

IPM^{*} Series: Pome Fruit

Symptoms	Possible Causes	Comments/Controls
FOLIAGE		
Leaf spots/blotches	Apple and pear scab: fungal diseases causing olive-brown velvety spots on leaves.	<ul style="list-style-type: none"> •Plant resistant varieties. Rake up and discard all leaves, fruits, and debris. A mulching mower with a bag or leaf shredder will hasten decomposition and reduce disease incidence the next year. For susceptible cultivars, follow U of MD spray guidelines.
	Cedar-apple rust: fungal disease that causes bright yellow spots with orange or black center on leaves.	<ul style="list-style-type: none"> •Plant resistant varieties. Cedar trees located within a 4-5 mile radius of apple trees serve as the alternate host for the disease. Look for and remove the orange or brown galls from nearby cedars in spring. Galls range in size from the diameter of a nickel to a quarter. In wet periods they may produce orange appendages called "horns".
	Black rot, also called frogeye leaf spot: small purple fungal leaf spots become light tan with brown borders.	<ul style="list-style-type: none"> •Fruits that shrivel and remain on the tree, called "fruit mummies", harbor fungal spores that cause "frogeye" leaf spots. Remove and discard mummies at once.
	Pear leaf blister mite: occurs on both apple and pear. Small green or yellow pimples turn into reddish-brown blisters. With a hand lens, tiny white or light-red mites can be seen on leaf undersides.	<ul style="list-style-type: none"> •Apply dormant oil spray before bud break in spring.
White-gray powder on leaves and buds	Burning from herbicide, pesticide, or fertilizer: light-colored spots from direct contact.	<ul style="list-style-type: none"> •Random or regular pattern. Often caused by misapplication or spraying on hot days. Damage due to excessive sunlight, heat, and insufficient water.
	Sunburn: yellow, brown, or white areas develop on upper sides of leaves.	
	Powdery mildew: on upper leaf surfaces; can cause leaf and shoot distortion if infection occurs at bud break.	<ul style="list-style-type: none"> •Select resistant varieties. Disease begins at tips of terminals and so is more serious on terminal bearing cultivars like 'Rome'. Remove damaged shoots and prune for improved air circulation. If powdery mildew was a problem the previous year, spray with wettable sulfur at bloom. Another option is horticultural oil. Check labels for powdery mildew control guidelines.

*Integrated Pest Management (IPM):
The balanced approach to pest problems

Leaf yellowing or browning

Spider mites: period-size pest feeds mostly on leaf undersides, causing stippling and bronzing. Damage is more severe during hot weather.

San Jose scale: circular scale covers are found on bark. They are either gray to brown or black in color and 1/16” in diameter. Yellow crawlers are present in early June, late July, and early September.

Pear rust mite: pear leaves turn brown or bronze.

Fireblight: bacterial disease causes entire leaves on individual branches to brown but not fall off.

Aphids: leaves curl, yellow, and drop. Aphids excrete honeydew which may lead to sooty mold on foliage.

Excessive water: older leaves uniformly yellow.

Drought stress: first observed on newer growth. Leaf tips and margins may appear dry or scorched.

- Spray with dormant oil during pre-bloom period. Broad-spectrum insecticides kill off mite predators and often worsen the problem.
- Light infestations may cause leaf wilting and branch dieback on susceptible plants. Heavy infestations may kill trees. Prune off infested branches showing dieback. Spray with dormant oil during the pre-bloom period to control light infestations. To prevent heavy infestations, use a summer oil spray when crawlers are active.
- Dormant oil application before bud swell.

•Plant resistant varieties. Prune out infected parts using the “ugly stub” pruning method. See tip at the end of this publication. Otherwise dormant pruning of cankers is recommended. Spray Bordeaux or fixed copper spray at the silver-tip stage (when buds just begin to open) for severe infections. Reduce or eliminate nitrogen applications.

- Primarily an early-season problem. Hard water spray directed at aphids will reduce population. Apply a dormant oil spray at bud swell. Reduce or eliminate annual fertilization.
- Modify soil for better drainage.
- On pear, leaf margins turn dark brown-black. Keep trees well watered during extreme drought.

Leaf scorching /marginal burning

Pesticide burn: including soaps and oils. Stressed plants are more likely to be burned. Emulsifiable concentrates are more likely to burn than wettable powders.

Fertilizer burn/root damage

Damage from lawn herbicides: includes dicamba and glyphosate. Stunted off-color growth.

Drought stress: first seen on new growth.

Sunburn: yellow, brown, or white areas develop on upper sides of leaves.

