



Home & Garden Pest Management Guide For British Columbia

2019 Edition

Chapter 13 Pests of Fruit Trees



Pests of Fruit Trees

This chapter describes insect and disease problems of fruit trees. Management information describes preventative and cultural measures that may control the pest. Try these first. Sometimes the management information also mentions pesticides. When more than one pesticide is mentioned, the least toxic pesticide is listed first. Before using a pesticide read and follow label directions, including the precautions, rates and days-to-harvest. See the “Pesticide Table” in Appendix I for information on available home garden pesticides. Also read Chapter 8 “Using Pesticides to Manage Pests”. It contains important safety information.

Proper identification of plant pests and diseases is an important step before attempting to control the pest. Not all plant problems are caused by pests; some are caused by cultural, nutritional or environmental conditions. See Chapter 2 for information on how to get help identifying plant problems.

Legislation and local by-laws in the Interior fruit-growing regions require that pests on fruit trees in home gardens be controlled. Unsprayed trees are a source of infestation for near-by commercial orchards. Recommendations for control of common tree fruit pests and diseases in the Interior are also published in the factsheet “[A Guide to Managing Tree Fruit Pests in the Home Garden](#)”.



Insect Pests of Apples and Pears

Ambrosia Beetle and Shothole Borer

(*Xyloborus dispar*, *Scolytus rugulosus*)

Trees stressed from transplanting, poor soil drainage or mechanical injury are most often attacked. They appear wilted, and numerous small holes 1.5 to 2 mm in diameter appear in the bark anywhere on the tree. Beetles are dark brown to black and about 2 mm long. Ambrosia and shothole adults are active in the spring; a second generation of shothole borers appears in the late summer.

Management:

Keep trees healthy and free of stress. Irrigate and fertilize to encourage tree vigour and resistance to infestation. Remove dead or dying limbs or trees and any wood showing beetle damage. Burn or chip prunings; do not keep any fruit tree firewood with intact bark. Firewood with bark may continue to breed insects for 2 or 3 years.



Shothole borer damage on apple

Aphids



Green apple aphid



Woolly apple aphid

These small (2 to 3 mm) soft-bodied, sap-sucking insects are found on leaves, twigs, or roots. They usually occur in colonies and may be covered with a white cottony substance. Damage from feeding may distort leaves, twigs, roots and fruit. Some species transmit virus diseases of plants.

Woolly apple aphids are recognized by cottony-white masses around pruning cuts, water sprouts and leaf axils. The aphids beneath the cottony material are purplish-brown in colour. They overwinter in sheltered places on the tree, such as the base of water sprouts or under dead bark

around nodular swellings, and may lead to winter killing of the tissues. Young fruit trees can be killed or severely stunted by heavy root infestations. The perennial canker fungus often attacks these injured tissues.

Management:

Aphids feed on sap and are favoured by conditions that produce rapid growth. On young trees, or when vigorous growth is caused on mature trees by excessive fertilizer, aphid populations may increase and cause damage before beneficial predator insects can control them. Encourage control by natural enemies by withholding insecticide sprays until at least 6 leaves of the terminal (end) shoots are infested with aphids. Always check before spraying to see if predator insects (see chapter 6) are present among the aphids as they often provide sufficient control.

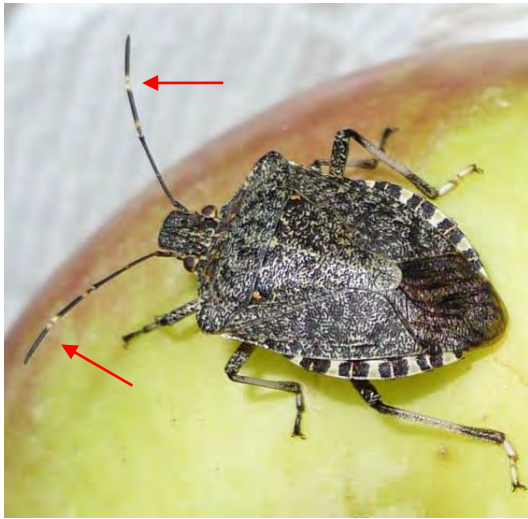
If your garden centre carries biological control agents, obtain *Aphidoletes aphidimyza* in May, and release them on your fruit trees. Ladybugs are also effective aphid predators. Native ladybugs occur in large numbers in most areas. Buying ladybugs to place on trees is generally disappointing, since they just fly away. If predators are not present, spray with an insecticidal soap. Malathion can also be used. Apply a dormant oil spray in late winter or early spring before the pre-pink stage of bud development. Ensure thorough coverage. This treatment will kill the overwintering eggs of mites and aphids. Apply summer oil for aphid control in the summer.

For woolly apple aphid, remove suckers to eliminate a source of population development, and prune out water sprouts in August. Several predators, including syrphid larvae and a tiny wasp attack woolly apple aphid. Insecticides applied against other pests will aid in control of woolly aphid.

Some ants ‘farm’ aphids for their sweet honeydew secretions and protect them from predatory insects. Applying a sticky band around the trunk or lower limbs will keep ants out of the tree and help the predators to do their job.

Brown Marmorated Stink Bug

(*Halyomorpha halys*)



Adult brown marmorated stink bug



Brown marmorated stink bug nymphs

Brown marmorated stink bug was first detected in British Columbia in 2015. It is a serious pest that feeds on more than 100 different plant species including tree fruits, berries, grapes, vegetables, and ornamental plants. Both adults and nymphs feed by inserting their needle-like mouthparts into the flesh of fruit or vegetables, resulting in dead areas and distortions. They can be a nuisance to homeowners when the adults aggregate on and in buildings in the fall as they seek warm overwintering sites.

The adult is shield-shaped, about the size of a dime, brown marbled appearance with alternating brown and white markings on the outer edge of the abdomen. It can be distinguished from other stink bugs by the presence of distinctive white bands on the antennae. Immature stages range in colour from bright orange, black or brown and later stages are pear-shaped with white markings on legs and antennae.

Management:

A tiny parasitic wasp *Trissolcus japonicus* that attacks the eggs of brown marmorated stink bugs in Asia has been found in the United States and British Columbia. Other predators such as spiders, ladybugs and lacewings will feed on brown marmorated stink bug eggs.

There are no home garden insecticides currently available for use on tree fruit for this pest.

Apple Clearwing Moth

(*Synanthedon myopaeformis*)



Apple clearwing moth larva



Apple clearwing moth adult

The apple clearwing moth is a new pest of apple introduced to the Similkameen and Okanagan Valleys in 2005. This pest is also present in the Fraser Valley. Damage has so far been confined to apple, but in Europe this pest also attacks pear, crabapple, quince, plum, apricot, cherry, hawthorn, and mountain ash. Larvae tunnel under the bark anywhere from below the crown area up to branches. Infested rootstocks appear swollen. Infestation can shorten the life of trees and could make the trees susceptible to attack by other insects such as shothole borer. The moths, which can be confused with wasp-type insects, can be observed resting during sunny days on leaves from mid-June through mid-August. To check for larval infestations, examine the bases of trees for 2 to 3 mm-wide holes and tunnels under the bark, especially on rootstocks that appear abnormally swollen.

Management:

Reduce the risk of infestations by minimizing wounds to trees, removing young trees with cankers, and sealing wounds with wound-protecting products. Trap clearwing moths with two litre plastic bottle traps or a 2 litre pail baited with grape juice. A bait of 8 L Water + 1 L apple juice + 1 L vinegar + 100 g sugar can also be used. Clear out moths weekly and top up bait as needed.



Apple clearwing moth bottle trap.

Photo courtesy of Okanagan Tree Fruit Company



Grape juice baited bottle trap with moths.

Photo courtesy Gary Judd, AAFC Summerland

Apple Curculio

(*Anthonomus quadrigibbus*)

Apple curculio occurs on apple, pear, crabapple, hawthorn, quince, cherry and Saskatoon berry. On apples, early season feeding damage appears as slightly raised russeted areas on maturing fruit. Late season damage appears as circular, depressed areas around small, dark, corky spots or holes. Early feeding damage on pears results in deformed and undersized fruit. Cherry fruit may be damaged by egg laying.

Adults are small (5 mm long), reddish-brown weevils with a long, narrow snout. They are slow-moving and will drop readily and play dead when disturbed.

Curculios overwinter as adults that emerge in the spring to feed on buds and developing fruit. They prefer to lay eggs in cherries and Saskatoon berries. There is one generation per year.



Apple curculio on cherry

Note: the plum curculio is a similar pest that is not present in British Columbia. It attacks all pome and soft fruits causing similar damage, and also causes characteristic crescent-shaped scars on young fruit. If plum curculio is suspected, an expert should be contacted to help confirm the identification.

Management:

Remove alternative food or breeding hosts such as Saskatoon from areas near fruit trees. There are no insecticides registered for control of apple curculio for the home garden.

Apple Ermine Moth

(*Yponomeuta malinella*)



Apple ermine moth larvae



Apple ermine moth adult and cocoons

Young larvae overwinter under their egg mass cover, called a “hibernaculum”. They emerge in spring and bore into leaves, making small mines. At apple blossom time, they come out of the

leaf mines and build a small tent around a few leaves on which they feed. They pupate in this tent, making clusters of elongate, white cocoons. The adults are 1 cm long moths. They have white wings with many black dots on them. They lay eggs in bunches of 15-30 from July to September. The eggs hatch and the young larvae overwinter as a group in the hibernaculum. They rarely occur in numbers sufficient to cause problems.

