is a copper-brown moth with white bands on the edges of the front wings. The moth is about 0.5 inch across. The larva is a yellowish to brownish caterpillar with dark brown lines on the back and a dark head. The webworm caterpillars initially feed by mining inside leaves, then they exit and gather to feed in small colonies or nests of webbed foliage as they mature. Due to their habit of feeding deep in the plant canopy, damage may be overlooked. Damaged foliage turns brown and is covered with dirty webbing. Considerable amounts of foliage may be spun together, and small trees may be completely webbed. Damage frequently is observed in early spring, March to May. This pest infests only juniper.

**Biology and life history** The caterpillars overwinter in the nest, which consists of webbed twigs, as well as silk tubes through which the caterpillars move through the juniper foliage and webbing. These larvae resume feeding in spring then pupate. Adult moths fly in late spring. Eggs are laid on leaves of the current season’s growth. Larvae feed first as leafminers, then feed on the surface of leaves, building silken tubes around the feeding site. They overwinter in small groups in these webbed sites. There is one generation per year.

**Pest monitoring** Watch for the first signs of webbing.

**Management—cultural control**
Hand-pick caterpillars and prune out infested growth. Irish juniper (*J. chinensis* ‘Stricta’) is the preferred host, although Chinese juniper, red cedar, and *Juniperus communis* varieties *aurea, horizontalis, depressa, hibernica, suecia,* and *J. squamata ‘Meyeri’* also are infested. *Juniperus procumbens* and *J. squamata* are infested only occasionally.

**Management—chemical control**
See Table 2 in: Chemical Control of Landscape Pests

For more information
See “Caterpillar” in: Common Landscape Pests

Juniper (Juniperus)—Root weevil
*Napomyza juniperi*

**Pest description and damage** Identification is important as root weevil species differ in susceptibility to pesticides and may have different life cycles. Adult weevils are small dark beetles with a snout (rostrum) and elbowed antennae. The tell-tale ragged notches of mining and exit holes may be found at the junction between living and dead tissue or at the base of the swollen portion. The damage may appear very similar to that caused by fungal pathogens in the genus *Phomopsis*.

**Management—cultural control**
Remove green galls and damaged tips while larvae are still in the galls.

**Management—chemical control**
See Table 3 in: Chemical Control of Landscape Pests

For more management options
See “Gallmakers” in: Common Landscape Pests

Juniper (Juniperus)—Spider mite
*Tetranychus spp.*

**Pest description and damage** Several species of spider mites can cause damage in deciduous, evergreen and coniferous ornamentals. Appearance of these mites varies with the species, although all are 0.02 inch or smaller. Adults and nymphs can be yellowish, greenish, or reddish brown, depending on species. Female European red mites are round with red bodies; males are yellowish-red. Twospotted mites are oval and yellowish-brown or green with distinctive black spots on the body. Plants may be covered with fine silk webbing at branch axils or over sections, small plants may be engulfed in webbing under very heavy infestations. Mites damage fruit indirectly by feeding on leaves, which causes stippling, bronzing, and possibly leaf drop. The reduction in photosynthesis causes loss of vigor and yield.

**For biology, life history, monitoring and management**
See “Spider mite” in: Common Landscape Pests

**Management—chemical control**
See Table 1 in: Chemical Control of Landscape Pests

PNW Insect Management Handbook
Kinnikinnik (Arctostaphylos)—Aphid
Includes manzanita leaf gall aphid (Tamalia coweni)

Pest description and damage  These aphids are grayish or greenish and prefer to feed on new plant growth. The manzanita leafgall aphid feeds on the leaves of kinnikinnik and other manzanita species (Arctostaphylos spp.). Aphid feeding causes the leaves to thicken and form bright red galls. Older galls turn brown. Severe infestations may slow the growth of the plant. Non-gall-forming aphids also may be seen occasionally on kinnikinnik. They are greenish, soft-bodied insects that may feed on leaves or stems. Honeydew, a sweet, sticky material, may be associated with aphid feeding. It may attract ants or become covered with a growth of dark, sooty mold. Severe infestations may result in leaf and twig dieback and tips turn brown as the galls age and aphids leave the plant.

Pest monitoring  Watch for the first sign of aphids with the onset of new growth in spring, or at other times of new growth flushes. Yellow sticky cards are sometimes attractive to aphids and will serve as an early warning.

Management—cultural control
Galls tend to form at the tips of branches; prune or shear off galls while they are still green, and the aphids will die quickly. Avoid frequent shearing and over fertilization, which encourages succulent new tip growth favored by aphid. For other aphid pests, wash aphids from plants with a strong stream of water or by hand-wiping.

Management—biological control
Syrphid fly larvae are important predators of the leafgall aphid and will feed on the aphids inside the galls. Avoid use of broad-spectrum insecticides which also kill the beneficial insects such as lady beetles and parasitic wasps.

Management—chemical control
See Table 3 in: Chemical Control of Landscape Pests

Kinnikinnik (Arctostaphylos)—Root weevil
Numerous species

Pest description and damage  Identification is important as root weevil species differ in susceptibility to pesticides and may have different life cycles. Also, the adults of most of the species are all females and capable of laying eggs after a period of feeding to mature their ovaries. Larvae, found around roots, are C-shaped, legless, and white, or slightly reddish, with tan heads, up to 0.5 inch in size. All species are quite similar in appearance and habits of feeding on root hairs, larger roots and root crown. Adult weevils are night feeders that mostly remain in the soil or in debris at the base of the plant during the day, then climb up to feed on leaves at night. Look for ragged notches on the edges of leaves, or flower petals or dead tips of plants where weevils have girdled the twig.

For biology, life history, monitoring and management
See “Root weevil” in: Common Landscape Pests

Management—chemical control
See Table 2 in: Chemical Control of Landscape Pests

Laurel, Portuguese (Prunus)—Carnation tortrix
Cacoecimorpha pronubana

Pest description and damage  Portuguese laurel (Prunus lusitanica) is sometimes infested with carnation tortrix. This is a small, bell-shaped brown moth with reddish underwings and dark bands on the upper wings. The caterpillars are light brown or greenish with brown heads and are about 0.375 to 0.5 inch long at maturity. The larvae feed by rolling leaves and tying them with webbing. The larvae are very active when disturbed often wriggling backwards. The carnation tortrix attacks many broad-leaved plants but seldom causes serious damage. Outside the U.S., it has been reported to be a serious pest of carnations.

Biology and life history  Adults females lay yellow, flattened oval-round eggs in groups of 10-200 for a total of 500-700. Eggs take 5 to 55 days to hatch. Larvae are active year-round and are able to disperse by ballooning on the wind. Pupation takes 10-15 days.

For biology, life history, monitoring and management
See “Leafroller and leaftier” in: Common Landscape Pests

Management—chemical control
See Table 3 in: Chemical Control of Landscape Pests

Laurel, Portuguese (Prunus)—Peachtree borer
Synanthedon exitiosa

Pest description and damage  Peach tree borer is native to North America and common in the Pacific Northwest. The adult is a metallic blue-black, clearwing moth. The male moth may have bands of light yellow scale on the abdomen, which makes it resemble a wasp. The female has an orange band around the abdomen. Full-grown larvae are 1 inch long and whitish with a brown head. The larvae burrow into the bark of the root crown and feed on the cambium. Feeding is restricted to an area a few inches above and below the soil line. Young trees can be completely girdled and killed. Older trees rarely are girdled, but the feeding reduces vigor and makes them vulnerable to other pests and diseases.

For biology, life history, monitoring and management
See:
- Peach, flowering (Prunus)—Peachtree borer

Management—chemical control
See Table 4 in: Chemical Control of Landscape Pests

Lilac (Syringa)—Ash borer
Lilac and ash borers (Podosessia syringae)

Pest description and damage  The lilac borer, also called the ash borer, is a clearwing moth that attacks lilac, privet and other members of the olive family. The adult moth resembles a paper wasp, with orange and yellowish markings on a black body. A thin wet stain is followed by a mix of frass and sap. Areas around the entry site may become sunken and frass and sawdust may accumulate around the base of plants. Eventually, plants show branch dieback, weaken or die. Borer holes are also entry for turkey-tail fungus (Trametes versicolor), which can further damage plants. Damage may be swift or slowly progressive.
Biology and life history  Adult clearwing moths emerge in spring from a round hole at the top of their gallery. They mate and lay eggs on the bark at the base of plants and the young larvae tunnel under the bark.

Pest monitoring  Deploy pheromone traps in spring to determine when the moths emerge. Also watch for wet sunken areas in the bark at the base of the tree/bush. Often the pupal case will still protrude from the exit hole. Spotting even old damage will provide some indication of how heavy the infestation is and inform the next season’s strategy.

Management—biological control
Entomopathogenic nematodes are available. They are to be sprayed at the base of trees over entry wounds so the nematodes can find their way into the galleries.

Management—chemical control
For biology, life history, monitoring and management

Management—cultural control
Remove pupating lilac leafminers, it may also remove the parasitoids. Often the mined leaf harbors a parasitoid feeding on the lilac leafminer larva and no moths will emerge. There is conflicting information on the wisdom of raking up leaves in fall. While it may remove pupating lilac leafminers, it may also remove the parasitoids.

Management—chemical control
See Table 3 in:
Chemical Control of Landscape Pests

For more information
See “Leafminer” in:
Common Landscape Pests

Lilac (Syringa)—Oystershell scale
Lepidosaphes ulmi

Pest description and damage  The mature scale is approximately 0.125 inch long, hard-shelled, brownish or gray in color, and usually elongated and slightly curved like an oyster or mussel shell. Oystershell scale are found on trunks, branches, and twigs of many broad-leaved deciduous plants. They occur less frequently on the leaves and other plant parts. Scale infestations often are limited initially to isolated colonies on single branches or twigs. Newly emerged crawlers look like bright white pimples on the bark. Stressed trees where the scale encrust entire branches suffer the greatest damage.

For biology, life history, monitoring and management
See:
Ash (Fraxinus)—Oystershell scale

See “Scale insect” in:
Common Landscape Pests

Management—chemical control
See Table 1 in:
Chemical Control of Landscape Pests

Lilac (Syringa)—Root weevil
Lilac root weevil (Otiorhynchus meridionalis) and numerous other species

Pest description and damage  Identification is important as root weevil species differ in susceptibility to pesticides and may have different life cycles. East of the Cascades, the lilac weevil is especially common. Look for regular U-shaped notches along the leaf edges. This species is unusual because males are common, and adults are often found in tandem. These nocturnal adults are nearly black and shiny with a snout (rostrum) and elbowed antennae. Larval feeding on roots is rarely a problem in established landscapes.

For biology, life history, monitoring and management
See “Root weevil” in:
Common Landscape Pests

Management—chemical control
See Table 2 in:
Chemical Control of Landscape Pests
Lily (Lilium)—Aphid
Foxglove aphid (Aulacorthum solani)
Green peach aphid (Myzus persicae)
Melon aphid (Aphis gossypii)

Pest description and damage  Several aphid species are pests of lilies. These aphids feed in colonies on the leaves. Feeding damage to the plant is usually minor, although some leaf and shoot distortion can occur if populations are high.

For biology, life history, monitoring and management  See “Aphid” in:
Common Landscape Pests

Management—chemical control  See Table 1 in:
Chemical Control of Landscape Pests

Linden (Tilia)—Aphid
Includes linden aphid (Eucalipterus tiliae)

Pest description and damage  The linden aphid is green with black lateral stripes. The aphids feed in colonies on the undersides of leaves. Feeding damage to the plant is usually minor, although some leaf and shoot distortion can occur if populations are high. This aphid also produces honeydew, which is a nuisance when it falls on cars or other surfaces. This aphid may be controlled by releasing parasitoids.

For biology, life history, monitoring and management  See “Aphid” in:
Common Landscape Pests

Management—chemical control  See Table 1 in:
Chemical Control of Landscape Pests

Lily (Lilium)—Lily leaf beetle  
Lilioceris lilii

Pest description and damage  This bright red leaf beetle is new to the PNW and is currently only known from a few locations in Bellevue, Washington. The adult beetles are shiny as though lacquered. Eggs are bright red, dimming to dull orange-brown before they hatch. The larvae are covered in a gooey excrement and look like a glob of slime. Adults chew ragged holes in the leaves and petals and the larvae scrape the leafy tissue from the surface. Eventually the leaf wilts down to nothing.

Biology and life history  Adults emerge early in spring as the first lily shoots appear. They mate and lay eggs immediately. Adults can be found well into summer with continuous eggs and larvae.

Pest monitoring  Inspect ground as new shoots emerge and remove any adults found.

Management—cultural control
Remove larvae as noticed; select lilies most resistant cultivars and species. Asian lilies are highly favored.

Management—biological control
None known from this area.

Management—chemical control  See Table 2 in:
Chemical Control of Landscape Pests

For more information  See “Leaf beetles” in:
Common Landscape Pests

Murray, T. Pest Watch:  Lily leaf beetle (http://cru.cahe.wsu.edu/CEPublications/FS084E/FS084E.pdf)

Linden (Tilia)—Fall webworm  
Hyphantria cunea

Pest description and damage  Large silken tents filled with caterpillars, frass and dead leaves, eventually engulf entire branches of deciduous trees. Young caterpillars are pale greenish or yellow with a dark stripe down the back and a yellow stripe along the sides. Long silky hairs arise from yellow and black tubercles. When mature the caterpillars are covered with yellow, rusty then black colored silky hairs. Adults are bright white with orange and black markings on the underside of the abdomen. Woolly scales cover masses of 200 to 500 greenish eggs.

For biology, life history, monitoring and management  See:
Cottonwood (Populus)—Fall webworm

See “Caterpillar” in:
Common Landscape Pests

Management—chemical control  See Table 2 in:
Chemical Control of Landscape Pests

Linden (Tilia)—Lecanium scale  
Lecanium spp.

Pest description and damage  Lecanium scales are most noticed as they expand in spring. Female lecanium scale are about 0.125 inch in diameter and vary from red to dark brown in color. They are oval and raised, resembling small “helmets,” “turtles,” or bumps on branches, and stems. Male scale are smaller, fairly flat, and oblong. The crawlers are pale yellow and feed on the undersides of leaves. They also produce honeydew.

For biology, life history, monitoring and management  See:
Ash (Fraxinus)—Lecanium scale

See “Scale insect” in:
Common Landscape Pests

Management—chemical control  See Table 1 in:
Chemical Control of Landscape Pests
Linden (*Tilia*)—Linden gall mite
Lime gall mite (*Eriophyes tiliae*)
Linden gall mite (*Phytoptus tiliae*)

**Pest description and damage** A very tiny eriophyid mite; causes elongated, pimple-like, red to greenish galls on leaves. Damage is seldom serious.

**Management—biological**
Predatory mites are important biological control agents.

**Management—chemical control**
See Table 3 in:
Chemical Control of Landscape Pests

For more information
See “Gallmakers” in:
Common Landscape Pests

Linden (*Tilia*)—Spider mite
*Tetranychus* spp.

**Pest description and damage** Several species of spider mites can cause damage in deciduous, evergreen, and coniferous ornamentals. Appearance of these mites varies with the species, although all are 0.02 inches or smaller. Adults and nymphs may be yellowish, greenish, or reddish brown, depending on species. Spider mites are oval and yellowish-brown or green with distinctive black spots on the body. Plants may be covered with fine silk webbing at branch axils or over sections, small plants may be engulfed in webbing under very heavy infestations. Mites damage leaves and fruit indirectly by feeding on leaves, which causes stippling, bronzing, and possibly leaf drop. The reduction in photosynthesis causes loss of vigor and yield.

**For biology, life history, monitoring and management**
See “Spider mite” in:
Common Landscape Pests

**Management—chemical control**
See Table 1 in:
Chemical Control of Landscape Pests

Locust (*Robinia*)—Locust borer
*Megacyllene robiniae*

**Description, biology and damage** This is a serious pest of black locust. An attractive yellow and black long-horned beetle which can be seen on goldenrod and rabbit brush in the fall. In fall, the adults lay eggs in cracks and in wounds on the bark. Larvae mine beneath bark and in wood and can literally honeycomb the wood so that infested limbs are likely to break (with or without a wind).

**Pest monitoring** Look for wet spots as sap seeps to the bark when larvae tunnel into the bark in spring. As larvae bore into wood, sawdust is forced out the entry hole.

**Management—cultural control**
Keep trees vigorous with adequate water and limiting damaging agents such as animals. Remove weak or infested trees and grind or burn infested branches before beetles emerge.

**Management—chemical control**
See Table 4 in:
Chemical Control of Landscape Pests

Madrone (*Arbutus*)—Leafminer

Madrone shield bearer (*Coptodisca arbutiella*)
Serpentine madrone miner (*Marmara arbutiella*)

**Description, biology and damage** The serpentine madrone miner is a tiny moth. Larvae of this leaf- and twig-mining moth blaze sinuous, serpentine mines across the surface of leaves. Although damage might be unsightly on individual leaves, they do not affect the long-term health of the tree. This moth affects madrone throughout its range. The madrone shield bearer forms small dark areas on the upper leaf surface. When ready to pupate, the larvae cut two oval pieces of leaves (upper and lower leaf surface), stitches them together with silk, and moves with this case to a protected location and pupates within. These two insects generally occur in low numbers. Occasionally there is a flare-up in the population which crashes by the next season due to natural controls.

**Pest monitoring** Leafminers usually are scattered in low numbers throughout the trees. Usually, only a few mines can be found.

**Management—cultural control**
Remove infested leaves as they are seen if they are bothersome; or tolerate minor blemishes which do not harm the tree.

**Management—chemical control**
See Table 3 in:
Chemical Control of Landscape Pests

Madrone (*Arbutus*)—Root weevil

**Pest description and damage** Species identification is important as root weevil species differ in susceptibility to pesticides and can have different life cycles. Adult weevils are small dark nocturnal beetles with a snout (rostrum) and elbowed antennae. Larvae are rarely a problem in landscapes. Look for ragged notches on the edges of leaves on young trees, or dead tips of plants where weevils have girdled the twig.

**For biology, life history, monitoring and management**
See “Root weevil” in:
Common Landscape Pests

**Management—chemical control**
See Table 2 in:
Chemical Control of Landscape Pests
Maple (Acer)—Aphid

Includes Norway maple aphid (Periphyllus lyropictus)

Description, damage, biology and life history The aphids on maple are most severe in the spring. This aphid usually develops wings and flies from the host in spring about the time it is reaching noticeable numbers. The aphids return in fall, congregating at the base of the tree. Honeydew production is usually the most noticeable problem with these aphids. When numbers of aphids are high, look for small gnat-like insects patrolling the leaves. These are parasitoid wasps seeking aphid hosts.

For biology, life history, monitoring and management
See “Aphid” in: Common Landscape Pests

Management—chemical control
See Table 1 in: Chemical Control of Landscape Pests

Maple (Acer)—Carpenterworm

Prionoxystus robiniae

Pest description and damage Carpenterworms are the larvae of a large mottled gray and black moth (goat moth). The caterpillars are white to pinkish-red with a dark head and are 1 to 3 inches long when mature. The caterpillars bore in the trunk and main branches. Discolored or bleeding limbs, branch dieback, and lumpy or gnarled trunks may be indications of carpenterworm infestation. Sawdust-like material (frass) and wood chips mixed with loose webbing on or around infested trees is typical. Trees with severe carpenterworm infestations are susceptible to wind breakage and may need to be removed. Infestations may kill trees eventually.

For biology, life history, monitoring and management
See: Cottonwood (Populus)—Carpenterworm

Management—chemical control
See Table 4 in: Chemical Control of Landscape Pests

Maple (Acer)—Cottony maple scale

Pulvinaria innumerabilis

Pest description and damage Mature cottony maple scale are small, flat, oval, brown insects 0.25 to 0.375 inch in diameter. The “cotton” is actually waxy threads covering as many as 1,500 eggs. The developing females and nymphs produce copious amounts of honeydew which can collect on foliage and branches and cause growth of sooty mold. Honeydew is also a nuisance when it falls on nearby cars and sidewalks, and it also attracts bees, wasps, and ants. Occasionally, heavy outbreaks of this scale occur, usually on weakened or stressed trees. Cottony maple scale reaches epidemic numbers on silver maple, but noticeable populations can occur on red maple. It also is known to survive on other species of maple, honey and black locust, white ash, euonymus, oak, boxelder, dogwood, hackberry, sycamore, beech, elm, willow, basswood, and poplar.

For biology, life history, monitoring and management
See “Scale insect” in: Common Landscape Pests

Management—chemical control
See Table 1 in: Chemical Control of Landscape Pests

Maple (Acer)—Maple bladder gall mite

Maple bladder gall mite (Vasates quadripedes)

Description, biology and damage The maple bladdergall mite is a tiny eriophyid mite that feeds on the underside of leaves. Infested leaves initially develop small depressions which soon grow into brilliant red bladder-like galls 0.125 to 0.25 inch in length. Later in the season, the galls may turn green or black. Silver and red maples are particularly susceptible to bladdergall mites. Severe infestations may cause leaves to become distorted. Although an aesthetic concern, bladdergalls are seldom harmful to the trees. Occasionally trees may be defoliated (trees drop their leaves to rid themselves of mites); this is an effective “strategy” of the plant to rid itself of these parasites. Trees often recover without galls in the next year.

Biology and life history The mites overwinter in cracks and under bark scale and begin feeding in spring after leaves emerge. Mite activity typically stops by around July.

Management—cultural control
Hand pick severely infested or distorted leaves to improve appearance of small trees if needed. A few galls will not impact the overall health of the tree.

Management—chemical control
See Table 3 in: Chemical Control of Landscape Pests

Maple (Acer)—Leafcutting bee

Numerous species in the family Megachilidae

Description and crop damage Leafcutting bee activity is noted by the uniform oval and round pieces cut from the edges of leaves. The adult bee uses these little oval pieces to line the sides of an old beetle gallery or hole in the ground. She then gathers pollen to form a ball of food, and lays one egg, then seals the apartment with a wall made of a round leaf piece. Damage is transitory while leaves are pliable enough to be rolled up (but not so soft as to decay in the tunnel). Once leaves have hardened off, the leaf cutters will find other suitable hosts.

Management—cultural control
If the missing leaf portions are objectionable, try laying a light sheet or fine curtain netting over the plant until the leaves have hardened off, or the bees have found another suitable leaf donor. The trade-off between pollination services provided by the leafcutting bees and the damage can be a positive one. Plants are rarely harmed by the loss of some leaves.

Maple (Acer)—Maple tip moth (Maple shoot borer or Maple twig borer)

Proteoteras spp.

Description and damage Moths are dark olive-green with yellow and gray mottling. The larvae are whitish with brown head and yellow-brown thoracic shield. Larvae bore into tips of branches and the terminal shoot causing dieback as the leaves wilt and turn brown. Damage is most evident on young trees when the terminal is killed and the growth structure altered.
Biology and lifecycle  In Oregon, larvae emerge in July and pupate in August. The maple tip moth appears to overwinter in the adult stage. In spring, the moths lay eggs near the tips of branches. Come May, the first evidence of tip dieback occurs as the caterpillars bore into and feed within the shoots.

Management—chemical control

See Table 4 in: Chemical Control of Landscape Pests

For more information

See “Caterpillar” in: Common Landscape Pests

Maple (Acer)—Oystershell scale

Lepidosaphes ulmi

Pest description and damage  The mature scale is approximately 0.125 inch long, hard-shelled, pinkish or brownish or gray in color, and usually elongated and slightly curved like an oyster or mussel shell. Oystershell scale are found on trunks, branches, and twigs of many broad-leaved deciduous plants. They occur less frequently on the leaves and other plant parts. Scale infestations often are limited initially to isolated colonies on single branches or twigs. Newly emerged crawlers look like bright white pimples on the bark.

For biology, life history, monitoring and management

See: Ash (Fraxinus)—Oystershell scale

See “Scale insect” in: Common Landscape Pests

Management—chemical control

See Table 1 in: Chemical Control of Landscape Pests

Maple (Acer)—Root weevil

Various species

Pest description and damage  Identification is important: species differ in susceptibility to pesticides. Adult weevils are small dark nocturnal beetles with a snout (rostrum) and elbowed antennae. Look for ragged notches on the edges of leaves or flower petals. Larvae are C-shaped, legless, and white, sometimes reddish, with tan heads, up to 0.5 inch in size. The larvae are rarely a significant problem in established landscapes.

For biology, life history, monitoring and management

See “Root weevil” in: Common Landscape Pests

Management—chemical control

See Table 2 in: Chemical Control of Landscape Pests

Maple (Acer)—Rose leafhopper

Edwardsiana rosae

Pest description and damage  Rose leafhoppers are small, active, whitish-green insects which run backwards, forwards or sideways when disturbed. The nymphs (immature) are white with red eyes. Rose leafhoppers feed on the leaves, causing white or pale blotches that resemble, but are larger than, spider mite stippling. Injured leaves may drop prematurely. The egg-laying in the fall also wounds the canes, providing entry points for fungal pathogens. Cast skins can be found on the underside of leaves. Leafhopper damage is mostly aesthetic though there are occasional outbreaks.

For biology, life history, monitoring and management

See: Rose (Rosa)—Rose leafhopper

See “Leafhopper” in: Common Landscape Pests

Management—chemical control

See Table 1 in: Chemical Control of Landscape Pests

Maple (Acer)—Satin moth

Leucoma salicis

Pest description and damage  The adult moth is satiny white with black markings on the legs. The attractive larvae are approximately 2 inches long when grown and reddish brown with double white dorsal patches and tufts of hairs along the sides. They can seriously skeletonize then defoliate cottonwood, poplar, and willow. They occasionally attack oak and aspen. Lombardy poplar and silver maple are particularly susceptible.

For biology, life history, monitoring, and management

See: Poplar (Populus)—Satin moth

See “Caterpillar” in: Common Landscape Pests

Management—chemical control

See Table 2 in: Chemical Control of Landscape Pests

Maple (Acer)—Western boxelder bug

Boisea rubrolineata

Pest description and damage  The boxelder bug is often a nuisance pest around and in homes where boxelder is commonly grown. These bugs feed on the leaves, flowers, and seedpods of the boxelder tree (Acer negundo), and on other maple species and ash. They may also feed on the fruits of apple, cherry, peach, pear, and plum trees. Large numbers of the bug usually occur only on female boxelder trees. They actually do little damage to ornamentals, though they can cause some leaf distortion. The adult bugs are mostly black and have three thin red lines on the thorax and several fine red lines on each wing. The wings lie flat on the bug’s back when it is at rest.

Biology and life history  In spring, the overwintered females lay eggs in the cracks and crevices of the boxelder tree’s bark, and the nymphs hatch in a few days. The nymphs feed, grow and develop into adults during the summer. They then mate and lay eggs that hatch into the second generation nymphs. Most of the nymphs of the second generation grow to full size by August and September. In fall the adults seek overwintering places in dry, sheltered hollow tree trunks; under rocks, boards and other debris; in cracks and crevices in walls; in door and window casings; around building foundations; and inside houses. They become a nuisance outdoors in patios or indoors when they invade homes in significant numbers.

Management—cultural control

Removal of seed pods of boxelder trees from the ground around the trees may help. Replacement of maple and boxelder trees
with other tree species that do not produce as much seed will reduce populations. Where boxelder bugs become a nuisance as congregations on house walls, patios, decks or storage areas, use a vacuum to remove them.