•Leaf margins are affected first. Leaves are particularly susceptible to burn when temperatures exceed 80-85°F. Copper, sulfur, and Captan® fungicides may cause leaf burn.

•Marginal leaf scorch and root dieback caused by root contact with excessive salts from fertilizers. Avoid fertilizer spikes and follow U of MD recommendations found in publication EB 125.

•Symptoms from fall-applied herbicides may not appear until spring.

- Irrigate during dry periods
- Damage due to excessive sunlight, heat, and insufficient water.

Leaves curled, twisted, or rolled

Green apple aphid, rosy apple aphid: also feed on buds. Black sooty mold may grow on honeydew excretions produced by the aphids.

Sub-freezing temperatures after bud swell

Herbicide injury: new growth affected first.

Various leafrollers: larvae feed and pupate in leaves folded over with silken threads.

•Early season problem. A hard water spray will dislodge aphids. Reduce or eliminate nitrogen applications to reduce succulent growth favored by aphids. Apply labeled insecticidal soap or horticultural oil products to control high populations.

- First leaves will curl and be off-color. Do not apply herbicides near fruit trees. Follow U of MD spray guidelines in publication EB 125.

Leaves with black/sticky coating

Sooty mold: grows on sticky honeydew excreted by aphids, scales, or pear psylla during feeding.

Spray Superior oil at “green tip” stage of bud development (50% of buds show some green tissue). Remove water sprouts throughout growing season. High pest pressure can debilitate trees.

<p>Leaves chewed</p>	<p>Various caterpillars: holes in leaves or entire portions of leaves missing.</p> <p>Japanese beetles: skeletonize leaf tissue by feeding between the veins.</p> <p>Pear sawfly (pear slug): Small, dark, slug-like larvae feed between leaf veins (skeletonize leaves) on pear trees.</p>	<ul style="list-style-type: none"> •Inspect trees throughout the growing season. Hand pick or spray foliage with B.t. product to control young larvae. •Avoid Japanese beetle traps. They increase the amount of damage suffered by landscape and fruit plants. Sweep Japanese beetles off foliage and fruit into a bucket of soapy water. •Use horticultural oil if populations are high.
<p>Webbed or tented foliage</p>	<p>Eastern tent caterpillar: caterpillars found within silken tents</p>	<ul style="list-style-type: none"> •If numerous caterpillars are present, use B.t. when the caterpillars are small. Knock down or prune out webs on terminal branches and destroy caterpillars.
<p>Serpentine trails or blotches in leaves</p>	<p>Various leafminers: maggots or small caterpillars that feed between upper and lower leaf surfaces.</p>	<ul style="list-style-type: none"> •Usually controlled with post-petal fall insecticide sprays. Small infestations should be monitored but do not warrant additional pesticide applications.
<p>Wilting of foliage</p>	<p>Drought stress: foliage wilts, droops, and drops prematurely.</p> <p>Root damage: associated with freezes, dry sites, drought, insufficient watering, or mechanical injury.</p> <p>Poorly drained/heavy clay soils: limits root growth.</p> <p>Borers: wood-boring insects interrupt the flow of water and food through the tree.</p> <p>San Jose scale: circular scale covers are found on bark. They are either gray to brown or black in color and 1/16" in diameter. Leaf wilting and dieback are the first symptoms noticed. Yellow crawlers are present in early June, late July, and early September.</p>	<ul style="list-style-type: none"> •May lead to twig and limb dieback. Provide adequate water during summer and fall months. •Prune out affected branches. Don't cultivate near root zone. •Select suitable, well-drained planting sites. Amend soil with organic matter. •Check for signs of borer entry on trunk and large branches. •Light infestations may cause leaf wilting and branch dieback on susceptible plants. Heavy infestations may kill trees. Prune off infested branches showing dieback. Spray with dormant oil during the pre-bloom period to control light infestations. To prevent heavy infestations, use a summer oil spray when crawlers are active.
<p>SHOOTS, TWIGS, BRANCHES</p>		
<p>Shoots wilt and bend at ends (called a "shepherd's crook") Sunken, black or wine-colored cankers</p>	<p>Fireblight: bacterial disease causes a blackening or browning of leaves on affected branches. Leaves remain attached and don't fall off.</p>	<ul style="list-style-type: none"> •Plant resistant varieties. Prune out infected parts using the ugly stub pruning method. See tip at end of publication. Otherwise dormant pruning of cankers is recommended. Spray Bordeaux or fixed copper spray at the silver-tip stage (when buds just begin to open) for severe infections. Reduce or eliminate nitrogen applications.
<p>Shoots wilt</p>	<p>Oriental fruit moth: 3/8-inch long larvae with brown-black heads bore several inches into new shoots. Larvae overwinter in debris under tree. Young, rapidly growing trees more severely affected.</p>	<ul style="list-style-type: none"> •Prune out and dispose of wilted tips 6 inches below visible damage. Cultivate shallowly around base of tree 2 weeks before bloom. Follow U of MD guidelines for early season sprays.
<p>Dark, sunken cankers, gummosis may be observed</p>	<p>Various fungal and bacterial diseases: Enter through wounds caused by insects, lawnmowers, frost cracks, or hail.</p>	<ul style="list-style-type: none"> •Prune out and dispose of infected wood below visible damage. Prune on dry, warm days in early spring. Do not leave stubs. Fertilize only in late winter or early spring.

