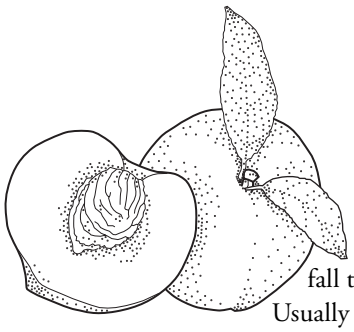
CHAPTER 2

Stone Fruits



A healthy stone fruit planting is relatively tolerant of pests. There are many environmental and cultural practices that directly influence pest pressure, pest management, and overall tree health. For example, stone fruit trees do not tolerate "wet feet." Because of their relatively early blooming, stone fruit trees are susceptible to late spring frosts. The success of stone fruit trees is highly dependent on a site with excellent air and water drainage. Air drainage is enhanced if the site is higher than the surrounding terrain. Also, the temperature moderation on the lee side by a large body of water reduces the risk of frost damage. Soil drainage can be enhanced by tiling or by planting trees on wide, raised beds. Sites should be in a rotation program so stone fruits will not directly follow stone fruits. Site selection and improvement should begin 1 to 2 years prior to planting. This includes draining low spots, eliminating undesirable weed species, improving soil fertility, and adjusting the soil pH to the levels recommended by the local Cooperative Extension Service educator.

Scion and rootstock choice also greatly influence pest management as both vary in their resistance to many pests as well as in their suitability to the intended site. Contact local Extension educators to determine which cultivars and rootstocks are best suited for the conditions. Always obtain the nursery stock from a reputable nursery which certifies trees to be virus-free. To obtain the desired scion-rootstock combination, order nursery stock well in advance of planting. Planting recommendations vary from planting in spring and fall in southern locations to spring planting in more northern climes.

Cultural care to maintain a healthy planting includes providing proper nutrition, assuring adequate moisture, and removing weeds that compete for water and nutrients. Nutrient needs are best determined by a combination of soil tests and foliar analysis. The nutrient application must be timed in a manner that allows the plant to harden off in the fall to reduce the chance of winter injury. Usually this means that fertilization is either in the dormant season or early to midsummer.

Proper pruning is a crucial part of pest management for stone fruits. There are a number of pruning systems, depending on the species and spacing. Remember:

- Stone fruits produce fruit blossoms on last year's growth.
- Time of pruning greatly affects susceptibility to pruning injury. Summer pruning should be completed by midsummer, and dormant pruning should not start until late winter and may continue through petal fall.
- Prunings should be removed from the orchard and destroyed to prevent re-infestation of the orchard.

Care of the fruit during harvest and storage greatly influences fruit quality and the development of post-harvest disorders. Fruit should be harvested at the appropriate stage of maturity for its intended use. Fruit intended for shipping is harvested firmer than fruit for local distribution. Care must be taken to harvest only fruit of proper maturity. Avoid bruising, and cool the fruit quickly to remove field heat. Stone fruit stores best at 32°F and 85 percent humidity. However, peaches cannot be left at temperatures below 50°F until they ripen, or they may become dry and mealy.

Winter injury shortens the life of the planting, reduces vigor, and makes the planting more susceptible to other disorders. The cultural and pest control methods used to produce a healthy tree also reduce the tree's susceptibility to winter injury. The susceptibility to winter injury is further reduced by:

- Avoiding late or excessive nitrogen fertilization;
- Using fall cover crops or allowing weeds to grow to harden the trees by competing for water and nutrients;

- Painting the trunk with white latex paint; and
- Pruning after late winter or at first bloom.

Integrated Management of Stone Fruit Diseases

The objective of an integrated disease management program is to provide a commercially acceptable level of disease control from year to year while minimizing the cost of disease management. For each orchard, develop a program that integrates all available control tactics.

Identifying and Understanding Major Stone Fruit Diseases

Accurate disease identification is critical in making smart disease management decisions. Growers should develop a basic understanding of the pathogen biology and disease life cycles for the major stone fruit diseases. The more you know about a disease, the better equipped you will be to make sound and effective management decisions. The following literature contains colored photographs of disease symptoms on stone fruits, as well as information on pathogen biology and disease development.

Compendium of Stone Fruit Diseases
Published by the American Phytopathological Society, 3340 Pilot Knob Rd., St. Paul, Minnesota 55121. Phone: (612) 454-7250 or (800) 328-7560.

Diseases of Tree Fruits in the East
Published by Michigan State University Cooperative Extension Service as publication number NCR 45. Your county Extension office may have this bulletin in stock, or phone Michigan State University. Phone: (517) 355-0240.

Brown Rot

Brown rot, caused by the fungus *Monilinia fructicola*, is the most destructive disease of stone fruits in the Midwest. European brown rot, caused by *M. laxa*, affects sour cherry in some northern regions of the Midwest, but is not as widespread as *M. fructicola*.

Brown rot affects blossoms, fruit, spurs, and small branches. Infected blossoms wilt, dry, and persist into the summer. One to several small, light brown, soft spots develop on fruit. During warm, humid weather the lesions quickly expand, and tan to gray spore tufts break through the fruit skin. Rotted fruit persist as mummies on the tree or fall to the ground.