Management—chemical control
See Table 1 in:
Chemical Control of Landscape Pests

For more information


Maple (Acer)—Western flower thrips
Frankliniella occidentalis

Description, biology and damage Adults are yellow to yellow-brown, 0.05 inch long, narrow, with wings. Larvae are smaller and wingless. Both stages feed on developing growth causing leaf distortion and black necrotic tissue. Most damage to maple occurs when thrips disperse from grass fields when they are mowed or harvested in the summer.

For biology, life history, monitoring and management
See “Thrips” in:
Common Landscape Pests

Management—chemical control
See Table 2 in:
Chemical Control of Landscape Pests

For more information
Rosetta, R. 2008. Western flower thrips. PNW Nursery IPM (http://oregonstate.edu/dept/nurspest/thrips.htm)


Mountain ash (Sorbus)—Apple-and-thorn skeletonizer
Choreutis pariana

Pest description and damage Larvae are 0.5 inch long, yellowish to greenish, with black spots and a yellow-brown head. Pupae are yellow to brown with a white silken cocoon. The larvae skeletonize and roll leaves from the side. Damaged leaves are brown and papery and drop prematurely. Damage varies from inconsequential to serious, so monitoring is an important management tool.

For biology, life history, monitoring and management
See:
Crabapple (Malus)—Apple-and-thorn skeletonizer

See “Caterpillar” in:
Common Landscape Pests

Management—chemical control
See Table 4 in:
Chemical Control of Landscape Pests

Mountain ash (Sorbus)—Cherry bark tortrix
Enarmonia formosana

Pest description and damage Cherry bark tortrix is a pest of most woody ornamental trees and shrubs in the family Rosaceae. The larvae are 0.33 to 0.4 inch long, pale gray to flesh-color with small, pale gray spines scattered on the surface, with a yellowish-brown head. Larvae feed directly on the cambium tissues under the tree bark and may cause death of the tree in sufficient numbers. Otherwise, the feeding activity decreases the supply of nutrients to the tree and increases susceptibility to disease, insect attack, and environmental stress, including cold injury. The first indication of attack is the exuding of reddish-brown gum-like resin, which often is mixed with fecal pellets and silk. The trunk and larger limbs of bearing fruit trees are affected, usually at pruning wounds or graft unions.

For biology, life history, monitoring and management
See:
Cherry (Malus)—Cherry bark tortrix

Management—chemical control
See Table 4 in:
Chemical Control of Landscape Pests
Mountain ash (Sorbus)—Leaf blister mite
Phytopus pyri

**Pest description and damage** The leaf blister mite is a very tiny, white, sausage-shape eriophyid mite. They are seldom visible to the unaided eye. Eriophyid mites feed on the underside of mountain ash leaves and cause the development of blister-like fuzzy patches on the upper leaf surface. These raised spots are generally light green, round, and look somewhat wrinkled. Older leaf blisters may turn brown. Severe infestations may result in premature leaf drop but normally this is an inconsequential pest.

**Management—cultural control**
A strong, direct spray of water may wash mites from trees and reduce dust, which seems to favor eriophyid mite infestations. Hand-pick infested leaves to improve appearance of small trees.

Mountain ash (Sorbus)—Mountain ash sawfly
Pristiphora geniculata

**Pest description and damage** This is a new pest in western Washington and possibly elsewhere. It was first noticed in the spring of 2009 in Everett, Lynnwood and Monroe areas, so it is likely to have arrived earlier. Typical of many sawflies, small gregarious larvae hatch from eggs in early spring and begin feeding in groups. Larvae are at first greenish with black dots down the side and a black head and legs. Before they pupate, the head and body turn orange with black spots. Initially only soft leaf tissue is consumed leaving a fine network of leaf veins, but as larvae feed, larger veins are consumed along with the other leafy tissue. Finally, only the petiole, midrib, and the bases of a few secondary veins remain. Known hosts include the European and American mountain ash (Sorbus aucuparia and S. americana). Sawfly larvae are caterpillars with 5-7 prolegs (soft fleshy gripping hind legs) while moth larvae have five or fewer prolegs. Moth larvae also have little crochets on their prolegs while sawfly larvae do not. This is important because Bacillus thuringiensis is effective on moth and butterfly caterpillars, but not on sawfly caterpillars. A characteristic of sawflies is to feed in groups along a leaf edge with their hind end curled upward.

**Biology and life history** Adult sawflies emerge from the cocoons overwintering in the soil and leaf litter. Females cut slits in the marginal leaf surfaces and insert eggs in blister-like “pockets” in the leaf tissue. Larvae emerge and feed gregariously. By three to four weeks, the larvae are full grown and will drop to the ground to spin their cocoons. In Monroe, Washington, adults emerged in August and a second generation of larvae began to feed immediately suggesting a third generation.

**Pest monitoring** Sawflies that are new to an area tend to build up large numbers and can cause significant defoliation. Early detection by watching as the new growth in the lower canopy develops is important because sawflies typically eat continuously and then drop out of sight (to pupate in the soil). Damage appears to occur overnight. Control of the first generation will reduce the number and severity of defoliation by the second and third generations.

**Management—cultural control**
Prune out infested branches, though that seems more radical than allowing defoliation to occur with branches releafing. Often the first generation of larvae that emerge in the spring concentrate their feeding damage on the lower branches, while later generations feed on the higher branches.

Management—chemical control
See Table 2 in: Chemical Control of Landscape Pests

For more information
See “Sawfly” in: Common Landscape Pests

Mountain ash (Sorbus)—Pear sawfly (pear slug)
Pest description and damage Pear slug is a European insect now found in most areas of the U.S. It attacks both pear and cherry and also is found on mountain ash, hawthorn, and ornamental Prunus. The adult is a glossy black fly-like insect, about 0.2 inch long. The larva initially resembles a small tadpole due to the olive-green slime that covers the body, and the head being wider than the rest of the body. Mature larvae are 0.375 inch long and orange-yellow. Larvae feed on the upper surface of leaves, skeletonizing them. Heavy feeding causes leaf drop, with reduction in vigor and yield, particularly on young trees. The pear sawfly is green in color, caterpillar-like and feeds along the leaf edges and may be difficult to detect.

For biology, life history, monitoring and management
See: Pear (Pyrus)—Pear sawfly (pear slug)
See “Sawfly” in: Common Landscape Pests

Management—chemical control
See Table 2 in: Chemical Control of Landscape Pests

Mountain ash (Sorbus)—Root weevil
Various species
Pest description and damage Identification is important: species differ in susceptibility to pesticides. Adult weevils are small dark nocturnal beetles with a snout (rostrum) and elongated antennae. Look for ragged notches on the edges of leaves, or flower petals. Larvae are C-shaped, legless, and white, sometimes reddish, with tan heads, up to 0.5 inch in size. Larvae are rarely a significant problem in established landscapes.

For biology, life history, monitoring and management
See “Root weevil” in: Common Landscape Pests

Management—chemical control
See Table 2 in: Chemical Control of Landscape Pests
Mountain ash (Sorbus)—Tent caterpillar
Forest tent caterpillar (Malacosoma disstria)
Western tent caterpillar (Malacosoma californicum pluviale)

Pest description and damage The western tent caterpillar attacks a wide variety of plants including alder, apple, ash, birch, cherry, cottonwood, and willow, as well as fruit trees and roses. The adult moths are stout, light to dark brown, and are active in early- to mid-summer. Adults are attracted to lights at night. Western tent caterpillars are hairy, dull yellow-brown, with rows of blue and orange spots on the body. Forest tent caterpillars are black and blue with dorsal white footprints. Eggs of these moths are laid on twigs or buildings in masses and may be especially numerous around lights. The eggs are brown to gray in color, about 0.0625 inch long, and look like bits of gray, hardened foam. The larvae feed in large groups on foliage of host plants and can do significant damage by defoliation. Larvae of western tent caterpillars build moderate silken tents over leaves, but leave the tent to feed in new areas. They usually return in the evening. Both can defoliate small trees: defoliation can reduce growth and make the trees more susceptible to competition, diseases or poor weather, potentially killing them. Healthy trees usually will grow new leaves by midsummer.

For biology, life history, monitoring and management
See:
Alder (Alnus)—Tent caterpillar

See “Caterpillar” in:
Common Landscape Pests

Management—chemical control
See Table 2 in:
Chemical Control of Landscape Pests

Narcissus (Narcissus)—Narcissus bulb fly
Lesser bulb fly (Eumerus tuberculatus)
Narcissus bulb fly (Merodon equestis)

Pest description and damage The larva is a fat, yellowish-white, and wrinkled maggot and 0.75 inch long. The lesser bulb fly adults are blackish green with white markings on the abdomen; the larvae are smaller and more numerous in the bulbs. The maggots of the narcissus bulb fly burrow into the bulbs near the basal plate and feed inside the bulbs, destroying bulb scale and flower parts while maggots of the lesser bulb fly are thought to be scavengers. Infested bulbs may develop a few, grassy-looking leaves if the bulb is not too badly damaged. Severely damaged bulbs are soft, brown, and decayed. The narcissus bulb fly attacks amaryllis, Galtonia, hyacinth, iris, lily, Leucojum, Narcissus, Scilla, tulip, and Vallota. The lesser bulb fly also attacks and may be a primary pest on onions and shallots and other bulbs.

For biology, life history, monitoring and management
See:
Daffodil (Narcissus)—Narcissus bulb fly

Oak (Quercus)—Carpenterworm
Prionoxystus robiniae

Pest description and damage Carpenterworms are the larvae of a large mottled gray and black moth (goat moth). The caterpillars are white to pinkish-red with a dark head and are 1 to 3 inches long when mature. The caterpillars bore in the trunk and main branches. Discolored or bleeding limbs, branch dieback, and lumpy or gnarled trunks may be indications of carpenterworm infestation. Trees with severe carpenterworm infestations are susceptible to wind breakage and may need to be removed. Infestations may kill trees eventually.

For biology, life history, monitoring and management
See:
Cottonwood (Populus)—Carpenterworm

Management—chemical control
See Table 4 in:
Chemical Control of Landscape Pests

Oak (Quercus)—Oak gall wasp
Includes
Bassettia gall wasp (Bassettia ligni)
California jumping gall wasp (Neuroterus saltatorius)
Oregon oak gall wasp (Besbicus mirabilis)
California gallfly (Andricus californicus)

Pest description and damage Over 400 galls have been identified on oak. Leaf galls are caused by the feeding of several species of oak gall wasp larvae. Typical galls are enlarged or swollen plant tissues. These may assume several forms, depending on the species of wasp. The main gall wasps on Oregon white oak include Andricus californicus, which forms large, persistent, apple-like galls on twigs; Bassettia ligni, which causes seed-like galls under the bark of branches that often girdle and kill the branch; Besbicus mirabilis, which forms mottled, spherical galls on the underside of leaves; and Neuroterus saltatorius, which forms mustard-seed-like galls on lower leaf surfaces that drop in the fall and jump around like Mexican jumping beans (caused by activity of the enclosed larvae).

The California gallfly causes the largest and most conspicuous of the galls on oak, achieving a diameter of 1 to 4 inches. It is a twig gall that is often called an oak apple. It starts out green and in time becomes red on the sunny side. Later in the season, the gall turns brown or greyish just before the adult wasps chew their way out. The gall does no apparent damage to the tree and is removed easily without harming the twig. During its development, the gall may host up to a dozen larvae.

Jumping oak galls cause small yellow spots on the upper surface of infested leaves. On the underside of the leaves are tiny seed like galls. These appear in midsummer or later. Inside each gall is the larvae of a tiny wasp. In the fall, the galls drop from the leaves to the ground, where the activity of the larva causes the gall to jump an inch or more off the ground. The wasps overwinter in the galls on the ground. In the spring, emerging females lay eggs in opening oak buds. Adult females emerging from these galls lay eggs on the leaves, producing the larvae which cause the jumping oak galls. Although they may be unsightly, jumping oak galls do relatively little damage.

Stem galls are caused by the feeding of any of several species of oak gall wasp larvae. Typical galls are enlarged or swollen. Galls associated with oak stems are often smooth and round, but may be elongate, thorny, or rough. They can be single galls or clusters of galls. Colors vary from green to reddish to brown, depending on the wasp species causing the gall and the age of the gall.

Management—chemical control
See Table 3 in:
Chemical Control of Landscape Pests

For more information
See “Gallmakers” in:
Common Landscape Pests
Oak (Quercus)—Oak phylloxera

*Phylloxera quercus*

**Pest description and damage** Phylloxerids are very small (0.01 to 0.02 inch) aphid-like insects that lack cornicles. They are usually spiny in appearance and found in clusters. Winged forms have reduced wing venation. They attack the foliage and buds of red and white oak trees of all sizes. Buds and young developing leaves (undersurface) on terminals and branch ends are attacked, causing bright yellow spots and leaf distortion.

**Pest monitoring** Early detection on foliage will allow time to decide which/if management options will be useful.

**Management—biological control**
Natural controls usually keep damage to a minimum. There are 10 species of predators recorded as feeding on oak phylloxera; however, at times significant damage and defoliation may occur and ornamentals may require chemical control.

**Management—chemical control**

*See Table 1 in:*
Chemical Control of Landscape Pests

For more information

Oak (Quercus)—Oak skeletonizer

Oak skeletonizer (*Bucculatrix ainsliella*)

**Oak-ribbed skeletonizer (*Bucculatrix albertiella*)**

**Pest description and damage** This insect also is known as the oak ribbed casemaker (*Bucculatrix albertiella*). The adult moth is mottled white, brown, and black with a wingspread of about 0.33 inch. The mature larvae are about 0.25 inch long and pale yellow to green. Young larvae feed inside leaves, chewing away tissues and leaving a linear mine. Older larvae feed on the underside of leaves, leaving only the upper surface and veins, which turn brown. Severely damaged leaves may be almost transparent. The oak ribbed casemaker is reported on California white (valley) oak (*Quercus lobata*) and coast live oak (*Q. agrifolia*).

**Biology and life history** This insect appears to pass the winter inside its characteristic cocoon. Immature larvae make flat, white, circular hibernating cocoons, while cocoons of mature larvae are oblong and white with distinctive longitudinal ribs. The latter can be found on leaves, twigs, or other nearby underlying objects. It is easy to transport this insect stage from place to place with infested plant material. The moths appear in spring and lay eggs on the undersides of leaves. The larvae emerge and feed on the foliage. There are two generations per year.

**Management—biological control**
Natural enemies probably help keep populations in check. Avoid use of broad-spectrum insecticides which kill beneficial insects.

**Management—cultural control**
Rake up fallen leaves to remove cocoons; destroy by deep composting.

**Management—chemical control**

*See Table 2 in:*
Chemical Control of Landscape Pests

For more information
See “Caterpillar” in:
Common Landscape Pests

Oak (Quercus)—Pit scale

*Asterolecanium* spp.

**Description, biology and damage** Adult scale are covered with a hard shell and are about 0.06 inch in diameter. They may be brown, gold, or greenish. They feed on twigs and small branches, with young wood most commonly infested. Pit scale feeding causes the tissue of the twig to swell around the insect, so the scale only appears to be in a pit on the bark. Numerous scale on a twig cause it to appear roughened. Severe infestations cause twig dieback. Heavy infestations of pit scale combined with drought stress or anthracnose (a fungal disease) can result in severe weakening or death of trees.

For biology, life history, monitoring and management
*See “Scale insect” in:*
Common Landscape Pests

**Management—chemical control**

*See Table 1 in:*
Chemical Control of Landscape Pests

Oak (Quercus)—Rose leafhopper

**Includes** *Edwardsiana rosae*

**Pest description and damage** Rose leafhoppers are small, active, whitish-green insects which run backwards, forwards or sideways when disturbed. The nymphs (immature) are white with red eyes. Rose leafhoppers feed on the leaves, causing white or pale blotches that resemble, but are larger than, spider mite stippling. Injured leaves may drop prematurely. The egg-laying in the fall also wounds the canes, providing entry points for fungal pathogens. Cast skins can be found on the underside of leaves. Leafhopper damage is mainly aesthetic.

For biology, life history, monitoring and management

*See:*
Rose (*Rosa*)—Rose leafhopper

*See “Leafhopper” in:*
Common Landscape Pests

**Management—chemical control**

*See Table 1 in:*
Chemical Control of Landscape Pests

Oak (Quercus)—Western oak looper

*Lambdina fiscellaria somniaria*

**Pest description and damage** The adult moth is yellowish to dark brown. Mature larvae of the western oak looper are about 1 inch long and light brown with black spots when mature. They move in a characteristic “looping,” inchworm fashion. The western oak looper feeds mainly on the foliage of the Oregon white (or Garry) oak (*Quercus garryana*). It is probably the most damaging insect on white oak from Oregon north to British Columbia. In some years, oaks over large areas in the Willamette Valley are defoliated. The damage is temporary, since the trees leaf out the next year, and outbreaks are not sustained.

**Management—chemical control**

*See Table 2 in:*
Chemical Control of Landscape Pests
Peach, flowering (Prunus)—Aphid
Includes green peach aphid (Myzus persicae)

Pest description and damage Several species of aphids may feed on the foliar, stem, flower, bud, bark or root tissues of many trees and shrubs. Aphids tend to be small (0.0625 to 0.125 inch long), oval to pear-shaped, soft-bodied insects with piercing–sucking mouthparts. Color varies with aphid species, but green peach aphid is green. Aphids feed in colonies and are often found on the new or most succulent plant tissues. Feeding damage to plants is usually minor, but can compromise the vigor of the host. When aphid populations are high, leaf and shoot distortion can occur. Aphids produce honeydew, a sweet, sticky secretion that collects on underlying plant tissues and encourages growth of a black sooty mold. In addition to cosmetics, honeydew may become a sticky nuisance when it falls on decks, cars, or other landscape surfaces. Some aphids are vectors of plant diseases, particularly viruses.

For biology, life history, monitoring and management
See “Aphid” in: Common Landscape Pests

Management—chemical control
See Table 1 in: Chemical Control of Landscape Pests

Peach, flowering (Prunus)—Cherry bark tortrix
Enarmonia formosana

Pest description and damage CBT is a pest of most woody ornamental trees and shrubs in the family Rosaceae. The larvae are 0.33 to 0.4 inch long, pale gray to flesh-color with small, pale gray spines scattered on the surface, with a yellowish-brown head. Larvae feed directly on the cambium under tree bark and may cause death of the tree in sufficient numbers. Otherwise, the feeding activity decreases the supply of nutrients to the tree and increases susceptibility to disease, insect attack, and environmental stress, including cold injury. The first indication of attack is the exuding of reddish-brown, gum-like resin, which often is mixed with fecal pellets and silk. The trunk and larger limbs of bearing fruit trees are affected, usually at pruning wounds and graft unions.

For biology, life history, monitoring and management
See: Cherry (Malus)—Cherry bark tortrix

Management—chemical control
See Table 4 in: Chemical Control of Landscape Pests

Peach, flowering (Prunus)—Fall webworm
Fall webworm (Hyphantria cunea)

Pest description and damage Large silken tents filled with caterpillars, frass and dead leaves, eventually engulf entire branches of deciduous trees. Young caterpillars are pale greenish or yellow with a dark stripe down the back and a yellow stripe along the sides. Long silky hairs arise from yellow and black tubercles. When mature, the caterpillars are covered with yellow to rusty- to black-colored silky hairs. Adults are bright white with orange and black markings on the underside of the abdomen. Woolly scales cover masses of 200 to 500 greenish eggs.

For biology, life history, monitoring and management
See: Cottonwood (Populus)—Fall webworm
See “Caterpillar” in: Common Landscape Pests

Management—chemical control
See Table 2 in: Chemical Control of Landscape Pests

Peach, flowering (Prunus)—Leafrollers
Includes
European leafroller (Archips rosanus)
Fruit tree leafroller (Archips argyraspilus)
Oblique banded leafroller (Choristoneura rosaceana)

Pest description and damage For the most part, the term, “leafrollers” refers to the larvae of moth species. They all cause similar damage but differ in their appearance and, more importantly, in their life cycle. The leafroller pests can be divided into single-generation moths, such as the fruit tree leafroller and the European leafroller, and two-generation moths, such as the oblique-banded leafroller and three-lined leafroller. The larvae are mostly green caterpillars with a light brown to black head. Adults have distinctive bands or mottling on the wings but are rarely seen. Leaftiers are similar in appearance, although larvae are up to 0.5 inch long, dirty white, with a brownish head. The tortricid moth larvae are noted for their violent backward wriggling—a means of escape. Newly hatched larvae also may work into blossoms and damage developing fruit, which then abort and fall off the tree. The larvae web the leaves and flowers together beginning in late April, and then feed on the developing fruit or flowers.

For biology, life history, monitoring and management
See: Cherry, flowering (Prunus)—Oblique-banded leafroller
See “Leafroller and leaftier” in: Common Landscape Pests

Management—chemical control
See Table 3 in: Chemical Control of Landscape Pests

Peach, flowering (Prunus)—Peach silver mite
Vasates cornutus

Pest description and damage Peach silver mites are tiny, four legged eriophyid mites, yellow to pinkish white, and somewhat wedge-shaped. On rare occasions when very high populations of peach silver mite survive the winter, they produce symptoms on the unfolding leaves. Symptoms consist of minute, yellow spots and a tendency for the leaf edges to curl toward the midrib. Ordinarily, however, most injury is not noticed until mid- to late summer, when heavily infested leaves take on a silvery appearance.

Biology and life history The mites overwinter as females in bark crevices, around buds, and under bud scale. They move to the leaves soon after budbreak in spring. Later in the season, they are found primarily on the lower leaf surface. Before leaf fall, females move to overwintering sites on the tree. Many generations are produced during the season.
Management—biological control
Treatments applied specifically for control of peach silver mite rarely are needed and should be avoided, because peach silver mites serve as early season food for predaceous mites, which in turn aid in reducing populations of other pest mites.

Management—chemical control

See Table 3 in:
Chemical Control of Landscape Pests

Peach, flowering (Prunus)—Peach tree borer
Synanthedon exitiosa

Biology and life history The borer overwinters as a larva on or under the tree bark, usually below ground. As temperatures rise above 50°F in the spring, the larva resumes feeding on the tissues under the bark. At maturity in May and June, the larva pupates. Adult moths emerge beginning in June and continue through September. Eggs are laid quickly after mating. Young larvae hatch after 8 to 10 days and bore immediately into the base of the tree. Larvae in the bark above the soil line usually do not survive the winter in cold areas.

Pest monitoring Monitor for flying clearing moths by using pheromone traps starting in mid-June or watch for gummy frass at base of trees. This insect can do substantial damage if not controlled: one larva can kill a small tree.

Management—biorational control
Pheromone mating disruption (Isomate P) at 100-250 dispensers/a. Dispensers must be placed in trees before first moth flight. Flight is usually from late June through September. If mating disruption is used, monitor blocks with traps baited with peachtree borer lures at 1 trap/2.5 a. If two or more moths are caught, a conventional insecticide application may be required.

Management—cultural control
Place a light metal or flexible plastic cone around the base of the tree before egg laying begins to protect it from larval entry. The cone should be pushed 1 to 2 inches into the soil and should fit snugly around the trunk at the top to prevent the tiny larvae from getting beneath it. Budding tape or other flexible material helps seal the top. Alternatively, if only one or a few peach trees are involved in a home orchard, it is quicker and cheaper to control this insect by direct removal: use a pocket knife or some pointed instrument to remove dirt around the tree and dig out the larvae.

Management—chemical control

See Table 4 in:
Chemical Control of Landscape Pests

For more information

Rosetta, R. 2010. Peach tree borer. PNW Nursery IPM (http://oregonstate.edu/dept/nurspest/peach_tree_borer.htm)

Peach, flowering (Prunus)—Peach twig borer
Anarsia lineatella

Pest description and damage Peach twig borer is a European insect first found in California in the 1880s. It is a major pest of apricots, peaches, plums, and prunes. There are no native hosts outside the orchard. The adult is a steel-gray moth with white and dark scales, about 0.33 to 0.5 inch long. The larva is a caterpillar, approximately 0.5 inch long, with a dark brown head and distinctive, alternating light and dark bands on the body. The pupa is smooth and brown. The larva of the borer causes injury to fruit and trees. Feeding on the buds and twigs occurs early in the season, after which the larva bores into the shoots, causing a characteristic “flagging” or wilting of the new growth. Later generations of larvae feed on shoots or fruit, disfiguring the fruit.

Biological and life history The borer overwinters as an immature larva in tunnels constructed in the crotches of twigs and branches. These overwintering sites can be identified by the small chimneys of frass and wood chips produced by the feeding of the larvae. Larvae become active at the pink bud stage and emerge to feed on buds and young leaves before boring into a shoot. These larvae eventually leave the mined shoot to pupate. Adults emerge in mid- to late May. Eggs are laid on fruit, shoots, or undersides of leaves. Eggs are yellowish-white to orange. The eggs hatch, and these larvae feed and mature on shoots and immature fruit. The next adult flight is in mid-July. Part of the larvae from this flight overwinter, the rest produce a partial third flight.

Pest monitoring Check for overwintering sites on small trees. Otherwise, examine shoots in late April or early May. Wilted shoots are easy to spot, and you should open them to check for larvae.

Management—biological control
A tiny parasitic wasp that parasitizes eggs is active in orchards at shuck fall.

Management—cultural control
Cut out mined shoots below the wilted area to eliminate larvae. Overwintering larvae may be found under thin bark in branch axils and destroyed. Look for a buildup of chewed bark and frass.

Management—chemical control

See Table 4 in:
Chemical Control of Landscape Pests

For more information

Peach, flowering (Prunus)—Spider mite
Tetranychus spp.

Pest description and damage Several species of spider mites can cause damage in deciduous, evergreen and coniferous ornamentals. Appearance of these mites varies with the species, although all are 0.02 inch or smaller. Adults and nymphs can be yellowish, greenish, or reddish brown, depending on species. Female European red mites are round with red bodies; males are yellowish-red. Twospotted mites are oval and yellowish-brown or green with distinctive black spots on the body. Plants may be covered with fine silk webbing at branch axils or over sections, small plants may be engulfed in webbing under very heavy infestations. Mites damage leaves and fruit indirectly by feeding on leaves, which causes stippling, bronzing, and possibly leaf drop. The reduction in photosynthesis causes loss of vigor and yield.

For biology, life history, monitoring and management
See “Spider mite” in:
Common Landscape Pests

Management—chemical control

See Table 1 in:
Chemical Control of Landscape Pests

For more information

Rosetta, R. 2010. Peach tree borer. PNW Nursery IPM (http://oregonstate.edu/dept/nurspest/peach_tree_borer.htm)
Pear, flowering (Pyrus)—Aphid
Includes green peach aphid (Myzus persicae)

Pest description and damage  Aphids tend to be small (0.0625 to 0.125 inch long), oval to pear-shaped, soft-bodied insects with piercing–sucking mouthparts. Color varies but most aphids tend to match host plant coloration. Aphids tend to feed in colonies and are often found on the most succulent plant tissues. Feeding damage to trees is usually minor, but if heavy can compromise the vigor of the host. Aphids produce honeydew that supports the growth of a black sooty mold fungus. Some aphids are vectors of plant diseases, particularly viruses.

For biology, life history, monitoring and management
See "Aphid” in:
Common Landscape Pests

Management—chemical control
See Table 1 in:
Chemical Control of Landscape Pests

Pear, flowering (Pyrus)—Apple-and-thorn skeletonizer
Choreutis pariana

Pest description and damage  Larvae are 0.5 inch long, yellowish to greenish, with black spots and a yellow-brown head. Pupae are yellow to brown within a white silken cocoon. The larvae skeletonize and roll leaves from the tip or sides. Damaged leaves are brown and papery and drop prematurely.

Damage varies from inconsequential to serious, so monitoring is an important management tool.