White woolly, waxy material on new growth	Woolly apple aphid: dark aphids under fluffy white wax on exposed roots, wounds on trunks and branches, and at the bases of new shoots on branches. Heavy infestations on the roots of small trees may kill them. Heavy infestations on large trees may deform twigs and branches and cause unthrifty trees.	<ul style="list-style-type: none"> • Usually controlled by a parasitic wasp (<i>Aphelinus mali</i>). Horticultural oil or soap sprays in spring reduce large infestations until wasps appear. Parasitized aphids turn into black mummies and the white wax disintegrates.
Silken webs/tents in branch crotch	Eastern tent caterpillar: caterpillars found within silken tents.	<ul style="list-style-type: none"> • If numerous caterpillars are present, use B.t. when the caterpillars are small. Knock down or prune out webs on terminal branches and destroy caterpillars.
Twig/branch dieback	<p>Root damage, drought, or mechanical injury</p> <p>Wet, poorly-drained soil</p> <p>Herbicide damage: new foliage stunted or distorted.</p>	<ul style="list-style-type: none"> • Prune out affected areas and keep trees well-watered. • Select suitable, well-drained planting sites. Pear trees are somewhat more tolerant of wet soils than are apple trees. • Glyphosate may cause a flattening and distortion of twigs and small branches.
Foliage/twigs/limbs broken or injured	<p>Ice, wind, or hail damage: cankers may develop.</p> <p>Squirrels: small twigs pruned for nest-building.</p>	<ul style="list-style-type: none"> • Prune out affected parts.
Bark is cracked longitudinally	Frost/freeze cracks, sunscald: cracks usually occur on south or west side of tree. Caused, in part, by differential freezing and thawing of water in tree.	<ul style="list-style-type: none"> • Consider painting the trunks and large scaffold branches of young trees with white latex paint. Failure of trees to properly harden off makes them more vulnerable to frost crack and sunscald injury. Avoid late summer-early fall pruning or fertilizing.
Trunk bark/wood is gouged or scarred	<p>Lawn mower or string trimmer injury</p> <p>Imbedded wires or collars: from tree support apparatus.</p>	<ul style="list-style-type: none"> • Mulch to within 6 inches of trunk. If tree support is necessary due to slope, high wind, or type of dwarfing rootstock, be sure to use a soft collar and adjust annually to allow for tree growth.
Roughened bark with clusters of hard, gray-colored specks	<p>San Jose scale: circular scale covers are found on bark. They are either gray to brown or black in color and 1/16" in diameter. Leaf wilting and dieback are the first symptoms noticed. Yellow crawlers are present in early June, late July, and early September.</p> <p>Lecanium scale: reddish-brown to black bumps usually found on young wood.</p>	<ul style="list-style-type: none"> • Light infestations may cause leaf wilting and branch dieback on susceptible plants. Heavy infestations may kill trees. Prune off infested branches showing dieback. Spray with dormant oil during the pre-bloom period to control light infestations. To prevent heavy infestations, use a summer oil spray when crawlers are active. Spray with dormant oil prior to the bloom period.
Water sprouts/suckers	<p>Environmental stress</p> <p>Removal of large branches and limbs: causes prolific growth of water sprouts directly below the pruning cut.</p>	<ul style="list-style-type: none"> • In all cases promptly pull or cut all suckers and water sprouts at point of attachment, unless you wish to select one to train as a scaffold branch.
Dark, raised circles on trunk with rough texture	Burr knots: caused by the progressive formation of aerial roots. Occurs frequently with dwarfing rootstocks M.7, M.9, M.26, MM.106, MM.111, and Mark.	<ul style="list-style-type: none"> • Burr knots can weaken a tree structurally if present in large numbers.