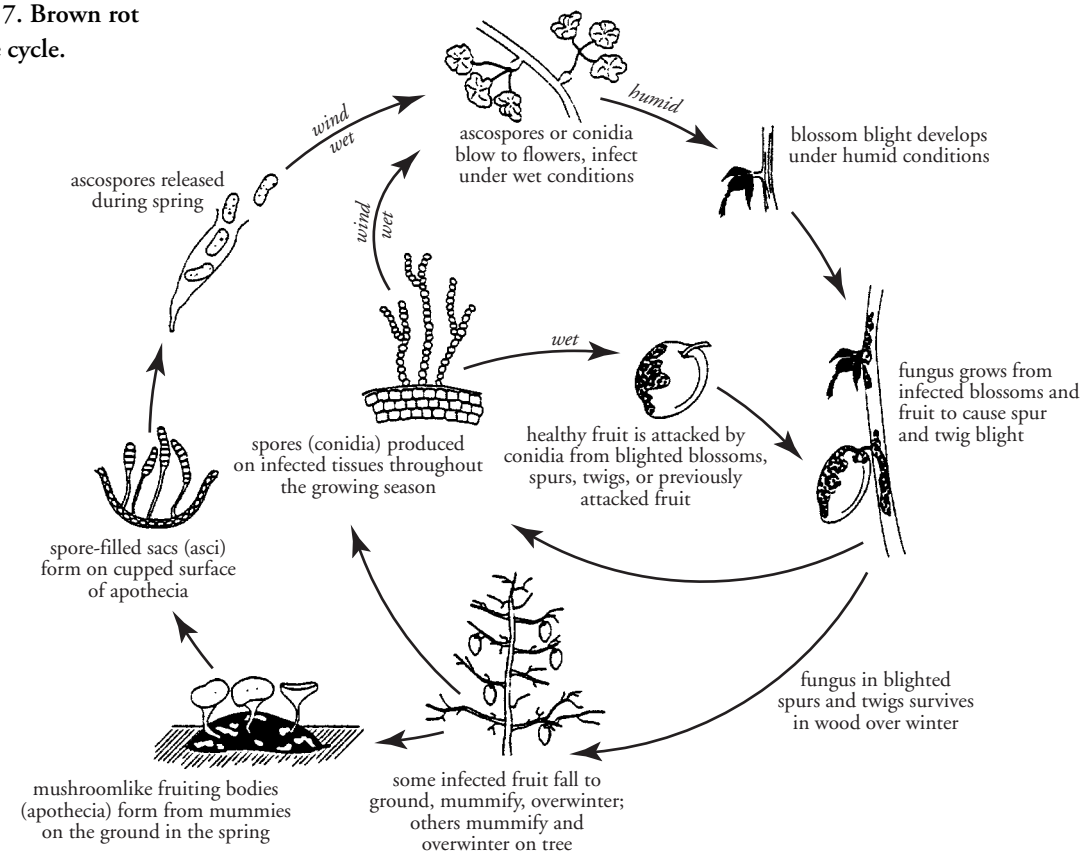
Disease Development: The brown rot fungus overwinters in mummies on the ground or in the tree and in other infected tissue (Figure 7). In the spring, spores are released and carried by wind and splashing rain to susceptible tissue. Blossom infection can occur after 5 hours of wetting at 77°F but requires 18 hours of wetting at 50°F. The fungus develops slowly below 55°F and above 80°F. Susceptibility of fruit increases with maturity. The fungus can penetrate unbroken fruit but also takes advantage of wounds caused by hail, insects, or cracking.

Control of Brown Rot: Brown rot is controlled by a combination of orchard sanitation (removal of mummies and infected tissues) to reduce the population of the pathogen and well-timed applications of protective fungicides. Two sprays during bloom and two to three sprays before harvest are usually needed if the weather is wet or humid. *Monilinia* species are prone to becoming resistant to fungicides. Therefore, fungicides should be used in a manner that will delay the onset of resistance (see "Disease Management as a Component of IPM," p. 11). Insect control during fruit maturation is important to minimize fruit injury. Handling fruit carefully and removing field heat with refrigeration will reduce post-harvest decay by brown rot. Sweet cherries are more susceptible than sour cherries, nectarines are more susceptible than peaches, and apricots are highly susceptible. Specific cultivars of stone fruit trees with significant resistance to brown rot are not known.

Cherry Leaf Spot

Cherry leaf spot, caused by the fungus *Blumeriella jaapii*, is a potentially devastating disease of sour and sweet cherries and plums. Besides a direct loss in yield and quality of fruit, premature defoliation weakens trees and makes them less winter-hardy.

Figure 7. Brown rot disease cycle.



During late spring, small purple spots develop on the upper surfaces of leaves. The spots enlarge, turn reddish brown, and sometimes coalesce to form large, irregular lesions. White to pink masses of spores (conidia) are visible on the undersides of leaves during wet weather. On plums and sometimes on cherries, the centers of the spots become dry and fall out, producing "shot-holes." Infected leaves eventually turn yellow and drop.

Disease Development: The cherry leaf spot fungus overwinters in fallen leaves. At about the time of petal fall, ascospores and sometimes conidia are ejected from leaves on the orchard floor. Infection occurs through stomata (pores for gas exchange) on the undersides of leaves. After leaves have unfolded, they are susceptible throughout the season; however, they become less susceptible with age. Conidia are spread by wind and splashing rain to other leaves where additional infections occur. Optimal conditions for disease are temperatures of 60° to 68°F with rainfall (Table 7). Spread of conidia and subsequent infections continue throughout the season.