For biology, life history, monitoring and management
See:
Crabapple (Malus)—Apple-and-thorn skeletonizer

Management—chemical control
See Table 2 in:
Chemical Control of Landscape Pests

Pear, flowering (Pyrus)—Cherry bark tortrix
Enarmonia formosana

Pest description and damage  CBT is a pest of most woody ornamental trees and shrubs in the family Rosaceae. The larvae are 0.33 to 0.4 inch long, pale gray to flesh-color with small, pale gray spines scattered on the surface, with a yellowish-brown head. Larvae feed directly on the cambial tissues of the tree and may cause death of the tree in sufficient numbers. Otherwise, the feeding activity decreases the supply of nutrients to the tree and increases susceptibility to disease, insect attack, and environmental stress, including cold injury. The first indication of attack is the exuding of reddish-brown, gum-like resin, which often is mixed with fecal pellets and silk. The trunk and larger limbs of bearing fruit trees are affected, usually at pruning wounds.

For biology, life history, monitoring and management
See:
Cherry (Malus)—Cherry bark tortrix

Management—chemical control
See Table 4 in:
Chemical Control of Landscape Pests

Pear, flowering (Pyrus)—Oystershell scale
Lepidosaphes ulmi

Pest description and damage  The mature scale is approximately 0.125 inch long, hard-shelled, pinkish to brownish or gray in color, and usually elongated and slightly curved like an oyster or mussel shell. Oystershell scale are found on trunks, branches, and twigs of many broad-leaved deciduous plants. They occur less frequently on the leaves and other plant parts such as the fruit. Scale infestations often are limited initially to isolated colonies on single branches or twigs. Newly emerged crawlers look like bright white pimpls on the bark.

For biology, life history, monitoring and management
See:
Ash (Fraxinus)—Oystershell scale

Management—chemical control
See Table 1 in:
Chemical Control of Landscape Pests

Pear, flowering (Pyrus)—Pear leaf blister mite
Phytoptus pyri

Pest description and damage  Adults of the pear blister mite are very tiny and can be seen only under magnification. These mites are light to amber yellow, cylindrical, tapered at the posterior end, with two pairs of short legs at the front of the body. The overall appearance is that of a small worm. Nymphs are similar in appearance to the adult but are smaller. Pear blister mite feeding on leaves causes reddish to yellowish-green blisters; blisters turn brown or black as the tissue dies later in the season. Leaves may drop prematurely. Loss of foliage weakens trees and reduces shoot growth and flowering.

Biology and life history  Blister mites overwinter as mature females under outer bud scales. As buds swell in the spring, the mites burrow inside to feed. As leaves unfurl, blisters are already evident. At petal fall, they move to more leaves or fruit, causing the characteristic blisters. Several generations per year may develop within the blisters. As they become more crowded, mites move to growing terminals, where their feeding produces more blisters. Mites move from tree to tree, perhaps by wind or carried on birds or insects.

Pest monitoring  Scouting for pear blister mite is not effective during the current season. By the time blisters are noticed, the mites are safely inside and the damage is done. Plan on taking action if broad-spectrum insecticide applications are avoided. Heavy rain and cold weather also suppress mite numbers.

Management—biological control
Phytoseiid predator mites almost always keep mites under control if broad-spectrum insecticide applications are avoided. Heavy rain and cold weather also suppress mite numbers.

Management—cultural control
Suppression of broadleaf weeds such as mallow, bindweed, white clover, and knotweed with cultivation or grasses may reduce mite numbers. Wash mites from the tree with a strong stream of water. Water trees properly, as drought-stressed trees are more susceptible. Avoid excessive nitrogen applications, as this encourages mites.

Management—chemical control
See Table 3 in:
Chemical Control of Landscape Pests
**pear, flowering (Pyrus)—Pear sawfly (pear slug)**

California pear sawfly (*Pristophora abbreviata*)

**Pest description and damage**  Pear sawfly is a European insect now found in most areas of the U.S. It attacks both pear and cherry and is found on mountain ash, hawthorn, and ornamental *Prunus*. The adult is a glossy black fly-like insect, about 0.2 inch long. The larva initially resembles a small tadpole due to the olive-green slime that covers the body, and the head being wider than the rest of the body. Mature larvae are 0.375 inch long and orange-yellow. Larvae feed on the upper surface of leaves, skeletonizing them. Heavy feeding causes leaf drop, with reduction in vigor and yield, particularly on young trees. California pear sawfly has been found occasionally defoliating pear trees. Larvae eat round holes in leaf, with extensive feeding only the midrib will remain. The larvae are bright green, closely matching the leaf color, and feed along edges of leaves. A minor pest in orchards, it can severely defoliate ornamental pears.

**Biology and life history**  Pear slug overwinters as a pupa in a cocoon 2 to 3 inches deep in the soil. Adults emerge over an extended period in late April–May. The adult female inserts eggs into leaf tissue, and eggs hatch in 10 to 15 days. Larvae immediately begin to feed on the upper surface of the leaf. After 3 to 4 weeks, they drop to the soil to pupate. Second generation adults emerge in July, and larvae from this generation feed in August and September. Most larvae from this generation drop to the ground to overwinter.

**Pest monitoring**  Watch trees for the slug-like larvae or skeletonized leaves in early spring to indicate potential for defoliation by subsequent generations, and again in August and September when large populations can build up. Watch for the caterpillar-like bright green sawflies on pear or tell-tale leaf skeletons consisting of only midrib and main veins caused by California pear sawfly.

**Management—biological control** Specific biocontrol agents are not known; but, this is rarely a pest in backyard gardens, so significant biocontrol likely occurs most years.

**Management—cultural control**

Pick off or squash individual larvae, or wash them off with a strong stream of water. Old records recommended fine road dust (or other fine powder to stick to the slimy surface and suffocate the pear slug larvae.

**Management—chemical control**

See Table 2 in:  Chemical Control of Landscape Pests

For more information

See:  Common Landscape Pests


**pear, flowering (Pyrus)—San Jose scale**

*Quadraspisidius perniciosus*

**Pest description and damage**  San Jose scale fruit trees and many ornamentals throughout the U.S., particularly in hot, dry climates. San Jose scale can be differentiated from other scale insects by the scale (shell) that covers the adult females. The scale is hard, gray to black, and cone-shaped. The scale has a tiny white knob in the center with a series of grooves or rings around it. Twigs with infested bark are roughened, rather than smooth, and twig death may occur. Often there is a purple halo on the bark around the scale. Fruit is also infested. Crawlers are flat and yellow and common in June and again in August to September.

**For biology, life history, monitoring and management**

See:  Cherry, flowering (*Prunus*)—San Jose scale

See “Scale insect” in:  Common Landscape Pests

**Management—chemical control**

See Table 1 in:  Chemical Control of Landscape Pests

**pear, flowering (Pyrus)—Tent caterpillar**

Forest tent caterpillar (*Malacosoma disstria*)

Western tent caterpillar (*Malacosoma californicum pluviale*)

**Pest description and damage**  The western tent caterpillar attacks a wide variety of plants including alder, apple, asp, birch, cherry, cottonwood, and willow, as well as fruit trees and roses. The adult moths are stout, light to darker brown, and are active in early- to mid-summer. Adults are attracted to lights at night. Western tent caterpillars are hairy, dull yellow-brown, with rows of blue and orange spots on the body. Forest tent caterpillars are black and blue with dorsal white footprints. Eggs of these moths are laid on twigs or buildings in masses and may be especially numerous around lights. The eggs are brown to gray in color, about 0.0625 inch long, and look like bits of gray, hardened foam. The larvae feed in large groups on foliage of host plants and can do significant damage by defoliation. Larvae of western tent caterpillars build moderate silken tents over leaves, but leave the tent to feed in new areas. They usually return in the evening. Both can defoliate small trees which may weaken or kill them; defoliation can reduce growth and make the trees more susceptible to competition, diseases or poor weather. Healthy trees usually will grow new leaves by midsummer.

**For biology, life history, monitoring and management**

See:  Alder (*Alnus*)—Tent caterpillar

**Management—chemical control**

See Table 2 in:  Chemical Control of Landscape Pests
**Photinia (Photinia)—Aphid**

Several species

**Pest description and damage** Several species of aphids may feed on the foliar, stem, flower, bud, bark or root tissues of broadleaf trees, shrubs. Aphids tend to be small (0.0625 to 0.125 inch long), oval to pear-shaped, soft-bodied insects with piercing–sucking mouthparts. Color varies but most aphids tend to match host plant coloration. Aphids feed in colonies and are often found on the new or most succulent plant tissues. Feeding damage to shrubs is usually minor, but can compromise the vigor of the host. When aphid populations are high, leaf and shoot distortion can occur. Aphids produce honeydew, a sweet, sticky secretion that collects on underlying plant tissues and encourages growth of a black sooty mold. Some aphids are vectors of plant diseases, particularly viruses.

**For biology, life history, monitoring and management**

See “Aphid” in:
Common Landscape Pests

**Management—chemical control**

See Table 1 in:
Chemical Control of Landscape Pests

**Photinia (Photinia)—Cherry bark tortrix**

*Enarmonia formosana*

**Pest description and damage** CBT is a pest of most woody ornamental trees and shrubs in the family Rosaceae. The larvae are 0.33 to 0.4 inch long, pale gray to flesh-color with small, pale gray spines scattered on the surface, with a yellowish-brown head. Larvae feed directly on the cambial tissues of the tree and may cause death of the tree in sufficient numbers. Otherwise, the feeding activity decreases the supply of nutrients to the tree and increases susceptibility to disease, insect attack, and environmental stress, including cold injury. The first indication of attack is the exuding of reddish-brown, gum-like resin, which often is mixed with fecal pellets and silk. The trunk and larger limbs of bearing fruit trees are affected, usually at pruning wounds and graft unions.

**For biology, life history, monitoring and management**

See:
Cherry (Malus)—Cherry bark tortrix

**Management—chemical control**

See Table 4 in:
Chemical Control of Landscape Pests

**Photinia (Photinia)—Root weevil**

Numerous species

**Pest description and damage** Species identification is important as root weevil species differ in susceptibility to pesticides and can have different life cycles. Adult weevils are small dark nocturnal beetles with a snout (rostrum) and elbowed antennae. Larvae are rarely a problem in landscapes. Look for ragged notches on the edges of leaves, or flower petals or dead tips of plants where weevils have girdled the twig.

**For biology, life history, monitoring and management**

See “Root weevil” in:
Common Landscape Pests

**Management—chemical control**

See Table 2 in:
Chemical Control of Landscape Pests

**Photinia (Photinia)—Scale insect**

Lecanium scale (*Lecanuni spp.*)
Oystershell scale (*Lepidosaphes ulmi*)
San Jose scale (*Quadraspidiotus perniciosus*)

**Description, biology and management** Small soft insects with various scale coverings. Identify scale based on scale known from the host, and the description of the male, female and crawler shapes and color of eggs and crawlers.

**For biology, life history, monitoring and management**

See:
Ash (Fraxinus)—Lecanium scale
Ash (Fraxinus)—Oystershell scale
Cherry, flowering (*Prunus*)—San Jose scale

See “Scale insect” in:
Common Landscape Pests

**Management—chemical control**

See Table 4 in:
Chemical Control of Landscape Pests

**Pine (Pinus)—Black pineleaf scale**

*Nuculaspis californica*

**Description, biology and damage** Mature scale are almost circular, 0.06 inch in diameter, and yellowish brown to black. Young hatch in spring and summer. Scale feeding is restricted to the needles and results in their becoming splotched with yellow patches. Heavy infestations cause premature needle drop and may result in death of the tree. Affected trees often display a thin crown, yellow or reddish coloration, and a shortening of the needles. This insect attacks various species of pine, ponderosa most commonly, as well as Douglas-fir and hemlock.

**For biology, life history, monitoring and management**

See “Scale insect” in:
Common Landscape Pests

**Management—chemical control**

See Table 4 in:
Chemical Control of Landscape Pests

**Pine (Pinus)—Coneworm and shoot moth**

*Dioryctria spp.*

**Pest description and damage** Adult coneworms are mottled gray snout moths banded with subtle colors. The coneworm larvae are small and cream-colored or light brown with a darker head. Coneworms attack true firs by boring into shoot tips or stems, especially around wounds, and feeding on the soft bark tissues. The portion of the branch beyond the injured point may die back. Coneworms also may bore into green cones, feed on the soft bark of young growth, or feed inside the bark on the trunk cambium. There are many species of *Dioryctria* which feed on different parts of small plants, trunk and shoots as well as cones.

**For biology, life history, monitoring and management**

See:
Douglas-fir (*Pseudotsuga*)—Coneworm

**Management—chemical control**

See Table 4 in:
Chemical Control of Landscape Pests
Pine (Pinus)—Eriophyid mite
Trisetacus spp.

**Pest description and damage** Eriophyid mites are tiny, elongated, whitish or tan mites that feed under bud scales or in the needle sheaths, often down in the fascicles at the needle base. Two types of symptoms of eriophyid mite feeding are browning of the newly emerging shoots and yellowing, twisting, distortion, and stunting of needles. Occasionally there is development of numerous buds where a single bud has been infested (rosetting). Severe infestations may kill needles and cause needle drop, leaving naked branch tips. Rosettes may develop into witches’ broom growths. Two-needle pines, particularly lodgepole or shore pine, are affected.

**Biology and life cycle** Little is known about these pests. They presumably overwinter as eggs deep in the needle fascicles and hatch in spring as new growth begins.

**Management**

- **Cultural control**
  - Prune out heavily infested branch tips.

- **Chemical control**
  - See Table 3 in: Chemical Control of Landscape Pests

**For more information**

Pine (Pinus)—European pine shoot moth
Rhyacionia buoliana

**Pest description and damage** Adult moths are reddish-orange with silver markings on the wings. The mature larvae are about 0.63 inch long and reddish-brown with black heads. The larvae of the European pine shoot moth feed on the terminal buds. They first bore into needles or base of the bud. Next the larva bores partially into the buds and weaves a small web between the two, and seals it with pitch. Eventually the infested buds are covered with what appears to be a glob of pitch, but it is hollow. As the bud develops, the injured side cannot grow, so the non-injured side grows faster and elongating shoots develop a characteristic “shepherd’s crook.” The larvae will bore down into the shoot at the base of the elongating shoot that then turns brown. All pines are susceptible, especially two- and three-needle species. This pest is of cosmetic concern to pine tree exporters and landscape plants. This insect is also under quarantine in some areas and that increases costs to ship greens or Christmas trees to non-infested areas.

**Biology and life history** This insect overwinters as larvae in the mined buds, covered with resin-coated webs. Each larva may infest several buds throughout its growth. In spring, the adult moths emerge and lay eggs on needles near leaf bases in the late spring. The larvae hatch and mine the needle, which then turns yellow or brown. By midsummer, the larvae change buds and mine both buds and shoots below the bud. They spend winter protected inside the infested bud or shoot and emerge the following spring in about a few days, the small white larvae excavate short feeding tunnels at right angles to the gallery. When fully grown, the larvae construct small pupal cells at the ends of the larval mines and then emerge as adults the next spring. One generation per year is the general rule.

**Pest monitoring** Look for pitch tubes and red boring dust in bark crevices and on the ground.

**Management**

- **Cultural control**
  - Healthy trees are better able to resist borer infestations, so use proper watering, fertilizing, and pruning practices. Remove heavily infested trees to protect healthy adjacent ones.

- **Chemical control**
  - See Table 4 in: Chemical Control of Landscape Pests

**Pine (Pinus)—Mountain pine beetle**
Dendroctonus ponderosae

**Pest description and damage** Adults are black and about 0.25 inch long. Larvae are white and found under the bark in straight galleries. The mountain pine beetle attacks pine trees (trunks and branches) 4 or 5 inches in diameter or larger. The adults and larvae mine the bark, weakening and girdling trees. Heavily infested trees may decline or die. Red sawdust on the bark and ground and pitching on the trunk or large branches may indicate the presence of these bark beetles. Bark beetles typically attack weakened trees. Lodgepole pine is the preferred host, but other pines also are attacked. This insect is ranked as the most destructive of the bark beetles.

**Biology and life history** The insects overwinter as larvae or adults under the bark of the host tree. In the spring, adults emerge, fly to a new host tree and excavate galleries in the bark. Eggs are deposited singly along the gallery on alternate sides. When the eggs hatch in a few days, the small white larvae excavate short feeding tunnels at right angles to the gallery. When fully grown, the larvae construct small pupal cells at the ends of the larval mines and then emerge as adults the next spring. One generation per year is the general rule.

**Pest monitoring** Look for pitch tubes and red boring dust in bark crevices and on the ground.

**Management**

- **Cultural control**
  - Healthy trees are better able to resist borer infestations, so use proper watering, fertilizing, and pruning practices. Remove heavily infested trees to protect healthy adjacent ones.

- **Chemical control**
  - See Table 4 in: Chemical Control of Landscape Pests

**Pine (Pinus)—Pandora moth**
Coloradia pandora

**Pest description and damage** The adult is a large, brown-gray, heavy-bodied moth with black markings on the wings. Pandora moth larvae are brownish- to yellowish-green, spiny, and about 1 inch long at maturity. The larvae feed on the needles of pines, especially ponderosa, Jeffrey, and lodgepole. The stubs of eaten needles remain on the twigs, and the crowns of infested trees often are thinned. The larvae may cause severe defoliation when there are large outbreaks. They travel in single file when moving to new locations.
feeding areas. This is a sporadic pest of forest and landscape trees.

**Biology and life history** The adult moths emerge in midsummer and lay eggs on pine needles or bark. The larvae emerge and feed on new foliage throughout the summer. They overwinter on the tree in clusters, then resume feeding in spring. They drop to the soil to pupate. Pupation lasts for at least 1 year. Control is not needed except in outbreak years.

**Pest monitoring** Be alert for signs that the population is growing: increased defoliation or clusters of larvae in the winter.

**Management—cultural control**
Prune out severely defoliated sections of the tree. Pick larvae by hand if found. These larvae were considered a delicacy among the tribes in areas where they are found.

**Management—chemical control**

*See Table 2 in:*
Chemical Control of Landscape Pests

**For more information**

*See “Aphid” in:*
Common Landscape Pests

**Pine (Pinus)—Pine aphid**
*Cinara strobi*

**Pest description and damage** *Cinera* species are generally large aphids. These soft bodied insects have piercing–sucking mouthparts. Many of the pine aphids tend to be waxy and feed in colonies. They are often found on the bark or underside of branches and twigs or among needles. Feeding damage to mature plants is usually minor, but it can compromise the vigor of small trees. Often the first indication that aphids are present is the large number of yellowjackets that are foraging among the foliage for honeydew. Some of the branches may appear flocked with white waxy material. Infestations are often sudden but brief.

*For biology, life history, monitoring and management*

*See Table 2 in:*
Chemical Control of Landscape Pests

**Management—chemical control**

*See Table 1 in:*
Chemical Control of Landscape Pests

**Pine (Pinus)—Pine bark adelgid**
*Pineus strobi*

**Pest description and damage** This adelgid feeds on the bark of pines and spruce. They appear woolly and may be confused with woolly aphid species. Pine bark adelgids form woolly or cottony white masses on the trunk, branches, or twigs. The adelgids are black and short-legged under the white material. Heavy infestations can look like snow on the trunks of trees. Seedling and young trees may have adelgids at the base of the needles or on shoots instead of on the trunks. Needles often become somewhat yellowish (chlorotic). Severe adelgid infestations can result in stunting or death of trees.

**Biology and life history** The insect overwinters in an immature state on the tree. As the weather warms, they secrete waxy material over their bodies in woolly tufts. Small clusters of eggs are laid in the tufts in early spring. Crawlers emerge and move to other parts of the tree or are blown or carried to other hosts.

**Pest monitoring** Begin observing shoots prior to budbreak, looking for white cottony insects on the bark of the trunk or undersides of branches. Confirm by checking leaves. Check for presence of natural enemies.

**Management—biological control**
Encourage natural predators including lady beetles and lacewings. Check colonies to determine if there are live adelgids or crawlers.

**Management—cultural control**
Hand-wipe or use a stiff brush to control small infestations where possible. Wash adelgids from trunks and foliage with a strong stream of water. Where practical, remove and destroy heavily infested branches and trees.

**Management—chemical control**

*See Table 1 in:*
Chemical Control of Landscape Pests

**Pine (Pinus)—Pine white butterfly**
*Neophasia menapia*

**Pest description and damage** Adult pine butterflies are white with black markings and closely resemble the cabbage butterfly; females have a yellow cast to the forewings. Females lay emerald green eggs along needles tilted at a 45° angle. The larva of the pine butterfly is a dark green caterpillar with white stripes on the sides and a black head. The caterpillars feed gregariously on the needles: young larvae feed in clusters on the older needles, while older larvae feed in smaller groups or singly. They cause relatively little damage except in years of severe outbreaks. They feed high in the canopy so damage, unless severe, is rarely noticed. Their preferred host tree is ponderosa pine, but they are common in western white pine. Adults are also commonly seen flying around Douglas-fir. In Eastern Washington, the larvae of this butterfly have caused significant defoliation in pine forests.

**Biology and life history** The insect overwinters as eggs on pine needles in the upper canopy. In the late spring, the larvae emerge and begin to feed on the new needles as they begin to appear. They pupate in a chrysalis suspended by silk in the tree or underlying vegetation. In mid- to late summer, the adults fly and females lay their eggs.

**Management—cultural**
Because of their preference for tree tops, cultural controls in landscape settings are not practical. On small trees, larvae can be picked off and destroyed.

**Management—biological**
Butterflies are often kept to low numbers by the many parasites specializing in Lepidoptera. Presumably, crown feeding birds also would feed on them.

**For biology, life history, monitoring and management**

*See “Caterpillar” in:*
Common Landscape Pests

**Management—chemical control**

*See Table 2 in:*
Chemical Control of Landscape Pests
**Pine (Pinus)—Pine needle scale**  
*Chionaspis pinifoliæ*

**Pest description and damage** Pine needle scale are elongate, pure white scale which feed on the needles. The scale beneath the covering are reddish-orange, with rusty colored eggs. Heavily infested trees may appear crusted with white. Infested needles turn yellow, then brown. Twigs and branches may be killed. Repeated infestations may kill trees eventually. Pine needle scale often are found with the black pine leaf scale, which are gray to black instead of white. Pine needle scale also infest ornamental pines, arborvitaes, cedar, hemlock, spruce and Douglas-fir.

**Biology and life history** The insect overwinters as eggs beneath the female scale cover. The eggs hatch in May or June, and the reddish crawlers migrate to a new part of the host tree or are blown or carried to new hosts. One or two generations occur, depending on location. If there are two generations, second generation crawlers are found by midsummer.

**Pest monitoring** Check pines that appear yellowish or unthrifty. Look for white scale protected inside the curved interior of the needle bundles. Occasionally trees are visibly white with scale. Since scale insects don’t fall off, check to be sure that the scale are still present under the scale-covering or that crawlers are on the foliage before initiating pesticide application.

**Management—cultural control**
Keep plants healthy with proper watering. Populations are reported to build more rapidly on stressed or dusty plants.

**Management—biological control**
Small numbers are easily tolerated and provide food for parasitoids which keep this scale in check. Parasitoids, lady beetles, and birds feed on this scale. Holes in scale are made by exiting parastoids. The whitish residue on the needle indicates where a scale has been eaten; both are evidence of natural enemies at work.

**Management—chemical control**

*See Table 1 in:*
Common Landscape Pests

**For more information**
*See also “Scale insect” in:*
Common Landscape Pests


**Pine (Pinus)—Pine needle sheath miner**  
*Zelleria haimbachii*

**Pest description and damage** Adult pine needle sheath miners are silvery moths about 0.5 inch across. Young larvae are bright orange with a black head. Older larvae are tan-color and 0.5 inch long. Young larvae mine inside needles, while older larvae feed at the base of needles inside the needle sheath. Damaged needles often droop or stick out from the stem at a sharp angle. Pine sheath miners attack species and hybrids of two- and three-needle pines and western white pine; and seem to prefer smaller trees.

**Biology and life history** The insect overwinters as an immature larva within the needle sheath. In spring, feeding resumes and the larva pupates on the shoot tip. Adults lay eggs on needles from early to midsummer. There is one generation per year.

**Pest monitoring** Look beneath trees for clusters of needles bound together to form a tube, or on branches for needles bound together rather than fanned out.

**Management—cultural control**
On smaller trees, prune out and destroy heavily infested branch tips or needle clusters in early spring.

**Management—chemical control**

*See Table 3 in:*
Chemical Control of Landscape Pests

**Pine (Pinus)—Pine sawfly**

*Includes Neodiprion nanulus contortae*

**Pest description and damage** Larvae are yellow-green with black heads and about 0.63 inch long when fully grown. Female adults are about 0.38 inch long and are yellow-brown. Males are slightly smaller and mostly black. Larvae can strip all old needles from trees. New foliage is not eaten. Mortality and top kill can occur on large ponderosa pines after 2 years of heavy defoliation. Defoliation may be similar to that of pine butterfly. Larvae and adults are distinctly different, however.

**Biology and life history** Pine sawfly overwinters as eggs inside slits in pine needles. Eggs hatch from late May to early June and larvae feed gregariously on old foliage into July. Last instars drop to the ground and pupate in papery, tough cocoons in the duff. Adults emerge from late September to late October and lay eggs in niches cut in needles.

**Management—biological control**
Sawflies are subject to various viral and fungal diseases. Rodents and birds are important predators, but outbreaks can still occur.

**Management—chemical control**

*See Table 2 in:*
Chemical Control of Landscape Pests

**For more information**
*See “Sawfly” in:*
Common Landscape Pests

**Pine (Pinus)—Powdery pine needle aphid**  
*Eulachnus rileyi*

**Pest description and damage** A powdery gray aphid that occurs all season and can causes early needle drop.

**For biology, life history, monitoring and management**

*See “Aphid” in:*
Common Landscape Pests

**Management—chemical control**

*See Table 1 in:*
Chemical Control of Landscape Pests
Pine (Pinus)—Sequoia pitch moth

*Synanthedon sequoiae*

**Pest description and damage** The adult is a clearwing moth with yellow and black markings resembling yellowjacket wasps. The larvae are about 1 inch long, yellowish, with a reddish-brown head. Larvae feed by boring into branches or trunks. At the point where the larva enters the wood, small to large masses of creamy yellow to pinkish pitch accumulate. The larva feeds locally underneath the pitch mass. This pest causes mainly aesthetic damage because of the pitch masses. They do not attack sequoia, the coast redwood.

**Biology and life history** Eggs are laid on the bark of host trees. The larvae bore into the inner bark and establish a feeding site. The feeding site can be distinguished easily by the large accumulation of pitch and frass on the exterior of the bark. Pupation takes place within this mass, and the adult moths fly through the summer months. About half the population completes its life cycle in 1 year; the other half requires 2 years.

**Pest monitoring** Periodically check pitch masses for the partially emerged pupa case. If the moth has emerged the pupal case will be papery and empty. Pheromone traps are available to time adult activity and physically remove males.

**Management—cultural control**

Healthy trees are not commonly attacked. Infestations often are associated with pruning wounds or mechanical damage to the tree. Trees pruned or wounded in the spring and summer when adult moths are flying are far more likely to be attacked than those pruned or injured in the fall and winter. The moths also may be attracted to trees undergoing stresses associated with drought or saturated soil. Remove pitch masses by hand or dig out larvae with a knife.