Shoots chewed, trunk girdled, bark stripped

Deer feeding: worse during very cold snowy winters.

Antler rubbing by bucks: bark is abraded or rubbed away by antlers.

- One strand electric fences are effective. Repel deer with commercial repellents or by hanging one or more of the following from mesh bags on trees: small soap bars, human hair, blood meal or mothballs.

Roots and base of young trees chewed

Voles (meadow mice) and rabbits: rabbits and voles gnaw wood and can girdle and kill young trees. More serious problem during very cold winters. Voles nest in mulch, weeds and plant debris around trunk.

- Keep orchard mowed and mulch pulled back from trunk. Place tree guards (18 inch high cylinders formed from hardware cloth) around trees and 2-3 inches below soil line. Reduce high population levels of voles by placing mouse traps at tunnel entrances.

Bulging or deformity of trunk at graft union

Scion wood over-grows or under-grows the rootstock: The scion wood is the desired cultivar that is grafted onto the rootstock. Normal on grafted trees.

- Remove all suckers that arise below the graft union. If graft union is damaged or killed, sucker growth from rootstock may outgrow desired scion stock.

Top of young tree breaks off at or near ground level

Failure of graft union: incompatibility between scion wood and rootstock.

- Check with supplier before purchasing trees to determine degree of compatibility.

FLOWERS/FRUITS

Blooms are brown and dry or water-soaked (blasted)/Bud cross section reveals brown tissue

Winter-kill of buds: extended periods of very cold temperatures. Young trees are more vulnerable. Blooms and buds at the ends of branches and facing upwards are more vulnerable.

Spring frost damage to buds and flowers: open blooms are more cold-sensitive.

Low temperature damage in early spring: trees may leaf out without flowering. (Leaf buds are hardier than flower buds.)

Misuse of dormant oil sprays or pesticide sprays, including spraying when blooms are open or when temperatures are below 40°F.

- Avoid planting in low areas or frost pockets. Avoid planting very early blooming cultivars.

- Cover espaliered or short stature trees with tarps or quilts to prevent freeze damage.

- Over-spraying dormant oil, lime-sulfur, and other fungicides and insecticides may damage buds and blooms. Follow label directions.

Blossom drop

Stressful conditions: drought, wind, low temperatures.

Lack of pollinizer trees: almost all apple and pear cultivars are self-infertile. At least two different cultivars with similar bloom times are required for pollination and fertilization.

Poor pollination/fertilization: bee activity is low during cool, wet weather.

Spraying insecticides during bloom period

Over-use of nitrogen fertilizers prior to bloom period

- Plant trees in fertile, well drained soil. Avoid low areas susceptible to late spring frost.

- Determine the pollination requirements of trees before planting. Pollination charts are available in fruit tree catalogs.

- Avoid broad spectrum pesticides that kill pollinating insects.

- Reduce applications of high nitrogen fertilizers.

Failure to fruit/minimal fruit set

Immature tree

Winter-kill of buds: extended periods of very cold temperatures. Young trees are more vulnerable. Blooms and buds at the ends of branches and facing upwards are more vulnerable.

- Apple and pear trees bear fruit at 5-6 years of age. Excessive pruning of young trees can postpone fruiting.

- Avoid planting in low areas or frost pockets. Avoid planting very early blooming cultivars.

Spring frost damage to buds and flowers: open blooms are more cold-sensitive than closed or partially opened buds.

Low temperature damage: trees may leaf out without flowering (leaf buds are hardier than flower buds).

Low light conditions

Lack of pollinizer trees: most apple and pear cultivars are self-infertile. At least two different cultivars with similar bloom times are required for pollination and fertilization.

Poor pollination/fertilization: bee activity is low during cool, wet weather.

Spraying insecticides during bloom period: may kill pollinating insects.

Spraying dormant oil or Bordeaux on open blooms: may damage tender tissues.

Over-use of nitrogen fertilizers

Biennial bearing pattern: failure to prune after a heavy crop, particularly on certain apple cultivars like ‘Golden Delicious’.

Severe pruning: reduces number of blooms.

- Cover espaliered or short stature trees with tarps or quilts to prevent freeze damage. Avoid planting in low areas or frost pockets.

- Follow proper thinning and pruning guidelines. Situate plantings for optimum light exposure.
- Determine the pollination requirements of trees before planting. Pollination charts are available in most fruit catalogs.

- Avoid spraying insecticides during bloom.

- Leaf and flower buds may be killed or damaged by misuse or overuse of dormant oil sprays, including spraying when temperatures are below 40°F.