Control of Cherry Leaf Spot: Fungicides are the primary means of controlling cherry leaf spot. Because the fungus infects through stomata on leaves, and stomata are not open until leaves have unfolded, sprays can be delayed until petal fall. Sprays need to be repeated every 7 to 10 days until harvest and followed up with one or two post-harvest applications to reduce the amount of fungus that will overwinter. Removing leaf litter in the fall or early spring should reduce the number of primary infections. During dry years or where disease pressure is low, using fungicides only after an infection has

occurred (Table 7) might provide adequate control, although it is riskier than a 7- to 10-day protectant schedule. Cultivars with resistance to cherry leaf spot have not been identified.

Peach Leaf Curl

Peach leaf curl, caused by the fungus *Taphrina deformans*, can result in severe defoliation that in turn reduces fruit quality, yield, and tree vigor. A related disease, plum pockets, occurs on plums but is generally not a threat in commercial orchards.

Disease Development: Symptoms are first seen about a month after bloom. Leaves are initially red and become distorted, thickened, and curled before eventually turning brown and dropping. Infected fruit are distorted and off-color. Spores of the fungus are produced on the surface of diseased leaves and are spread by wind and splashing rain. Spores that become lodged under bud scales and rough bark overwinter in those sites. In the spring, spores germinate and infect young leaves *while still in the bud*. Leaf curl is more severe when extended cool and rainy weather occurs at bud burst; apparently, cool weather retards leaf maturation and prolongs the period that leaves are susceptible. Infection is greatest at temperatures of 50° to 70°F and minimal below 45°F and above 86°F.

Peach Leaf Curl Control: No peach or nectarine cultivars are immune to leaf curl, but Redhaven and its derivatives are more resistant than Redskin and its derivatives. A single fungicide spray applied in the fall after leaves drop or in the spring *while trees are still dormant* will control leaf curl. By bud burst, most infection has already occurred, and fungicide sprays are relatively ineffective.

Bacterial Spot

Bacterial spot, caused by the bacterium *Xanthomonas campestris* pv. *pruni*, is a sporadic but potentially devastating disease of apricots, nectarines, peaches, plums, and prunes. Diseases caused by bacteria are nearly impossible to manage when conditions favor bacterial growth, and bacterial spot on stone fruits is no exception. Entire crops can be lost in years with long periods of warm, wet weather.

Table 7. Approximate minimum number of hours of leaf wetness at various temperatures required for leaf spot infections caused by conidia on sour cherry.[a]

Average temperature (°F)	Wetness (Hours)[b]
46	28
47	25
48	23
49	20
50	19
51	17
52	15
53	14
54	12
55	11
56	10
57	9
58	8
59 to 60	7
61 to 62	6
63 to 68	5
69 to 70	6
71 to 72	7
73	8
74	9
75	11
76	12
77	14
78	16
79	18
80	21
81	28

a Requirements for primary (ascospore) infections are presumed to be similar.
b Hours of wetness from the beginning of the rain. Data of S. Eisensmith and A. Jones (Michigan State University).

Small, angular, gray, water-soaked lesions appear on the undersides of leaves, especially along the midvein, tip, or margins. As lesions expand, they turn brown or black, and the centers of spots can fall out, giving the leaf a tattered appearance. Heavily infected leaves turn yellow and drop. Infected fruit is marred by brown to black pits and cracks. Elliptical cankers develop on current-year or 1-year-old stems.

Disease Development: The bacterial spot pathogen overwinters on twigs and in buds either with or without symptoms. In the spring, bacterial populations multiply, and infection occurs during wet conditions. Water congestion of plant tissue is

important for disease development, and outbreaks are especially severe following storms with wind-driven rain. Abrasion by wind-borne sand injures tissue and leads to further infection. Warm, rainy weather throughout the season is conducive to secondary infections.

Control of Bacterial Spot: Peach varieties vary in their susceptibility to bacterial spot (Table 8). Chemical control is unreliable, so the best way to manage bacterial spot is by planting the most resistant cultivars. Fertilization should be adequate for tree health but not excessive; succulent tissues are very susceptible to bacterial spot. Sand abrasion can be minimized by planting a cover crop. Windbreaks will reduce wind speeds and should result in less tissue injury and spread of the pathogen. Dormant applications of fixed copper may reduce bacterial populations. The antibiotic oxytetracycline (Mycoshield), applied at shuck-split and continued at 7- to 10-day intervals until 3 weeks before harvest, has been used with varying degrees of success.

Table 8. Relative resistance of peach cultivars to bacterial spot.

Resistant	Tolerant	Least resistant
Candor	Biscoe	Autumnglo
Cresthaven	Earlirio	Blake
Earliglo	Garnet Beauty	Harmony (Canadian)
Encore	Glohaven	Jerseyland
Harbelle	Jerseyqueen	Redcrest
Harbinger	Loring	Redhaven
Harbrite	Rio-Oso-Gem	Sweet Sue
Harken	Sentinel	Suncrest
Jerseydawn	Springold	Sunhigh
Norman	Summerglo	Triogem
Pekin	Sunqueen	Tyler
Ranger	Sunshine	Velvet
Redkist	Surecrop	Washington
Redskin	Topaz	

Adapted from Rutgers University *Commercial Tree Fruit Production Guide*.

Perennial Canker (Leucostoma canker, Valsa canker) of Peaches

Canker in peaches can be caused by either of two closely related fungi, *Leucostoma cincta* and *L. persoonii*. The disease is common on peaches throughout the Midwest, especially in northern growing regions; it is sporadic and less important on other stone fruits. Perennial canker is most destructive in young orchards where large oval or elliptical cankers form on the trunk or scaffold limbs. Cankers can continue to expand each year, eventually girdling the branch or trunk. Cankers often are covered with wet gum, but this symptom is not diagnostic for the disease.