**Pine (Pinus)—Root weevil**

Various species

**Pest description and damage** Identification is important: species differ in susceptibility to pesticides. Adult weevils are small dark nocturnal beetles with a snout (rostrum) and elbowed antennae. Look for ragged notches on the edges of leaves, or flower petals. Larvae are C-shaped, legless, and white, sometimes reddish, with tan heads, up to 0.5 inch in size. Larvae are rarely a significant problem in established landscapes.

**For biology, life history, monitoring and management**

See “Root weevil” in: Common Landscape Pests

**Management—chemical control**

See Table 2 in: Chemical Control of Landscape Pests

**Pine (Pinus)—Spider mite**

*Oligonychus* spp.

*Tetranychus* spp.

**Pest description and damage** Several species of spider mites can cause damage in coniferous ornamentals. Appearance of these mites varies with the species, although all are 0.02 inch or smaller. Adults and nymphs can be yellowish, greenish, or reddish brown, depending on species. Spider mites are oval and yellowish-brown or green with distinctive black spots on the body. Plants may be covered with fine silk webbing at branch axils or over sections, and small plants may be engulfed in webbing under very heavy infestations. Mites damage cone production indirectly by feeding on needles, which causes stippling, bronzing, and possibly needle drop. The reduction in photosynthesis causes loss of vigor and yield.

**For biology, life history, monitoring and management**

See “Spider mite” in: Common Landscape Pests

**Management—chemical control**

See Table 1 in: Chemical Control of Landscape Pests

**Pine (Pinus)—White pine weevil**

*Pissodes strobi*

**Pest description and damage** White pine weevils are brown beetles with snouts and elbowed antennae. These weevils have rusty-colored wing covers with black and white patches. Adults grow to about 0.5 inch long and feed on shoots and needles of pines and spruces. The larvae feed on needles and mine shoot tips, often distorting or killing the terminals and causing trees to appear deformed. Infested terminals often develop a “shepherd’s crook” appearance. The weevil attacks eastern white pine (*Pinus strobus*), Sitka spruce (*Picea sitchensis*), and a wide variety of other pines and spruce and even Douglas-fir.

**Biology and life history** Adult beetles overwinter in litter on the ground. In the spring, adults walk or fly to host trees, where they settle on the leader to mate. Eggs are deposited in a cavity made by the female chewing with her snout into the bark of the tree. The eggs hatch, and the larvae commence feeding in the bark, killing the leader. As they feed, the current season’s growth is emerging, but this soon collapses, causing the characteristic “shepherd’s crook.” The larvae then bore into the wood to pupate. The adult weevils emerge in late summer (around mid-August into fall) and overwinter in organic debris on the ground. There is one generation per year.

**Management—cultural control**

Prune and destroy affected terminals in the summer before adult beetles emerge. This will help reduce next year’s infestation.

**Management—chemical control**

See Table 2 in: Chemical Control of Landscape Pests

**Pine (Pinus)—Woolly pine needle aphid**

*Schizolachnus piniradiatae*

**Description, biology and damage** Woolly pine needle aphids are long-legged, dark green or brown and covered with a white, woolly material. The aphid can be found in colonies among the needles. The aphid produces large amounts of honeydew (a sweet, sticky material) which often is covered by a black growth of sooty mold. Heavy aphid infestations may cause trees to turn yellowish, but otherwise cause only minor damage. Honeydew attracts ants and yellowjackets and bald faced hornets.

**For biology, life history, monitoring and management**

See “Aphid” in: Common Landscape Pests

**Management—chemical control**

See Table 1 in: Chemical Control of Landscape Pests
Plum, flowering (Prunus)—Aphid
Hop aphid (Phorodon humuli)
Leaf curl plum aphid (Brachycerus helichrysi)

Description, biology and damage Hop aphids are soft-bodied and yellowish to bluish-green, oval insects. Their feeding causes leaves to roll. Typically, the aphids are found on the underside of plum leaves, or inside the rolled leaves. Heavily infested plants may drop leaves, resulting in severe defoliation. The leaf curl plum aphid is typically pale green to yellow in color during the summer and darker green to brown later in the year. Feeding by the leaf curl plum aphid causes severe curling of leaves on plum.

Biology and life history The aphid overwinters as eggs in crevices and twigs on plum, prune, or cherry. The eggs hatch near budbreak and the nymphs feed on unopened buds and the underside of the leaves. The leaves curl and protect the aphid as they feed. After two to three generations, winged forms are produced that migrate to summer hosts, which include weeds, ornamental plants, and vegetables. Following several more generations, the winged forms migrate back in the fall to the fruit trees to mate and lay the overwintering eggs. Some aphids remain on the winter host all year round.

For biology, life history, monitoring and management
See “Aphid” in:
Common Landscape Pests

Management—chemical control
See Table 1 in:
Chemical Control of Landscape Pests

Plum, flowering (Prunus)—Cherry tortrix
Enarmonia formosana

Pest description and damage CBT is a pest of most woody ornamental trees and shrubs in the family Rosaceae. The larvae are 0.33 to 0.4 inch long, pale gray to flesh-color with small, pale gray spines scattered on the surface, with a yellowish-brown head. Larvae feed directly on the cambium under the tree bark and may cause death of the tree in sufficient numbers. Otherwise, the feeding activity decreases the supply of nutrients to the tree and increases susceptibility to disease, insect attack, and environmental stress, including cold injury. The first indication of attack is the exuding of reddish-brown, gum-like resin, which often is mixed with fecal pellets and silk. The trunk and larger limbs of bearing fruit trees are affected, usually at pruning wounds.

For biology, life history, monitoring and management
See:
Cherry (Malus)—Cherry bark tortrix

Management—chemical control
See Table 4 in:
Chemical Control of Landscape Pests

Plum, flowering (Prunus)—Peachtree borer
Synanthedon exitiosa

Pest description and damage The adult is a metallic blue-black, clearwing moth. The male moth may have bands of light yellow scale on the abdomen, which makes it resemble a wasp. The female has an orange band around the abdomen. Full-grown larvae are 1 inch long and whitish with a brown head. The larvae burrow into the bark of the crown and feed on the cambium. Feeding is restricted to an area a few inches above and below the soil line. Young trees can be completely girdled and killed. Older trees rarely are girdled, but the feeding reduces vigor and makes them vulnerable to other pests and diseases. Infested trees exude a reddish-amber gum and frass mixture at the root crown throughout the growing season.

For biology, life history, monitoring and management
See:
Peach, flowering (Prunus)—Peachtree borer

Management—chemical control
See Table 4 in:
Chemical Control of Landscape Pests

Plum, flowering (Prunus)—Peach twig borer
Anarsia lineatella

Pest description and damage Peach twig borer is a European insect first found in California in the 1880s. It is a major pest of apricots, peaches, plums, and prunes. There are no native hosts outside the orchard. The adult is a steel-gray moth with white and dark scale, about 0.33 to 0.5 inch long. The larva is a caterpillar, approximately 0.5 inch long, with a dark brown head and distinctive, alternating light and dark bands on the body. The pupa is smooth and brown. The larva of the borer causes injury to fruit and trees. Feeding on the buds and twigs occurs early in the season, after which the larva bores into the shoots, causing a characteristic “flagging” or wilting of the new growth. Later generations of larvae feed on shoots or fruit, disfiguring the fruit.

For biology, life history, monitoring and management
See:
Peach (Persica)—Peach twig borer

Management—chemical control
See Table 4 in:
Chemical Control of Landscape Pests

Plum, flowering (Prunus)—Pear sawfly (pear slug)
Caliroa cerasi

Pest description and damage Pear slug is found in most areas of the U.S. It attacks pear, cherry and other ornamental Prunus. The adult is a glossy black fly-like insect, about 0.2 inch long. The larva initially resembles a small tadpole due to the olive-green slime that covers the body, and the head being wider than the rest of the body. Mature larvae are 0.375 inch long and orange-yellow. Larvae feed on the upper surface of leaves, skeletonizing them. Heavy feeding causes leaf drop, with reduction in vigor and yield, particularly on young trees.

For biology, life history, monitoring and management
See:
Pear, flowering (Pyrus)—Pear sawfly (pear slug)

Management—chemical control
See Table 2 in:
Chemical Control of Landscape Pests
Plum, flowering (Prunus)—Scale
Lecanium scale (Lecanium spp.) and numerous other species

Pest description and damage Adult female scale live under a shell-like covering that may resemble a "volcano," "barnacle," "hemispherical bump," "cotton puffs," "oyster" or even flat, soft and naked, and within various dull colors and markings. They are often found attached along the branches, twigs, leaves or needles or even fruit. Most scale insects measure from 0.0625 to 0.25 inch long. Occasionally scale build up large enough numbers to cause damage to the host plant. These insects have piercing–sucking mouthparts that they inject into plant tissues to feed on plant juices. Large populations of scale can devitalize plants and retard growth, as well as discolor the foliage. Severe infestations can kill twigs. In many cases, large quantities of honeydew are produced, which makes leaves and fruit shiny and sticky. Sooty mold fungus may grow on the honeydew giving the plants a dirty, sooty appearance.

For biology, life history, monitoring and management
See “Scale insect” in:
Common Landscape Pests

Management—chemical control
See Table 1 in:
Chemical Control of Landscape Pests

Plum, flowering (Prunus)—Tent caterpillar
Forest tent caterpillar (Malacosoma disstria)
Western tent caterpillar (Malacosoma Californicum Pavalicium)

Pest description and damage The western tent caterpillar attacks a wide variety of plants including alder, apple, ash, birch, cherry, cottonwood, and willow, as well as fruit trees and roses. The adult moths are stout, light to darker brown, and are active in early- to mid-summer. Adults are attracted to lights at night. Western tent caterpillars are hairy, dull yellow-brown, with rows of blue and orange spots on the body. Forest tent caterpillars are black and blue with dorsal white footprints. Eggs of these moths are laid on twigs or buildings in masses and may be especially numerous around lights. The eggs are brown to gray in color, about 0.0625 inch long, and look like bits of gray, hardened foam. The larvae feed in large groups on foliage of host plants and can do significant damage by defoliation. Larvae of western tent caterpillars build moderate silken tents over leaves, but leave the tent to feed in new areas. They usually return in the evening. Both can defoliate small trees which may weaken or kill them; defoliation can reduce growth and make the trees more susceptible to competition, diseases or poor weather. Healthy trees usually will grow new leaves by midsummer.

For biology, life history, monitoring and management
See:
Alder (Alnus)—Tent caterpillar

See “Caterpillar” in:
Common Landscape Pests

Management—chemical control
See Table 2 in:
Chemical Control of Landscape Pests

Poplar (Populus)—Aphid
Includes
Lettuce root aphid (Pemphigus bursarius)
Poplar petiole gall aphid (Pemphigus populitransversus)
Pemphigus populicauis

Pest description and damage There are nearly a dozen aphids that feed on poplar leaves, petioles, stems, and bark. Many have herbaceous alternate hosts such as the poplar-lettuce root aphid. This aphid can be distinguished from other aphids by their short antennae (less than one-third body length) and undeveloped cornicles. These aphids feed on the leaf petioles, or along the midrib causing these tissues to enlarge and enclose the aphids. The hard, pale green, rounded galls form along the petiole or at the base of the leaf or as a swelling along the midvein. Aphids inside the galls appear grayish and waxy. The leaves are not damaged, but may be turned at right angles to the petiole. Aphids cause little damage to poplars but may be serious pests to their summer hosts such as mustard, buttercup, lettuce, turnip, beet and sugar beet, and aster.

Biology and life history Where lettuce or related weeds are not available, these aphids overwinter in the egg stage on the bark of Lombardy poplar. They develop to adults and reproduce once on poplar before migrating to summer hosts in the Brassica or Aster families. In late summer, winged forms reappear, and these migrate back to poplar to mate and lay eggs.

For biology, life history, monitoring and management
See “Aphid” in:
Common Landscape Pests

See “Gallmakers” in:
Common Landscape Pests

Management—chemical control
See Table 1 in:
Chemical Control of Landscape Pests

Poplar (Populus)—Azalea bark scale
Eriococcus azalea

Pest description and damage This scale superficially resembles mealybugs in appearance. Mature female scale are about 0.125 inch long and appear like white cottony sacs, often located on twigs and stems of azalea, especially in branch axils. Eggs, crawlers and the scale under the wax are red.

For biology, life history, monitoring and management
See:
Azalea (Rhododendron)—Azalea bark scale

See “Scale insect” in:
Common Landscape Pests

Management—chemical control
See Table 1 in:
Chemical Control of Landscape Pests

PNW Insect Management Handbook
Poplar (Populus)—Carpenterworm  
*Prionoxystus robiniae*  
**Pest description and damage**  
Carpenterworms are the larvae of a large mottled gray and black moth (goat moth). The caterpillars are white to pinkish-red with a dark head and are 1 to 3 inches long when mature. The caterpillars bore in the trunk and main branches. Discolored or bleeding limbs, branch dieback, and lumpy or gnarled trunks may be indications of carpenterworm infestation. Trees with severe carpenterworm infestations are susceptible to wind breakage and may need to be removed. Infestations may kill trees eventually.

**For biology, life history, monitoring and management**  
See:  
Cottonwood (Populus)—Carpenterworm

**Management—chemical control**  
See Table 4 in:  
Chemical Control of Landscape Pests

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Poplar (Populus)—Fall webworm  
*Hyphantria cunea*  
**Pest description and damage**  
Large silken tents filled with caterpillars, frass and dead leaves, eventually engulf entire branches of deciduous trees. Young caterpillars are pale greenish or yellow with a dark stripe down the back and a yellow stripe along the sides. Long silky hairs arise from yellow and black tubercles. When mature, the caterpillars are covered with yellow, rusty then black colored silky hairs. Adults are bright white with orange and black markings on the underside of the abdomen. Woolly scales cover masses of 200 to 500 greenish eggs.

**For biology, life history, monitoring and management**  
See:  
Cottonwood (Populus)—Fall webworm

See “Caterpillar” in:  
Common Landscape Pests

**Management—chemical control**  
See Table 2 in:  
Chemical Control of Landscape Pests

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Poplar (Populus)—Oystershell scale  
*Lepidosaphes ulmi*  
**Pest description and damage**  
The mature scale is approximately 0.125 inch long, hard-shelled, pinkish to brownish or gray in color, and usually elongated and slightly curved like an oyster or mussel shell. Oystershell scale are found on trunks, branches, and twigs of many broad-leaved deciduous plants. They occur less frequently on the leaves and other plant parts. Scale infestations often are limited initially to isolated colonies on single branches or twigs. Newly emerged crawlers look like bright white pimplles on the bark.

**For biology, life history, monitoring and management**  
See:  
Ash (Fraxinus)—Oystershell scale

See “Scale insect” in:  
Common Landscape Pests

**Management—chemical control**  
See Table 1 in:  
Chemical Control of Landscape Pests

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Poplar (Populus)—Poplar-and-willow borer  
*Cryptorhyncus lapathi*  
**Pest description and damage**  
The adult poplar-and-willow borer is a black and pink to cream-colored weevil (a flightless snout beetle) about 0.375 inch long. The larvae are white, legless, and about 0.25 inch long at maturity. Larvae feed by mining beneath the bark of trunk and branches. In late summer, feeding larvae expel large quantities of sawdust-like frass (excrement) through holes in the bark accompanied by flow of a thin sap. Larval feeding may girdle branches, resulting in breakage, leaf wilt or eventual branch death. Severe infestations cause lumpy, swollen bark, with cracks and bark scars with exposed wood. Old wood may produce large numbers of new shoots. Willows are the preferred host, but the poplar-and-willow borer also attacks poplars. The adults chew small holes in the bark of twigs and shoots, introducing a fungus which may cause shoots to wilt. This insect has become a serious problem in hybrid poplar plantations, and in willows grown for the cut flower industry and restoration plantings. In landscapes, damage is most common on native willows.

**For biology, life history, monitoring and management**  
See:  
Willow (Salix)—Poplar-and-willow borer

**Management—chemical control**  
See Table 4 in:  
Chemical Control of Landscape Pests

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Poplar (Populus)—Rose leafhopper  
**Includes**  
*Edwardsiana rosae*  
**Pest description and damage**  
Rose leafhoppers are small, active, whitish-green insects which run forward, backward or sideways when disturbed. The nymphs (immature) are white with red eyes. Rose leafhoppers feed on the leaves, causing white or pale blotches that resemble, but are larger than, spider mite stippling. Infected leaves may drop prematurely. The egg-laying in the fall also wounds the canes, providing entry points for fungal pathogens. Cast skins can be found on the undersides of leaves. Leafhopper damage is mainly aesthetic.

**For biology, life history, monitoring and management**  
See:  
Rose (Rosa)—Rose leafhopper

See “Leafhopper” in:  
Common Landscape Pests

**Management—chemical control**  
See Table 1 in:  
Chemical Control of Landscape Pests

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Poplar (Populus)—Satin moth  
*Leucoma salicis*  
**Pest description and damage**  
The adult moth is satiny white with black markings on the legs. Larvae are approximately 2 inches long when grown and reddish brown with double white patches on top and tufts of hairs along the sides. They can seriously defoliate cottonwood, poplar, and willow. They occasionally attack oak and aspen, Lombardy poplar and silver maple.

**Biological and life history**  
The insect overwinters as larvae in a small silken cocoon attached to the trunk or branch of the host tree. The larvae become active and feed after leaves have fully formed in the spring. After pupation, the adult moth emerges in midsummer.
The adult moths are attracted to lights. The females lay eggs in masses on host plants, often on the leaves but also on bark. After hatching, the young larvae feed until fall, then hibernate. There is one generation per year.

**Pest monitoring** Watch for signs of skeletonizing by the newly hatched larvae in fall and resumption of feeding in early spring as new growth develops.

**Management—biological**

Look for evidence of parasitoid wasp cocoons in the bark crevices. There are native as well as four introduced parasitoids in Canada. Parasitoids may cause the sudden decline in numbers just when defoliation is greatest and larvae are most noticeable and abundant. All the more important to monitor for parasitoids at that time.

**Management—cultural control**

Larvae and pupae may be removed from affected leaves. Remove heavily infested twigs. Use light to attract females to small host trees so that caterpillars can be monitored to determine hatch and feeding or controlled more easily.

**Management—chemical control**

See Table 2 in: Chemical Control of Landscape Pests

For more information

See “Caterpillar” in: Common Landscape Pests

Hortsense. Satin Moth (http://pep.wsu.edu/hortsense/scripts/query/displayProblem.asp?tableName=plant&problemID=617&categoryId=1)

Satin Moth (http://www.forestry.ubc.ca/fetch21/FRST308/lab5/leucoma_saliciis/satin.html)

**Privet (Ligustrum)—Lilac leafminer**

*Caloptilia syringella*

**Pest description and damage** The adult insect is a golden yellow moth about 0.5 inch long. The larvae are small, pale yellow to green caterpillars, 0.125 to 0.25 inch long. The larvae mine leaves during the early part of their development. Later larval instars are responsible for rolling and skeletonizing leaves.

**For biology, life history, monitoring and management**

See: Lilac (*Syringa*)—Lilac leafminer

Common Landscape Pests

**Management—chemical control**

See Table 3 in: Chemical Control of Landscape Pests

**Privet (Ligustrum)—Thrips**

*Frankliniella spp.*

**Pest description and damage** Several species of thrips cause injury to many woody ornamentals. All are very small insects, less than 0.05 inch long. Color varies from reddish-yellow to mid-dark brown. Winter populations are darker in color. Thrips have rasping mouthparts and damage plants by sucking on the contents of plant cells. Thrips can damage flower buds, opened flowers, and leaf buds. Damage to flowers appears as streaking in the blossoms and a reduced flower life. Damage to foliage is particularly noticeable if it occurs in the bud stage. In this case, leaves typically are distorted and may be flecked with yellow pollen.

**For biology, life history, monitoring and management**

See “Thrips” in: Common Landscape Pests

**Management—chemical control**

See Table 1 in: Chemical Control of Landscape Pests

**Quince, flowering (Cydonia)—Cherry bark tortrix**

*Enarmonia formosana*

**Pest description and damage** CBT is a pest of most woody ornamental trees and shrubs in the family Rosaceae. The larvae are 0.33 to 0.4 inch long, pale gray to flesh-color with small, pale gray spines scattered on the surface, with a yellowish-brown head. Larvae feed directly on the cambial tissues of the tree and may cause death of the tree in sufficient numbers. Otherwise, the feeding activity decreases the supply of nutrients to the tree and increases susceptibility to disease, insect attack, and environmental stress, including cold injury. The first indication of attack is the exuding of reddish-brown, gum-like resin, which often is mixed with fecal pellets and silk. The trunk and larger limbs of trees are affected, usually at pruning wounds and graft unions.

**For biology, life history, monitoring and management**

See: Cherry (*Malus*)—Cherry bark tortrix

**Management—chemical control**

See Table 4 in: Chemical Control of Landscape Pests

**Rhododendron (Rhododendron)—Aphid**

*Includes* *Masonaphis spp.*

*Macrosiphum rhododendri*

**Pest description and damage** Rhododendron aphids are often spotted first by the cast exoskeletons of the aphids covering buds and sticky new growth. By then the aphids may have flown. They are soft-bodied insects with piercing–sucking mouthparts. Color varies from pink to green. Feeding damage to mature plants is usually minor, but can compromise the vigor of small plants. Leaves, infested as they expand, are somewhat smaller and distorted with wavy edges. The health of established landscape plants is not threatened by aphid feeding activities.

**For biology, life history, monitoring and management**

See “Aphid” in: Common Landscape Pests

**Management—chemical control**

See Table 1 in: Chemical Control of Landscape Pests
Rhododendron (Rhododendron)—Azalea bark scale
Eriococcus azaleae

Pest description and damage  This scale superficially resembles mealybugs in appearance. Mature female scale are about 0.125 inch long and appear like white cottony sacs, often located on twigs and stems of azalea, especially in branch axils. Eggs, crawlers and the female scale under the wax are red.

For biology, life history, monitoring and management
See: Azalea (Rhododendron)—Azalea bark scale

Management—chemical control
See Table 1 in:
Chemical Control of Landscape Pests

Rhododendron (Rhododendron)—Azalea and rhododendron lace bug
Azalea lace bug (Stephanitis pyrioides)
Rhododendron lace bug (Stephanitis rhodendri)

Pest description and damage  Lace bugs use piercing–sucking mouthparts to feed on individual cells, so the upper leaf surface is yellow and stippled. The underside of leaves is covered with varnish-like “tar” spots. Infestations are more severe on plants in the sun. Damage is usually apparent by early to mid-July. While almost never fatal, repeated infestations of rhododendron lace bugs may result in yellowed, sickly plants. Adult insects are whitish-tan and approximately 0.125 inch long with lacy-looking wings. Nymphs grow to about 0.13 inch and are spiny. The damage the insects cause is similar on first inspection to that of leafhoppers but for the presence of tar spots. Identification is based on the dark markings on the thorax and wings.

For biology, life history, monitoring and management
See: Azalea (Rhododendron)—Azalea and rhododendron lace bug

Management—chemical control
See Table 1 in:
Chemical Control of Landscape Pests

Rhododendron (Rhododendron)—Carnation tortrix
Cacoecimorpha pronubana

Description, biology and damage  The larvae feed by rolling leaves and tying them with silk webbing. The larvae are very active when disturbed. The carnation tortrix attacks many broadleaf evergreen plants but seldom causes serious damage. Larvae are active year-round. Rarely becomes a serious pest.

For biology, life history, monitoring and management
See “Leafroller and leaftier” in:
Common Landscape Pests

Management—chemical control
See Table 3 in:
Chemical Control of Landscape Pests

Rhododendron (Rhododendron)—Cottony cushion scale
Icerya puchasi

Pest description and damage  Female cottony cushion scales are orange, yellow, or brown, and their most distinguishing feature is the elongated, ribbed, white cottony egg sac that is attached to its body. The egg sac contains from 600 to 800 red eggs and may be longer than the body of the female; the resulting length of the female plus the egg sac can be almost 0.5 inch. Eggs hatch into crawlers, which are red with black legs and antennae. They settle along leaf veins and produce the white cottony secretion for which they are known.

For biology, life history, monitoring and management
See “Scale insect” in:
Common Landscape Pests

Management—chemical control
See Table 1 in:
Chemical Control of Landscape Pests

Rhododendron (Rhododendron)—Lecanium scale
Lecanium spp.

Pest description and damage  Lecanium scale are most noticed as they expand in spring and produce copious honeydew. The female lecanium scale are about 0.125 inch in diameter and vary from red to dark brown in color. They are oval and raised, resembling small “helmets,” “turtles,” or bumps on branches, stems, while crawlers feed on the undersides of leaves. Male scale are smaller, fairly flat, and oblong.

For biology, life history, monitoring and management
See: Ash (Fraxinus)—Lecanium scale

Management—chemical control
See Table 1 in:
Chemical Control of Landscape Pests

Rhododendron (Rhododendron)—Rhododendron whitefly
Dialeurodes chittendeni

Pest description and damage  Whiteflies are small white insects that hold their wings roof-like over their abdomens rather than flat like true flies. Infested leaves, usually the tender young leaves at the branch tips, are mottled yellow on the upper surface, and the margins often curl. Rhododendron whiteflies often leave white, sometimes circular, powdery residues on the leaf surface. Whiteflies can produce large amounts of sticky honeydew, which can develop a heavy coating of black sooty mold. The rhododendron whitefly is mainly an aesthetic pest, although heavy infestations can damage susceptible plants.

Biology and life history  The insect overwinters as a nymph. There are several species of whiteflies. Some overwinter as adults on the undersides of evergreen leaves (salal, Oregon grape, rhododendron). These disappear in spring, leaving no offspring or damage to these leaves. Adults occur from mid-May to early August. Tiny black eggs are laid in circles, half-circles, or they are scattered about singly on the undersides of leaves. There is one generation per year.
Management—cultural control
Rhododendron species with smooth surfaces underneath the leaf are most affected. Species with a thick and leathery epidermis are often unaffected. Do not over fertilize. Whitefly numbers increase with increasing foliar nitrogen levels. If necessary, switch to a slow-release fertilizer and/or one with less nitrogen. Lightly vacuum plants in the early morning to remove adult whiteflies when they are cold and less likely to fly away. Whiteflies are also known to spend winter under rhododendron leaves without establishing on those plants. Check for eggs, or larvae to be sure that there is a live population.

Management—chemical control
See Table 1 in: Chemical Control of Landscape Pests

For more information
See “Whitefly” in: Common Landscape Pests

For more information

Rhododendron (Rhododendron)—Root weevil
Numerous species

Pest description and damage Identification is important: species differ in susceptibility to pesticides. Adult weevils are small dark nocturnal beetles with a snout (rostrum) and elbowed antennae. Look for ragged notches on the edges of leaves, or flower petals. Larvae are C-shaped, legless, and white, sometimes reddish, with tan heads, up to 0.5 inch in size. Larvae rarely cause significant root girdling damage in established landscapes.

For biology, life history, monitoring and management
See “Root weevil” in: Common Landscape Pests

Management—chemical control
See Table 2 in: Chemical Control of Landscape Pests

Rockrose (Cistus)—Root weevil
Numerous species

Pest description and damage Identification is important: species differ in susceptibility to pesticides and may have different life cycles. Adult weevils are small dark nocturnal beetles with a snout (rostrum) and elbowed antennae. In addition to the ragged notches in leaves (often not noticed) the weevils may girdle some of the stems resulting in dead branch tips. The C-shaped, legless weevil larvae are white with tan heads, up to 0.5 inch in size. They rarely cause significant damage in established landscapes.