- Excessive nitrogen stimulates leaf and shoot growth at the expense of fruit buds and fruit.
- Follow U of MD pruning guidelines.

- Do not prune out healthy fruit-bearing wood (with buds or fruiting spurs) during the dormant season. Follow U of MD pruning guidelines.

Small or undersized fruits

Failure to thin or prune properly
Low soil fertility
Drought

Rosy apple aphid: early season feeding on fruits causes apples to be small and lobed.

- Thin to reduce number of fruit or blossoms.
- Follow soil test recommendations.
- Irrigate during critical periods such as fruit set and enlargement.
- Control early populations with insecticidal soap or horticultural oil. Remove narrow leaf plantain (alternate host) from surrounding area.

Premature drop

Larvae of various insect pests

Natural thinning

Spring frost: may damage or kill buds and developing fruits.

Poor pollination/fertilization

Drought, cold or hot temperatures

- Open and inspect dropped fruit to identify pest(s) and decide management strategies. Promptly discard all drops to prevent re-infestation.

- Apple trees over-produce fruit and thin themselves naturally in June. Trees produce full crops with only 10% of the original blooms.

- Don’t plant trees in low, cold areas susceptible to late frost.

- Lack of pollinizer tree or insufficient bee visits. Avoid spraying insecticides during bloom.

- Flower parts and developing ovaries can suffer damage and cause fruit abortion.

Young fruits turn brown and dry down

Severe drought: especially with European pears

- Irrigate trees, beyond the branch tips, during dry periods.

Cracking/splitting

Excessive moisture during ripening

Scab: (See “Leaf spots/blotches”)

- Pick ripened fruit promptly and use mulches to maintain even soil moisture.

- Lesions enlarge, coalesce and crack.

<p>External damage</p>	<p>Pesticide burn</p> <p>Hail: small, roughened areas on fruit.</p> <p>Mechanical damage</p> <p>Sunscald: white, tan, or brown sunken areas on exposed surfaces.</p> <p>Powdery mildew: rough, spider-webbing or russetting on fruit surface.</p> <p>Pear rust mite (only on pear): feeding on fruit surface causes russetting or rough netting, usually from stem end down to blossom end.</p>	<ul style="list-style-type: none"> •Captan®, sulfur, and oil sprays may produce russetting on sensitive varieties. •Cosmetic damage should not affect eating quality. •From contact with branches or rough handling. •May alter fruit flavor. Remove and discard affected fruit. •Cosmetic only; does not affect eating quality. •Apply dormant oil before bud swell. Apply horticultural oil sprays during growing season.
<p>Apples dimpled/brown trails or streaks in flesh</p>	<p>Apple maggot: small, white maggot makes tunnels through fruit.</p>	<ul style="list-style-type: none"> •Worse on thin-skinned and early varieties. Pick up and discard all drops. Where pest pressure is severe, hang 4-5 sticky red spheres on outer branches to trap adult flies (late June-late July). Consult U of MD, Bulletin 125 for spray recommendations.
<p>Holes chewed/holes Shallow and pin prick-size</p>	<p>Fruitworms and leafrollers: leafrollers are a major pest in MD orchards. Leafroller larvae gouge fruit at the stem end. Fruitworms grow up to 1 ½ inches in length and make deep holes in fruit.</p> <p>Codling moth “stings”: caused by larvae that puncture fruit and die.</p> <p>Plum curculio: feeding by rough snout-nosed adult beetle. Very active during bloom and early fruit set. Adults drop to ground when disturbed.</p>	<ul style="list-style-type: none"> •Discard all infested fruit. Follow U of MD spray guidelines. •Follow U of MD guidelines for early season sprays. •Fruit may also be misshapen; often drops prior to maturity. Follow U of MD guidelines for early season sprays.
<p>Fruits exude gum and frass (excrement). Small holes at blossom-end or in side of fruit.</p>	<p>Codling moth and oriental fruit moth larvae: <i>these are similar in appearance and behavior. Both tunnel into fruit, have multiple generations and are controlled with post-petal fall insecticide sprays.</i></p> <p>Codling moth: mature larvae over-winter under loose apple tree bark, brush and other protected areas. Pupate and emerge as adults around petal fall. Females lay eggs directly on fruit. Larvae begin feeding 2-4 weeks after full bloom. They are cream-pink colored with brown head and reach 1/2 inch in length.</p> <p>Oriental fruit moth: larvae over-winter in cocoons in tree bark or in debris under trees. Adults emerge at bloom and mate; females lay eggs on leaves.</p>	<ul style="list-style-type: none"> •Follow U of MD recommendations for early season sprays (at late petal fall and then 10-14 days later). To reduce pest pressure, pick up and discard all drops and damaged fruit still on the tree. Wrap 6 inch wide strips of cardboard or burlap around trunk and large limbs in August. Check wrapping in December, discarding trapped larvae/pupae. •Control weeds around planting. Do some shallow cultivation around base of tree 2 weeks before bloom.
<p>Raised, tan-brown, crescent scars/larvae tunnel into core</p>	<p>Plum curculio: 1/3 inch long yellow-white grub with brown head. Adult is small black beetle with long snout. Eggs laid directly in fruit under scar. Late in the season, eggs laid by second generation adults may not hatch, leaving only the superficial scar.</p>	<ul style="list-style-type: none"> •See U of MD publication EB125 for insecticide to be sprayed during first warm days following petal fall. Cool, wet weather at petal fall makes control more difficult (prolongs emergence and feeding). Monitor adult population by jarring branches and collecting curculios on a light-colored tarp.