Disease Development: The pathogens overwinter as fruiting bodies in the bark of cankers or in dead branches. Spores are extruded from the fruiting bodies and are spread by wind-driven rain. Low-temperature injury, pruning wounds, hail damage, insect wounds, and leaf scars are potential infection sites. Optimal temperatures for growth of *L. cincta* and *L. persoonii* are 68° and 86°F, respectively.

Control of Perennial Canker: Control of canker diseases in stone fruit trees requires integrating cultural practices that promote winter hardiness and rapid wound healing with orchard sanitation. Canker diseases in general are exacerbated if trees are stressed. Trees should be planted in sites with well-drained soil and good air circulation. Trees should be trained to avoid narrow crotch angles, which are generally prone to injury. Adequate hardening-off before winter can be achieved by fertilizing early in the season and planting a cover crop by early July. Clean cultivation by disking is not recommended as this can damage roots. Trickle irrigation during dry periods will increase resistance to canker diseases. Applying white latex paint to the southwest side of trunks and lower scaffold branches helps prevent low-temperature injury on cold, sunny winter days. Rapid healing is enhanced by delaying pruning until growth resumes in the spring. Avoid leaving stubs when pruning; these heal poorly and are likely sites for infection. Cankers and dead wood should be removed and destroyed by burning or burying. In addition to cultural practices aimed at reducing stress, the lesser peach tree borer must be controlled to minimize perennial canker. This insect lays its eggs on and in cankers. As the larvae tunnel, they carry the fungus into healthy bark and wood.

Peach Scab

Peach scab, caused by the fungus *Cladosporium carpophilum*, occurs throughout the Midwest but is most important in the southern regions. The disease causes an unsightly spotting of fruit and sometimes creates entry points for the brown rot fungus, *Monilinia fructicola*.

Disease Development: The fungus overwinters in infected twigs. Spore production begins at shuck-split and peaks about 2 to 6 weeks later. Sporulation is greatest during humid periods. Spores are carried by wind and splashing rain to fruit. Infections remain latent (no symptoms) for 40 to 70 days. After the latent period, scab lesions appear as small, round, greenish black, velvety spots on fruit. Lesions tend to develop near the stem end of the fruit. Severely infected fruit may be stunted, misshapen, or cracked.

Control of Peach Scab: Peach scab is controlled by fungicide applications and by pruning so that leaves and fruit dry quickly and fungicides can penetrate the canopy. Fungicides are especially important at shuck fall and should be continued every 7 to 10 days until 40 days before harvest or as labels permit. Good canopy penetration by the fungicide will enhance coverage of fruit and result in less disease.

Black Knot of Plums

Black knot of plums and prunes is caused by the fungus *Apiosporina morbosa* (formerly *Dibotryon morbosum*). Wild plums and cherries are also hosts and are common reservoirs for the pathogen. The elongated, corky swellings, or "black knots," stunt growth and eventually girdle and kill branches.

Disease Development: New stem growth becomes infected starting at about pink bud, and infections continue for about 2 weeks. Moisture is required for infection, and disease development is greatest at temperatures of 55° to 77°F. Several months are required for the knots to develop. Some knots are visible the same year as infection, but others are not visible until the following growing season. Newly forming knots are soft, greenish swellings that grow along the length of branches or twigs. As knots age, they become dry, hard, black, and are parasitized by other fungi, which often give the knots a pink or cream-colored appearance.

Control of Black Knot: Cultivars of plums vary in susceptibility to black knot. Stanley, Bluefre, Damson, and Shropshire are most susceptible; Fellenburg, Methley, Milton, Bradshaw, and Early Italian are moderately susceptible; Formosa, Shiro, and Santa Rosa are slightly susceptible; and President is resistant. Wild plums and cherries should be removed from woodlots near plum orchards. New plantings should be established in sites away from infected trees. Knots should be removed by making cuts 6 inches below the knot and then destroyed by burning or burying the prunings. Fungicides applied from white bud through first cover will help control black knot but are not a substitute for good orchard sanitation.

Insect and Mite Pests of Stone Fruits

Identifying and Understanding Major Stone Fruit Pests

It is important for growers to recognize all stages of the insects and mites that attack stone fruits. Proper identification is critical to making the correct management decisions. In addition, growers should develop a basic understanding of the pests' habits. The more you know about the pest, the better equipped you will be to make sound and effective management decisions. The following books contain color photographs of pests of stone fruits, as well as information on their biology.

Common Tree Fruit Pests
Authored by Angus Howitt and published in 1993 as North Central Regional Extension Publication #63 by Michigan State University Cooperative Extension Service. Phone: (517) 355-0240.

Mid-Atlantic Orchard Monitoring Guide
Edited by Henry Hogmire and published as NRAES 75 by the Northeast Region Agricultural Engineering Service, Cooperative Extension Service.
Phone: (607) 255-7654.

oriental fruit moth

Oriental Fruit Moth

(*Grapholitha molesta*; order Lepidoptera, family Tortricidae)

Damage: The oriental fruit moth is one of the most serious pests of peaches in the Midwest. Early in the season, this insect damages succulent terminal growth. It attacks fruit in midsummer. Although there may be four to five generations each year, it is the second and third generations that cause most of the damage. In addition to peaches, this insect attacks apples, plums, cherries, pears, and nectarines.

Appearance: The oriental fruit moth is a small (1/4-inch), charcoal-colored moth. Fine alternating bands of light and dark lines on the wings give it a mottled appearance. The small, flat, oval eggs are laid individually or in small clusters on the foliage primarily, usually on the upper leaf surfaces of the terminal growth. The larva is pinkish white with a brown head and is 1/2-inch long when fully grown. The larva pupates in a silk cocoon in crevices in the bark or in litter at the base of the tree. The larva is similar to the codling moth larva but can be distinguished by the presence of an anal comb.