For biology, life history, monitoring and management
See “Root weevil” in: Common Landscape Pests

Management—chemical control
See Table 2 in: Chemical Control of Landscape Pests

Rose (Rosa)—Aphid
Macrosiphum rosae

Description, biology and damage Rose aphids are small, soft, pinkish or green insects found on the succulent new growth, including buds and stems. White cast skins also may be present even after the aphids have moved on to other hosts. Often the damage is negligible, but heavy aphid feeding can reduce the quantity and quality of the flowers produced and for rose growers, may mar the perfection of the outer petals important in showing roses.

For biology, life history, monitoring and management
See “Aphid” in: Common Landscape Pests

Management—chemical control
See Table 1 in: Chemical Control of Landscape Pests

Rose (Rosa)—Fall webworm
Hyphantria cunea

Pest description and damage This pest produces large silken tents filled with caterpillars, frass and dead leaves, eventually engulf entire branches of deciduous trees and shrubs. Young caterpillars are pale greenish or yellow with a dark stripe down the back and a yellow stripe along the sides. Long silky hairs arise from yellow and black tubercles. When mature, the caterpillars are covered with yellow, rusty then black colored silky hairs. Adults are bright white with orange and black markings on the underside of the abdomen. Woolly scales cover masses of 200 to 500 greenish eggs.

For biology, life history, monitoring and management
See:
Cottonwood (Populus)—Fall webworm

See “Caterpillar” in:
Common Landscape Pests

Management—chemical control
See Table 2 in: Chemical Control of Landscape Pests

Rose (Rosa)—Gall wasp
Mossy rose gall wasp (Diplolepis rosae)
Spiny rose gall wasp (Diplolepis bicolor)

Pest description and damage The mossy rose gall wasp and spiny rose gall wasp are both tiny wasps which induce galls to form on the leaves. Galls may form on leaves, stem, bud or root. The larva of the wasp is inside the gall. The appearance of the two galls is different. The mossy rose gall wasp causes a cluster of hard, kernel-like cells to form on the rose stem or leaf, with moss-like filaments all over it. The spiny rose gall has a spherical hard body with many spiky protrusions. Other gall wasps cause buds to enlarge and harden.

Biology and life history The insect overwinters as a larva in the gall, and in early spring the adult wasp matures and chews out through the gall. It looks for expanding leaf tissue to lay eggs on. The eggs hatch and the feeding of the larvae induces the gall to form around it. There is one generation per year.

Pest monitoring In late winter, place a few galls in a baggy and leave outside in a protected location. Check regularly for the emergence of the first gall wasps. Then confirm emergence holes in galls on the plants.
Management—cultural control
Cut out galls when they are still green and fresh and before gall wasps have emerged and flown away. Adult emergence is in spring, so late summer and winter removal of the galls works best. Old galls have holes and become brown and matted.

Management—chemical control
See Table 3 in:
Chemical Control of Landscape Pests

For more information
See “Gallmakers” in:
Common Landscape Pests

Rose (Rosa)—Leafcutting bee
*Megachile* spp.

Description, biology and damage Leafcutting bees are black and look like small bumblebees. Female leafcutting bees remove smooth oval, circular or semicircular notches from the edges of leaves of roses and other plants. These leaf pieces are used by the bees to create protective cells for raising their young. Leafcutting bees are important pollinators and seldom do major harm to plants.

Rose (Rosa)—Rose leafhopper
*Edwardsiana rosae*

Pest description and damage Rose leafhoppers are small, active, whitish-green insects which run forward, backward or sideways when disturbed. The nymphs (immature) are white with red eyes. Rose leafhoppers feed on the leaves, causing tiny, white or pale stippling or blotches that resemble, but are larger than, spider mite stippling. Injured leaves may drop prematurely. The egg-laying in the fall also wounds the canes, providing entry points for fungal pathogens. Cast skins can be found on the undersides of leaves. Leafhopper damage is mainly aesthetic. Leafhopper damage is mainly aesthetic. Tolerate it, if possible

Biology and life history The insect overwinters as eggs within the cane bark of wild or cultivated rose or on caneberries. Eggs hatch in the spring, and the emerging nymphs feed on the leaves. When mature, the nymphs may leave roses for summer hosts which include species of *Cornus, Quercus, Prunus, Crataegus, Malus, Populus* and *Acer*. There are several generations each year (three in eastern Washington).

Pest monitoring Check for leafhoppers and shed skins early in the season to determine if any treatment is needed.

Management—cultural control
Leafhopper damage is mainly aesthetic. Tolerate it, if possible unless there is evidence the infestation will be more severe than usual.

Management—biological control
Several natural predators feed on leafhoppers, including damsel bugs and assassin bugs. Avoid use of broad-spectrum insecticides which may kill these predators.

Management—chemical control
See Table 1 in:
Chemical Control of Landscape Pests

For more information
See “Leafhopper” in:
Common Landscape Pests


Rose (Rosa)—Leafroller

Includes
*European (filbert) leafroller (Archips rosanun)*
*Fruit tree leafroller (Archips argyrospilus)*
*Oblique-banded leafroller (Choristoneura rosaceana)*
*Three-lined leafroller (Pandemis limitata)*

Pest description and damage These leafrollers are tortricids, noted for wriggling backwards quickly. They become small moths. They all cause similar damage but differ in their appearance and, more importantly, in their life cycle. The leafroller pests can be divided into single-generation moths, such as the fruit tree leafroller and the European leafroller, and two-generation moths, such as the oblique-banded leafroller and three-lined leafroller. The larvae are mostly green caterpillars with a light brown to black head. Adults have distinctive bands or mottling on the wings but are rarely seen.

For biology, life history, monitoring and management
See:
*Cherry, flowering (Prunus)—Oblique-banded leafroller*
See “Leafroller” in:
Common Landscape Pests
See “Caterpillar” in:
Common Landscape Pests

Management—chemical control
See Table 3 in:
Chemical Control of Landscape Pests

Rose (Rosa)—Raspberry cane maggot
*Pegomya rubivora*

Pest description and damage The cane maggot is the larva of a small fly that feeds on the cambial tissues of host plants. The larvae are white and legless and feed while tunneling downward in new canes. Canes are usually 1 to 3 feet long when attacked. Young shoots will suddenly, and a purple discoloration appears where the maggot girdles the cane. This causes a distinct drooping, a condition often referred to as “limber neck.” Canes also may show a characteristic swelling where feeding is occurring. This usually is not a serious pest. It is more often a pest of blackcaps and other cane fruits.

Biology and life history The insect overwinters as a pupa in the soil. The adult flies emerge in April. The female deposits eggs near the tops of the young canes. After hatching, the young maggots burrow into the pith of young shoots and tunnel downward. Later feeding involves girdling the cane just under the bark.

Pest monitoring Remove and burn wilted canes as soon as they are seen. Cut canes off near the base. Very little loss is caused by this insect even when 60 to 70% of new canes are infested.

Management—cultural control:
Cut off infested canes several inches below the wilted portion.

Management—chemical control
See Table 4 in:
Chemical Control of Landscape Pests
**Rose (Rosa)—Red humped caterpillar**

_Schizura concinna_

**Pest description and damage** The red humped caterpillar is the larva of a 1 inch, gray-brown moth. The mature larvae are yellow with a red head, and the fourth segment is humped. The body has orange, black, and white lengthwise stripes, as well as dark, fleshy “spikes” on it. Young red humped caterpillars are found in clustered colonies which disperse as caterpillars mature. They eat entire leaves (except the major veins) and can cause considerable defoliation. They have been a problem on cherry and other hosts east of the Cascade Mountains.

**Management—chemical control**

See Table 2 in:  
Chemical Control of Landscape Pests

**For more information**

See “Caterpillar” in:  
Common Landscape Pests


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**Rose (Rosa)—Root weevil**

Numerous species

**Pest description and damage** Identification is important: species differ in susceptibility to pesticides and may have different life cycles. Adult weevils are small dark nocturnal beetles with a snout (rostrum) and elbowed antennae. In addition to the ragged notches in leaves (often not noticed) the weevils may girdle some of the stems resulting in dead branch tips. The C-shaped, legless weevil larvae are white with tan heads, up to 0.5 inch in size. They rarely cause significant damage in established landscapes.

**For biology, life history, monitoring and management**

See “Root weevil” in:  
Common Landscape Pests

**Management—chemical control**

See Table 2 in:  
Chemical Control of Landscape Pests

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**Rose (Rosa)—Rose midge**

_Dasineura rhodophaga_

**Pest description and damage** The rose midge is a tiny yellow-brown or reddish fly that lays its eggs in newly developing bud and shoot tips. The hatching maggots feed on the growing tips or new rose canes. New buds and shoots are deformed and killed, and the dead tissues turn brown or black. Abnormal flowers develop from damaged buds.

**Biology and life history** The insect overwinters as a pupa in the soil under plants. Adults emerge in spring, and females lay eggs under the sepals of flower buds or on expanding leaf buds or shoots. The larvae emerge, and their feeding causes damaged tissue to turn brown, then black. The larva then drops to the soil to pupate. There are several generations per year.

**Management—chemical control**

Cut out and destroy infested tips.

**Management—chemical control**

See Table 3 in:  
Chemical Control of Landscape Pests

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**Rose (Rosa)—Rose sawfly**

**Includes**

Bristly roseslug (_Cladius difformis_)

Curled rose sawfly (_Allantus cinctus_)

Roseslug (_Endelomyia aethiops_)

**Pest description and damage** These pests are larvae of small wasps called sawflies. Roseslugs are small yellow-green larvae, about 0.25 inch long that skeletonized the upper leaf surface of roses. The bristly roseslug has spiny hairs while the roseslug larva is hairless. The curled rose sawfly is a darker green and often is found curled on the leaf. Signs of feeding include dry brown blotches where all of the leaf except the veins and the lowest layer of leaf tissue are removed. Roseslugs rarely occur in large numbers but can do considerable aesthetic damage. Curled rose sawfly consumes, rather than skeletonizes the leaves.

**Biology and life history** Rose is the only food of this insect. The female lays eggs in pockets on the edges of the leaves. The larvae emerge and feed on the surface of the leaf. When fully grown, the larva drops to the soil to pupate. There are one or two generations per year depending on the species.

**Pest monitoring** Watch for the first “windows” to appear in leaves in the spring. Controlling the first generation reduces damage from subsequent generations.

**Management—chemical control**

See Table 2 in:  
Chemical Control of Landscape Pests

**For more information**

See “Sawfly” in:  
Common Landscape Pests

Rose (Rosa)—Rose stem miner
*Marmara* spp.

**Pest description and damage** Larvae of this leaf- and twig-mining moth make sinuous, serpentine mines across the undersides of leaves. Where they cut through veins, the distal portion of the leaf may fade in color. Although damage is unsightly on individual leaves, they do not affect the long-term health or aesthetic quality of the plant.

**Management—cultural control**
If mines detach from the plant’s appearance, prune or pick off and destroy infested leaves and canes. Rose stem miner is rarely a serious problem.

**Management—chemical control**
See Table 3 in: Chemical Control of Landscape Pests

Rose (Rosa)—Small carpenter bee
*Ceratina* spp.

**Pest description and damage** Small bees, 0.18 inch long and metallic blue or blue-green, burrow into the pith of cut stems to create cells for their young. Cells are provisioned with pollen and nectar. Damage is not serious. These bees can burrow only in pruned stems.

**Biology and life history** females overwinter as adults in partially or completely excavated stems. In the spring, the female modifies this resting place (hibernaculum) into a brood nest by further excavation. When a desired depth is reached, she collects pollen and nectar, places this mixture at the base of the burrow, lays an egg on the provision, and then caps off the cell with plant material. Several cells are constructed end to end in each plant stem. The maturing bees then chew their way out of the stem.

**Management—cultural control**
Cover cut stems ends with wax to prevent burrowing and egg laying. Prune out and destroy or burn damaged canes in winter where females are hibernating and before they emerge in spring.

Rose (Rosa)—Spider mite
*Panonychus ulmi*
*Tetranychus* spp.

**Pest description and damage** Several species of spider mites can cause damage in deciduous, evergreen and coniferous ornamentals. Appearance of these mites varies with the species, although all are 0.02 inch or smaller. Adults and nymphs can be yellowish, greenish, or reddish brown, depending on species. Spider mites are oval and yellowish-brown or green with distinctive black spots on the body. Plants may be covered with fine silk webbing at branch axils or over sections, small plants may be engulfed in webbing under very heavy infestations. Mites damage leaves and fruit indirectly by feeding on leaves, which causes stippling, bronzing, and possibly leaf drop. The reduction in photosynthesis causes loss of vigor and yield.

**For biology, life history, monitoring and management**
See “Spider mite” in: Common Landscape Pests

**Management—chemical control**
See Table 1 in: Chemical Control of Landscape Pests

Rose (Rosa)—Tent caterpillar
*Forest tent caterpillar (Malacosoma disstria)*
*Western tent caterpillar (Malacosoma californicum pluviale)*

**Pest description and damage** The western tent caterpillar attacks a wide variety of plants including alder, apple, ash, birch, cherry, cottonwood, and willow, as well as fruit trees and roses. The adult moths are stout, light to darker brown, and are active in early- to mid-summer. Adults are attracted to lights at night. Western tent caterpillars are hairy, dull yellow-brown, with rows of blue and orange spots on the body. Forest tent caterpillars are black and blue with dorsal white footprints. Eggs of these moths are laid on twigs or buildings in masses and may be especially numerous around lights. The eggs are brown to gray in color, about 0.0625 inch long, and look like bits of gray, hardened foam. The larvae feed in large groups on foliage of host plants. Leaf defoliation can do significant damage especially to young, weak plants. Larvae of western tent caterpillars build modest silken tents over leaves at the tips of branches. The larvae leave the tent to feed in new areas but return in the evening. Both species can defoliate small trees and reduce growth, tree vigor, and make the plants more susceptible to competition, diseases or other pests. Healthy plants usually will grow new leaves by midsummer.

**For biology, life history, monitoring and management**
See:
- Alder (*Alnus*)—Tent caterpillar

**Management—chemical control**
See Table 2 in: Chemical Control of Landscape Pests

Rose (Rosa)—Thrips
*Western flower thrips* (*Frankliniella occidentalis*) and other species

**Pest description and damage** Several species of thrips cause injury to many woody ornamentals. All are very small insects, less than 0.05 inch long. Color varies from reddish-yellow to mid-dark brown. Winter populations are darker in color. Thrips have rasping mouthparts and damage plants by sucking on the contents of plant cells. Tiny specks of honeydew or black fecal tar spots can be found, and leaves are bleached and silvered by feeding activities of thrips. Thrips can damage flower buds, flower petals, and leaf buds. Damage to flowers appears as streaking in the blossoms and a reduced flower life. Damage to foliage is particularly noticeable if it occurs in the bud stage. In this case, leaves and flower petals typically are distorted.

**For biology, life history, monitoring and management**
See “Thrips” in: Common Landscape Pests

**Management—chemical control**
See Table 2 in: Chemical Control of Landscape Pests

Rose (Rosa)—Western spotted cucumber beetle
*Diabrotica undecimpunctata*

**Pest description and damage** The adult beetle is yellowish green, 0.25 inch long, and has 11 black spots on its wing covers. Mature larvae are white, except for the head and last abdominal segment, which are brown. They are about 0.625 inch long. The larvae appear to have “two heads.” The adult beetles eat small holes in the leaves and blossoms. Larvae feed on roots and bore into the base of stems, killing small plants and reducing root mass in mature plants.
For biology, life history, monitoring and management

See: Dahlia (Dahlia)—Western spotted cucumber beetle

Management—chemical control

See Table 2 in: Chemical Control of Landscape Pests

Sequoia/Redwood (Sequoia)—Juniper scale

Carulaspis juniperi

Pest description and damage The female scale insect is approximately 0.05 to 0.1 inch in diameter and white with a notable central yellow spot. The male scale has a more elongated appearance. This insect feeds on the sap within the stem or leaf. Leaves, twigs, branches, and cones may be attacked. Their feeding can reduce the vigor of the foliage supported by that stem. Symptoms of scale feeding include loss of normal color and luster of foliage, no new growth, and yellowing and death of branches. Though uncommon, severe infestations may kill entire plants or small trees.

For biology, life history, monitoring and management

See “Scale insect” in: Common Landscape Pests

Management—chemical control

See Table 1 in: Chemical Control of Landscape Pests

Skimmia (Skimmia)—Spider mite

Includes
Brown mite (Bryobia rubrioculus)
Citrus red mite (Panonychus citri)
Spider mite (Tetranychus spp.)

Pest description and damage Several species of spider mites can cause damage in ornamental hosts. Appearance of these mites varies with the species, although all are 0.02 inch or smaller. Adults and nymphs can be yellowish, greenish, or reddish brown, depending on species. Spider mites are oval and yellowish-brown or green with distinctive black spots on the body. Plants may be covered with fine silk webbing at branch axils or over sections, small plants may be engulfed in webbing under very heavy infestations. Mite damage to leaves causes stippling, bronzing, and possibly leaf drop. The reduction in photosynthesis causes loss of vigor and yield.

For biology, life history, monitoring and management

See “Spider mite” in: Common Landscape Pests

Management—chemical control

See Table 1 in: Chemical Control of Landscape Pests

For more information
Brown mite http://jenny.tfrec.wsu.edu/opm/displaySpecies.php?pn=293

Spiraea (Spiraea)—Aphid

Green apple aphid (Aphis pomi)
Spiraea aphid (Aphis spireicola)

Pest description and damage These two aphids are virtually indistinguishable so are often treated the same. In some cases, spirea aphid is more common in apples than the apple aphid or green apple aphid. Both are yellowish-green with dark eyes and short antennae. Mature wingless aphids are bright green with black cornicles, legs and antennal tips. The winged adults have a dark, more elongated head and thorax, and yellow-green abdomen and whitish wings.

Biology and life history The aphids overwinter as shiny black, rounded eggs laid on smooth twigs and watersprouts. They are similar in appearance to the rosy apple aphid and the apple grain aphid. The aphids hatch as new growth emerges from the bud. The young females (called stem mothers) produce winged and wingless females parthenogenetically (females require no males) and produce live young. It takes 10-20 days (temperature dependent) to complete a generation and there can be 9-16 generations in a year.

For biology, life history, monitoring and management

See “Aphid” in: Common Landscape Pests

Management—chemical control

See Table 1 in: Chemical Control of Landscape Pests

References:

Spiraea (Spiraea)—Snapdragon plume moth

Platyptilia antirrhina

Pest description and damage Adult is a grayish to tan T-shaped moth with slender, plumed wings and a 0.5 inch wingspread. The small greenish larvae are about 0.5 inch long when mature. The larvae initially mine leaves. Later, they feed on terminal leaves and bore into developing flowers and inside the stems.

Biology and life history The insect usually overwinters as an adult. In the spring, the eggs usually are laid on newly forming flowers or on the underside of leaves of terminal young growth. Hatching occurs in 2 to 3 weeks. Young larvae mine in leaves and later burrow into the stem, petioles, flowers, or seed pods. It takes 3 to 5 weeks for the larvae to develop through four instars. The caterpillars form pupae that hang upside down on the plant. The adults are weak fliers and usually remain on or near the host plant. The moths are most active during the early evening and found hanging around porchlights in the early morning.

For monitoring and management

See “Caterpillar” in: Common Landscape Pests

Management—chemical control

See Table 2 in: Chemical Control of Landscape Pests
**Spiraea (Spiraea)—Spider mite**
*Tetranychus* spp.

**Pest description and damage**  Several species of spider mites can cause damage to spiraea. Appearance of these mites varies with the species, although all are 0.02 inch or smaller. Adults and nymphs can be yellowish, greenish, or reddish brown, depending on species. Female European red mites are round with red bodies; males are yellowish-red. Twospotted mites are oval and yellowish-brown or green with distinctive black spots on the body. Plants may be covered with fine silk webbing at branch axils or over sections, small plants may be engulfed in webbing under very heavy infestations. Mites damage spiraea by feeding on leaves, which causes stippling, bronzing, and possibly leaf drop. The reduction in photosynthesis causes loss of vigor and seed productivity.

For biology, life history, monitoring and management

See “Spider mite” in:
Common Landscape Pests

Management—chemical control

See Table 1 in:
Chemical Control of Landscape Pests

**Spruce (Picea)—Carnation tortrix**
*Cacaecimorpha pronubana*

**Description and crop damage**  Larvae are active, dark green, about 0.37 to 0.5 inch long when mature, with a light brown to greenish brown head. Adult moth has bright light brown or reddish underwings. Darker brown upper wings have a transverse band. This pest attacks many broadleaf evergreens. Caterpillars weave needles together and feed within, causing small brown clusters of dead terminals. Larvae are active year-round.

For biology, life history, monitoring and management

See “Leafroller” in:
Common Landscape Pests

See “Caterpillar” in:
Common Landscape Pests

Management—chemical control

See Table 3 in:
Chemical Control of Landscape Pests

**Spruce (Picea)—Coneworm**
*Dioryctria* spp.

**Pest description and damage**  Adult coneworms are mottled gray snout moths banded with subtle colors. The coneworm larvae are small and cream-colored or light brown with a darker head. Coneworms attack true firs by boring into shoot tips or stems, especially around wounds, and feeding on the soft bark tissues. The portion of the branch beyond the injured point may die back. Coneworms also may bore into green cones, feed on the soft bark of young growth, or feed inside the bark on the trunk cambium. Confounding the issue are insects of other orders that attack cones and several small moths that bore into shoots.

For biology, life history, monitoring and management

See:
Douglas-fir (*Pseudotsuga*)—Coneworm

Management—chemical control

See Table 4 in:
Chemical Control of Landscape Pests

**Spruce (Picea)—Cooley spruce gall adelgid**
Includes *Adelges cooley* and other species

**Pest description and damage**  Many species of this aphid-like insect feed on newly growing needles of spruce although each species forms unique galls in different sectors of the tree. The adelgids fly to spruce from Douglas-fir, then begin to excrete waxy filaments. Within the protection of the filaments, the small purplish female lays clusters of tan eggs. The eggs hatch and the nymphs begin to feed on the expanding new growth needles. The needle bases swell, encasing the nymphs within the protective, green cone-like galls. In July, the galls dry and crack open, releasing the adelgids, which then fly to Douglas-fir. On Douglas-fir, feeding on the needles only causes some yellowing and minor distortion of the needles (no galls). On spruce, feeding and galls can significantly disfigure branches of the tree.

**Biology and life history**  In spring, winged adelgids fly to spruce where they form cottony tufts within which to lay clusters of eggs. When the crawlers hatch, they move the expanding buds and begin to feed on needles. In response, the bases of the needles begin to swell over the crawlers. As the needle bases swell, they form a cone-like gall. These distinctive galls are green through spring and early summer, but later they begin to dry up. As they dry, they shrink and crack open, releasing the adelgids. The adelgids then fly to Douglas-fir where they will cycle a generation then return to spruce.

Management—cultural control

Plant Douglas-fir and spruce as far apart as possible. Hand-prune and destroy any gall on spruce before these galls open.

Management—biological control

The usual adelgid and aphid parasitoids and predators, including small birds.

Management—chemical control

See Table 1 in:
Chemical Control of Landscape Pests

For more management options

See “Gallmakers” in:
Common Landscape Pests
Spruce (Picea)—Douglas-fir tussock moth

*Orgyia pseudotsugata*

**Pest description and damage** The adult male moth is brown to gray, about 1 inch across. During the day, the male flies in search of the wingless adult female. Once mated, the female moth lays eggs in a cluster. The hatching larvae are dispersed by drifting about on a thread in the breeze. Mature larvae are about an inch long, hairy, gray or light brown, with black heads. They are distinguished by three long tufts of black hairs on their body (two in front, one in back) and lighter tufts along their back. The hairs from tussock moth caterpillars break off easily and may cause skin or respiratory irritation. The preferred hosts are Douglas-fir and fir, but also include spruce, pine, and larch. The larvae feed mainly on forest trees and are infrequent pests in the landscape. The larvae start at branch tips at the top of the tree and work down, feeding mainly on the new foliage and causing severe defoliation.

**For biology, life history, monitoring and management**

*See:*  
Douglas-fir (Pseudotsuga)—Douglas-fir tussock moth

*See “Caterpillar” in:*  
Common Landscape Pests

**Management—chemical control**

*See Table 2 in:*  
Chemical Control of Landscape Pests

Spruce (Picea)—Hemlock scale

*Abgrallaspis ithacae*

**Pest description and damage** Hemlock scale feed on the needles of Eastern hemlock (*Tsuga canadensis*) and spruces (especially Colorado blue). Adult scale are round to oval, dark gray or black, and about 2 mm (0.1 inch) in diameter. Immature scale (crawlers) are green to yellow. Scale typically are found as small bumps on the underside of needles. Scale feed on the needles by sucking out the cell contents. The initial symptom of infection is yellow spots on the upper surface of the needles. As few as 4 to 6 scale insects per needle will cause needle-drop. Colorado blue spruce, in particular, loses large numbers of needles. Severe infestations may weaken trees sufficiently to cause death. The hemlock scale is most common on stressed trees.

**For biology, life history, monitoring and management**

*See:*  
Hemlock (Tsuga)—Hemlock scale

*See “Scale insect” in:*  
Common Landscape Pests

**Management—chemical control**

*See Table 1 in:*  
Chemical Control of Landscape Pests

Spruce (Picea)—Pine needle scale

*Chionaspis pinifoliae*

**Pest description and damage** Pine needle scale are elongate, pure white scale that feed on the needles. Heavily infested trees may appear “flocked.” Infested needles turn yellow, then brown. Twigs and branches may be killed. Repeated infestations may kill trees eventually. Pine needle scale are found with the black pineleaf scale, which is gray to black instead of white. Pine needle scale is a serious pest of ornamental pines and also may infest arborvitae, cedars, hemlock, spruces and Douglas-fir.

**For biology, life history, monitoring and management**

*See:*  
Pine (Pinus)—Pine needle scale

*See “Scale insect” in:*  
Common Landscape Pests

**Management—chemical control**

*See Table 1 in:*  
Chemical Control of Landscape Pests

Spruce (Picea)—Silver-spotted tiger moth

*Lophocampa argentata*

**Pest description and damage** Adult moths are brownish or tan with distinct silver-white spots on the wings. The caterpillars can reach 1.5 inches in length and are mostly reddish-brown with some blue-black or yellowish hairs. The caterpillars of the silver-spotted tiger moth feed on the needles, often “tenting” branches with dirty-looking webs. While most of the feeding occurs through fall and winter, the webs are most noticeable in the spring. Minor infestations cause little harm to trees. Douglas-fir is the preferred host, but pine, arborvitae, spruce, and true firs also are attacked.

**For biology, life history, monitoring and management**

*See:*  
Douglas-fir (Pseudotsuga)—Silver-spotted tiger moth

*See “Caterpillar” in:*  
Common Landscape Pests

**Management—chemical control**

*See Table 2 in:*  
Chemical Control of Landscape Pests

Spruce (Picea)—Spruce aphid

*Elatobium abietinum*

**Pest description and damage** The spruce aphid is green and only 0.05 to 0.1 inch long at maturity. Plants affected by spruce aphid first show banded yellowish blotches on the needles, sometimes with honeydew (sticky material excreted by the aphid) present. The needles may turn completely yellow or brown and drop. New growth is not affected, leaving trees with bare centers and green tips.

**Biology and life history** Spruce aphids feed during the winter and early spring before new growth occurs, so affected trees may have needles only on the tips of branches later in the year. Damage is usually not apparent until after aphids have left the tree. Aphids appear early in the season (about February) and may increase rapidly during March and sometimes April. Check weekly for aphids on important trees starting about November (monitor less important trees beginning around February, depending on weather).
Management—biological control
Aphids have many natural enemies, including lady beetles, syrphid fly larvae, and lacewings. Avoid broad-spectrum insecticide applications that would disrupt these controls.