Circular clusters of tiny black specks/ small sooty smudges

Fly speck and sooty blotch: common, late-season fungal diseases.
Sooty mold on pear: from pear psylla feeding.

- Symptoms can be rubbed or peeled off following harvest. Fruit may be dipped in a 10% bleach solution to remove fly speck, sooty blotch and sooty mold. Rinse and dry fruit afterward.

Spots on fruits

Various fungal and bacterial diseases

Bitter rot: sunken, brown-black spots that enlarge.

Scab: velvety, olive-brown spots. Lesions become corky.

Fireblight: brown spots. Fruit eventually shrivels.

San Jose scale: small, red-purple spots with light-colored center. Small black dots (scale covers) may be observed.

- Apply appropriate pesticides according to U of MD recommendations found in EB 125. For all fruit problems, promptly remove all infected fruit from the vicinity of the orchard and dispose. Prune out dead wood in the trees and remove brush from the orchard.

- Associated with fireblight infection. Remove infected fruit. (See “fireblight” entries above.)

- Plant resistant varieties. (See “apple scab” entries above.)

- Plant resistant varieties. (See “fireblight” entries above.)

- Peel off skin of affected fruits. Pick up and discard fruit drops. Apply a dormant oil spray prior to bud break. (See “San Jose scale” entries above.)

Deformed fruits

Apple maggot (See “Apples dimpled”.)

Rosy apple aphid: causes very small fruit; may be lobed.

Earlier infection of fruit buds

Aphid feeding on buds

Tarnished plant bug: adults are up to ¼ inch in length with a shield-shaped thorax. Pierce and injure plant parts while feeding. Injurious mostly to blooms and very small fruits.

Green stink bugs may cause fruit distortion later in season.

Leafrollers: various caterpillars feed on blooms, foliage, and then on young fruit often causing premature fruit drop.

Plum curculio: ¼ inch long, humped beetle with long snout. Adult females produce distinctive, crescent-shaped ovipositing scar on fruit skin. Larvae are legless and cream-colored with a brown head. Damage more severe in mild, humid, overcast weather during and after bloom period and on trees with very dense foliage.

Poor pollination: causes “catfacing”. Fruits are gnarled with irregular depressions.

Hail damage: scars can be observed.

- Control damaging insect and disease pests.
- Remove all affected fruit.

- Control scab, cedar-apple rust, and powdery mildew early in the spring.

- Deforms and scars fruit (“cat-facing” injury).
- Feeding leads to depressions (dimples) in fruit. If fruits don’t drop early they remain scarred through season. Pull off and dispose of fruits.

- Control weeds around trees, especially wild mustard.

- Fruit scarred or gouged at fruit at stem end or fruit marked with corky or rosette depressions.

- Adults emerge from hibernation from bloom period through six weeks after bloom. Adults mate and feed on fruits; females insert eggs into developing fruit. Larvae feed and grow inside causing early season cultivars to drop fruits in June. Late summer second generation adult feeding also causes fruit damage. Monitor by jarring branches over a tray or white tarp during petal fall. Follow U of MD guidelines for critical early season sprays. Promptly discard all affected fruit on tree and on ground.

- Remove immediately from tree or ground.

- Damage is cosmetic.

Internal damage/corky areas or browning

Environmental stress: drought, waterlogged soil, or high and low temperatures during ripening, harvesting, and handling.

- Cut back on nitrogen fertilizers. Irrigate during dry periods.