Life Cycle and Habits: The oriental fruit moth overwinters as full-grown larvae in cocoons in protected places on the trunk or around the base of the tree. They pupate beginning in late March, and moth emergence usually coincides with peach bloom. First-generation larvae tunnel into the young, tender terminal growth near the base of a leaf early in the season. The larvae may tunnel down the center of the twig for 2 to 6 inches before completing development or exiting and moving to another shoot. This injury causes dieback or flagging of these twigs. Larvae often damage two or three twigs before reaching maturity. These larvae can complete their development in less than a month.

Larvae of subsequent generations feed on fruit, when available, and twigs. As the twigs harden, the partially grown larvae leave them and enter the fruits to feed. Larvae commonly bore to the center of the fruit and feed around the pit. Larvae feeding on the fruit often causes it to drop. Young fruit often exude gum from the entrance and exit holes left by the larvae. Damaged fruit that remain on the tree are distorted. Occasionally, the larvae may tunnel into the fruit through the stem. In such instances, there may not be any apparent evidence of how the larvae entered the fruit after it was harvested.

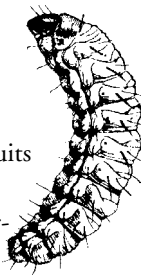
Monitoring and Thresholds: Pheromone traps are available for this insect to monitor moth activity and effectively time sprays. Traps are placed in the interior of the tree canopy at eye level or higher just before bloom. One trap per 10 acres is recommended for commercial orchards, with a minimum of two traps. Sprays for the first generation should be applied 6 days after peak flight, which coincides with peak egg laying. Examine trees regularly in the early spring for signs of wilted shoots. Examine wilted shoots carefully to determine if oriental fruit moth was the cause. Young trees with vigorous new growth are often very susceptible to this injury. Detection of early season shoot damage indicates the potential for fruit damage by later generations.

Mating Disruption: Some producers in Michigan and on the West Coast have successfully adopted mating disruption strategies for oriental fruit moth management in peaches. With mating disruption, pheromone dispensers are placed throughout the orchard. As the pheromone is released from the dispensers, male moths that normally use the pheromone to locate females become confused. This interferes with the mating process. Mating disruption is recommended only for orchards of 5 acres or larger. Mating disruption is expensive and does not eliminate the need for insecticide sprays to control other pests.

Chemical Control: Sprays for the first generation should be applied 6 days after peak flight. This often coincides with the time for plum curculio control. Sprays for the second and third generations need to be applied 3 days after peak flight. Depending on the anticipated harvest date for the fruit, sprays for the third generation may need to be adjusted or omitted in order to meet the necessary pre-harvest intervals (PHI) requirements for certain insecticides.

Plum Curculio

(*Conotrahelus nenuphar*; order Coleoptera, family Curculionidae)

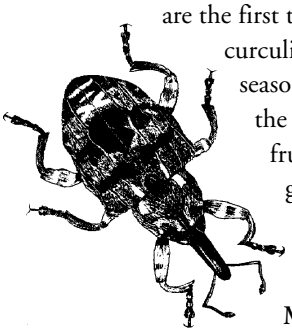


plum curculio larva

Damage: Plum curculio attacks stone fruits as well as apples and pears. Surface feeding and egg laying by the overwintering adults can scar or misshape the fruit by harvest, while feeding by the larvae causes premature drop of the fruit.

Appearance: The adult is a typical snout beetle, 1/4-inch long and dark brown with patches of white or gray. There are four prominent humps on the wing covers. The snout is one-quarter the length of the body, with mouth parts located at the end. The larva is a legless, grayish white grub with a brown head. Its length is about 1/3-inch when full grown.

Life Cycle and Habits: Plum curculio overwinters in the adult stage in ground litter or soil usually outside the orchard. Adults migrate into the orchards each spring, with border rows near woods often showing the initial injury. The first signs of damage typically coincide with the onset of 60°F nighttime temperatures. Eggs are laid on crescent-shaped flaps cut in the skin of young fruit. Often border rows near woods are the first to show injury. Fruits attacked by plum curculio will drop from the tree early in the season, along with unpollinated fruit. When the larvae are fully developed, they exit the fruit through clean-out holes, drop to the ground, and pupate 1 to 2 inches below ground. There is one generation per year.



plum curculio adult

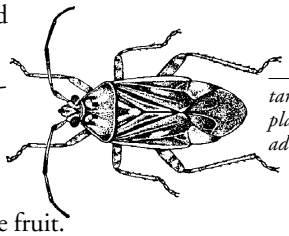
Monitoring and Thresholds: Currently there are no methods to accurately predict when plum curculio damage will occur. However, plum curculio pyramid traps are currently being tested in several midwestern states.

Chemical Control: Plum curculio is usually controlled with petal-fall and shuck-split sprays directed at the adult prior to egg laying. Considerable egg-laying damage can occur over a short period of time. Where plum curculio has been a problem in the past, use preventive sprays at petal fall and shuck-split to reduce damage. Cool weather during petal fall may delay the immigration of the adults into the orchard. Under these conditions, a first cover and possibly a second cover spray may be needed.

Tarnished Plant Bug

(*Lygus lineolaris*; order Heteroptera, family Miridae)

Damage: Tarnished plant bug damages young peach buds, causing blossom drop and early fruit drop. After bloom, feeding by this insect causes cat-facing and increased fruit drop. Tarnished plant bug cat-facing is characterized by sunken corky areas on the surface of the fruit.