Management:

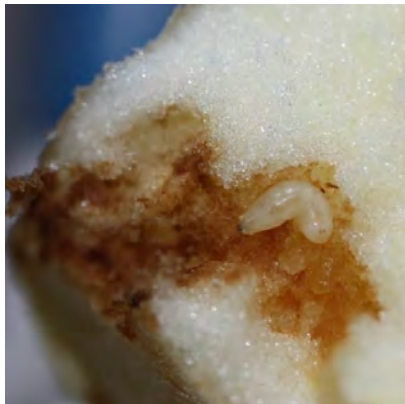
A number of biological control agents have been introduced in the Interior to help control apple ermine moth. This pest is not common in the Lower Mainland. Prune out and destroy any nests as soon as they are found. Insecticide sprays applied for other caterpillars will also control ermine moth larvae.

Apple Maggot

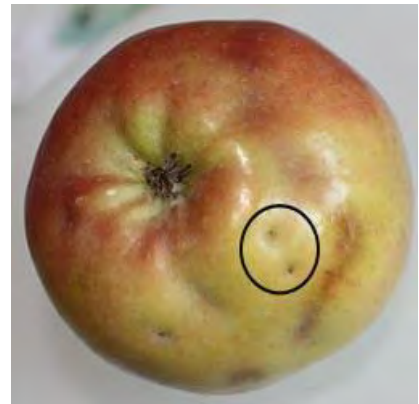
(Rhagoletis pomonella)



Apple maggot adult.
Photo credit Joseph Berger,
Bugwood.org



Apple maggot larva



Apple maggot stings (egg laying punctures) and dimpling on fruit

The apple maggot has recently been found in non-commercial host trees in the Fraser Valley, Greater Vancouver, Vancouver Island and Prince George. The B.C. Southern Interior remains the only apple producing region in North America free of this serious pest. The CFIA and the B.C. Ministry of Agriculture are seeking the cooperation of all citizens to prevent the spread of this pest from the Lower Mainland to the B.C. Interior via infested host fruit (apples, crabapples, and hawthorn), fruit containers and soil.

Apple maggot infested fruit has small dimples and depressions where females insert their eggs under the skin of the fruit. Apples infested in the early season will appear bumpy as they mature. Damage appears as brown tunnels through the flesh of the fruit. Heavily infested fruit can become mushy and prematurely drop. Apple maggot adults are small flies, about half the size of house fly, with patterned wings, a white spot between the wings, and white bands on thorax and abdomen. The larvae are small (6-9 mm long), legless white maggots.

Help prevent the spread of apple maggot:

- Do not take any host fruit, or any fruit bins or other containers used to hold apples out of the Lower Mainland.
- Do not take plants with garden soil that were grown near host trees out of the Lower Mainland.
- If you receive fruit from the Lower Mainland that appears to be infested, seal it in a plastic bag and take it to your nearest garden centre, Master Gardener, or CFIA or Ministry of Agriculture office.
- Suspicious fruit can also be sent to the [Plant Health Laboratory](#) for a free diagnosis.
- Do not compost any apples that appear to be infested with apple maggot. Place the fruit in a sealed plastic bag and bury at least 30 cm deep or take it to the local landfill for burial.

Management:

Remove any unmanaged or wild host trees (including crabapples and hawthorn) to eliminate sources of apple maggots and other pests. Inspect fruit regularly for signs of apple maggot infestation. Infested fruit should be destroyed before the larvae leave the fruit to hibernate in the soil.

Monitor for the presence of apple maggot flies using sticky plastic red spheres in host trees before mid-June. Yellow sticky cards can also be used for monitoring, but the native snowberry maggot fly, which is common in B.C. and looks identical to the apple maggot fly, will also be caught on yellow sticky cards. Proper identification of the flies caught is critical.

Tree covers produced by a B.C. company for fruit flies will also protect apple trees from apple maggot infestations (www.kootenaycovers.com).

Apply permethrin within 7 days of first fly capture and repeat at 14 days intervals to protect fruit. Read and carefully follow label instructions. Also treat crabapples and hawthorn. A commercial pesticide applicator will have access to more effective insecticides.

Codling Moth

(*Cydia pomonella*)

Codling moth larvae are pinkish in colour and up to 12 mm long. They burrow into apple, crabapple, quince and pear fruit to feed on the seeds. When mature they exit the fruit and find a sheltered site on the tree trunk, base of the tree or major limbs to spin a white cocoon in which to pupate or spend the winter. The entry and exit holes on fruit are plugged with dark masses of reddish-brown excrement.

The codling moth overwinters as a mature larva in a cocoon on or at the base of host trees. There are 2 and sometimes 3 generations each summer. Overwintering larvae change into adults soon after apple blossom time; the second brood of adults appears from late July through August.



Codling moth entry hole covered with frass



Codling moth larva and damage

Management:

In the Okanagan, Similkameen and Shuswap Valleys, backyard fruit trees must be managed to prevent buildup of tree fruit pests. As part of the area-wide SIR (Sterile Insect Release) program, codling moths must be controlled in home gardens. For further information, contact the SIR office at 1-800-363-6684 or visit <http://www.oksir.org/>

To help reduce codling moth numbers, remove and destroy any infested fruit and early dropped fruit. In mid-June, wrap a 10-cm-wide cardboard band (open corrugation against tree) around the base of host trees and major limbs. First-brood larvae will spin-up in and under the bands. Replace the bands in mid-July and destroy the old bands and any cocoons on the tree. Remove and destroy the second bands anytime during the winter.

A number of spray applications may also be required to protect the fruit over the summer. To improve chemical spray coverage, prune the host trees to open up and to lower the top of the canopy. This will also aid in detecting infested fruit.

The first spray should be applied 10 to 14 days after 90% of the petals have fallen or when larval entry holes (small tan to pale-brown wounds) are first noticed. Apply another treatment one to two weeks later. To control the second generation, apply a spray again in late July or early August or when fresh larval entry holes are noticed. Permethrin and malathion are registered for codling moth control. Btk does not provide good enough control. Follow all label instructions carefully. A commercial pesticide applicator will have access to more effective insecticides.

Repeated use of permethrin may kill predatory mites and result in a buildup of leaf-feeding mites.

Leafrollers, Leaf Skeletonizer and other Leaf-eating Caterpillars



Apple and thorn skeletonizer larvae and damage



Leafroller larva

These pests attack a wide range of fruit and ornamental trees and shrubs. Some feed from within rolled leaves; others skeletonize leaf surfaces. Damage may occur throughout the growing season. It is important to control these pests to prevent infesting near-by commercial tree fruit orchards.

Larvae of the oblique-banded and three-lined leafrollers and the eye-spotted bud moth emerge from overwintering sites on host trees in the spring to feed on newly emerged leaves, flower buds, blossoms and young fruit. Bud moth larvae appear again in mid-summer to feed on leaves and fruit. Leafrollers may have 1 or 2 summer generations. All 3 feed under leaves attached to fruit, between touching fruit, or in rolled-up terminal leaves. Fruit-tree and European leafroller larvae hatch from overwintering eggs during apple blossom time and also feed on blossoms and young fruit. Moths from this generation lay eggs that hatch the following year.

Apple-and-thorn skeletonizer larvae feed on the upper surface of apple, pear and cherry leaves. The leaves turn upwards, are covered with silk threads and gradually turn brown due to larvae eating the upper green tissue. There may be 2 generations of this pest.

Mature leafroller caterpillars are green with brown or black heads, and measure up to 2 to 2.5 cm long; bud moth larvae are brown and 1.5 mm long when full grown.

Management:

Watch plants for signs of feeding damage in the spring (chewed buds, blossoms, leaves and young fruit). For small infestations, remove caterpillars by hand, or by pruning and burning (where permitted). Thinning fruit to singles will reduce fruit damage.

Large infestations may be treated with Btk (*Bacillus thuringiensis*). Btk is a bacterium that kills only caterpillars and is harmless to other insects and wildlife. Malathion can also be used. Treat when larvae are first noticed and repeat as necessary. Btk is the only product that can be applied during bloom, when young caterpillars are often feeding. Other products must be applied either pre- or post-bloom to protect bees.

Mites

Mites are tiny spider-like animals, barely visible without magnification. There are several different kinds that can affect the health and vigour of fruit trees. Dormant oil is generally applied to reduce mite problems. Do not apply dormant oil when temperatures are below 4°C. NOTE: Dormant oil may damage the bark of 'Red Delicious' apple trees.

Dormant oil can be mixed with lime sulphur for disease control, however, lime sulphur can be damaging to beneficial mites. Lime sulphur alone will not prevent an outbreak of mites. (Do not use lime sulphur on apricots or filberts.)

Pearleaf Blister Mite

(Phytoptus pyri)

Pearleaf blister mite is difficult to see with the naked eye. Its presence is only detected by the appearance of reddish blisters on leaves that later turn brown or black. Fruit may become deformed and russeted. This pest is a problem mainly on pears.



Pearleaf blister mite damage

Management:

If pearleaf blister mite damage has caused leaf and fruit injury, treat infested trees in the late dormant stage with lime sulphur or dormant oil. Apply dormant oil every year in future to prevent reoccurrence of the problem.

Rust Mite

(Aculus schlechtendali, Eritrimerus pyri)

Rust mites are only evident by the damage they cause to host trees: apple leaves appear dry and rusty or purplish; peach leaves turn silvery; pear leaves turn black and drop. Young leaves may turn yellow. Fruit varieties sensitive to rust mite feeding suffer loss of vigour that can affect fruit quality. Rust mite feeding on pear fruit causes russet or roughening of the skin.