Management—cultural control
Wash aphids from plants with a strong stream of water. Aphid populations tend to be higher in plants that are fertilized liberally with nitrogen and heavily watered, as this produces flushes of succulent growth. Avoid excessive watering and use slow-release or organic sources of nitrogen. Control ants, which “farm” the aphids and protect them from predators in order to harvest their honeydew.

For biology, life history, monitoring and management
See “Aphid” in:
Common Landscape Pests

Management—chemical control
See Table 1 in:
Chemical Control of Landscape Pests

Spruce (Picea)—Spruce bud scale
Physokermes hemicryphus
Pest description and damage Female scale are semiglobular, brown or reddish, and occur at the base of new shoots. They tend to be very inconspicuous, as they may be partly hidden by the bark and may resemble buds. Lower branches often are infested heavily and may be killed, while upper branches are much less affected. Spruce bud scale produce a large amount of honeydew which often is covered with black sooty mold.

For biology, life history, scouting, and management options
See “Scale insect” in:
Common Landscape Pests

Management—chemical control
See Table 1 in:
Chemical Control of Landscape Pests

Spruce (Picea)—Spruce needleminer
Endothenia albolineana
Pest description and damage Adult moth is dark brown with a wing expanse of 0.5 inch. The larvae are light greenish to brown and grow to approximately 0.5 inch long. The spruce needleminer feeds on spruce needles from the inside out, starting at the base of the needle. Large amounts of webbing are deposited around the needles. Completely mined and hollowed out needles look translucent and may be cut off, sometimes resulting in severe needle loss. The spruce needleminer attacks mainly blue, Sitka, and Engelmann spruce in the western U.S.

Biology and life history The larvae overwinter in hollowed-out needles. As the weather warms, they resume feeding and pupate in mid-spring. Adult moths emerge in May and June and lay eggs on needles. When eggs hatch, each larva cuts a hole near the base of the needle and then mines the interior. There is one generation per year.

Management—cultural control
Hand-pick larvae on small trees.

Management—chemical control
See Table 3 in:
Chemical Control of Landscape Pests

Spruce (Picea)—Spruce spider mite
Oligonychus ununguis
Pest description and damage Several species of spider mites can cause damage in deciduous, evergreen and coniferous ornamentals. Appearance of these mites varies with the species, although all are 0.02 inch or smaller. Adults and nymphs can be yellowish, greenish, or reddish brown, depending on species. Female European red mites are round with red bodies; males are yellowish-red. Twospotted mites are oval and yellowish-brown or green with distinctive black spots on the body. Plants may be covered with fine silk webbing at branch axils or over sections, small plants may be engulfed in webbing under very heavy infestations. Mites damage leaves and fruit indirectly by feeding on leaves, which causes stippling, bronzing, and possibly leaf drop. The reduction in photosynthesis causes loss of vigor and yield.

For biology, life history, monitoring and management
See “Spider mite” in:
Common Landscape Pests

Management—chemical control
See Table 1 in:
Chemical Control of Landscape Pests
Spruce (Picea)—White pine weevil
Pissodes strobi

Pest description and damage  White pine weevils are brown beetles with light blotches on the highly curved back. Adults grow to about 0.25 inch long and feed on shoots and needles of pine and spruce. The larvae feed on needles and also mine shoot tips, often distorting or killing back the terminals and causing trees to appear deformed. Infested terminals often develop a “shepherd’s crook” appearance. The weevil attacks eastern white pine (Pinus strobus), Sitka spruce (Picea sitchensis), and a wide variety of other pines and spruce and even Douglas-fir.

Biology and life history  Adult beetles overwinter in litter on the ground. In the spring, adults walk or fly to host trees, where they settle on the leader to mate. Eggs are deposited in a cavity on the tree. The eggs hatch, and the larvae commence feeding in the bark, killing the leader. As they feed, the current season’s growth is emerging, but this soon collapses, causing the characteristic “shepherd’s crook.” The larvae then bore into the wood to pupate. The adult beetles emerge in late summer (around mid-August into fall) and overwinter in organic debris on the ground.

Management—cultural control
Prune and destroy affected terminals in the summer before adult beetles emerge. This will help reduce next year’s infestation.

Management—chemical control
See Table 2 in:  Chemical Control of Landscape Pests

For more information

Spruce (Picea)—Webworm
Cephalcia spp.

Pest description and damage  Webworms are larvae of web-spinning sawflies. The larvae cause characteristic damage on spruce and also on some pines. The older needles on the tree are consumed, and the webworms construct a large web at the feeding site, which becomes covered with frass. The new growth on the tree may extend beyond the defoliated stems of the older growth.

Biology and life history  The insect overwinters as a larva or pupa in the soil. Adults emerge in mid-spring. The females lay eggs on old needles of the tree. The larvae hatch and soon begin feeding, spinning loose webs at the base of the needles. They feed on the old growth, pulling the cut needles into the web. The larvae feed for up to 3 weeks. When they are fully formed, usually in June, they drop to the ground and form earthen cells 3 inches below the surface. There is one generation per year.

Management—biological control:
In Austria, nematodes applied to the soil gave good control if the soil pH was kept at 5.0-7.0 with lime applications.

Management—chemical control
See Table 2 in:  Chemical Control of Landscape Pests

For more information
See “Sawfly” in:  Common Landscape Pests

Sycamore (Platanus)—Aphid
Drepanosiphum platanoides

Pest description and damage  Several species of aphids can become a problem for sycamores. Aphids tend to be small (0.0625 to 0.125 inch long), oval to pear-shaped, soft-bodied insects with piercing-sucking mouthparts. Color varies but most aphids tend to match host plant coloration. Aphids tend to feed in colonies and are often found on the most succulent plant tissues. Feeding damage to trees is usually minor, but can compromise the vigor of the host, if aphid populations are high. Aphids produce honeydew that supports growth of a black sooty mold fungus. In addition to cosmetics, honeydew may become a sticky nuisance when it falls on decks, cars, or other landscape surfaces.

For biology, life history, monitoring and management
See “Aphid” in:  Common Landscape Pests

Management—chemical control
See Table 1 in:  Chemical Control of Landscape Pests

Sycamore (Platanus)—Fall webworm
Hyphantria cunea

Pest description and damage  Large silken tents filled with caterpillars, frass and dead leaves, eventually engulf entire branches of deciduous trees including apple, cherry, peach, pecan, English walnut, black walnut, ash, boxelder, birch, chokecherry, elm, hickory, linden, poplar, sycamore, white oak and willow and some shrubs. Young caterpillars are pale greenish or yellow with a dark stripe down the back and a yellow stripe along the sides. Long silky hairs arise from yellow and black tubercles. When mature, the caterpillars are covered with yellow, rusty then black colored silky hairs. Adults are bright white with orange and black markings on the underside of the abdomen. Woolly scales cover masses of 200 to 500 greenish eggs.

For biology, life history, monitoring and management
See:  Cottonwood (Populus)—Fall webworm

Management—chemical control
See Table 2 in:  Chemical Control of Landscape Pests

Sycamore (Platanus)—Sycamore scale
Stomacoccus platani

Pest description and damage  The sycamore scale is tiny. This insect causes leaves to develop small yellow spots. Eventually, the leaves become pock-marked with numerous small, brown, necrotic (dead) spots that may be confused with leaf spot fungi. Leaves infested while young are often smaller and disfigured. Premature leaf fall also may occur, although other factors may cause early leaf drop. Scale also feed on bark, causing twig dieback.

Biology and life history  The scale overwinters in crevices on the bark. Eggs are laid in late winter in cottony masses. Egg hatching coincides with leaf budbreak and continues until the leaves are fully expanded. The crawlers move from the bark to the new foliage to feed. Sycamore scale frequently align themselves along the major veins of the leaf to feed. They remain here until maturity, and then
migrate back to the bark to lay eggs for a new generation. There may be three to five generations per year.

For biology, life history, monitoring and management

See “Scale insect” in:
Common Landscape Pests

Management—chemical control

See Table 1 in:
Chemical Control of Landscape Pests

Tulip (Tulipa)—Bulb mite
Rhizoglyphus echinopus

Pest description and damage  Mature bulb mites vary from about 0.02 to 0.03 inch (0.5 to 0.9 mm) long and have four pairs of legs. Their bodies are shiny, white, somewhat transparent, and smooth with reddish brown appendages. They are usually found in colonies. Their oval shape and sluggish behavior can deceive the human eye into identifying them as eggs. They avoid the light and hide under damaged or diseased tissue. Bulbs infested with bulb mites may rot and fail to produce new growth, or new growth may be off-color, stunted, and distorted. Although the bulb mite is not considered a primary pest of bulbs, it is often responsible for serious losses; the slightest injury to a bulb will allow bulb mites to enter and become established. Once the mites are inside the bulb, they rapidly turn the bulbs into rotten pulp. Infested or bruised bulbs are the most susceptible to damage. Not only do mites destroy bulb tissue, but they also carry fungi and bacteria which often spur additional damage. Bulb mites also heavily affect hyacinths and lilies. Bulbs planted too late in the season are often heavily infested and dried out by the time they are planted.

Biology and life history  Bulb mites rarely are noticed as isolated individuals, but rather as large colonies. All stages of the mite can be found throughout the year.

Management—cultural control

It is very important to avoid rough handling of bulbs to prevent injury that might afford an entry point for fungi and bulb mites. Bulb mites cannot withstand drought, and dry bulbs in storage usually are not attacked (unless mites are already deep inside tissue). Mites can build up on decaying vegetation. Fallow area or rotate to non-hosts if populations are high. Treat bulbs with hot water before planting.

For more information

Tuliptree (Liriodendron)—Tuliptree aphid
Illinoia (Syn = Macrosiphum) liriodendri

Pest description and damage  Tuliptree aphids are small, green to pinkish elongate soft-bodied insects with long legs. They form clusters of aphids of various sizes on the undersides of the leaves, especially at the tips of branches. The terminal shoots become dull as nitrogen is removed by these sucking pests. They are also noted for producing copious amounts of honeydew that coats underlying vegetation.

Biology and life history  In the fall, adult aphids lay eggs tucked in crevices formed by buds and branches where they will spend the winter. At this time adult aphids disappear. Eggs hatch at bud break and begin to feed and mature. At maturity, the parthenogenetic, unmated females give birth to live nymphs. These develop and give birth to more aphids. Winged adults that can migrate to new hosts develop in fall.

Pest monitoring  Begin monitoring for aphids and biological controls in spring at budbreak.

Management—chemical control: HOME USE and COMMERCIAL USE

See “Aphid” in:
Common Landscape Pests

Viburnum (Viburnum)—Bean aphid
Aphis fabae

Pest description and damage  Bean aphids are soft-bodied, dark green to black insects with lighter color legs. They are commonly found on the undersides of leaves and on new growth, often in dense colonies. Heavy aphid feeding may distort shoot tips and leaves, and leaves may turn yellow, wilt, or show other signs of stress. Typically, bean aphids produce large amounts of honeydew—a sweet, sticky material. This material can attract honeydew-feeding ants, and yellowjackets, which protect aphid colonies from predators. Honeydew also may become covered with a dark, unsightly growth of sooty mold. Viburnum is a winter host for this aphid, which may be found on various vegetables in the summer, including beans, lettuce, and squash. The aphid does not attack Viburnum davidii.

For biology, life history, monitoring and management

See “Aphid” in:
Common Landscape Pests

Viburnum (Viburnum)—Root weevil

Black vine weevil (Otiorhynchus sulcatus)
Obscure root weevil (Sciopithes obscurus)
Strawberry root weevil (Otiorhynchus ovatus)

Pest description and damage  Identification is important: species differ in susceptibility to pesticides and may have different life cycles. Adult weevils are small dark nocturnal beetles with a snout (rostrum) and elbowed antennae. In addition to the ragged notches in leaves (often not noticed) the weevils may girdle some of the stems resulting in dead branch tips. The C-shaped, legless weevil larvae are white with tan heads, up to 0.5 inch in size. They rarely cause significant damage in established landscapes.

For biology, life history, monitoring and management

See “Root weevil” in:
Common Landscape Pests

Management—chemical control

See Table 2 in:
Chemical Control of Landscape Pests
Viburnum (Viburnum)—Viburnum leaf beetle

Ptyrrhoptera viburni

**Pest description and damage**  Adults are brown and about 0.25 inch long. Mature larvae are greenish-yellow and are about 0.375 inch long. The adults and the larvae both chew holes in the leaves, although the feeding damage is different. Adults chew oblong shot holes in the leaves, whereas the larvae skeletonize the leaves. The popular snowball bush, V. opulus, is one of the known hosts of this beetle, although it may infest other Viburnums that are grown in the PNW.

**Biology and life history**  Viburnum leaf beetle is a European insect that is currently restricted to northwest Washington and British Columbia in Canada. The insect overwinters as eggs. The female beetle chews square holes in the twigs and deposits the eggs, then covers them with a black cap of wood chips and excrement. The eggs hatch in the spring and the larvae feed on the young expanding leaves. Adults appear in mid-summer and may be seen until frost.

**Management—cultural control**  Individual infested twigs with overwintering eggs clusters may be pruned out in the dormant season. Watch for feeding damage in the early spring and pick off or hose off the larvae.

**Management—chemical control**  
See Table 2 in:  Chemical Control of Landscape Pests

**For more information**  

Willow (Salix)—Aphid

**Includes**  giant willow aphid (Tuberolachnus salignus)

**Pest description and damage**  There are several species of aphids known to feed on the foliage, stems, flowers, or bark of willows. The largest of these soft-bodied piercing-sucking insects is the giant willow aphid. This aphid has a dark body that appears gray due to the many hairs; it also has conspicuous dorsal tubercles. This insect forms large colonies on the bark of willow, often most concentrated close to the ground. Damage seems minimal. There are a number of other species of aphids that infest willows with varying color patterns and preferences for feeding on bark, leaves, branches or new growth. Some produce more honeydew than others and some are regularly tended by ants.

**For biology, life history, monitoring and management**  
See “Aphid” in:  Common Landscape Pests

**Management—chemical control**  
See Table 1 in:  Chemical Control of Landscape Pests

**For more information**  
See “Aphid” in:  Common Landscape Pests

Willow (Salix)—Azalea bark scale

Eriococcus azaleae

**Pest description and damage**  This scale superficially resembles mealybugs in appearance. Mature female scale are about 0.125 inch long and appear like white cottony sacs, often located on twigs and stems of azalea, especially in branch axils. Eggs, crawlers, and the insects under the wax scale are red.

**For biology, life history, monitoring and management**  
See:  
Azalea (Rhododendron)—Azalea bark scale  
Common Landscape Pests

**Management—chemical control**  
See Table 4 in:  Chemical Control of Landscape Pests

Willow (Salix)—Willow beaked-gall midge

Mayetiola rigidae

**Pest description and damage**  The adult beaked-gall midge is a small black fly. The larvae are about 0.2 inch long when mature. The adult midge lays eggs on buds in the spring, and the larval tunneling and feeding of the larvae causes the bud to swell and harden. By summer, it develops a characteristic shape and a reddish color. Infestations are rarely sufficient to seriously injure a tree, but successive years of high infestations can alter the appearance of the plant, much as if the plant were excessively pruned. Pussy willow (Salix caprea) is reportedly a favorite host species.

**Biology and life history**  The insect overwinters as a partly developed larva in the gall. In spring, the adults emerge, mate, and the females lay eggs on swollen willow buds. The emerging larva tunnels into the bud and causes gall formation. The larva develops inside a hollow cavity in the gall, which by September is hardened and red. There is one generation per year.

**Management—cultural control**  
Prune out willow-beaked galls as they are noticed. If you prune them out in the fall or winter, be sure to destroy them by crushing or burying. The adults probably will still emerge if the galls are simply thrown to the ground.

**Management—chemical control**  
See “Gallmakers” in:  Common Landscape Pests

**For more information**  
See “Gallmakers” in:  Common Landscape Pests
**Willow (Salix)—Fall webworm**

_Hyphantria cunea_

**Pest description and damage** Large silken tents filled with caterpillars, frass and dead leaves, eventually engulf entire branches of deciduous trees including apple, cherry, peach, pecan, English walnut, black walnut, ash, boxelder, birch, chokecherry, elm, hickory, linden, poplar, sycamore, white oak and willow and some shrubs. Young caterpillars are pale greenish or yellow with a dark stripe down the back and a yellow stripe along the sides. Long silky hairs arise from yellow and black tubercles. When mature, the caterpillars are covered with rusty colored silky hairs. Adults are bright white with orange and black markings on the underside of the abdomen. Woolly scales cover masses of 200 to 500 greenish eggs.

For biology, life history, monitoring and management

See: Cottonwood (Populus)—Fall webworm

See “Caterpillar” in: Common Landscape Pests

**Management—chemical control**

See Table 1 in: Chemical Control of Landscape Pests

**Willow (Salix)—Flea beetle**

_Alder flea beetle (Altica ambiens)_

_Willow flea beetle (Altica subplicata)_

**Pest description and damage** Both adults are dark, shiny blue, and about 0.25 inch long. Larvae are black and about 0.25 inch long at maturity. Adults chew holes in leaves while the larvae feed in groups and skeletonize foliage of alder, poplar, willow dogwood and other hosts. They are capable of defoliating trees but more often they are found in smaller numbers throughout the trees. As the insects look similar and often both hosts grow together, it is difficult for the non-professional to identify beetles by species.

For biology, life history, monitoring and management

See: Alder (Alnus)—Alder flea beetle

**Management—chemical control**

See Table 2 in: Chemical Control of Landscape Pests

**Willow (Salix)—Oystershell scale**

_Lepidosaphes ulmi_

**Pest description and damage** The mature scale is approximately 0.125 inch long, hard-shelled, brownish or gray in color, and usually elongated and slightly curved like an oyster or mussel shell. Oystershell scale are found on trunks, branches, and twigs. They occur less frequently on the leaves and fruit. Scale infestations often are limited initially to isolated colonies on single branches or twigs. Newly emerged crawlers look like tiny bright white pimples on the bark.

For biology, life history, monitoring and management

See: Ash (Fraxinus)—Oystershell scale

Common Landscape Pests

**Management—chemical control**

See Table 1 in: Chemical Control of Landscape Pests

**Willow (Salix)—Poplar-and-willow borer**

_Cryptorrhyncus lapathi_

**Pest description and damage** The adult poplar-and-willow borer is a black and pink to cream-colored weevil (a flightless snout beetle) about 0.375 inch long. The larvae are white, legless, and about 0.25 inch long at maturity. Larvae feed by mining beneath the bark of trunk and branches. In late summer, feeding larvae expel large quantities of sawdust-like frass (excrement) through horizontal holes in the bark accompanied by flow of a thin sap. Larval feeding may girdle branches, resulting in breakage, leaf wilt or eventual branch death. Severe infestations cause lumpy, swollen bark, with cracks and bark scars with exposed wood. Old wood may produce large numbers of new shoots. Willows are the preferred host, but the poplar-and-willow borer also attacks poplars. The adults chew small holes in the bark of twigs and shoots, introducing a fungus which may cause shoots to wilt. This insect has become a serious problem in hybrid poplar plantations, and in willows grown for the cut flower industry and restoration plantings. In landscapes, damage is most common on native willows.

Biology and life history The adult weevils lay eggs just under the bark in the cambium, mostly near lenticel, buds and wounds in late summer and early fall. Eggs hatch soon after they are laid and begin to feed under the bark, creating a small chamber in which they hibernate over winter. They resume feeding in the cambium, then bore into the heartwood to pupate and adults emerge in late summer. It only takes one year from egg to adult but the adults can live up to three years so that the weevils are increasing over time. This allows an accelerated buildup of this insect.

Pest Monitoring Adults may be dislodged from branches by beating foliage. In spring, evidence of infestation is a sap flow down the trunk of the tree and moist sawdust being pushed out of the gallery. Adults are commonly found walking on the trunk or branches, especially at night. Look also for wilting of suckers and pronounced holes in the young stems from adults feeding.

**Management—cultural control**

Hand-pick adults when noticed on trunk and branches. Beating may also dislodge more than are visible. Remove infested branches showing evidence of attack and dispose of the prunings in a chipper or yard waste. Don’t allow wood to remain for weevils to emerge.

**Management—biological control**

Little is known of the effectiveness of biological control.

**Management—chemical control**

See Table 4 in: Chemical Control of Landscape Pests

**Willow (Salix)—Spiny elm caterpillar (mourning cloak butterfly)**

_Nymphalis antiopa_

**Pest description and damage** The spiny elm caterpillar is the larval stage of the mourning cloak butterfly. The adult butterfly is approximately 2.5 inches across, with purplish-brown to black wings bordered by a creamy yellow stripe and a row of blue spots. The larvae are purplish-black with white specks and have a row of orange to red spots along the back. They have brownish prolegs and are clothed with long, forked spines. The caterpillars often feed in large groups and eat all the leaves on a branch before moving. Their feeding results in raggedly chewed leaves. Spiny elm caterpillars also feed on willow and poplar trees. They usually are not a serious pest.

**Biology and life history** The adult butterfly overwinters in protected places, and is found flying on warm spring days
coinciding with budbreak. The females lay eggs in masses on twigs, and the larvae hatch and feed in large groups. After feeding, the mature larva pupates by suspending itself in a chrysalis from a leaf. The second generation, if there is one, emerges in August.

**Management—biological control**

There are several wasp parasites of the larvae. Birds will pursue and eat the adult butterfly.

**Management—cultural control**

Hand-pick larvae or remove heavily infested branches.

See “Caterpillar” in:
Common Landscape Pests

For more information


**Willow (Salix)—Satin moth**

*Leucoma salicis*

**Pest description and damage** The adult moth is satiny white with black markings on the legs. The attractive larvae are approximately 2 inches long when grown and reddish brown with double white dorsal patches and tufts of hairs along the sides. They can seriously skeletonize then defoliate cottonwood, poplar, and willow. They occasionally attack oak and aspen. Lombardy poplar and silver maple are particularly susceptible.

For biology, life history, monitoring, and management

See:
- Poplar (*Populus*)—Satin moth

See “Caterpillar” in:
Common Landscape Pests

**Management—chemical control**

See Table 2 in:
Chemical Control of Landscape Pests

**Willow (Salix)—Tent caterpillar**

Forest tent caterpillar (*Malacosoma disstria*)
Western tent caterpillar (*Malacosoma californicum pluviale*)

**Pest description and damage** The western tent caterpillar attacks a wide variety of plants including alder, apple, ash, birch, cherry, cottonwood, and willow, as well as fruit trees and roses. The adult moths are stout, light to darker brown, and are active in early- to mid-summer. Adults are attracted to lights at night. Western tent caterpillars are hairy, dull yellow-brown, with rows of blue and orange spots on the body. Forest tent caterpillars are black and blue with dorsal white footprints. Eggs of these moths are laid on twigs or buildings in masses and may be especially numerous around lights. The eggs are brown to gray in color, about 0.0625 inch long, and look like bits of gray, hardened foam. The larvae feed in large groups on foliage of host plants and can do significant damage by defoliation. Larvae of western tent caterpillars build moderate silken tents over leaves, but leave the tent to feed in new areas. They usually return in the evening. Both can defoliate small trees; defoliation can reduce growth and make the trees more susceptible to competition, diseases or poor weather, potentially killing them.

For biology, life history, monitoring and management

See:
- Alder (*Alnus*)—Tent caterpillar
- Common Landscape Pests

**Willow (Salix)—Western tiger swallowtail**

Western tiger swallowtail (*Papilio rutulus*)

**Pest description and damage** The tiger swallowtail larvae feed on leaves of cherry family plants, willows and a few other species. Generally limited to isolated numbers on single trees. Larvae spin a silken pad on which they rest. Initially larvae look like small bird droppings molting into bigger black and white bird droppings. The last molt is a thick green larva with black and yellow bands and conspicuous eyespots behind the head which is tucked under the body of the caterpillar. When disturbed the larvae may evert orange “horns” with a peculiar smell to deter predators. The chrysalis is a 1 inch long tan, marbled capsule with visible outlines of legs, antennae, eyes and proboscis. The benefit of the large yellow and black butterfly in the garden outweighs the minimal damage inflicted by a caterpillar.

For biology and life history, pest monitoring and management options

See:
- Cherry, flowering (*Prunus*)—Western tiger swallowtail
- Pink dogwood (*Cornus*)—Western tiger swallowtail
- Willow (*Salix*)—Western tiger swallowtail

**Witch-hazel (Hamamelis)—Root weevil**

Includes
- Black vine weevil (*Otiorhynchus sulcatus*)
- Clay-colored weevil (*Otiorhynchus singularis*)
- Strawberry root weevil (*Otiorhynchus ovatus*)

**Pest description and damage** Adult weevils are small dark nocturnal beetles with a snout (rostrum) and elbowed antennae. Look for ragged notches on the edges of leaves or flower petals.

For biology, life history, monitoring and management

See “Root weevil” in:
Common Landscape Pests

**Yew (Taxus)—Cottony camellia scale**

*Pulvinaria floccifera*

**Pest description and damage** The cottony camellia scale (sometimes called taxus scale) crawlers are flat brownish or yellowish sucking insects. Females create a distinctive oblong cottony egg sac. Pale yellow crawlers (young scale) feed on the undersides of leaves and along veins. Foliage with scale infestations may turn yellowish or pale in color. Due to copious honeydew, leaves below become covered with a crust of black sooty mold. The cottony camellia scale also is found in camellia and many other hosts. On yew, it is also known as the cottony yew scale. It is possible to have low numbers of this insect for years without an outbreak.

For biology, life history, monitoring and management

See:
- Camellia (*Camellia*)—Cottony camellia scale
- Common Landscape Pests

**Management—chemical control**

Chemical Control of Landscape Pests

**See Table 2 in:**
Chemical Control of Landscape Pests

**See Table 1 in:**
Chemical Control of Landscape Pests
Yew (Taxus)—False spider mite

*Pentamerismus taxi*

**Pest description and damage** These mites are small, deep red, small, short-legged mite generally flattened in shape. These mites can be found at the base of needles, often in considerable numbers. They are generally found on yew but also may occur on other evergreens.

**Biology and life history** Most mite species share a similar life cycle. The majority of species overwinter as eggs on host plants, although some may overwinter as adult females. Mites become active in the spring. There may be eight to ten overlapping generations per year.

**Pest monitoring** Observe the leaves for mites and webbing and check for the number of pest and predator mites. Sufficient biological control usually is achieved by midsummer.

**Management—biological control**
Phytoseiid predator mites almost always keep mites under control if broad-spectrum insecticide applications are avoided. Insect predators of mites include lady beetle adults and larvae, thrips, and pirate bugs. Heavy rain and cold weather also suppress mite numbers.

**Management—cultural control**
Elimination of broadleaf weeds such as mallow, bindweed, white clover, and knotweed with cultivation or grasses may reduce mite numbers. Wash mites from the tree with a strong stream of water. This also dislodges dust and dirt, which favor an increase in mite numbers. Water trees properly, as drought-stressed trees are more susceptible. Avoid excessive nitrogen applications, as this encourages mites.

**Management—chemical control**

See Table 1 in:
Chemical Control of Landscape Pests

Yew (Taxus)—Lecanium scale

*Lecanium* spp.