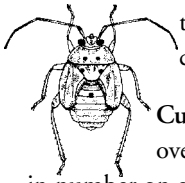


tarnished plant bug adult

Appearance: Adults are 1/4-inch long, mottled brown insects with wings folded over the abdomen. A yellow-tipped triangle is present in the middle of their backs. Nymphs are small and greenish and resemble the adult without wings. Both nymphs and adults have a beak used for sucking plant juices.

Life Cycle and Habits: Adult tarnished plant bugs overwinter under bark, in leaf litter, and other such protected places. The adult feeds on opening buds or flowers in early spring, and later on developing fruit. They lay eggs in the plant tissue of their many hosts. Nymphs emerge about 1 week later and feed for about 3 weeks before reaching adulthood. Several generations of this insect occur each year.

Monitoring and Thresholds: Pay particular attention to plant bugs when buds are in the pre-bloom stage. Adults are difficult to find and will fly when disturbed. They can be monitored with 6-by-8-inch, non-UV-reflecting, white sticky traps. Use one to two traps for every 5 acres. Hang traps in border rows near wooded areas. Treatment is recommended if an average of one tarnished plant bug per trap per week is captured.

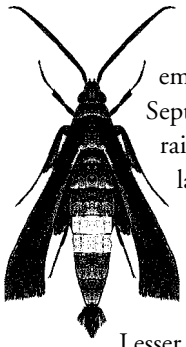


tarnished plant bug nymph

Cultural Control: Tarnished plant bugs overwinter in, feed on, and may build up in number on groundcover plants. Cover crop management is important in preventing tarnished plant bugs from moving into fruit trees. Because tarnished plant bug is attracted to flowering broadleaf

weeds, management of annual weeds through regular mowing is an important practice.

Chemical Control: Spray peaches at pink stage to reduce blossom drop. Sprays targeting tarnished plant bug at petal fall and shuck-split will reduce cat-facing injury to the fruit.



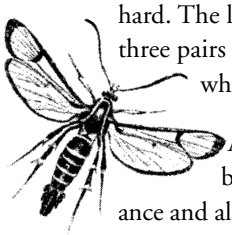
female peachtree borer

Peachtree Borers

(order Lepidoptera, family Sesiidae)
LESSER PEACHTREE BORER (*Synanthedon pictipes*)
PEACHTREE BORER (*Synanthedon exitiosa*)

Damage: These borers attack the trunk and limbs of stone fruit trees, especially peaches. The peachtree borer is a pest of young trees, and a single borer can kill a tree. The lesser peachtree borer prefers to attack mature trees. Peachtree borer injury occurs a few inches above or below ground, and lesser peachtree borer injury may occur anywhere on the trunk or limbs where larvae can get under dead bark.

Appearance: Adult peachtree borers are moths that look more like wasps. The adult female has a dark blue-black body with an orange band on the abdomen, dark blue front wings, and clear hind wings. The male is blue-black, marked with narrow yellow bands on the abdomen, thorax, head, and legs; front wings and hind wings are clear, but the edges and veins are outlined with blue-black scales. The male is 3/4- to 1 1/4-inches, the transparent portions of his wings are tinted with yellow, and at least three to four narrow bands of yellow are usually visible on the abdomen. Eggs are small, oval, reddish brown, and hard. The larva is dull white with a brown head and three pairs of short jointed legs. Larvae are 1 1/4-inch when fully grown.



male peachtree borer

Adult male and female lesser peachtree borers are similar to each other in appearance and also look like wasps. Lesser peachtree borer moths are slender and dark blue with some pale yellow markings; both pairs of wings are clear, except for the edges and veins that have blue-black scales. Lesser peachtree borers resemble the male peachtree borer. Larvae of the lesser peachtree borer are similar to other clearwing borer larvae. They are about 1 inch when mature. The head is light brown and the body is creamy white, but some individuals may be pinkish.

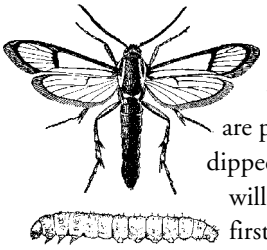
Life Cycle and Habits: The peachtree borer overwinters as larvae under the bark and resumes feeding and completes its larval stages in spring and early summer. When fully grown, the larva pupates under bark or in the soil near the tree base, then emerges as an adult. Adults start to emerge in mid-June; emergence peaks in midsummer and extends into September. Emergence is greater on days after a rain. Soon after adults emerge, the female moths lay eggs under bark scales or on rough bark. Each female lays about 400 eggs. Eggs hatch in 8 to 10 days into larvae that bore into the tree. It has only one generation per year.

Lesser peachtree borer overwinters as larvae underneath the bark. Larvae of all stages except the first may be found during the winter. The larvae feed for a period in the spring before burrowing just below the surface of the bark to pupate. Borers remain in the pupal stage from 18 to 30 days before emerging as adults. Female moths lay eggs in small clusters in cracks and crevices near wounds between ground level and 8 feet high. Females lay an average of 400 small oval, reddish brown eggs. Larvae begin to hatch in 8 to 10 days and burrow into the bark, often entering through cracks caused by other factors such as winter injury, pruning scars, or machinery wounds. Moths emerge from early May until late September. There are two generations a year, with adult emergence in May and June, then again in August and September.