Management:

Healthy, well-maintained trees will tolerate higher mite populations than weak or stressed trees. Winter pruning will remove many overwintering rust mites.

On apples and peach, treatment is not usually required. These mites are an important food source for beneficial predator mites that keep pest mites below damaging levels (see "Beneficial Insects", Chapter 6).

On pears, if defoliation and fruit damage has occurred during the previous growing season, treat trees in the late dormant stage with dormant oil. Apply in sufficient volume to ensure thorough coverage.

European Red Mite, Two-spotted and McDaniel Spider Mites

(*Panonychus ulmi*, *Tetranychus urticae*, *T. mcdanieli*)



European red mites



European red mite eggs

European red mite overwinters as small red eggs on tree branches that hatch in the spring. Several generations are produced over the summer. Two-spotted and McDaniel spider mites overwinter as adults under bark or in trash at the base of trees. They move into the tree canopy in the spring and produce several generations through the summer. The feeding action of these mites causes the foliage to turn pale green to a bronzed appearance. Leaves may crinkle or become densely webbed. On pear, the leaves will turn black and drop. Severe leaf injury can result in poor fruit size, colour and a reduction in fruit set the following season.

Management:

Healthy, well-maintained trees will tolerate higher mite populations than weak or stressed trees. Try to encourage predatory mites by avoiding use of harmful products such as permethrin. Predatory mites can effectively control these mites if supplemented with a dormant oil spray just prior to bud burst. NOTE: Oil controls European red mite eggs but not two-spotted mite. If damage occurs in the summer, wash mites from leaves by sprinkling trees with a garden hose or treat with insecticidal soap or summer oil at label rates.

Pear Psylla

(*Cacopsylla pyricola*)

Adult pear psylla fly to pear trees from nearby overwintering sites in the early spring. Bright yellow to orange eggs are laid on the small branches. Immature psylla are very small, flattened yellow to black insects usually found within a drop of honeydew on the undersides of leaves. Mature forms are winged, green to black in colour and jump from the leaves when disturbed. The large amounts of honeydew produced by the nymphs and adults drips onto the fruit and leaves. Black sooty mould grows on the honeydew causing blackened unsightly areas on the fruit. Damaged leaves usually drop early.



Pear psylla adult and hardshell stages

Management:

Reduce excessive tree vigour by limiting nitrogen applications and summer pruning to reduce psylla numbers. Psylla nymphs are attacked by several kinds of predatory insects that can keep psylla numbers below damaging levels. Therefore, whenever possible, avoid the use of insecticides damaging to beneficial insects.

Early Spring: About one month before bud-break, apply a dormant oil plus lime sulphur spray. This will control adult psylla that have migrated to the pear trees, and also discourages egg laying.

Early Growing Season: During pink bud stage, but before any blossoms have opened, apply an insecticidal soap at label rate.

Summer: Sprays of water applied from a garden hose on a regular schedule will remove honeydew deposits and prevent damage to fruit and leaves. Sprays of insecticidal soap will remove honeydew and control the adults and immature stages.

Pear Slug (Pear Sawfly)

(Caliroa cerasi)



Pear sawfly larvae and damage



Pear sawfly adult

Pear sawfly, more commonly called pear slug because of the slug-like appearance of the larvae, overwinters as a larva in the soil. Adults emerge in the spring to lay eggs on foliage of pear and cherry trees. A second adult brood appears in August and occasionally, a third in September. The dark green to blackish larvae feed on the upper green tissue of the leaves so that only the veins are left. When mature, the 7 mm long larvae turn yellow and drop to the ground to pupate.

Management:

Sprays applied against other pests on pear and cherry usually keep pear slug in check. However, if control is necessary, spray water to knock the larvae off the leaves. Malathion can also be used.

Scale Insects

Lecanium Scale (*Parthenolecanium corni*)

Look for 2 to 5 mm wide hemispherical wrinkled “bumps” (female scales) on small limbs and twigs. Some scales are brown; others mottled brown and white. Twigs heavily infested with scale can die back.



Lecanium scale



Oystershell scale

Oystershell Scale (*Lepidosaphes ulmi*)

Look for small whitish scales up to 3 mm long shaped somewhat like an oyster shell on tree limbs and branches. Heavy infestations will retard tree growth and reduce vigour.

San Jose Scale and European Fruit Scale

(*Quadraspidiotus perniciosus*, *Q. ostreaeformis*)

Look for small, stationary, rounded “bumps” or scales 1-2 mm in diameter on the surface of limbs and twigs, and under bark scales on the trunk. These peculiar insects reduce tree vigour and, if present in large numbers, may kill the tree. They will also attack fruit causing discolouration and some deformation.

Management:

Scrape scales off infested limbs with a knife to reduce the number of scales. Prune out heavily infested branches and consider removing old trees with encrusted scale. Apply a dormant oil spray in late winter or early spring up to pre-pink stage of bud development. Ensure thorough coverage. This treatment will also kill the overwintering eggs of mites and aphids. Alternatively, spray malathion at label rate in June when the mobile stage called “crawlers”, first appear. To detect when crawlers are active, wrap double-sided sticky tape around infested limbs. Check regularly, using a magnifying lens, for tiny orange crawlers stuck to the tape. Trees that receive dormant oil every spring seldom have problems with scales.



European fruit scale

Winter Moth and Bruce Spanworm

(*Operophtera brumata*, *O. bruceata*)

Winter moth and Bruce spanworm can cause major damage in Southern Vancouver Island and the Lower Mainland. The larvae (caterpillars) attack apple, birch, blueberry, cherries (fruiting and flowering), maple, plum, poplar and many other trees and shrubs. Eggs hatch in late March. In late March and early April, look for silken threads and tiny green caterpillars, about 1 mm long. From early April to late May or mid-June, the caterpillars feed on flowers, leaves, buds and young fruit. Defoliation occurs when infestations are severe. The male moths are pale tan-grey with a wing span of about 3.2 cm. The females are wingless. The full-grown larvae or worms are about 1.5 to 2 cm long. They are bright green with three narrow, whitish stripes on each side of the body.

Management:

Young worms are carried on the wind and can drift considerable distances on silken threads, so protected trees can become infested from wild or neglected trees in the neighbourhood.

It is important to control the larvae in April before they bore into buds. Apply 1 or 2 sticky bands, 15 cm wide, with Tanglefoot® or Stickem® glue, around the tree trunk no later than mid-October to trap the females as they crawl upward to deposit eggs on the trunk and larger limbs. To protect the tree trunk, place 3 layers of plastic wrap under the glue. Cotton or polyester batting may be used to fill any gaps under the plastic wrap. The lower band should be replaced when it becomes dry, filled with moths or debris, or when moths begin to be trapped on the upper band. All bands should be removed and disposed of no later than February.

For additional control, spray with Btk or permethrin. Spray in early April when apple blossom buds are in the pre-pink stage. Apply a second spray immediately after apple blossom time if infestations are heavy or where re-infestation occurs from nearby neglected trees. NOTE: Application of permethrin to leaves may result in mite problems later in the season.

Permethrin can also be applied to trunks of trees and shrubs in November to kill the female moths as they crawl up to lay eggs.



Winter moth – winged males and wingless female. Photo courtesy of Irene Verigin and Darrin Brager



Bruce spanworm larva

Diseases of Apples and Pears

Anthracnose and Perennial Canker

(*Cryptosporiopsis* spp.)

Anthracnose canker is a common disease of apples in high rainfall areas. The fungus infects through the lenticels of twigs and branches without requiring a wound or leaf scar to gain entry. Infections occur during wet weather especially after the onset of fall rains. Perennial canker is a similar disease that is more common in the Interior.

Damage first appears as reddish-brown spots on the bark of branches and twigs and sometimes on the trunk of young trees. The next year, the spots develop into well-marked, cracked, sunken and shriveled areas known as cankers. Cankers can girdle and kill branches and young trees. The length of most cankers is 5-10 cm but some can be over 25 cm long. The fungus can live in a canker for several years and produce spores continually. Spores spread with rain and wind to cause more cankers, and also cause bull's eye fruit rot.



Anthracnose canker on apple

Management:

Do not plant susceptible varieties if there are old, cankered trees nearby. Information on cultivar resistance is limited. The cultivars Bramley's, Fuji, Gravenstein, King and Northern Spy are rated as more resistant than Akane, Elstar, Empire, Gala, Grime's Golden, Idared, Lord Lambourne, McIntosh, Melrose, Transparent and Tydeman Red.

Prune out and remove all cankers during winter pruning. Prune out any new cankers that develop on limbs and trunks as soon as they are discovered, and bring prunings to the landfill. Developing cankers often girdle 1-year-old wood; remove any shoots that wilt or die suddenly during April through July as soon as they appear.

Fungicides have not proven to be effective at controlling anthracnose on apple, and are not recommended.

European Canker

(Nectria galligena)

This fungal disease is most troublesome in moist coastal areas. Infection occurs through leaf scars and wounds during rainy, fall weather and again during pruning and bud opening in the spring. Small, dark brown spots called cankers that form on infected bark produce spores in early spring. The cankers become sunken, dead areas that eventually girdle twigs, branches and occasionally larger limbs. Open cankers have concentric rings of raised tissue at the margins. Closed cankers can also form with flat, regular margins covered by dead bark. A speckling of round, red, fungal fruiting bodies can sometimes be seen on the surface of cankers during the second winter and spring.



European canker on apple

Management:

Information on cultivar resistance to canker is limited. The cultivars Bramley's, Gravenstein, Golden Delicious, Jonagold, Jonathan, Northern Spy, and Rome Beauty are rated as more resistant than Cox Orange, Gala, King, McIntosh, Red Delicious or Spartan. Asian pears, as well as 'Comice' and 'Spartlett' pears are very susceptible. Do not plant susceptible varieties if there are old, cankered trees nearby.