	Deficiencies of calcium, magnesium, or boron	<ul style="list-style-type: none"> •Associated with a wide range of fruit disorders- including cork spot and bitter pit. Have soil tested for these micronutrients and amend accordingly. Consider adding calcium chloride to pesticide sprays. •Pick ripened fruit promptly.
	Overly mature fruit	<ul style="list-style-type: none"> •Many cultivars, such as ‘MacIntosh’, need cool temperatures to develop good color.
Poor color		<ul style="list-style-type: none"> •Do not allow fruit to become overly mature.
Flying insects hovering around ripe fruit	High summer temperatures Yellow jackets and hornets	

The IPM Approach to Preventing and Managing Pest Problems

Apple and pear fruits are botanically referred to as pomes and are excellent candidates for the home garden, however they are subject to many problems (insects, diseases, weather extremes, wildlife).

To grow apples and pears successfully, you must grow healthy plants, anticipate and manage problems, or prevent problems altogether. The appearance and severity of pest problems varies between neighborhoods, areas of the state, and growing seasons. Pest problems tend to be worse in areas where there are a significant number of active or abandoned orchards. Diseases are also generally favored by wet seasons. When symptoms of a problem are noticed, you must be able to accurately identify the problem (e.g. weed, insect, disease), monitor for changes (e.g. increasing severity), and be prepared to act. Preventive techniques and control measures may be physical (e.g. hand-picking Japanese beetles), cultural (e.g. pruning to improve air circulation) or chemical (e.g. spraying horticultural oil to control San Jose scale crawlers and aphids).

Be aware, however, that a large number of the fruit problems observed each season by gardeners are not caused by pests but are cultural and environmental. These abiotic problems include: insufficient water, nutrients, space, sunlight and support, poor soil, low pH, temperature extremes, root damage from cultivation, choosing inappropriate varieties, and purchasing poor quality trees.

The **integrated pest management (IPM)** approach to preventing or managing pest problems is recommended and can be summarized as follows:

1. **Correctly identify the problem: if insect or disease, learn the life cycle and habits.**
2. **Learn to anticipate and prevent problems. Reduce plant stress by correcting abiotic problems.**
3. **Monitor for worsening symptoms.**
4. **If level of damage becomes unacceptable choose a least toxic control for insect or disease pests.**

Pesticides may still be required using the IPM approach, particularly in wet seasons, but you may reduce the number of sprays through monitoring and good sanitation practices. If disease-resistant apples are being grown, only one to three pesticide applications may be necessary to produce quality apples. Asian pears produce excellent backyard crops and tend to have few significant pest problems. (Refer to MCE publication EB 125, *Home Fruit Production Guide*, for more detailed pest control and spray schedule information.)

Cultivar Selection and Planting

Prevent problems before you plant your first tree by following these pointers:

- Plan your fruit planting one year prior to planting. This will give you time to take a soil test, select a well-drained, sunny location, add organic matter to the soil over the entire eventual root zone, adjust the soil pH if necessary and control weeds.
- Consult with neighbors who grow apples and pears. What varieties seem to grow well in your area?
- **Select varieties that have resistance to diseases you are likely to encounter.**
- Avoid poor quality bargain plants.
- Dwarf cultivars for containers tend to be disappointing.
- Avoid the M-26 and M-9 apple rootstocks.

Fertilizing

- Apple and pear trees, like most plants need the nutrients nitrogen, potassium and phosphorous in the greatest quantities. The latter two are needed in relatively large amounts when the tree is young. After the trees reach maturity, only nitrogen may be required.
- **Do not put any fertilizer in the hole before planting.**
- One month after planting, broadcast 8 ounces of 10-10-10 fertilizer over a 2 foot circle. Keep the fertilizer 6 inches away from the trunk and broadcast it evenly. Broadcast another 8 ounces of 10-10-10 around your tree two months later.
- Refer to Extension Service Publication EB 125 for specific information on fertilizing fruit plants. Reduce these fertilizer rates if trees becomes overly vegetative

(i.e. producing more than 12 to 14 inches of new shoot growth per year).

- Organic fertilizers, such as composted farm manure and yard waste, can be substituted for chemical fertilizers. Foliar applications of seaweed extract, compost tea, or fish emulsion are beneficial, especially when new growth begins in the spring and during bloom.
- Most fruit plants are fertilized in early spring. Late summer and fall fertilization may interfere with the hardening-off process and lead to winter damage.
- Over-fertilization, regardless of the nutrient source, can produce weak growth prone to attack by diseases and sap-sucking insect pests.