Monitoring and Thresholds: While pruning in early spring, look for symptoms of borer. If symptoms are found, then an intensive control strategy is needed. To determine the most appropriate time to apply insecticide, a sticky trap or bucket trap baited with a pheromone lure can be used to monitor activity of peachtree borer or lesser peachtree borer. Traps for peachtree borer should be hung 3 feet from the ground and set up in late May. Traps for lesser peachtree borer should be hung 4 to 5 feet above ground and set up in late April. It is important to notice when emergence begins (when the first moth is trapped) and when emergence reaches a peak (when the number of moths trapped per week is highest).

The pheromone lure for each of these pests also can attract other similar clearwing borers such as the lilac-ash borer. Trapped moths thus should be examined carefully to be sure the correct species is being counted. If a trap for lesser peachtree borer is set up in the same planting as a trap for peachtree borer, the two traps should be separated by at least 60 feet to minimize trapping of nontarget species.

Chemical Control: Control needs to target small borer larvae before they bore into trees. Control may also be achieved by fumigant action of the insecticide, which can kill larvae already in trees at the time of application. An insecticide with long residual action gives the best control of peachtree borer.



lesser peachtree borer

Protection from peachtree borer is most critical during the first 3 to 5 years after planting. When new trees are planted, the roots and crowns should be dipped in insecticide before planting; this will protect them from borers during their first year. In established plantings, insecticide should be applied as a bark drench at a rate of 1/2 to 1 gallon of spray mix per tree. Thorough coverage is necessary. The insecticide should run down the trunk and soak the ground at the base of the tree. Any prunings, debris, or weeds at the base of trees should be removed so that they do not block the treatment. With lesser peachtree borer, an insecticide should be applied as a bark drench to the trunk and scaffold branches at a rate of at least 1/2 to 1 gallon of spray mix per tree.

The best time to treat and the number of insecticide applications needed for borer control depend on whether trees are known to be infested with these pests. One insecticide treatment is adequate in orchards where trees show some peachtree borer infestation; the best time to treat is at the time of peak adult flight, which is usually in early August. In orchards where borer injury is found on most trees, two treatments should be made: the first about 10 days after adults begin to emerge (late June) and the second at peak emergence about 6 weeks later (early August). In orchards where trees show signs of infestation by lesser peachtree borer, then an early application is needed to target the first generation in June, as well as an early-September application that targets the second generation. The first treatment should be applied 10 days after adults begin to emerge, which will probably be in mid-May.

Cherry Fruit Flies

(order Diptera, family Tephritidae)
CHERRY FRUIT FLY (*Rhagoletis cingulata*)
BLACK CHERRY FRUIT FLY (*Rhagoletis fausta*)

Damage: Cherry fruit fly maggots attack the fruit of sweet and sour cherries. Infested fruit often appear normal until the maggots are nearly fully grown. Damage appears as sunken, shriveled areas on the surface of the fruit. Fruit may be blemished by the egg-laying punctures made by the female near the bottom of the fruit.

Appearance: The adults are black flies with yellow heads and are somewhat smaller than a house fly. Between the base of the wings is a white- or cream-colored dot. The dark markings on the wings are used to distinguish the species. The abdomen of the black cherry fruit fly is entirely black, while the cherry fruit fly is marked with a series of white crossbands.

Life History and Habits: Cherry fruit flies spend 10 months of the year in the soil beneath the trees. Adults emerge from late May to early July and lay their eggs on the fruit. The black cherry fruit fly generally begins to emerge about 10 to 14 days earlier than the cherry fruit fly. There are usually 10 days between the fly emergence and egg laying. The eggs hatch in about a week, and the maggots feed for about 2 weeks before exiting the fruit and dropping to the ground. They pupate 1 to 2 inches beneath the soil surface. There is only one generation of each fly.

Monitoring and Thresholds: Monitor cherry fruit flies with yellow sticky cards hung in the trees in late May. Examine the wing bands to distinguish the species.

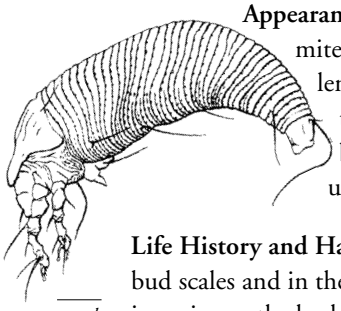
Chemical Control: Sprays need to target the adults *before* egg laying begins. Adults should be controlled 5 to 6 days after they emerge.

black cherry fruit fly and cherry fruit fly

Peach Silver Mite

(*Aculus cornutus*; order Acari, family Eriophyidae)

Damage: Peach silver mite sucks sap and causes peach leaves to turn silver in appearance.



peach silver mite

Appearance: This is an extremely small mite but may be seen with a hand lens. It is whitish and somewhat triangular and may be found on both surfaces of the leaves, usually near the veins.

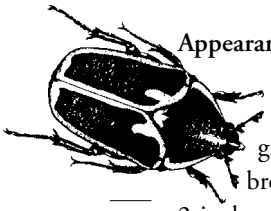
Life History and Habits: The adults hibernate under bud scales and in the bud axils. They become active in spring as the buds begin to open and foliage appears. Several generations are completed during the growing season.

Chemical Control: In general, sprays applied to control other mite species will control peach silver mite as well.