Prune out and remove all cankers during winter pruning. On young trees this often means pulling out the tree or pruning it back severely. Prune out any new cankers that develop on limbs and trunks as soon as they are discovered, and bring prunings to the landfill.

There are no fungicides registered for control of European canker in Canada. Fungicides applied for other diseases such as apple scab may help to reduce the numbers of new infections.

Fire Blight

(*Erwinia amylovora*)



Fire blight on apple – shoot blight



Fire blight on pear – blackened fruit cluster



Fire blight-infected apple fruitlet with bacterial ooze

Fire blight is a serious bacterial disease of pear, apple and quince trees. It also affects a number of ornamentals in the rose family, such as hawthorn, mountain ash and firethorn. Foliage and branches rapidly wilt, appear scorched and die. Dead shoot tips often form a crook. Dead leaves may remain attached to the tree after autumn leaf fall. Discoloured, slightly sunken areas called cankers develop on twigs and branches. Fresh cankers often ooze bacterial slime. Pear trees are highly susceptible, but apples can also be severely damaged. Fire blight is more likely to kill young trees than older trees.

Management:

Dormant Season: Removal of overwintering cankers is a critical step in preventing and controlling fire blight. Make cuts 15-30 cm below the canker margin.

Growing Season: Fire blight is a highly infectious disease that can be spread by rain, wind, insects, and tools. Cut out infected shoots and branches as soon as noticed, and burn (where permitted) or take cuttings to the landfill. Make cuts well below any visible signs of infection (40 cm). The disease can easily be spread on pruning tools, so it is important to disinfect tools after each cut by dipping them in a disinfectant such as 10% solution of Lysol, Pinesol, 70% rubbing alcohol or 10% household bleach. Continue to monitor for new infections, and remove them as quickly as possible.

If fire blight is a problem, reduce soil moisture as much as feasible and reduce nitrogen fertilizer applications. If planting apple, select varieties that are less susceptible to fire blight.

Fire blight infections take place during the blossom period when weather is warm and wet. Avoid running sprinklers that wet the blossom of susceptible trees during warm weather. Late bloom on pears and some apple varieties is particularly at risk. Hand-removal of late bloom can help to prevent blossom infection.

There are no chemical sprays that can cure fire blight once a tree is infected. Preventative sprays with copper octanoate (Cueva) can be used during the blossom period to reduce infection.

Fruit Rots

Apples and pears in storage are subject to fruit rot caused by many species of fungi. Some fruit rots begin in the orchard, while others may cause infection after harvest.

Management:

Harvest fruit prior to the onset of fall rains to reduce fruit rot caused by canker fungi. Windfall apples picked up off the ground may be contaminated with other fungi and bacteria. They should not be stored but should be processed promptly by cooking or freezing. Never make unpasteurized apple juice from windfalls as food poisoning could result. Fruit with fungal rots may contain mycotoxins (fungal toxins) and should be discarded.



Apple with blue mold (Penicillium)

Non-parasitic fruit rot, also called “breakdown”, is a common problem with some varieties of apples and pears. In most cases, harvesting at the correct time can prevent these problems. Pears must be picked as soon as the seeds start to turn brown while the fruit is still green and hard. If left to ripen on the tree, the fruit will turn soft and mushy on the inside.

Proper nutrient management can also reduce post-harvest rot problems. For example, calcium deficiency is associated with storage rots, breakdown, bitter pit, and soft fruit.

Powdery Mildew

(Podosphaera leucotricha)



Powdery mildew on apple leaves



Russet damage to fruit caused by mildew

Powdery mildew is a fungal disease that infects leaves and fruits of apple and pear. Look for a greyish-white, powdery growth on the surface of shoots, foliage and blossoms. Early season infection can cause russetting of fruit.

Management:

Select resistant varieties when planting. Prune for good air circulation and light penetration. Remove infected “white tipped” apple shoots during dormant season pruning. Dormant applications of lime sulphur will reduce the fungus on twigs but will not penetrate infected buds. If further control is needed, spray at the pink-bud stage with a fungicide containing sulphur at label rates. Repeat this treatment every 10 to 14 days as required. Follow all label recommendations, precautions and days to harvest intervals. Sulphur may burn foliage and fruit at temperatures above 26°C.

Summer oil sprays (Purespray Green) will also help to control powdery mildew, but should not be applied within 14 days of a sulphur application. The biofungicide Regalia may provide some suppression of powdery mildew.

Apple cultivar susceptibility to powdery mildew

Resistance Rating	Variety
Very susceptible	Braeburn, Gala,Granny Smith,Gravenstein,Honeycrisp, Idared, Jonagold, Jonathan, McIntosh, Newtown, Northern Spy, Rome Beauty
More resistant	Ambrosia, Belmac, Empire, Enterprise, Freedom, Goldrush, Golden Delicious, Red Delicious
Highly resistant	Liberty, Priscilla, Pristine, Williams Pride

Pear Trellis Rust

(*Gymnosporangium fuscum*)



Pear trellis rust on pear



Pear trellis rust gall on juniper

Pear trellis rust is a disease of pears and junipers that is common in the coastal area and Lower Mainland of B.C., and also occurs in a few locations in the Okanagan. When pears are grown within 30 m of infected junipers, numerous orange or yellow spots will appear on the pear leaves. They begin as tiny dots in late May and gradually increase in size until August. In late August, the spots swell up and spore-bearing structures emerge from the lower leaf surface. In severe cases, fruit may also be infected and twigs may have overwintering infections in the form of swollen galls.

Pear and juniper are known as “alternate hosts” for this disease. Spores produced on pears can infect only junipers, while spores produced on junipers can infect only pears.

Management:

In the coastal area, do not plant junipers and pears close to one another. They should be at least 30 m (100 feet) apart to minimize damage. Take note of your neighbours’ plants and any street tree plantings before deciding to plant pear or juniper. In some areas, flowering pear trees have been planted as street trees. They will eventually be damaged if you plant junipers nearby.

Remove old, infected junipers close to pear trees before April 1 to prevent infection of pear leaves. Pick off infected pear leaves (if practical) before August 1 to prevent infection of junipers. Fungicide sprays effective for this disease are not available to the home gardener.

Scab (Apple and Pear)

(*Venturia* spp.)



Apple scab on leaves



Apple scab on fruit

Scab is a common fungal disease of apple and pear trees. Early leaf infections appear as olive-green spots with feathery margins that become brown to black. Severely infected leaves turn yellow (apples) or black (pears), and drop early. Fruit lesions are circular and brown to black in colour, and become corky in appearance. The fruit is most susceptible when young; early infections often result in large fruit lesions and severely cracked and malformed fruit. The apple and pear scab fungi are closely related but not identical. The disease does not spread from one to the other. On apples, the fungus overwinters in fallen leaves. On pears, it overwinters in leaves and also in small, 1 mm spots on the twigs.

Management:

Dry spring and summer weather reduces scab problems. Scab is often a continual problem in wet areas, so in those areas avoid highly susceptible varieties (see table). Most common pear varieties are susceptible, however ‘Comice’, ‘Conference’, ‘Sierra’ and Asian pears are less damaged than ‘Anjou’, ‘Bartlett’ and ‘Flemish Beauty’.

Rake up and destroy fallen leaves to reduce the overwintering fungus. For pears, also prune off and destroy infected twigs and branches.

Fungicide sprays are not always necessary in the home garden if good sanitation is practiced, especially in the drier Interior areas. If needed, apply a recommended fungicide at bud break in the spring (when new growth is 1.5 cm green) and repeat at the pink-bud stage; one week after petal fall and then two weeks later. Additional sprays to provide protective coverage through May and June may be needed for susceptible varieties in wet areas. There are few effective fungicides registered for control of scab in home gardens. Use a fruit tree spray containing copper octanoate, sulphur or lime sulphur, according to label directions. A fungicide containing garlic is also registered for suppression of scab. If sprays are applied later in the season, be sure to follow the days-to-harvest on the label. If you are not able to control scab with available domestic fungicides and sanitation, consider having your trees professionally sprayed or replant with a resistant variety.

Apple cultivar susceptibility to scab

Resistance Rating	Variety
Very susceptible	Ambrosia, Empire, Gala, Golden Delicious, Idared, Jersey mac, McIntosh, Mutsu, Rome Beauty, Sinta, Summerred
More resistant	Akane, Chehalis, Grimes' Golden, Honeycrisp, King, Jonagold, Lord Lambourne, Red Delicious, Spartan, Transparent, Tydeman Red
Highly resistant	Belmac, Enterprise, Florina, Freedom, Goldrush, Liberty, Priscilla, Prima, Pristine, Redfree, Richelieu, Williams Pride, Crimson Crisp, Crimson Gold, Crimson Topaz, Galerina, Jonafree, Novamac, Nova Spy, Otava, Pixie Crunch, Querina, Rubinola, Scarlet O'Hara, Sundance, Wine Crisp

Other Disorders

Algae, Lichens and Moss

Green and variously coloured growths may be found on twigs, limbs and trunks of many trees and shrubs. The growths may be leaf-like, hairy or scale-like. As a rule, algae appear first, followed by lichens and finally moss. They do not damage the trees. They are much more prevalent in the damp coastal climate than in the Interior.