Watering and Mulching

- Water newly planted trees to a 6-8 inch depth 2-3 times each week during the first growing season. Reduce this amount if rainfall is plentiful. A small ridge of soil may be hoed around each tree to prevent runoff. Remember, young trees need adequate moisture in the fall to over-winter successfully.
- Trees up to 4-5 years in age are very susceptible to drought stress and need to be watered deeply during dry periods.
- Keep a 2-3 inches deep organic mulch around your trees during the growing and dormant seasons. Keep mulches 6 inches away from fruit tree trunks to prevent vole damage and trunk diseases.

Pruning and Training Apple and Pear Trees

Proper pruning can help prevent or minimize pest problems by:

- allowing sunlight and spray materials to enter the center of the tree.
- improving tree strength and inducing branching.
- improving air circulation within the tree, thus reducing the potential for foliar disease.
- removing dead or broken branches which may encourage disease problems.
- Don't make flush cuts. Prune back to the top of the branch collar (the slightly swollen area at the junction of branch and trunk).
- Don't apply paint or wound dressings to pruning cuts. Cuts heal more successfully on their own.

Follow the pruning recommendations in Bulletin 197, *Pruning Fruit Plants in Maryland*.

Protecting Trees From Wildlife Damage

- Protect young trees from vole damage by surrounding the lower trunk with hardware cloth, which should extend two inches below soil level.
- Apple and pear trees must be protected from deer. Use hardware cloth to loosely enclose the trunks of trees vulnerable to deer feeding.

- Where deer pressure is heavy, try rotating various commercial repellents. Hanging small cakes of deodorant soap from branches may also be helpful. Predator urine has not proven effective in Maryland.

Anticipating and Preventing Problems

- Contact backyard fruit growers and Extension staff in your county to learn about the most common problems.
- Plantings located in an area with a large number of active or neglected orchards will be more prone to insect and disease problems.
- Anything that stresses a fruit plant may encourage insect (especially borer) and disease problems. Stressors include: drought, physical damage to the trunk, compacted poorly-drained soil, defoliation, winter damage, poor planting stock, etc.
- Monitor and control pests and diseases in non-bearing trees. Small, young trees are more severely affected by insect and disease problems than are larger, older trees. They have fewer food reserves, less foliar cover, and are more succulent.
- Plant flowering plants around your fruit trees to attract beneficial insects that will control a portion of insect pests. For example, braconid wasps may parasitize the majority of Oriental fruit moth larvae in a backyard setting. Members of the aster, mint, and carrot family are especially useful.
- Prune out water sprouts and root suckers.
- Keep weeds cut down in and around your fruit plantings to remove favorable habitats for pests.
- Control insect pests, such as thrips, aphids, and leafhoppers, that vector (spread) diseases.
- Spray on a schedule for serious, predictable diseases such as apple scab, and for insects such as codling moth, that appear at the same time each year.
- Blooms should be removed at least for the first two years to allow trees to develop adequate size and root growth. This will vary depending on the species and rootstock. Trees on very dwarfing rootstock can be allowed to bear a light crop by the third or fourth season.
- Thin apple trees when fruits begin to form, so that fruits are 6 inches apart.
- Pick your fruit often; don't allow fruit to become over-ripe.
- Regularly remove and discard all diseased or infested plant parts, including leaves and fruits on the ground.

Fight Fireblight by Leaving an "Ugly Stub"

The fireblight bacterium is a systemic pathogen that can move rapidly into healthy tree tissue. Backyard orchardists are often unaware that pruning out infected shoots and limbs during the growing season can further spread the disease. Follow these pruning guidelines to improve fireblight control:

- Use very sharp pruning tools to remove infected limbs 8-12 inches below visible symptoms.
- Do not make the cut all the way back to another healthy limb or spur. Instead, leave a 4 inch long naked (“ugly”) stub. (The bacterium colonizes the ends of pruning cuts and produces cankers which serve as a source of inoculum for continued infection).
- Mark the stubs to make them easy to locate. (Spray paint in a bright color works well.)
- Remove and dispose of the infection-carrying “ugly stubs” during dormant pruning (November-January).

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Number 11. Mailing Room, New York Agricultural Experiment Station, Geneva, New York, 11456. \$2.00

Maryland Cooperative Extension Publications on Fruit Trees:
 HGIC # 69, Getting Started With Tree Fruits
 HGIC #77, IPM Series: Stone Fruits
 Bulletin 197, Pruning Fruit Plants in Maryland (\$1.00)
 EB 125, Home Fruit Production Guide (\$3.00)
 Available from the Home and Garden Information Center (address on page 1) or your local Extension office.

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Web sites:

Backyard Fruit Growers- www.sas.upenn.edu/~dailey/byfg.html
 HGIC- www.agnr.umd.edu/users/hgic

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