Green June Beetle

(*Cotinis nitida*; order Coleoptera, family Scarabaeidae)

Damage: Because green June beetle is a direct feeder on peach fruit, a single adult can cause significant damage. Like the Japanese beetle, initial feeding by a few green June beetles often attracts additional beetles. These beetles can attack both green and ripening fruit, and their damage contributes to Japanese beetle fruit feeding activity.



green June beetle

Appearance: Green June beetles are 3/4- to 1-inch long and are emerald green except for a tan border on the sides of their wing covers. The grubs have stout, grayish to white bodies with brown heads. When mature, they are 1 1/2- to 2-inches long. Unlike other white grubs, green June beetle grubs are more straight-bodied and have the curious habit of crawling on their backs.

Life History and Habits: Green June beetle grubs feed more on compost, manure, or decomposing organic matter in the soil. However, they throw up mounds of soil, and their burrowing activity can disturb the root system of grasses. In October or November when soil temperatures begin to cool, the grubs cease feeding and move more deeply into the soil where they spend the winter. The following March they begin migrating back to the sod zone where they continue to feed. They stop feeding in late May and move back down into the soil to transform into adult beetles. Green June beetle adults emerge in early July and are usually obvious as they feed on trees, shrubs, and flowers of many plants. Eggs are laid in soil with decaying vegetation.

Monitoring and Thresholds: There are few threshold guidelines relative to when peaches need to be treated for green June beetle. However, the first colonizers in early July will attract others into the orchard, so early control can reduce later infestations.

Chemical Control: Carbaryl is the most effective insecticide used in managing green June beetle. Repeated insecticide applications may be necessary at 7- to10-day intervals to prevent reinfestation during the adult flight period, or after heavy rains. Use of a spreader/sticker in the spray mix can increase the duration of effectiveness.

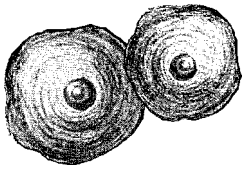
Periodical Cicada

periodical cicada adult

periodical cicada nymph

(See *Periodical Cicada* in *Apple and Pear Pests and Their Management* Section in Chapter 1)

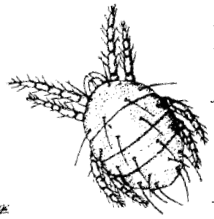
San Jose Scale



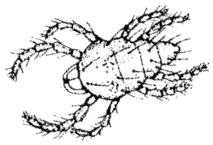
San Jose scale

(See *San Jose Scale* in *Apple and Pear Pests and Their Management* Section in Chapter 1)

European Red Mite



European red mite female



European red mite male

(See *European Red Mite* in *Apple and Pear Pests and Their Management* Section in Chapter 1)

Summary of Stone Fruit Pest Management Procedures

Cultural controls when establishing a new orchard:

- Choose a planting site with suitable soil and good water drainage.
- Purchase certified virus-free stock from a reputable nursery.
- Remove alternate hosts for plum curculio and black knot.

Controls while maintaining an orchard:

- Prune trees to ensure adequate spray coverage in all parts of the trees.
- Provide adequate but not excessive nitrogen fertilizer, especially to bacterial spot-susceptible cultivars.
- Mow orchard groundcover regularly to discourage tarnished plant bug.

Monitoring for pests:

Insect traps

- Hang pheromone traps for oriental fruit moth in trees prior to bloom and examine twice a week.
- Hang white, rectangular sticky cards for tarnished plants bugs prior to bloom.
- Hang pheromone traps for peachtree borer by late May and lesser peachtree borer by late April.

Scouting

- Pruning: look for scale injury to new wood and borer damage to trunk and limbs.
- Pink through second cover: look for plant bugs.
- Petal fall through second cover: look for plum curculio initial damage.
- Early June: begin looking for European red mite.
- Late June: begin looking for green June beetle.
- Harvest: evaluate for plum curculio, oriental fruit moth, and plant bug injury in order to help plan next year's management strategy.

Applying insecticides and miticides:

- Use a delayed dormant oil application to control European red mite and San Jose scale.
- Treat for peach leaf curl (or plum pockets) while trees are dormant.
- Avoid using products known to be highly toxic to predatory mites or predaceous insects.

Consider using mating disruption for oriental fruit moth management.

Peach Orchard Management Calendar

	Pre-season	Dormant	Pink	Full bloom	Petal fall	Shuck-split	First cover	Second cover	Third cover	Summer cover	July	August	Pre-harvest	Harvest	September	October	November
Check Trees, Put out Vole Bait	X															X	X
Dormant Pruning, Brush Removal	X	X	X	X	X												
Fertilization	X					X	X										
Plant Trees	X	X	X														X
Pre-emergence Herbicides	X	X															
Phytophthora Root Crown and Collar Rots		X					X				X				X		
Cut Buds, Estimate Crop		X															
Mites		X				X	X	X	X	X	X	X	X				
Peach Leaf Curl		X															X
Frost Protection			X	X	X	X											X
Brown Rot			X	X	X	X	X	X	X	X	X	X	X				
Tarnished Plant Bug and Stink Bug			X		X	X											
Oriental Fruit Moth			●		X	X	X	X	X	X	X	X	X				
Plum Curculio					X	X	X	X									
Scab			●			X	X	X	X	X							
Powdery Mildew						X	X	X	X	X							
Bacterial Spot						X	X	X	X	X							
Post-emergence Herbicides								X	X	X	X	X	X	X			
Irrigation								X	X	X	X	X	X	X	X	X	X
Fruit Thinning									X	X							
Peachtree Borer							●			X							
Lesser Peachtree Borer					●				X	X		X					
Foliar Analysis											X						
Summer Pruning											X						
Japanese Beetle													X				
Green June Beetle													X				
Fill in Ruts and Depressions																X	X

● Put pheromone traps in place or begin taking environmental data for pest prediction.