Management:

Annual dormant sprays with lime sulphur will discourage the establishment of these growths. Once established, however, they may be impossible to remove without physical scrubbing which is probably not justified. Copper and other fungicides applied for disease control will also discourage algae and lichens. For best results, apply copper spray in November followed by the highest rate of lime sulphur when the trees are still fully dormant in January. (Do not use lime sulphur on apricots or filberts.)

June Drop

This is a normal stage in fruit development since apples and pears tend to set many more fruits than can be carried to maturity. About one month after blossoming ends, some of the excess fruit fall off over a short time. Even with June drop, too many fruit may remain on a tree, and additional thinning is often necessary. Thin clusters down to a single fruit. Then, thin the remaining fruit to no more than one per 15-20 cm of branch. To save yourself unnecessary work, do not begin your regular thinning until after June drop has occurred.

Bitter Pit

Bitter pit is caused by calcium deficiency in the developing fruit. Hot, dry weather in July or August promotes bitter pit. Round, slightly sunken 2-3 mm spots that are dry, brown and spongy underneath develop, especially towards the blossom end of the fruit. Symptoms may worsen during storage.

Management:

Water trees regularly during dry periods in summer. Avoid excessive nitrogen fertilizer, heavy pruning and excessive thinning. In general, large fruit will have more bitter pit than small ones.



Bitter pit on 'Golden Delicious' apple

'Bramley's Seedling', 'Gravenstein', 'Golden Delicious', 'Jonagold', 'King' and 'Northern Spy' are very susceptible to bitter pit, while 'Gala', 'Red Delicious' and 'Spartan' are fairly resistant.

Sprays of calcium chloride or calcium nitrate during the fruit enlargement period will reduce bitter pit. Calcium chloride can cause some leaf burning. Do not apply when temperatures are over 27 °C. Do not exceed 6 mL/L water. Calcium nitrate is preferred where the trees could use some extra nitrogen. It may also cause leaf burning. Use 5-10 mL/L water.

Sunscald

Large fruit that is fully exposed to the sun during one or more particularly warm days, may be "sunburned". Severely damaged tissue may turn white within a few days. Less severe damage results in bronzed, toughened and slightly sunken tissue that may not be apparent until later in the season.



Management:

While thinning, keep in mind that large, exposed fruit of varieties such as ‘King’ and ‘Jonagold’ may be damaged during hot weather. Removing fully exposed fruit and saving those that are partly protected by leaves, reduces the risk of loss. To protect large, fully exposed fruit on a particularly hot day, a misting sprinkler will keep the fruit cool during the critical time. This method cannot be used repeatedly or for extended periods or it will result in other problems such as scab. If summer pruning, do not remove too much foliage at once during hot, sunny weather.

Water Core

Under some conditions, the fruit of a few varieties becomes more or less water-soaked and translucent when approaching maturity. If eaten promptly, these fruit are sweet and juicy. However, they do not cook or store well. The fruit from branches with good sun exposure are usually affected more than those grown in the shade. ‘King’, ‘Transparent’ and ‘Fuji’ apples are commonly affected at the Coast, especially if the summer and fall weather is unusually warm and dry.

Management:

Keep susceptible varieties well-supplied with water during warm weather. Harvest promptly, slightly before maturity, if the fruit is to be stored.

Insect Pests of Stone Fruit

(Peaches, Apricots, Prunes, Plums and Cherries)

Ambrosia Beetle and Shothole Borer

(*Xyloborus dispar*, *Scolytus rugulosus*)

Trees stressed from transplanting, poor soil drainage or mechanical injury are most often attacked. They appear wilted, and numerous small holes 1.5 to 2 mm in diameter appear in the bark anywhere on the tree. Beetles are dark brown to black and about 2 mm long.

Ambrosia and shothole adults are active in the spring; a second generation of shothole borers appears in the late summer.

Management:

Keep trees healthy and free of stress. Irrigate and fertilize to encourage tree vigour and resistance to infestation. Remove dead or dying limbs or trees and any wood showing beetle damage. Burn or chip prunings; do not keep any fruit tree firewood with intact bark. Firewood with bark may continue to breed insects for 2 or 3 years.



Shothole borer damage on apple

Aphids



Green peach aphid.

Photo courtesy Agriculture & Agri-Food Canada



Black cherry aphid

These small (2 to 3 mm) soft-bodied, sap-sucking insects are found on leaves, twigs, or roots. They usually occur in colonies and may be covered with a white cottony substance. Damage from feeding may distort leaves, twigs, roots and fruit. Some species transmit virus diseases of plants.

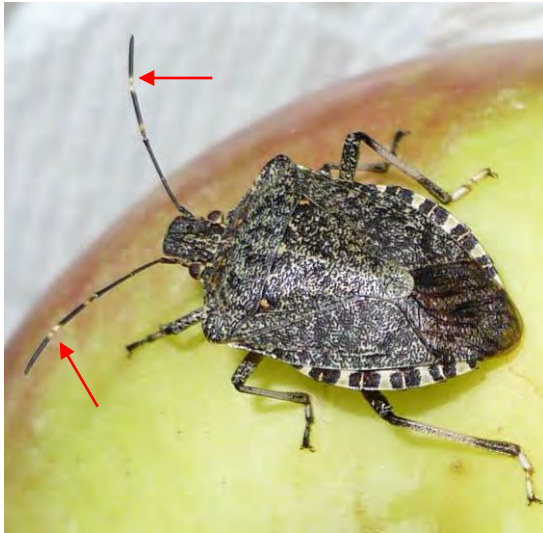
Management:

Aphids feed on sap and are favoured by conditions that produce rapid growth. On young trees, or when too much vigorous growth is caused on mature trees by excessive fertilizer, aphid populations may increase and cause damage before beneficial predator insects can control them. Encourage control by natural enemies by withholding insecticide sprays until at least 6 leaves of the terminal (end) shoots are infested with aphids. Always check before spraying to see if predator insects (see chapter 6) are present among the aphids as they often provide sufficient control.

If your garden centre carries biological control agents, obtain *Aphidoletes aphidimyza* in May, and release them on your fruit trees. Ladybugs are also effective aphid predators. Native ladybugs occur in large numbers in most areas. Buying ladybugs to place on trees is generally disappointing, since they just fly away. If predators are not present, spray with an insecticidal soap. Malathion can also be used. Apply a dormant oil spray in late winter or early spring before the pre-pink stage of bud development. Ensure thorough coverage. This treatment will kill the overwintering eggs of mites and aphids. Apply summer oil for aphid control in the summer. For woolly apple aphid, remove suckers to eliminate a source of population development, and prune out water sprouts in August. Several predators, including syrphid larvae and a tiny wasp attack woolly apple aphid.. Insecticides applied against other pests will aid in control of woolly aphid.

Some ants 'farm' aphids for their sweet honeydew secretions and protect them from predatory insects. Applying a sticky band around the trunk or lower limbs will keep ants out of the tree and help the predators to do their job.

Brown Marmorated Stink Bug



Adult brown marmorated stink bug



Brown marmorated stink bug nymphs

Brown marmorated stink bug was first detected in British Columbia in 2015. It is a serious pest and feeds on more than 100 different plant species including tree fruits, berries, grapes, vegetables, and ornamental plants. Both adults and nymphs feed by inserting their needle-like mouthparts into the flesh of fruit or vegetables, resulting in dead areas and distortions. They can be a nuisance to homeowners when the adults aggregate on and in buildings in the fall to seek warm overwintering sites.

The adult is shield-shaped, about the size of a dime, brown marbled appearance with alternating brown and white markings on the outer edge of the abdomen. It can be distinguished from other stink bugs by the presence of distinctive white bands on the antennae. Immature stages range in colour from bright orange, black or brown and later stages are pear-shaped with white markings on legs and antennae.

Management:

A tiny parasitic wasp *Trissolcus japonicus* that attacks the eggs of brown marmorated stink bugs in Asia has been found in the United States and British Columbia. Other predators such as spiders, ladybugs and lacewings will feed on brown marmorated stink bug eggs.

There are no insecticides currently available for use by home gardeners for this pest.

Cherry Bark Tortrix

(*Enarmonia formosana*)

This pest occurs in the Lower Mainland of B.C., but it is not a problem in the Interior fruit growing regions. Moths are mottled brown with coppery spots on the wings. They are about 1 cm long, fly from May through August and lay eggs in cracks of bark of cherry trees (flowering and edible). When the eggs hatch, the larvae bore into the bark of older cherry, apple and crabapple trees. They live in the bark until next year. Signs of larval feeding appear as brown tubes extending up to 1 cm out from the bark.

Management:

No insecticides are recommended. Do not plant susceptible trees, including the flowering cherry *Prunus serrulata*, weeping cherry (*P. subhirtella*) and sweet cherry. Avoid wounding trees while mowing or cutting weeds. Make proper pruning cuts to allow the collars to heal closed properly. Control weeds and vegetation at the base of the trunk to keep it exposed. Remove any loose bark and cocoons in the spring, and remove and destroy heavily infested branches or trees. A native *Trichogramma* wasp is very effective at parasitizing the egg stage. To conserve beneficial parasitoids, plant flowers in your gardens and avoid the use of insecticides.

European Earwig

(*Forficula auricularia*)

These are dark-brown insects, 1.6 cm long, with large pincers at the end of the abdomen. Some feeding damage occurs on peach, apricot and nectarine as fruit ripens but their presence inside split-stone fruits is most offensive. However, earwigs also act as biological control agents against some pests and as such are considered beneficial.