**Pest description and damage** Lecanium scales are most noticed as they expand in spring. As females swell in the spring they produce considerable honeydew. The female lecanium scale are about 0.125 inch in diameter and vary from red to dark brown in color. They are oval and raised, resembling small “helmets,” “turtles,” or bumps on branches, stems, and the underside of leaves. Male scale are smaller, fairly flat, and oblong. Crawlers are pale yellow and overwinter on stems of host plant.

**For biology, life history, monitoring and management**

See:
Ash (Fraxinus)—Lecanium scale
Common Landscape Pests

**Management—chemical control**

See Table 1 in:
Chemical Control of Landscape Pests

Yew (Taxus)—Root weevil

**Includes**
Black vine weevil (*Otiorhynchus sulcatus*)
Clay-colored weevil (*Otiorhynchus singularis*)
Strawberry root weevil (*Otiorhynchus ovatus*)

**Pest description and damage** Species identification is important. Adult weevils are small dark nocturnal beetles with a snout (rostrum) and elbowed antennae. Most of the species are all females and capable of laying eggs after a period of feeding to mature their ovaries. Larvae, found around roots of yew, are C-shaped, legless, and white with tan heads, up to 0.5 inch in size. Check base of unthrifty shrubs for girdling by larvae. This is especially important in new plantings. The larvae of all species are quite similar in appearance and habit: feeding on root hairs, larger roots and root crown. Look for notches in needles. Dead tips scattered in plants where weevils have girdled the twigs are common.

**For biology, life history, monitoring and management**

See “Root weevil” in:
Common Landscape Pests

**Management—chemical control**

See Table 2 in:
Chemical Control of Landscape Pests

Yew (Taxus)—Spruce bud scale

*Physokermes piceae*

**Pest description and damage** Females are semiglobular, brown or reddish, and occur at the base of new shoots. They tend to be very inconspicuous, as they may be partly hidden by the bark and may resemble buds. Lower branches often are infested heavily and may be killed, while upper branches are much less affected. Spruce bud scale produces a large amount of honeydew which often is covered with black sooty mold. They infest various species of yew, and Alberta and Norway spruce.

**For biology, life history, monitoring and management**

See:
Spruce (Picea)—Spruce bud scale

See “Scale insect” in:
Common Landscape Pests

**Management—chemical control**

See Table 1 in:
Chemical Control of Landscape Pests
Turfgrass Pests
Gwen Stahnke and Neil Bell

Latest revision—March 2019

INCLUDES MANAGEMENT OPTIONS FOR COMMERCIAL AND HOME USE

In all cases, follow the instructions on the pesticide label. The PNW Insect Management Handbook has no legal status, whereas the pesticide label is a legal document. Read the product label before making any pesticide applications.

Protect pollinators: See How to Reduce Bee Poisoning from Pesticides.

Note: Products are listed in alphabetical order and not in order of preference or superiority of pest control.

Turfgrass—Ant
Various species

See also
Turfgrass—Harvester ant

Pest description and crop damage Ants normally establish their colonies in sunny locations in well-drained soils. In turf, a nest consists of a series of underground tunnels and galleries which may extend three or more feet beneath the soil surface. Multiple openings provide access to the surface. During nest construction, ants excavate large quantities of soil which they deposit in mounds on the surface. Not only are these mounds unsightly, but they can smother the turfgrass immediately surrounding colony openings and make routine maintenance difficult by producing a bumpy, uneven turf.

Biology and life history A typical ant colony consists of an egg-laying queen, males, immature stages (eggs, larvae and pupae) and hundreds to thousands of sterile female workers which can become a nuisance as they forage around buildings, sidewalks, foundations and driveways. Ants consume a wide variety of foods including seeds, small insects, plant sap, flower nectar and fungal growth. Many ant species feed on honeydew, a sweet liquid secreted by plant-feeding insects such as aphid, mealybugs, scale insects and leafhoppers. In the spring and fall, colonies produce winged ants that leave the colony, mate and seek new nesting sites.

Management—chemical control: HOME USE
Effective ant control normally requires destruction of the queen. In most cases, this necessitates one or more applications of a liquid or granular insecticide. In situations where only a few colonies are present, apply insecticides directly to colony openings and the areas immediately surrounding the mounds.

♦ abamectin
♦ azadirachtin (neem oil)—Some formulations are OMRI-listed for organic use.
♦ Beauvaria bassiana—Some formulations are OMRI-listed for organic use.
♦ beta-cyfluthrin
♦ bifenthrin
♦ boric acid
♦ carbaryl
♦ clothianidin
♦ cyfluthrin
♦ cyhalothrin
♦ cypermethrin
♦ deltamethrin
♦ gamma-cyhalothrin
♦ imidacloprid
♦ lambda-cyhalothrin
♦ permethrin
♦ plant essential oils (cedarwood, clove, garlic, lemongrass, etc.)—Some formulations are OMRI-listed for organic use.
♦ pyrethrins—Some formulations are OMRI-listed for organic use.
♦ spinosad—Some formulations are OMRI-listed for organic use.
♦ tetramethrin

Management—chemical control: COMMERCIAL USE
Effective ant control normally requires destruction of the queen. In most cases, this necessitates one or more applications of a liquid or granular insecticide. In situations where only a few colonies are present, apply insecticides directly to colony openings and the areas immediately surrounding the mounds.

♦ abamectin (Abathor Granular Ant Bait, Advance 375A Granular Ant Bait)
♦ beta-cyfluthrin (Tempo SC Ultra Insecticide, Tempo Ultra GC Insecticide, Tempo Ultra WP Insecticide, Tempo Ultra WSP Insecticide)
♦ bifenthrin + carbaryl (Andersons Golf Prod Duocide Insect Control)
♦ bifenthrin (Talstar GC Granular Insecticide, Talstar PL Granular Insecticide Talstar S, Select Insecticide, Onyx Pro Insecticide, ActiShield, multiple label names)
♦ boric acid (Intice 10 Perimeter Bait)—Some formulations are OMRI-listed for organic use.
♦ carbaryl (Sevin Brand RP4 Carbaryl, Lebanon Sevin 7G Granular Insect Control, Sevin SL Carbaryl Insecticide)
♦ chlorpyrifos (Dursban Pro, Dursban 50W In WSP Speciality Insecticide, Hatchet Insecticide, Nufos 4E Insecticide, Vulcan, Quali-Pro Chlorpyrifos 4E Insecticide, Warhawk, Warhawk Clearform)—Retail sale of products containing chlorpyrifos for residential use ended 12/31/01.
♦ cyfluthrin (Tempo 20WP Golf Course Insecticide in WSP, Tempo 20 WP Insecticide)
♦ cypermethrin (Demon WP Insecticide)—Highly toxic to fish.
♦ deltamethrin (Deltagard G Insecticide, D-Fense SC Insecticide)
♦ esfenvalerate (Fenvastar Ecocap)
♦ esfenvalerate + pyrethrin + piperonyl butoxide (Onslaught FastCap Spider and Scorpion Insecticide)
♦ hydromethylnon (MaxForce Granular Insect Bait)
♦ indoxacarb (DuPont Provant Insecticide, Provant Insecticide, and as ant baits, e.g., Advion Insect Granule Insecticide, Advion Fire Ant Bait)
♦ lambda-cyhalothrin (Scimitar, Demand CS Insecticide, Demand EZ Insecticide, Demand G Insecticide, Cyonara 9.7 Insecticide, Cyzmic CS Controlled Release Insecticide, Exile 9.7, Patrol Insecticide)
♦ lambda-cyhalothrin+ thiamethoxam (Tandem Insecticide)
♦ mint oil, geraniol + oil of rosemary (Keyplex Ecotrol Plus Insecticide/Miticide, Essentria IC3 Insecticide)—OMRI-listed for organic use.
♦ pyrethrin oil (OR-3610A)—OMRI-listed for organic use.
♦ spinosad (Brandt Antixx Ant Killer)
♦ spinosad + iron phosphate (Bulls-eye Outdoor Granular Ant Bait)
Turfgrass—Billbug

Includes

Bluegrass billbug (Sphenophorus parvulus)
D Denver billbug (Sphenophorus cacticrariatus)
Hunting billbug (Sphenophorus venatus)
Phoenician billbug (Sphenophorus phoeniciensis)

Pest description and crop damage Adults are about 0.375 inch long, black, with a distinct snout. They lay eggs in late spring. Larvae are white with a brown head, and about 0.25 inch long when mature. Larvae generally reach damaging size by midsummer. Larvae feed on grass roots, cutting them off. Damage often shows up as irregular patches of drought-stressed turf. Kentucky bluegrass most commonly is attacked by billbug larvae. However, tall fescue, perennial rye, and chewings fescue and annual bluegrass are also susceptible. Billbugs cause problems mainly in eastern Oregon, central Washington and Idaho, especially around Ontario-Baker City and Boise-Twin Falls, and also occasionally from La Grande into the Columbia Gorge. More recently modest billbug damage has been observed in the Portland area near Tualatin and also in western Washington near Seattle. The species involved have not yet been identified. The Denver billbug appears to be primarily located in eastern Idaho.

Biological and life history Bluegrass billbugs overwinter as adults. Eggs are laid on grass stems in May or June and hatch in about 2 weeks. As the larvae mature, they move from the crown of the plant deeper into the soil where they feed on roots. There is one generation per year. The Denver and hunting billbugs have a similar life cycle but may lay eggs for a longer period of time resulting in larvae that overwinter in the soil. Damage from these species can occur much earlier in spring than damage from bluegrass billbug. Perennial ryegrasses, fine fescues, and tall fescues with high levels of endophytic fungi are resistant to billbugs.

Management—biological control
♦ beneficial nematodes—Read label carefully for application procedures, timing and appropriate soil temperatures for best efficacy.

Management—chemical control: HOME USE
Treat the entire lawn, not just affected areas. Spring applications when adults first become active may prevent larval populations from building to damaging levels. Do not permit children or pets on the treated turfgrass until it has been watered to wash the insecticide into the turf and the grass is completely dry. Most insecticides are toxic to bees exposed to direct treatment or to residues on blooming weeds/flowers in lawns: mow and remove clippings prior to applying insecticides.
♦ azadirachtin (Azasol, Azatin, Azaguard Botanical Insecticide/Nematicide, Gordons Pro T&O Azatrol EC Insecticide, Ornain 3% EC Botanical Insecticide, Neemix 4.5 IGR)—OMRI-listed for organic use.
♦ Beauvaria bassiana GHA (Botanigard ES, Botanigard 22WP)—Some formulations are OMRI-listed for organic use.
♦ beta-cyfluthrin (Tempo SC Ultra Insecticide, Tempo Ultra GC Insecticide, Tempo Ultra WP Insecticide, Tempo Ultra WSP Insecticide)
♦ bifenthrin (Talstar GC Granular Insecticide, Talstar PL Granular Insecticide Talstar S, Select Insecticide, Onyx Pro Insecticide, Actishield, multiple label names)—For adults.
♦ bifenthrin + imidacloprid (Allectus G Insecticide, Atera GC 2+1 SC Insecticide, Atera GC 2+1 SC Insecticide, Bithor SC)—Note: Neonicotinoid pesticides have been banned from use on public properties in some towns and counties (check with local authorities).
♦ carbaryl (Sevin Brand RP4 Carbaryl, Lebanon Sevin 7G Granular Insect Control, Sevin SL Carbaryl Insecticide)
♦ chlorantraniliprole (Acelepryn Insecticide, Acelepryn G Insecticide)—For larvae.
♦ chlorpyrifos (Andersons Golf Products Insecticide III, Dursban Pro, Dursban 50W In WSP Speciality Insecticide, Hatchet Insecticide, Nufo 4E Insecticide, Vulcan, Quali-Pro Chlorpyrifos 4E Insecticide, Warhawk, Warhawk Clearform)—For adults. Retail sale of products containing chlorpyrifos for residential use ended 12/31/01.
♦ clothianidin (Arena 0.25G Insecticide, Arena, 50 WG Insecticide, Arena 50 WDG Insecticide)—For adults or larvae. Note: Neonicotinoid pesticides have been banned from use on public properties in some towns and counties (check with local authorities).
♦ clothianidin + bifenthrin (Aloft GC G Insecticide, Aloft GC SC Insecticide, Aloft LC G Insecticide, Aloft LC SC Insecticide)—Restricted use.
♦ cyfluthrin (Tempo WP Insecticide, Tempo 20WP Golf Course Insecticide in WSP)—For adults.
♦ deltamethrin (Deltagard G Insecticide, D-Fense SC Insecticide)—For adults.
♦ esfenvalerate (Fenvarvet Ecocap)—Keep away from water sources. Not for use on sod farms or golf courses.
♦ esfenvalerate + pallethrin + piperonyl butoxide (Onslaught FastCap Spider and Scorpion Insecticide)
♦ imidacloprid (Adonis 2F Insect Conc., AmiTide Imidacloprid, Avatar PLX Insecticide, Lesco Bandit 0.5G Granular Insecticide, Lesco Bandit 2F Insecticide, Lesco Bandit 75 WSP Insecticide, Malice 0.5G, Malice 2F Insecticide, Malice 75WSP, Mallet 0.5G Insecticide, Mallet 2F Insecticide, Mallet 2F T&O Insecticide Mallet 75 WSP Insecticide, Mallet 7.1% PF Insecticide, Merit 0.5G Insecticide, Merit 2F Insecticide, Merit 75WP Insecticide, Merit 75WSP Insecticide, Midash 2SC T&O, Prokoz Zenith 0.5G Insecticide, Prokoz Zenith 2F Insecticide, Quali-Pro Imidacloprid
0.5G, Quali-Pro Imidacloprid2F T&O, Quali-Pro Imidacloprid 75 WSB Insecticide in WSP)—For larvae. Note: Neonicotinoid pesticides have been banned from use on public properties in some towns and counties (check with local authorities).

♦ lambda-cyhalothrin (Scimitar, Demand CS Insecticide, Demand EZ Insecticide, Demand G Insecticide, Cyonara 9.7 Insecticide, Czycz CS Controlled Release Insecticide, Exile 9.7, Patrol Insecticide)—For adults.

♦ mint oil, geraniol + oil of rosemary (Keyplex Ecotrol Plus Insecticide/Miticide, Essentria IC3 Insecticide)—OMRI-listed for organic use.

**Turfgrass—Chinch bug**

Blissus spp. (An as yet unidentified species, not B. leucopterus, the destructive species in the Midwest)

**Pest description and crop damage** Small black bug, 0.18 inch long, with characteristic white marks on wing covers. Nymphs are reddish with white or black markings. Chinch bugs are Hemipterans and as such have piercing, sucking mouth parts. They suck sap from the crown and stem of grasses. Because chinch bugs tend to aggregate, damage often occurs in clumps. Grass becomes yellow and dies. Chinch bug damage generally is from mid- to late summer. Lawns under moderate to severe drought stress often are affected severely, and so chinch bug damage is usually worst after a particularly warm summer. Shaded areas of turf are damaged noticeably less.

**Biology and life history** The species of chinch bug responsible for damage to turfgrass in the west is not well understood. The hairy chinch bug (B. leucopterus hirtus), which causes damage in northeastern states from Virginia to Minnesota and the southern chinch bug (B. insularis), found from the Carolinas to southern California, are better described. The species found in Oregon is unofficially known as the western chinch bug to differentiate it from these two. The western chinch bug is thought to have one generation per year. They likely overwinter as adults. They become active in spring when temperatures reach 45°F. Eggs are laid, which depending on temperature may hatch in 7 days or up to 6 weeks. The five immature (nymphal) stages are usually completed in 4–6 weeks.

**Scouting and thresholds** Chinch bugs are small, so are difficult to see unless you find a large population. The best places to look are where turf is damaged, good areas to look are on mounds, south-facing slopes, turf on the south side of buildings or any turf prone to drought stress.

**Management—biological control**

Fungal endophytes in grass, particularly in perennial ryegrass, reduce hairy chinch bug nymph survival.

**Management—cultural control**

Chinch bugs are not consistent pests. While conditions suitable for damage occur each year in the PNW, the last major outbreak occurred in 1985. They are not likely to damage vigorous, well-irrigated turfgrass stands. Heavily fertilized turfgrass areas are more susceptible. The most resistant turfgrasses are those that are lightly fertilized and regularly irrigated. Turfgrasses such as perennial ryegrass and fine and tall fescues with high levels of endophytic fungi are resistant to chinch bugs.

**Management—chemical control: HOME USE**

Do not permit children or pets on the treated turfgrass until it has been watered to wash the insecticide into the turf and the grass is completely dry. Most insecticides are toxic to bees exposed to direct treatment or to residues on blooming weeds/flowers in lawns: mow and remove clippings prior to applying insecticides.

♦ azadirachtin—Some formulations OMRI-listed for organic use.

♦ Beauvaria bassiana—Some formulations are OMRI-listed for organic use.

♦ bifenthrin

♦ carbaryl

♦ chlorantraniliprole

♦ clothianidin

♦ cyhalothrin

♦ deltamethrin

♦ fenvalerate

♦ imidacloprid

♦ lambda-cyhalothrin

♦ permethrin

♦ plant essential oils (cedarwood, clove, mint, rosemary, etc.)—Some formulations are OMRI-listed for organic use.

♦ pyrethrins

♦ spinosad

**Management—chemical control: COMMERCIAL USE**

Do not permit children or pets on the treated turfgrass until it has been watered to wash the insecticide into the turf and the grass is completely dry. Most insecticides are toxic to bees exposed to direct treatment or to residues on blooming weeds/flowers in lawns: mow and remove clippings prior to applying insecticides.

♦ azadirachtin (Azasol, Azatin, Azaguard Botanical Insecticide/ Nematicide, Gordons Pro T&O Azatrol EC Insecticide, Ormazin 3% EC Botanical Insecticide, Neemix 4.5 IGr)—OMRI-listed for organic use.

♦ Beauvaria bassiana GHA (Botanigard ES, Botanigard 22WP)—Some formulations are OMRI-listed for organic use.

♦ beta-cyfluthrin (Tempo SC Ultra Insecticide, Tempo Ultra GC Insecticide, Tempo Ultra WP Insecticide, Tempo Ultra WSP Insecticide

♦ bifenthrin (Talstar GC Granular Insecticide, Talstar PL Granular Insecticide Talstar S, Select Insecticide, Onyx Pro Insecticide, Actishield, multiple label names)

♦ carbaryl (Sevin Brand RP4 Carbaryl, Lebanon Sevin 7G Granular Insect Control, Sevin SL Carbaryl Insecticide)

♦ chlorantraniliprole (Acelepryn Insecticide, Acelerpyrin G Insecticide)—Suppression of chinch bugs only.

♦ chlorpyrifos (Andersons Golf Products Insecticide III, Dursban Pro, Dursban 50W In WSP Specialty Insecticide, Hatchet Insecticide, Nufos 4E Insecticide, Vulcan, Quali-Pro Chlorpyrifos 4E Insecticide, Warhawk, Warhawk Clearform)—Retail sale of products containing chlorpyrifos for residential use ended 12/31/01.

♦ clothianidin (Arena 0.25G Insecticide, Arena, 50 WG Insecticide, Arena 50 WDG Insecticide)—Apply as soon as overwintering adults are seen in the spring. Note: Neonicotinoid pesticides have been banned from use on public properties in some towns and counties (check with local authorities).

♦ clothianidin + bifenthrin (Aloft GC G Insecticide, Aloft GC SC Insecticide, Aloft LC G Insecticide, Aloft LC SC Insecticide)—Restricted use.

♦ cyfluthrin (Tempo 20 WP Golf Course Insecticide in WSP, Tempo 20 WP Insecticide)
cypermethrin (demonMAX, UP-Cyde PRO 2.0 Termiticide/Insecticide)—Highly toxic to fish.

deltamethrin (Deltagard G Insecticide, D-Fense SC Insecticide, Suspend SC Insecticide)—For adults.

dinotefuran (Zylam)—For suppression only. Note: Neonicotinoid pesticides have been banned from use on public properties in some towns and counties (check with local authorities).

imidacloprid

deltamethrin (Deltagard G Insecticide, D-Fense SC Insecticide, Suspend SC Insecticide)—For adults.

lambda-cyhalothrin (Scimitar, Demand CS Insecticide, Demand G Insecticide, Cyonara 9.7 Insecticide, Cyzmic CS Controlled Release Insecticide, Exile 9.7, Patrol Insecticide)

mint oil, geraniol + oil of rosemary (Keyplex Ecotrol Plus Insecticide/Miticide, Essentria IC3 Insecticide)—OMRI-listed for organic use.

Turfgrass—Crane fly

Common crane fly (Tipula oleracea)

European crane fly (Tipula paludosa)

Pest description and crop damage European crane fly (ECF) is a native of western Europe which was introduced to eastern Canada and found in British Columbia in 1965. The mild winters, cool summers and relatively abundant rainfall in the PNW is ideal habitat for this insect and its range now extends as far south as central California. It has recently been documented east of the Cascades with a heavy infestation in a newly developed housing area in Spokane WA and some in Bend, OR. The adult is a large two-winged fly that is often compared to a large mosquito. ECF have one generation per year. The larvae are wormlike, with leathery skin, 1 to 1.5 inches long. Larvae hatch in late summer (Aug.–Sept.) and feed through winter and into spring, damaging turf anytime between December and May. ECF larvae feed primarily on shoots and crowns, but also feed on roots. Affected turf areas often thin out severely in early spring when normal turf starts vigorous growth. Starlings and other birds are attracted to affected turf and may damage it as they search for larvae. In 1998, the common crane fly (CCF) was positively identified in WA. This crane fly has 2 generations per year. The wings on the CCF are longer than the body and CCF females can fly farther to distribute their eggs than ECF females. The CCF is also found on wheat, strawberries and other crops.

Biology and life history ECF overwinters as a third-instar larva in the soil. Adult emergence may begin anytime from July to mid-October. Adult males are 14–19 mm long, adult females are 19–25 mm long. Adult crane flies do not feed, they only drink water, and their life expectancy is 2–14 days. They usually mate and lay eggs within 24 hours of emergence. Eggs are laid on a wide range of crops, including turf, other grasses, legumes, crucifers, strawberry, corn and other crops. Eggs and early instar larvae require a very moist atmosphere or high mortality will occur. Eggs hatch in approximately 11–15 days. The young larvae develop rapidly through to the third instar, known as leatherjackets, in which state they overwinter. It is as growth resumes in late winter, December to April, that most turf damage occurs. By mid-April, larvae have molted to the fourth instar and feed only briefly before become inactive before pupation and adult emergence later in summer. There is only one generation per year. The CCF life cycle is similar, except it has 2 generations per year. The overwintering larvae from the previous fall pupate in February–March and emerge in late March to April, then mate and lay their eggs. The second generation of larvae mature from April through September and adults emerge for the second generation at the same time as the one generation of the ECF from Sept.–Oct.

Estimates of which crane fly is most prevalent by observation of emergence timing would indicate that approximately 90-95% of the crane flies in WA are the ECFs at the present time.

Scouting and thresholds Monitor turf areas starting in December, looking for thin patches. Larvae are typically found in the top 1 inch of turf, so sampling is fairly straightforward by removing soil cores and counting larvae. A common clue that ECF or CCF are present is a high level of bird activity on the turf. Consider treating when larval populations reach 25–50 or more per square foot and turf thinning is apparent. Brown patches in turf which are observed in mid to late summer could be a sign of CCF damage, but are most likely due to inadequate irrigation.

Management—cultural control

Observations that drought stress at the time of egg lay may significantly reduce larval populations. In the Willamette valley of Oregon, turning off turf irrigation systems shortly after Labor Day will often create enough drought stress to reduce larval populations without causing damage to turf. Unfortunately, around Labor Day is when most of the overseeding and seeding of new lawns is done. If there has been a history of a high population of ECF larvae in the past on your newly seeded site, it would be advisable to apply a preventative application at the time of seeding to limit the feeding of ECF larvae on the newly developing grass plants.

Management—biological control

Research indicates larvae are not affected by endophytic fungi common in some varieties of perennial ryegrass, fine fescue, and tall fescue. Research in the PNW has indicated limited efficacy of beneficial nematodes (55% reduction in larvae at best). Applied biological controls in general have not been shown to be effective on this pest, although birds and mammals such as raccoons and skunks may be highly effective.

♦ beneficial nematodes—Nematodes may only achieve 50% control, but this may be an acceptable level of control in some situations. Read label carefully for application procedures, timing and appropriate soil temperatures for best efficacy.

Management—chemical control: HOME USE

Do not permit children or pets on the treated turfgrass until it has been watered to wash the insecticide into the turf and the grass is completely dry. Most insecticides are toxic to bees exposed to direct treatment or to residues on blooming weeds/flowers in lawns: mow and remove clippings prior to applying insecticides.

♦ azadirachtin—Some formulations are OMRI-listed for organic use.

♦ bifenthrin

♦ chlorantraniliprole

♦ fenvalerate

♦ imidacloprid

♦ plant essential oils (peppermint, rosemary, etc.)—Some formulations are OMRI-listed for organic use.

♦ pyrethrins—Some formulations are OMRI-listed for organic use.

Management—chemical control: COMMERCIAL USE

When pest densities exceed thresholds, apply insecticides in the spring. Where serious prior infestations have occurred or when spring applications were missed, apply in mid-November to December. Most applications need irrigation or rainfall after treatment to get the insecticide to the thatch/soil interface layer where larvae are present. Do not permit children or pets on the treated turfgrass until it has been watered to wash the insecticide into the turf and the grass is completely dry. Most insecticides are toxic to bees exposed to direct treatment or to residues on blooming weeds/flowers in lawns: mow and remove clippings prior to applying insecticides.