Earwig

Management:

For soft fruit trees, apply controls in May to mid-June before earwigs become resident in the tree canopy. Use a combination of the following methods:

- Trap and kill earwigs by wrapping several 15-cm wide bands of corrugated cardboard around the tree trunks. Remove and place in freezer during the day and then re-apply in the evening after the dead earwigs are shaken out.
- Keep earwigs out of trees by wrapping a smooth part of the trunk with a 10-15 cm wide band of plastic and applying a 3-5 cm wide band of Stickem© glue or Tanglefoot© to the plastic. Apply the sticky barrier before earwig activity is first noticed.
- Use commercial earwig baits on the ground at the base of trees.

- Place rolled up or crumpled newspaper in the tree to trap earwigs for disposal. Keep newspaper dry by covering with plastic bags.
- Place small boxes stuffed with crumpled paper or rolls of newspaper on the ground to capture earwigs for disposal.
- Remove debris and weed growth from the base of trees to aid in earwig control.

Leafrollers and other Leaf-eating Caterpillars

Leafrollers

These pests attack a wide range of fruit and ornamental trees and shrubs. Some feed from within rolled leaves; others skeletonize leaf surfaces. Damage may occur throughout the growing season. It is important to control these pests to prevent infesting near-by commercial tree fruit orchards.



Leafroller larva

Larvae of the oblique-banded and three-lined leafrollers and the eye-spotted bud moth emerge from overwintering sites on host trees in the spring to feed on newly emerged leaves, flower buds, blossoms and young fruit. Bud moth larvae appear again in mid-summer to feed on leaves and fruit. The leafrollers may have 1 or 2 summer generations. All 3 species feed under leaves attached to fruit, between touching fruit, or in rolled-up terminal leaves. Fruit-tree and European leafroller larvae hatch from overwintering eggs during apple blossom time and also feed on blossoms and young fruit. Moths from this generation lay eggs that hatch the following year. Apple-and-thorn skeletonizer larvae feed on the upper surface of apple, pear and cherry leaves. The leaves turn upwards, are covered with silk threads and gradually turn brown due to larvae eating the upper green tissue. There may be 2 generations of this pest. Mature leafroller caterpillars are green with brown or black heads, and measure up to 2 to 2.5 cm long; bud moth larvae are brown and 1.5 mm long when full grown.

Management:

Watch plants for signs of feeding damage in the spring (chewed buds, blossoms, leaves and young fruit).

For small infestations, remove caterpillars by hand, or by pruning and burning (where permitted). Thinning fruit to singles will reduce fruit damage. Large infestations may be treated with Btk (*Bacillus thuringiensis*). Btk is a bacterium that kills only caterpillars and is harmless to other insects and wildlife. It is especially preferred in areas frequented by children or pets. Malathion can also be used.

Treat when larvae are first noticed and repeat as necessary. Btk is the only product that can be applied during bloom, when young caterpillars are often feeding. Other products must be applied either pre- or post-bloom to protect bees.

Winter Moth and Bruce Spanworm

(*Operophtera brumata*, *O. bruceata*)

Winter moth and Bruce spanworm can cause major damage in Southern Vancouver Island and the Lower Mainland. The larvae (caterpillars) attack apple, birch, blueberry, cherries (fruiting and flowering), maple, plum, poplar and many other trees and shrubs. Eggs hatch in late March. In late March and early April, look for silken threads and tiny green caterpillars, about 1 mm long. From early April to late May or mid-June, the caterpillars feed on flowers, leaves, buds and young fruit. Defoliation occurs when infestations are severe. The male moths are pale tan-grey with a wing span of about 3.2 cm. The females are wingless. The full-grown larvae or worms are about 1.5 to 2 cm long. They are bright green with three narrow, whitish stripes on each side of the body.



Bruce spanworm larva

Management:

Young worms are carried on the wind and can drift considerable distances on silken threads, so protected trees can become infested from wild or neglected trees in the neighbourhood.

It is important to control the larvae in April before they bore into buds. Apply 1 or 2 sticky bands, 15 cm wide, with Tanglefoot© or Stickem© glue, around the tree trunk no later than mid-October to trap the females as they crawl upward to deposit eggs on the trunk and larger limbs. To protect the tree trunk, place 3 layers of plastic wrap under the glue. Cotton or polyester batting may be used to fill any gaps under the plastic wrap. The lower band should be replaced when it becomes dry, filled with moths or debris, or when moths begin to be trapped on the upper band. All bands should be removed and disposed of no later than February.

For additional control, spray with Btk or permethrin. Spray in early April when apple blossom buds are in the pre-pink stage. Apply a second spray immediately after apple blossom time if infestations are heavy or where re-infestation occurs from nearby neglected trees. NOTE: Application of permethrin to leaves may result in mite problems later in the season.

Permethrin can also be applied to trunks of trees and shrubs in November to kill the female moths as they crawl up to lay eggs.

Mites

Mites are tiny spider-like animals, barely visible without magnification. There are several different kinds that can affect the health and vigour of fruit trees. Dormant oil is generally applied to reduce mite problems. Do not apply dormant oil when temperatures are below 4°C.

Dormant oil can be mixed with lime sulphur for disease control, however, lime sulphur can be damaging to beneficial mites. Lime sulphur alone will not prevent an outbreak of mites. (Do not use lime sulphur on apricots or filberts.)

European Red Mite, Two-spotted and McDaniel Spider Mites

(*Panonychus ulmi*, *Tetranychus urticae*, *T. mcdanieli*)



European red mites



European red mite eggs

European red mite overwinters as small red eggs on tree branches that hatch in the spring. Several generations are produced over the summer. Two-spotted and McDaniel spider mites overwinter as adults under bark or in ground cover at the base of trees. They move into the tree canopy in the spring and produce several generations through the summer. The feeding action of these mites causes the foliage to turn pale green to a bronzed appearance. Leaves may crinkle or become densely webbed. Severe leaf injury can result in poor fruit size, colour and a reduction in fruit set the following season.

Management:

Healthy, well-maintained trees will tolerate higher mite populations than weak or stressed trees. Try to encourage predatory mites by avoiding use of harmful products such as permethrin. Predatory mites can effectively control these mites if supplemented with a dormant oil spray just prior to bud burst. NOTE: Oil controls European red mite eggs but not two-spotted mite. If damage occurs in the summer, wash mites from leaves by sprinkling trees with a garden hose or treat with insecticidal soap or summer oil at label rates.

Peach Tree Borer

(Synanthedon exitiosa)



Peach tree borer damage with gumming at base of tree



Peach tree borer larvae



Peach tree borer adult male

This pest attacks peaches, apricots, cherries and several other stone fruit trees. Look for gumming at the base of the tree. Young trees may be girdled and die. Older trees may be seriously weakened and become susceptible to other pests such as bark beetles.

Damage is caused by cream-coloured, brown-headed larvae 2.5 cm long that feed on inner bark at the soil or just below. Adults are clear-winged moths that are active from Late June until September depending on location. Eggs are laid on the trunk and newly-hatched larvae move down to the crown area where they burrow into the tree.

Management:

Look for borer activity at the base of trees in the spring. Remove borers after cutting into their tunnels with a sharp knife or by probing with a piece of stovepipe wire or other stiff wire, metal coat hangers work well. When all borers have been removed, protect trees from re-infestation with trunk-collars made from tar paper, thin aluminum or plastic sheeting. The collars must cover the area around the base of the tree and 45 cm up the trunk to exclude the larvae. Make sure the top of the collar is well sealed against the tree trunk. Polyester batting wrapped around the base of infested trees prior to adult emergence will trap and remove emerging adults. There are currently no registered insecticides for homeowners for the control of peach tree borers. Rimon (novaluron) is available through commercial spray services. Pheromone traps baited with peach tree borer lures can be used to time male moth activity.

Peach Twig Borer

(*Anarsia lineatella*)

Mature peach twig borer larvae measure about 12 mm long and are reddish-brown with pale to white body segments that give them a ringed appearance. They overwinter as young larvae (caterpillars) on host trees. In the spring, they bore into the developing shoots causing them to wilt and die. These larvae pupate and give rise to the first adult generation which produces a single summer generation of larvae. The caterpillars attack the ripening fruit, creating holes and furrows at the stem end. The second brood of adult moths that appears in late summer produces the overwintering generation of larvae.



Peach twig borer larva

Management:

Watch for wilted shoots and destroy any larvae present. Place infested fruits in a sealed plastic bag for disposal or put them in the freezer for a few days to kill them before placing in the compost.

Pear Slug (Pear Sawfly)

(*Caliroa cerasi*)



Pear sawfly larvae and damage



Pear sawfly adult

Pear sawfly, more commonly called pear slug because of the slug-like appearance of the larvae, overwinters as a larva in the soil. Adults emerge in the spring to lay eggs on foliage of pear and cherry trees. A second adult brood appears in August and occasionally, a third in September. The dark green to blackish larvae feed on the upper green tissue of the leaves so that only the veins are left. When mature, the 7 mm long larvae turn yellow and drop to the ground to pupate.

Management:

Sprays applied against other pests on pear and cherry usually keep pear slug in check. However, if control is necessary, spray water to knock the larvae off the leaves. Malathion can also be used.

Scale Insects

Lecanium Scale

(*Parthenolecanium corni*)

Look for 2 to 5 mm wide hemispherical wrinkled “bumps” (female scales) on small limbs and twigs. Some scales are brown; others mottled brown and white. Twigs heavily infested with scale can die back.



Lecanium scale



European fruit scale

San Jose Scale and European Fruit Scale

(*Quadraspidiotus perniciosus*, *Q. ostreaeformis*)

Look for small, stationary, rounded “bumps” or scales 1-2 mm in diameter on the surface of limbs and twigs, and under bark scales on the trunk. These peculiar insects reduce tree vigour and, if present in large numbers, may kill the tree. They will also attack fruit causing discolouration and some deformation.

Management:

Scraping the scales off the infested limbs with a knife will reduce the number of female scales. Prune out heavily infested branches and consider removing large old trees with encrusted scale. Apply a dormant oil spray in late winter or early spring up to pre-pink stage of bud development. Ensure thorough coverage. This treatment will also kill the overwintering eggs of mites and aphids. Alternatively, spray malathion at label rate usually in June when the mobile stage called “crawlers”, first appear. Ensure thorough coverage. To detect when crawlers are active, wrap double-sided sticky tape around infested limbs. Check regularly, using a magnifying lens, for very tiny orange crawlers stuck to the tape. Trees that receive dormant oil every spring seldom have problems with scales.

Spotted Wing Drosophila



Top left: Spotted wing drosophila adult male with wing spots.



Top right: Spotted wing drosophila adult female.

Bottom right, Spotted wing drosophila female ovipositor



Photo Credits: Sheila Fitzpatrick, Agriculture & Agri-Food Canada.

Spotted wing drosophila is a serious new fruit fly pest of soft fruit and berries. It is now widespread in Coastal and Interior fruit growing areas of B.C.

Adults are light yellow or brown flies with red eyes, about 2 - 3 mm long. They look like regular vinegar flies but male flies have a single black spot on the end of each wing. Females have no spots, but have a distinctive saw-like egg laying device (ovipositor) which enables them to cut into thin-skinned fruit and deposit eggs inside.

Unlike most vinegar flies which normally infest overripe, fallen, decaying fruit, spotted wing drosophila females lay their eggs inside intact ripening fruit. Larvae hatch and begin to feed within the fruit, causing softening in the area of feeding. Known hosts in B.C. include cherry, peach, plum, nectarine, apricot, strawberry, blueberry, blackberry, raspberry, mulberry, salmonberry, thimbleberry, fig, table grape, Oregon grape, currant, elderberry and honeysuckle.

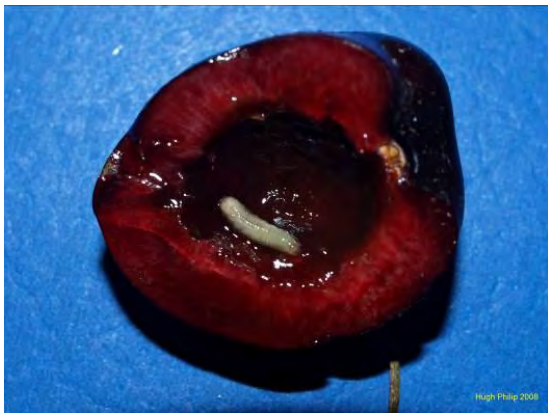
Management:

Good sanitation practices are critical to controlling spotted wing drosophila. Clean up leftover and fallen fruit. Seal fruit in plastic bags or freeze for at least 48 hours before disposal. Home composting of infested fruit will not kill flies.

Harvest on time, pick clean and often, as overripe unharvested fruit serve as sources of infestation. Refrigerate fruit as soon as possible after picking. Insecticides containing pyrethroids or malathion registered for control of other fruit pests in the home garden will provide control of spotted wing drosophila. Read and follow label directions and do not apply when bees are present. Contact a commercial pesticide applicator for other chemical control options.

Western Cherry Fruit Fly

(Rhagoletis indifferens)



Western cherry fruit fly larva



Western cherry fruit fly adult and fruit damage

The western cherry fruit fly overwinters under sweet and sour cherry trees as a pupa in the soil. About the time cherry fruit begins to turn pink, adults emerge and after mating, females lay their eggs in developing fruit. Peak emergence occurs at about harvest time (mid-to late July). Eggs hatch into legless white maggots that reach 8 mm in length at maturity. They feed around the pit (stone) of ripening and ripe cherries. There are no visible signs on infested fruit until the maggots are nearly mature and have cut several exit holes through the skin. The maggots drop from the fruit, burrow in the ground and may remain in the soil for 1 or 2 years.

Management:

All owners of cherry trees in the Okanagan, Creston or Similkameen areas are required by law to prevent and control infestations of cherry fruit flies. Contact your local Regional District By-Law enforcement officer for further information. Complete control of cherry fruit fly using sprays can be difficult and ineffective for non-commercial growers, even if a commercial tree-spraying service is used. Owners should carefully consider the costs and benefits of growing backyard trees before planting, and remove trees that will not get adequate care.

If you decide to plant a cherry tree, consider growing an early season variety such as ‘Santina’ or ‘Celeste’. Varieties that bear fruit early need to be protected from cherry fruit fly for a shorter period of time, and may also escape serious damage from other fruit fly pests such as the spotted wing drosophila.

Non-chemical control requires removal of all fruit before the larvae emerge. This reduces breeding sources and fruit fly populations for next season. It is important that all fruit remaining on the tree after harvest be removed and destroyed to prevent fruit fly production.

A non-chemical option for controlling cherry fruit fly involves preventing the fly from reaching the fruit to lay eggs. ‘Kootenay Covers’ (www.kootenaycovers.com) markets large, specially designed net bags that can be placed over cherry trees up to 18 feet in diameter. The covers must be applied before cherry fruit fly emergence, usually around the time that the fruit starts to colour. The bag is secured around the tree until after harvest, effectively excluding the fruit fly. As an added benefit, it also protects the fruit from birds and wasps.

Pruning to keep cherry trees to a manageable size will help facilitate complete harvest of all the fruit, and make it easier to use tree covers to exclude insects.

Chemical Control: Insecticides registered for control of cherry fruit fly are no longer available for use by home gardeners in Canada. Commercial spray services are available in most areas and can provide a cherry fruit fly program with effective organic and conventional insecticides. Multiple applications during fruit ripening are necessary.

Diseases of Stone Fruit

(Peaches, Apricots, Prunes, Plums and Cherries)

Bacterial Canker or Blight

(*Pseudomonas* spp.)

Bacterial canker is much more severe in the wet coastal climate than in the Interior. However the disease has been an increasing problem on young cherry trees in Interior regions, causing gumming cankers and decline or death of young trees. Cherry, peach and apricot trees are most susceptible when young. Black or brown buds as well as blossom blast (burn) and twig dieback, often accompanied by gumming occur in early spring. Environmental stresses and other injuries will also cause gumming. Cherry fruit may be infected, exhibiting numerous small sunken black spots. Small black spots may appear on leaves, later dropping out to leave a shot-hole appearance similar to that caused by coryneum blight. Bacterial canker is favoured by cool, wet weather. Most infections probably occur in the early spring with frost damage or during wet fall weather. Large trees can withstand quite a lot of leaf shothole without affecting fruit production.

Management:

Prune out as many dead twigs and cankers as possible, making the cut well below the diseased area (30-45 cm). Avoid spreading the disease by pruning only in dry weather. Do not plant young cherry trees or other *Prunus* species under or adjacent to old, infected trees.

Copper sprays may help to prevent new infections but will not cure infected trees. Copper resistance is known to be present in the pathogen population, and will reduce copper effectiveness if present. Make the first application prior to fall rains; repeat at leaf fall and once or twice before buds open in the spring, if cool, wet weather persists. Follow label directions. Where a range of rates is given, use the highest rate for dormant applications. To avoid leaf injury, use a lower rate during the growing season, and apply only under fast-drying conditions. Copper spray will also help to control two fungal diseases, coryneum blight and peach leaf curl.



Gumming cankers on cherry caused by bacterial canker



Shot hole on cherry leaf caused by bacterial canker

Black Knot

(*Apiosporina morbosa*)

The black knot fungus causes black swollen growths on the twigs and branches of plums and prunes in coastal B.C. The disease does not occur in Okanagan orchards, but may be seen on chokecherry in the area. Early growths are soft, greenish swellings, most abundant on small twigs, though severe infections may affect larger limbs. The knots enlarge with the tree's growth reaching a diameter of 15-20 cm. As they grow they become black and hard and can girdle twigs and branches.



Black knot on wild Prunus sp.

Management:

Japanese plums are more resistant than European plums. Sour cherry is also susceptible to black knot. Before March 1 each year, prune out and burn or dispose of twigs and branches that have knots. Knots on larger limbs can be cut out by removing the diseased areas and 7.5 cm beyond the swelling down to the inner wood. Diligent pruning and gall removal must be done every year, as the infections are not easily recognized the first year, and many will be missed.

Spray infected trees with lime sulphur at the dormant stage. Apply wettable Sulphur at full bloom and petal fall, according to label directions.

Brown Rot

(*Monilinia fructicola*)

Brown rot begins at the blossom stage. Infected blossoms wilt, shrivel and become covered with greyish mold. Petals may appear light brown or water-soaked, similar to frost injury. Blighted blossoms do not produce fruit. The amount of blossom blight directly affects the amount of fruit rot. Dead blossoms may stick to twigs or remain trapped inside clusters of cherries until harvest, providing a source of spores for the fruit rot phase. On peaches and apricots the infection may spread to twigs, causing brownish, oval cankers that may girdle and kill twigs. Gumming may also occur on infected twigs.

Fruit Rot: Fruit rot first appears as small, circular brown spots that increase rapidly in size causing the entire fruit to rot. Light brown to greyish spores appear in tufts on rotted areas. Infected fruit eventually turn into shriveled, black mummies that may drop or remain attached to the tree through the winter. Brown rot can be serious on injured fruit such as cherries split by rain.