♦ azadirachtin (Azasol, Azatin, Azaguard Botanical Insecticide/Nematicide, Gordons Pro T&O Azatrol EC Insecticide, Ornamin 3% EC Botanical Insecticide, AzaMax AG 0.6)—For early larval instages in early fall for best results. OMRI-listed for organic use.
♦ bifenthrin (Talstar GC Granular Insecticide, Talstar PL Granular Insecticide Talstar S, Select Insecticide, Onyx Pro Insecticide, Actishield, multiple label names)—Mow the lawn first and remove the clippings. Highly toxic to bees.
♦ bifenthrin + imidacloprid (Allectus G Insecticide)—Note: Neonicotinoid pesticides have been banned from use on public properties in some towns and counties (check with local authorities).
♦ bifenthrin + zeta-cypermethrin (Talstar XTRA Granular)
♦ carbaryl (Sevin Brand RP4 Carbaryl, Lebanon Sevin 7G Granular Insect Control, Sevin Sl Carbaryl Insecticide)—Mow the lawn first and remove the clippings. Highly toxic to bees. Keep children and pets off the lawn until it has been thoroughly watered after treatment, and the grass is completely dry.
♦ chlorantraniliprole (Acelepryn Insecticide, Acelepryn G Insecticide)
♦ chlorpyrifos (Andersons Golf Products Insecticide III, Dursban Pro, Dursban 50W In WSP Specialty Insecticide, Hatchet Insecticide, Nufo 4E Insecticide, Vulcan, Quali-Pro Chlorpyrifos 4E Insecticide, Warhawk, Warhawk Clearform)—Retail sale of products containing chlorpyrifos for residential use ended 12/31/01.
♦ clothianidin (Arena 0.25G Insecticide, Arena, 50 WG Insecticide, Arena 50 WDG Insecticide)—Apply as soon as overwintering adults are seen in the spring. Note: Neonicotinoid pesticides have been banned from use on public properties in some towns and counties (check with local authorities).
♦ clothianidin + bifenthrin (Aloft GC G Insecticide, Aloft GC SC Insecticide, Aloft LC G Insecticide, Aloft LC SC Insecticide)—Restricted use.
♦ dinotefuran (Zylam)—Effective at oviposition and all larval stages. Note: Neonicotinoid pesticides have been banned from use on public properties in some towns and counties (check with local authorities).
♦ esfenvalerate + prallethrin + piperonyl butoxide (Onslaught FastCap Spider and Scorpion Insecticide)
♦ imidacloprid (Adonis 2F Insect Conc., AmTide Imidacloprid, Avatar PLX Insecticide, Lesco Bandit 0.5G Granular Insecticide, Lesco Bandit 2F Insecticide, Lesco Bandit 75 WSP Insecticide, Malice 0.5G, Malice 2F Insecticide, Malice 75WSP, Mallet 0.5G Insecticide, Mallet 2F Insecticide, Mallet 2F T&O Insecticide Mallet 75 WSP Insecticide, Mallet 7.1% PF Insecticide, Merit 0.5G Insecticide, Merit 2F Insecticide, Merit 75WP Insecticide, Merti 75WSP Insecticide, Midash 2SC T&O, Proko Zenith 0.5G Insecticide, Proko Zenith 2F Insecticide, Quali-Pro Imidacloprid 0.5G, Quali-Pro Imidacloprid 2F T&O, Quali-Pro Imidacloprid 75 WSB Insecticide in WSP)—Apply at oviposition (Early September) for best results. Applications made later will not be successful. Note: Neonicotinoid pesticides have been banned from use on public properties in some towns and counties (check with local authorities).
♦ indoxacarb (DuPont Provaunt Insecticide, Provaunt Insecticide)—Apply to larvae in September/October for preventative applications. The higher label rate can be used as late as April for control of larvae. Do not use on sod farms.
♦ lambda-cyhalothrin (Scimitar, Demand CS Insecticide, Demand EZ Insecticide, Demand G Insecticide, Cyonara 9.7 Insecticide, Cymic CS Controlled Release Insecticide, Exile 9.7, Patrol Insecticide)—Better results when applied at earlier instars. Not as effective as bifenthrin at later larval stages.
♦ thiamethoxam (Meridian 0.33G Insecticide, Meridian 25WG Insecticide, Flagship 25WG Insecticide)—Effective only when applied at oviposition. Note: Neonicotinoid pesticides have been banned from use on public properties in some towns and counties (check with local authorities).

For more information: Cranefly pests of the PNW—http://whatcom.wsu.edu/cranefly/index.htm

**Turfgrass—Cutworm**

**Primarily**
Black cutworm (*Agrotis ipsilon*)
Variegated cutworm (*Peridroma saucia*)

**Pest description and crop damage** Adult cutworms are medium to large moths but all damage is due to larval feeding. Larvae are typically about an inch long, have a small black head and vary in color from nearly black to grey brown or multicolored in the case of variegated cutworms. Commonly found in older turf stands, particularly those dominated by bentgrass. Activity generally is confined to foliage, although at times feeding may be at ground level. Populations build as summer progresses. Actual cutworm damage to home lawns is rare, they are more of an issue on golf course putting surfaces.

**Biology and life history** Both species overwinter as larvae and adults emerge throughout May and June. Eggs are laid on host plants, and hatch after a few days. Young larvae feed only on foliage, although mature larvae develop a subterranean habit and may cut off plants at the surface and feed on them in their burrows. If the lawn has been aerated, cutworms may be found in the late summer and fall in these holes and damage is apparent around them.

**Management—biological control**

Birds can often assist in control since they will pluck them from the turf, although this in itself may be damaging to turf.

♦ *Bacillus thuringiensis*—Some formulations are OMRI-listed for organic use.
♦ beneficial nematodes—Read label carefully for application procedures, timing and appropriate soil temperatures for best efficacy.

**Management—Chemical control: HOME USE**

Do not permit children or pets on the treated turfgrass until it has been watered to wash the insecticide into the turf and the grass is completely dry. Most insecticides are toxic to bees exposed to direct treatment or to residues on blooming weeds/flowers in lawns: mow and remove clippings prior to applying insecticides.

♦ azadirachtin—Some formulations are OMRI-listed for organic use.
♦ *Beauvaria bassiana*—Some formulations are OMRI-listed for organic use.
♦ bifenthrin
♦ carbaryl
♦ chlorantraniliprole
♦ clothianidin
♦ cyfluthrin
♦ cyhalothrin
♦ deltamethrin
♦ fenvalerate
♦ gamma-cyhalothrin
♦ imidacloprid
♦ lambda-cyhalothrin
♦ permethrin
♦ plant essential oils (clove, garlic, thyme, etc.)—Some have demonstrated efficacy against Lepidopteran larvae. Some formulations are OMRI-listed for organic use.
♦ pyrethrins—Some formulations are OMRI-listed for organic use.
♦ spinosad
Management—Chemical control: COMMERCIAL USE

Do not permit children or pets on the treated turfgrass until it has been watered to wash the insecticide into the turf and the grass is completely dry. Most insecticides are toxic to bees exposed to direct treatment or to residues on blooming weeds/flowers in lawns: mow and remove clippings prior to applying insecticides.

- azadiractin (Azasol, Azatin, Azaguard Botanical Insecticide/Nematicide, Gordons Pro T&O Azatrol EC Insecticide, Ornamin 3% EC Botanical Insecticide, Neemix 4.5 IGR)—OMRI-listed for organic use.
- beta-cyfluthrin (Tempo SC Ultra Insecticide, Tempo Ultra GC Insecticide, Tempo Ultra WP Insecticide, Tempo Ultra WSP Insecticide)
- bifenthrin (Telstar GC Granular Insecticide, Telstar PL Granular Insecticide Telstar S, Select Insecticide, Onyx Pro Insecticide, Actifestyle, multiple label names)
- bifenthrin + imidacloprid (Allект G Insecticide)—Note: Neonicotinoid pesticides have been banned from use on public properties in some towns and counties (check with local authorities).
- capsaicin + allyl isothiocyanate (Dazitol Concentrate)
- carbaryl (Sevin Brand RP4 Carbaryl, Lebanon Sevin 7G Granular Insect Control, Sevin SL Carbaryl Insecticide)
- chlorantraniliprole (Acelepryn Insecticide, Acelepryn G Insecticide)
- chlorpyrifos (Andersons Golf Products Insecticide III, Dursban Pro Dursban 50 W In WSP Speciality Insecticide, Hatchet Insecticide, Nufos 4E Insecticide, Vulcan, Quali-Pro Chlorpyrifos 4E Insecticide, Warhawk, Warhawk Clearform)—Retail sale of products containing chlorpyrifos for residential use ended 12/31/01.
- clothianidin (Arena 0.25G Insecticide, Arena, 50 WG Insecticide, Arena 50 WDG Insecticide)—Apply as soon as overwintering adults are seen in the spring. Note: Neonicotinoid pesticides have been banned from use on public properties in some towns and counties (check with local authorities).
- clothianidin + bifenthrin (Aloft GC G Insecticide, Aloft GC SC Insecticide, Aloft LC G Insecticide, Aloft LC SC Insecticide)—Restricted use.
- cyfluthrin (Tempo 20WP Golf Course Insecticide in WSP, Tempo 20 WP Insecticide)
- deltamethrin (Deltagard G Insecticide, D-Fense SC Insecticide, Suspend SC Insecticide)—For adults.
- dinotefuran (Zylam)—Note: Neonicotinoid pesticides have been banned from use on public properties in some towns and counties (check with local authorities).
- esfenvalerate (Fenvastar Ecocap)—Keep away from water sources. Not for use on sod farms or golf courses.
- esfenvalerate + pallethrin + piperonyl butoxide (Onslaught FastCap Spider and Scorpion Insecticide)
- imidacloprid (Adonis 2F Insect Conc., AmTide Imidacloprid, Avatar PLX Insecticide, Lesco Bandit 0.5G Granular Insecticide, Lesco Bandit 2F Insecticide, Lesco Bandit 75 WSP Insecticide, Malice 0.5G, Malice 2F Insecticide, Malice 75WSP, Mallet 0.5G Insecticide, Mallet 2F Insecticide, Mallet 2F T&O Insecticide Mallet 75 WSP Insecticide, Mallet 7.1% PF Insecticide, Merit 0.5G Insecticide, Merit 2F Insecticide, Merit 75 WP Insecticide, Merit 75 WSP Insecticide, Midash 25C T&O, Prokob Zenith 0.5G Insecticide, Prokob Zenith 2F Insecticide, Quali-Pro Imidacloprid 0.5G, Quali-Pro Imidacloprid2F T&O, Quali-Pro Imidacloprid 75 WSB Insecticide in WSP)—For larvae. Note: Neonicotinoid pesticides have been banned from use on public properties in some towns and counties (check with local authorities).
- indoxacarb (DuPont Provaunt Insecticide, Provaunt Insecticide)—For larvae.
- mint oil, geraniol + oil of rosemary (Keyplex Ecotrol Plus Insecticide/Miticide, Essentria IC3 Insecticide)—OMRI-listed for organic use.
- spinosad A&D (Conserve SC Turf & Ornamental Insect Control)—For larvae. Some formulations are OMRI-listed for organic use.

Turfgrass—Earthworm
Includes nightcrawler (Lumbricus terrestris)

Pest description and crop damage Earthworm bodies are long and worm-like, usually from one to six inches long. The body is segmented. Earthworms are beneficial in soil for aeration, water penetration, thatch control, addition of bacteria, organic matter and other benefits. Earthworm castings are composed of soil and plant residue and are very effective at improving soil structure. Although earthworms are generally considered beneficial, on rare occasions and in rare situations, earthworms may become undesirable. Their burrowing activity and cast deposition can cause damage to new seedlings or roughen established turf areas.

Biological and life history Earthworms are mainly free-living terrestrial worms. They are found in soil, leaf litter and under stones and logs, usually in wetter, more heavily vegetated regions. Earthworms move along by extending the front end of the body, taking hold of the substrate using bristles on their body, then drawing up the rear end. Earthworms don’t have lungs, but instead breathe through the skin. In order to breathe this way, the skin must be kept moist. Earthworms do this by excreting mucous and body fluids onto the skin. This need for moisture restricts their activities to a burrowing life in damp soil. They emerge only at night when temperatures are cooler, and retreat deep underground during hot, dry weather. Most earthworms are scavengers that feed on dead organic debris, including leaves. Soil consumed by worms is deposited on the surface of the ground, in the form of ‘castings.’ All earthworms are hermaphrodites (that is, a single individual can produce both male and female gametes, the eggs and sperm). Eggs are produced when two earthworms inseminate each other during mating. Mating occurs usually when the ground is wet following rain. Egg cocoons are deposited in the soil. The fertilized eggs develop directly into young worms. The juveniles grow continuously until they reach adult size.

Management—biological control

Birds can often assist in control since they will pluck them from the turf, although this in itself may be damaging to turf.

Management—cultural control

There is no treatment threshold for earthworms: the threshold is determined by the tolerance level of the homeowner or turf caretaker. Power raking or rolling of the turf when castings are soft will usually even the soil. Grass clippings can be collected, if desired, to remove some of the food source. This, however, also reduces the return of organic matter and nutrients to the soil.

Management—chemical control: HOME USE

There are no pesticides registered for earthworm control.

Management—chemical control: COMMERCIAL USE

There are no pesticides registered for earthworm control.
**Turfgrass—Harvester ant**

*Pogonomyrmex* spp.

**Pest description and crop damage** Harvester ants are native to western North America. In the PNW, they are found in eastern Oregon and Washington. They are fairly large reddish-brown insects with a “beard” used in digging. They are common in grasslands where they build large mounds. Harvester ants are seed feeders. They are capable of producing painful bites, but they are not aggressive and rarely sting unless the colony is disturbed.

**Management—chemical control: HOME USE**

- abamectin
- bifenthrin
- cyhalothrin
- deltamethrin
- permethrin

**Management—chemical control: COMMERCIAL USE**

- abamectin (Abathor Granular Ant Bait, Advance 375A Granular Ant Bait)
- bifenthrin (Talstar GC Granular Insecticide, Talstar PL Granular Insecticide Talstar S, Select Insecticide, Onyx Pro Insecticide, Actishield, multiple label names)
- hydramethylnon (Amdro Pro)—Bait.

**Turfgrass—Leafhopper**

*Cicadellidae* (several species)

**Pest description and crop damage** Slender, less than 0.25 inch long, green, yellow, or brownish gray insects that hop and fly short distances above the lawn surface. Feeding causes grass blades to look mottled or whitish.

**Management—biological control**

Research indicates larvae are not affected by endophytic fungi common in some varieties of perennial ryegrass, fine fescue, and tall fescue. Research in the PNW has indicated limited efficacy of beneficial nematodes. Biological controls in general have not been shown to be effective on this pest.

- beneficial nematodes—Read label carefully for application procedures, timing and appropriate soil temperatures for best efficacy.

**Management—chemical control: HOME USE**

Reinfestation may occur from adjacent, untreated areas. Repeat applications may be necessary. Do not permit children or pets on the treated turfgrass until it has been watered to wash the insecticide into the turf and the grass is completely dry. Most insecticides are toxic to bees exposed to direct treatment or to residues on blooming weeds/flowers in lawns: mow and remove clippings prior to applying insecticides.

- acephate (Orthene Turf Tree & Orn. WSP)
- azadiractin (Azasol, Azatin, Azaguard Botanical Insecticide/Nematicide, Gordons Pro T & O Azatrol EC Insecticide, Ornamin 3% EC Botanical Insecticide, Neemix 4.5 IGR)—OMRI-listed for organic use.
- bifenthrin + imidacloprid (Allactus G Insecticide)—Note: Neonicotinoid pesticides have been banned from use on public properties in some towns and counties (check with local authorities).
- chlorpyrifos (Andersons Golf Products Insecticide III, Dursban Pro, Dursban 50W In WSP Specialty Insecticide, Hatchet Insecticide, Nufos 4E Insecticide, Vulcan, Quali- Pro Chlorpyrifos 4E Insecticide, Warhawk, Warhawk Clearform)—Retail sale of products containing chlorpyrifos for residential use ended 12/31/01.
- clothianidin + bifenthrin (Aloft GC G Insecticide, Aloft GC SC Insecticide, Aloft LC G Insecticide, Aloft LC SC Insecticide) Restricted Use.
- deltamethrin (Deltagard G Insecticide, D-Fense SC Insecticide, Suspend SC Insecticide)—For adults.
- esfenvalerate (Fenvarad G Insecticide, D-Fense SC Insecticide, Suspend SC Insecticide)—For adults.
- permethrin
- phenothrin
- plant essential oils (clove, garlic, rosemary, etc.)
- pyrethrins—Some formulations are OMRI-listed for organic use.
- spinosad—Some formulations are OMRI-listed for organic use.
- tetramethrin

**Management—chemical control: COMMERCIAL USE**

Reinfestation may occur from adjacent, untreated areas. Repeat applications may be necessary. Do not permit children or pets on the treated turfgrass until it has been watered to wash the insecticide into the turf and the grass is completely dry. Most insecticides are toxic to bees exposed to direct treatment or to residues on blooming weeds/flowers in lawns: mow and remove clippings prior to applying insecticides.

- bifenthrin
- cyhalothrin
- deltamethrin
- lambda-cyhalothrin
- permethrin
- phenothrin
- plant essential oils (clove, garlic, rosemary, etc.)
- pyrethrins—Some formulations are OMRI-listed for organic use.
- spinosad—Some formulations are OMRI-listed for organic use.
- tetramethrin

**Turfgrass—Sod webworm**

**Includes**

- Cranberry girdler (*Chrysoteuchia topiaria*)
- Larger sod webworm (*Pedasia trisecta*)

**Pest description and crop damage** The larger sod webworm (LSW) and cranberry girdler (CBG) are larvae of “lawn moths.” The moths are characterized by wings that are partially folded around the body giving the moths a very slender appearance as well as a pronounced “snout.” The LSW is one of the larger webworms with a wingspan of 21 to 35 mm, while the CBG is smaller with a wingspan of 20 to 25 mm. The wings are usually white, grey or tan, and may have patterns of silver, gold, copper or other colored scale. Larvae can cause considerable damage to turf areas if conditions favor their development. However, due to the high natural mortality of small larvae, damage is seldom severe. Presence of larvae is indicated by dying back of grass shoots until irregular brown spots occur. Close examination usually shows leaf blades chewed off at base of plant.

**Biology and life history** Webworms overwinter as larvae in the soil. Adults emerge in late May through June. Moths have erratic flight, move freely over lawn about dusk, and are attracted to light. Adults lay eggs shortly after emergence. Eggs hatch in 5
to 14 days and the young larvae feed on the tender young grass leaves, spinning a protective silky web. As the larvae mature, they construct subterranean burrows and feed only at night. CBG will burrow into the crown and feed on plant roots, and is often referred to as the subterranean webworm. In the PNW, the larval stage lasts through the winter and may involve as many as 8 instars.

**Scouting and thresholds** Worms or worm droppings can be detected by breaking apart a section of dying sod. Thresholds for larval numbers have not been established in the PNW.

**Management—biological control**

Disease, insect predators and especially bird predation exact a very high toll on larvae, and collectively reduce larval populations up to 90%.

♦ *Bacillus thuringiensis*—Some formulations are OMRI-listed for organic use.
♦ beneficial nematodes—Read label carefully for application procedures, timing and appropriate soil temperatures for best efficacy.

**Management—chemical control: HOME USE**

To protect bees, mow lawns before treatment to remove any bloom that might attract them.

Insecticides listed below are to prevent larval injury to lawns. The insecticides will not greatly reduce the number of moths present at the time of application. Moths will migrate into treated lawns from surrounding areas. Do not permit children or pets on the treated turfgrass until it has been watered to wash the insecticide into the turf and the grass is completely dry. Most insecticides are toxic to bees exposed to direct treatment or to residues on blooming weeds/flowers in lawns: mow and remove clippings prior to applying insecticides.

♦ azadirachtin—Some formulations OMRI-listed for organic use.
♦ *Bacillus thuringiensis* (Bt)—Some formulations are OMRI-listed for organic use.
♦ *Beauvaria bassiana*—Some formulations are OMRI-listed for organic use.
♦ bifenthrin
♦ carbaryl
♦ clothianidin
♦ cyhalothrin
♦ deltamethrin
♦ fenvalerate
♦ gamma-cyhalothrin
♦ imidacloprid
♦ lambda-cyhalothrin
♦ permethrin
♦ plant essential oils (mint, rosemary, thyme etc.)
♦ pyrethrins—Some formulations are OMRI-listed for organic use.

**Management—chemical control: COMMERCIAL USE**

To protect bees, mow lawns before treatment to remove any bloom that might attract them.

Insecticides listed below are to prevent larval injury to turf areas. The insecticides will not greatly reduce the number of moths present at the time of application. Moths will migrate into treated turf stands from surrounding areas. Do not permit children or pets on the treated turfgrass until it has been watered to wash the insecticide into the turf and the grass is completely dry. Most insecticides are toxic to bees exposed to direct treatment or to residues on blooming weeds/flowers in lawns: mow and remove clippings prior to applying insecticides.

♦ azadiractin (Nemix 4.5 IGR/ org. prod., zaMax AG 0.6)—OMRI-listed for organic use.
♦ beta-cyfluthrin (Tempo SC Ultra Insecticide, Tempo Ultra GC Insecticide, Tempo Ultra WP Insecticide, Tempo Ultra WSP Insecticide)
♦ bifenthrin (Talstar GC Granular Insecticide, Talstar PL Granular Insecticide Talstar S, Select Insecticide, Onyx Pro Insecticide, Actichield, multiple label names)
♦ bifenthrin + imidacloprid (Allectus G Insecticide)—Note: Neonicotinoid pesticides have been banned from use on public properties in some towns and counties (check with local authorities).
♦ carbaryl (Sevin Brand RP4 Carbaryl, Lebanon Sevin 7G Granular Insect Control, Sevin SL Carbaryl Insecticide)
♦ chlorantraniliprole (Acelepryn Insecticide, Acelepryn G Insecticide)
♦ chlorpyrifos (Andersons Golf Products Insecticide III, Dursban Pro Dursban 50W In WSP Speciality Insecticide, Hatchet Insecticide, Nufos 4E Insecticide, Vulcan, Quali-Pro Chlorpyrifos 4E Insecticide, Warhawk, Warhawk Clearform)—Retail sale of products containing chlorpyrifos for residential use ended 12/31/01.
♦ clothianidin (Arena 0.25G Insecticide, Arena, 50 WG Insecticide, Arena 50 WDG Insecticide)—Apply as soon as overwintering adults are seen in the spring. Note: Neonicotinoid pesticides have been banned from use on public properties in some towns and counties (check with local authorities).
♦ clothianidin + bifenthrin (Aloft GC G Insecticide, A loft GC SC Insecticide, A loft LC G Insecticide, A loft LC SC Insecticide)—Restricted use.
♦ cyfluthrin (Tempo 20 WP Golf Course Insecticide in WSP, Tempo 20 WP Insecticide)
♦ deltamethrin (Deltagard G Insecticide, D-Fense SC Insecticide, Suspend SC Insecticide)—For adults.
♦ dinofeturan (Zylam)—Note: Neonicotinoid pesticides have been banned from use on public properties in some towns and counties (check with local authorities).
♦ esfenvalerate (Fenvastar Ecocap)—Keep away from water sources. Not for use on sod farms or golf courses.
♦ esfenvalerate + pallethrin + piperonyl butoxide (Onslaught FastCap Spider and Scorpion Insecticide)
♦ gamma-cyhalothrin (Optimate CS Controlled Release Insecticide)
♦ imidacloprid (Adonis 2F Insect Conc., AmTide Imidacloprid, Avatar PLX Insecticide, Lesco Bandit 0.5G Granular Insecticide, Lesco Bandit 2F Insecticide, Lesco Bandit 75 WSP Insecticide, Malice 0.5G, Malice 2F Insecticide, Malice 75 WSP, Mallet 0.5G Insecticide, Mallet 2F Insecticide, Mallet 2F T&O Insecticide Mallet 75 WSP Insecticide, Mallet 7.1% PF Insecticide, Merit 0.5G Insecticide, Merit 2F Insecticide, Merit 75 WSP Insecticide, Merti 75 WSP Insecticide, Midash 2SC T&O, Proko Zenith 0.5G Insecticide, Proko Zenith 2F Insecticide, Quali-Pro Imidacloprid 0.5G, Quali-Pro Imidacloprid 2F T&O, Quali-Pro Imidacloprid 75 WSB Insecticide in WSP)
♦ indoxacarb (DuPont Provaunt Insecticide, Provaunt Insecticide)—For larvae.
♦ mint oil, geraniol + oil of rosemary (Keyplex Ecotrol Plus Insecticide/Miticide, Essentria IC3 Insecticide Conc.)—OMRI-listed for organic use.
♦ spinosad A & D (Conserve SC Turf & Ornamental Insect Control)
Turfgrass—White grub

Includes *Aphodius* spp.

**Pest description and crop damage** White grubs are the larvae of a number of scarab beetle species. The most common in the PNW are *A. granarius*, a European species, and *A. pardalis*, a west coast species. Other white grubs found in the PNW are larvae of May or June beetles, (*Polyphaga* spp. and *Phyllophaga* spp.). Adult aphodius are small (2.2 mm by 4.9 mm), shiny black, with dull red or yellow markings. They feed on all kinds of debris including dung, leaf litter and carrion. Larvae sizes vary; they have robust, cream-color bodies and black heads. White grubs feed primarily on roots. Turf damage generally appears as patches of dead turf that are not anchored to the soil. Symptoms may occur from spring through fall. In general this is not a consistent pest of turf in the PNW. Most documented damage has occurred on golf courses.

**Biology and life cycle** Adult aphodius are found first in May through June, and again in August and September. The first larval population causes the most damage and peaks in June-July. These insects may have two generations per year.

**Scouting and thresholds** Damage tends to be visible in early to mid-spring as patches of dead or dying turf. Damage first becomes noticeable when larval densities reach 100/sq ft.

**Management—biological control**
- beneficial nematodes—Read label carefully for application procedures, timing and appropriate soil temperatures for best efficacy.

**Management—chemical control: HOME USE**
Spray when grubs are active near the soil surface. Irrigate the treated area immediately after application with 0.5 to 1 inch water to wash insecticide into underlying soil. Do not permit children or pets on the treated turfgrass until it has been watered to wash the insecticide into the turf and the grass is completely dry. Most insecticides are toxic to bees exposed to direct treatment or to residues on blooming weeds/flowers in lawns: mow and remove clippings prior to applying insecticides.
- *Beauvaria bassiana*—Some formulations are OMRI-listed for organic use.
- bifenthrin
- carbaryl
- chlorantraniliprole
- clothianidin
- imidacloprid

**Management—chemical control: COMMERCIAL USE**
Spray when grubs are active near the soil surface. Irrigate the treated area immediately after application with 0.5 to 1 inch water to wash insecticide into underlying soil. Do not permit children or pets on the treated turfgrass until it has been watered to wash the insecticide into the turf and the grass is completely dry. Most insecticides are toxic to bees exposed to direct treatment or to residues on blooming weeds/flowers in lawns: mow and remove clippings prior to applying insecticides.
- carbaryl (Sevin Brand RP4 Carbaryl, Lebanon Sevin 7G Granular Insect Control, Sevin SL Carbaryl Insecticide)—For larvae.
- chlorantraniliprole (Acelepryn Insecticide, Acelepryn G Insecticide, Merit 2F Insecticide, Merit 75WP Insecticide, Merti 75WSP Insecticide, Midash 2SC T&O, Prokoz Zenith 0.5G Insecticide, Prokoz Zenith 2F Insecticide, Quali-Pro Imidacloprid 0.5G, Quali-Pro Imidacloprid2F T&O, Quali-Pro Imidacloprid 75 WSB Insecticide in WSP)—For larvae. Note: Neonicotinoid pesticides have been banned from use on public properties in some towns and counties (check with local authorities).
- clothianidin (Arena 0.25G Insecticide, Arena, 50 WG Insecticide, Arena 50 WDG Insecticide)—Apply as soon as overwintering adults are seen in the spring. Note: Neonicotinoid pesticides have been banned from use on public properties in some towns and counties (check with local authorities).
- dinotefuran (Zylam)—Provides only suppression of white grub larvae. Must apply prior or during egg hatch for control. Note: Neonicotinoid pesticides have been banned from use on public properties in some towns and counties (check with local authorities).
- imidacloprid (Fortify Season Long Grub Control, Adonis 2F Insect Conc., AmTide Imidacloprid, Avatar PLX Insecticide, Lesco Bandit 0.5G Granular Insecticide, Lesco Bandit 2F Insecticide, Lesco Bandit 75 WSP Insecticide, Malice 0.5G, Malice 2F Insecticide, Malice 75WSP, Mallet 0.5G Insecticide, Mallet 2F Insecticide, Mallet 2F T&O Insecticide Mallet 75 WSP Insecticide, Mallet 7.1% PF Insecticide, Merit 0.5G Insecticide, Merit 2F Insecticide, Merit 75WP Insecticide, Merti 75WSP Insecticide, Midash 2SC T&O, Prokoz Zenith 0.5G Insecticide, Prokoz Zenith 2F Insecticide, Quali-Pro Imidacloprid 0.5G, Quali-Pro Imidacloprid2F T&O, Quali-Pro Imidacloprid 75 WSB Insecticide in WSP)—For larvae. Note: Neonicotinoid pesticides have been banned from use on public properties in some towns and counties (check with local authorities).
- trichlorfon (Dylox 6.2 Granular, Dylox 420 SL Turf & Ornamental)—For larvae.