Peach with brown rot



Plums infected with brown rot



Apricots are very susceptible to shoot blight caused by brown rot



Mummified fruit are a source of brown rot and should be removed

Management:

Remove rotten fruit from the tree and fallen fruit from the ground to reduce disease spread and overwintering potential. Prune out any cankered or dead twigs as they are found. Remove and destroy any mummified fruit and blighted twigs during winter pruning, and remove excessive branches to allow for increased air flow. For cherry varieties that produce heavy clusters of fruit prone to brown rot, it can be helpful to reduce cluster formation by shortening the current season's growth, or by hand thinning fruit while fruitlets are still green. Fruit thinning can also reduce brown rot on other stone fruit by reducing fruit-to-fruit contact. Fruit thinning will also increase the size of fruit.

Avoid injuring or bruising fruit when picking, and discard all fruit with brown rot spots before storing. To reduce brown rot in peaches being ripened for canning, spread them out in a single layer so that they do not touch one another.

Trees with a history of brown rot may require one or more fungicide applications. Spray trees at the pink bud stage and at full bloom and again during fruit ripening if rainy conditions occur. A fruit tree spray containing copper octanoate or sulphur may be used. If a commercial applicator is hired to do the spraying, other, more effective commercial fungicides may be used.

If you are planning to plant a cherry tree, consider growing an early season variety such as 'Santina' or 'Celeste'. Varieties that bear fruit early are more likely to escape insect damage that can lead to brown rot and other fruit rots.

Cherry Leaf Curl and Witches' Broom

(*Taphrina wiesneri*)

Cherry leaf curl occurs in coastal B.C., but it is uncommon in the Interior fruit growing areas. Broom-like tufts develop on branches. Leaves are thick and reddish with a white fungal growth on the undersurface. The causal fungus is closely related to the one causing peach leaf curl but the damage on cherries is minor.

Management:

Once a branch has become infected it will remain so. Trace the broom to where it grows from a normal branch; prune it out at least 30 cm below that point.

This should be done early in the growing season when the brooms are easily seen. Brooms leaf out earlier and have no flowers when compared with healthy branches. Do not plant young cherry trees under or adjacent to old, infected ones.

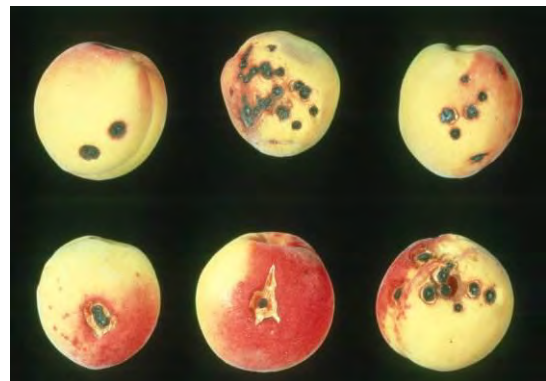


Cherry leaf curl affected branch on sweet cherry

Coryneum Blight (Shot Hole)

(*Wilsonomyces carpophilus*)

Warm, wet weather favours this fungal disease which infects buds, blossoms, leaves, fruit and twigs. Leaves develop numerous small, tan to purplish spots approximately 6 mm in diameter that drop out causing a shot hole appearance. Red to purplish spots also form on the fruit and can be accompanied by a clear, gummy exudate. Gummy twig and branch cankers also occur. On apricot trees, limb cankers occasionally develop. The fungus overwinters on infected twigs and buds, which are the main sources of infection for leaves and fruit in the spring.



Coryneum blight on apricot

Management:

During the dormant season rake up and destroy fallen leaves and prune out and destroy twigs and branches with cankers. Avoid over-tree sprinkler irrigation.

After Harvest: To prevent twig and bud infections, apply a copper fungicide after harvest on peaches, or early September (before fall rains) on apricots and cherries. This spray also helps to control peach leaf curl. Follow label recommendations and precautions.

Peach Leaf Curl

(*Taphrina deformans*)

Peach leaf curl is a disease of peaches and nectarines. Infection of buds occurs in late winter or very early spring, as soon as buds begin to swell. Infected buds produce leaves with a reddish tinge, a thick, crisp texture and curled growth. A white dusting of the fungus forms on the leaf surface. Infected leaves will drop early. Secondary leaf development may also become infected under cool and wet conditions. Occasionally twigs become infected and distorted and infected fruit surfaces develop a reddish growth. Severe leaf curl infections can result in fruit drop, increased susceptibility to winter damage, die-back of terminal twigs and failure to set fruit. Repeated defoliation can weaken and eventually kill trees.



Peach leaf curl

Management:

No peach variety is immune to leaf curl, but 'Pacific Gold' and 'Renton' are partially resistant, and 'Redhaven' and most varieties derived from 'Redhaven' have some tolerance. Avoid infection by planting and training trees under the eaves of buildings or other sites where they are protected from rain or by erecting a temporary shelter over trees. The fungus attacks buds and newly-developing leaves so trees require protection from rain during the early spring. Prune off and dispose of dead twigs or branches.

Spring: Only developing leaves are susceptible, therefore it is essential that fungicides be applied before the buds break in the spring. Control measures are of no value after the disease becomes evident. Apply lime sulphur at the full dormant rate before early season bud development. This may be as early as February in coastal areas. Complete coverage is essential for effective control.

Fall: A spray of copper applied after harvest in September will give adequate control of peach leaf curl in most years in the Interior. However, in wet years or in wet climate areas, the late winter dormant spray is also needed. Copper applied in September will also help to control Coryneum blight.

Little Cherry Disease

(*Little cherry virus*)

Little cherry disease is caused by a virus that infects sweet and sour cherry, as well as ornamental flowering cherry. Some or all of the fruit on an infected tree will be smaller than normal and lacking in flavour and sweetness. The fruit are half to two-thirds normal size, do not ripen properly and remain poorly coloured. Fruit symptoms are most pronounced in the 'Lambert' variety.

Little cherry virus is spread by mealybugs. The virus is also readily transmitted by all types of budding and grafting, if infected plant material is used.

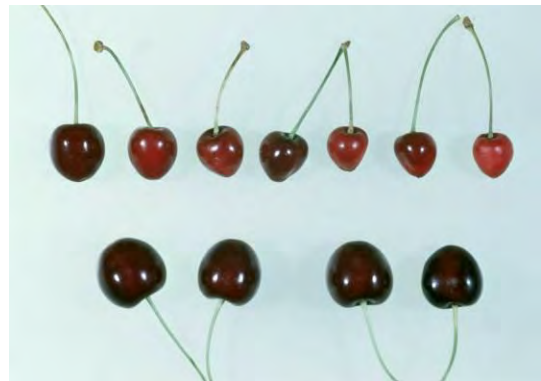
Little cherry virus is a declared pest in B.C., under the authority of the *B.C. Plant Protection Act*, *Little Cherry Control Regulation*. The regulation applies to both the Okanagan-Similkameen and Creston Valleys. It prohibits the planting or sale of ornamental flowering cherries in these fruit-growing regions.

Management:

Plant only healthy, virus-free trees, and use only virus-tested material for propagation. New cherry trees should not be planted close to older cherry trees that may be infected with little cherry or other harmful viruses.

Removal of diseased trees is essential for control of this disease. Trees with little cherry virus must be removed under the authority of the BC Plant Protection Act, if they are located within the "Little Cherry Control Area".

There are no chemical controls available for virus diseases. However, insecticide sprays for cherry fruit fly can be helpful to control the vector, the apple mealy bug. Biological control by a predatory wasp species helps to keep mealybug populations at low levels in many areas of B.C.



*Little cherry virus on 'Lambert' cherry
(healthy fruit in bottom row)*



*Little cherry virus on 'Celeste' cherry
(healthy fruit on right)*

Powdery Mildew

(*Podosphaera clandestina*, *Sphaerotheca pannosa*)



Powdery mildew on cherry leaf



Powdery mildew on nectarine

Powdery mildew is a fungal disease that infects leaves and fruits of cherry, peach, and nectarine. Look for a greyish-white, powdery growth on leaves and white patches on fruit.

Management:

Prune for good air circulation and light penetration. Rake and remove or compost leaves in the fall to help reduce disease pressure. Early season sweet cherry varieties are much less likely to have fruit damage caused by powdery mildew than late season varieties.

Dormant applications of lime sulphur will reduce the fungus on twigs. If further control is needed, spray at the blossom stage with a sulphur fungicide at label rates. Repeat this treatment every 10 to 14 days as required. Follow all label recommendations, precautions and days to harvest intervals. Sulphur may burn foliage and fruit at temperatures above 26°C, and should not be used on apricots. Summer oil sprays (Purespray Green) will also help to control powdery mildew, but should not be applied within 14 days of a sulphur application. The biofungicide Regalia may provide some suppression of powdery mildew.

Other Disorders

Fruit Drop

Fruit that appears to be growing normally may suddenly drop before ripening. This natural fruit thinning can have many causes, including poor pollination, cold injury, heavy set and competition between fruit. Fruit trees commonly set more fruit than they can carry.

Early season fruit drop may result from poor pollination, which is often a problem when bloom occurs during cold rainy weather. Be aware that some cherry varieties require cross pollination. When purchasing a cherry tree, determine whether that variety is self-fertile, or if it requires cross-pollination with another variety.

June Drop is a wave of natural fruit drop that occurs in late May or early June, when a tree sheds fruit “over and above” the amount it can carry. Smaller and weaker fruit will be dropped.

Note that hand thinning is important to reduce fruit loads, increase fruit size, and limit alternate year bearing, and is often still necessary even after natural fruit drop. It also reduces disease and insect damage by increasing air flow around the fruit and reducing fruit-to-fruit contact.