EXTENSION

Utah State University

# The Home Orchard Pest Management Guide

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HG 137 Revised April 2006

# THE HOME ORCHARD PEST MANAGEMENT GUIDE

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# Internet Sites for Pest Management Information

Home orchard insect and disease information and plant pest diagnostic assistance is available on the Utah State University Extension Insect and Plant Disease Web site: http://extension.usu.edu/cooperative/ipd

Orchard pest advisories and pest control timing information for Utah is available on the Utah IPM Web site: http://extension.usu.edu/cooperative/ipm

# Components of a Successful Pest Management Program

## Pest Identification

Before deciding to take any control action, be sure you have correctly identified the pest (insect, mite or disease), and be sure that it is or will be serious enough to be worth the cost and time of control. Refer to the color photo insert and section on pest biology at the end of this guide for descriptions and pictures that will help you identify many of the common pests found in home orchards. You may also want to consult your local Utah State University Extension County Office for more information on orchard pests and to obtain assistance with their proper identification and timing and methods for control.

## Surveying for Pests and Injury

One of the most important features of a successful pest management program is to look for pests and damage symptoms on a regular basis in your home orchard trees. Monitoring devices, such as insect pheromone traps, can be used, but may provide less accurate information when only a few trees are involved because they can draw in pests from outside the area of concern. Check your fruit trees at least every 2 weeks during the growing season for signs of pests and pest damage. Pick a few leaves on each side of the tree to check for insect and disease damage. Look on the undersides of leaves where insects and mites usually live. Check the trunk for injury, oozing sap, or migrating insects. Observe fruit for scars or insect entry holes.

## Control Action Guidelines

For home purposes, some pests can be ignored if their levels are too low to justify the costs involved in their control. More time can be invested in cultural and sanitation practices (see sections below) because the homeowner can often afford to trim out some damaged fruit. On the other hand, some orchard pests in the state, such as the apple maggot, plum curculio, and fire blight, are pests you must control to help protect commercial orchards in your area.

## Identifying “Windows of Opportunity”

All types of pests have a life cycle or set of developmental events that occur during their lifetime. The type of life cycle varies with the pest; however, most pests have certain weak points or “windows of opportunity” during their life cycle when they are most vulnerable to control. For insects, these windows are often during the immature life stages. Weeds are typically easiest to control during their seedling stage, early in the season when they are just beginning to grow (annuals), or late in the season when they are preparing for dormancy (perennials). Diseases are often easiest to control by using preventive or early intervention tactics before the disease begins to develop or becomes established. To optimize management of a pest, control tactics should be targeted for these weak points.

# General Orchard Management Practices

The easiest, lowest cost and often most reliable way to avoid many pest problems is to provide an environment that discourages pest activities or reduces the tree's susceptibility to damage. These types of methods include adjustments in cultural practices such as fertilization, water management and sanitation, and management of areas adjacent to the orchard trees. In addition, proper management of naturally occurring biological control organisms can help reduce pest problems. For pests that directly attack the fruit or trunks of trees, exclusion or pesticides are often the most reliable pest control options.

## Tolerant/Resistant Varieties

Use insect and disease resistant varieties and rootstocks whenever they are available. In Northern Utah, choose varieties that will survive cold winter temperatures. Winter damage resulting in bark cracking can cause a tree to be more susceptible to attack by many diseases and insects.

## Soils and Nutrition

Although you cannot change the soil type around your home, there are some practices you can follow to improve growing conditions for your fruit trees. Proper fertilization of trees with a nitrogen containing fertilizer is important for optimal tree growth; however, over fertilization can lead to excessive, lush growth that can be attractive to aphids, psylla and other foliage pests or increase susceptibility to disease. Fertilizers should be applied in the spring and not later than June 30 since they may prevent the tree from "hardening off" properly for winter. Two common soil problems in fruit orchards are dry and dusty conditions, which encourage mite outbreaks, and poor drainage and over watering, which can lead to crown and root rot problems.

## Nutrient Deficiencies

Iron and zinc are often deficient in the high pH soils common in most of Utah. These deficiencies can be temporarily corrected by foliar applications of micronutrients. Iron deficiency is best corrected by the soil application of a chelated iron compound.

## Water Management

Mismanagement of water is a major contributing factor to many pest problems. Too little water can stunt growth of trees, cause poor development of root systems, lower fruit and nut yields, and exacerbate the injurious effects of many pests. Severe water stress can cause leaves to drop and nuts or fruit to remain on trees after harvest. On the other hand, excessive watering can damage roots by depriving them of oxygen and create conditions that favor infection of soilborne diseases, particularly Phytophthora root and crown rot. Overwatering is by far more common in Utah than underwatering. Allow surface soil to dry out before irrigating. Orchard trees can be irrigated with surface water (flood or furrow), sprinkler, or drip methods. Flood or furrow irrigation may discourage ground squirrels and pocket gophers from digging burrows near tree trunks. Sprinkler irrigation can increase disease problems if water is applied so leaves or fruit remain wet for extended periods; adjust sprinkler heads so this does not happen.

## Sanitation

Many pests can overwinter and survive inside fruit, other tree parts and debris. Gather and discard fallen and rotten fruit, and fruit remaining on trees after you have harvested (e.g., cherries and apples that remain on tree after you have picked all you want). Pick up and destroy or till under June or July-drop walnuts, apples, and pears as soon as they fall since they may contain codling moth. Rake up dead leaves under trees. Prune and destroy dead and injured twigs or branches since diseases and insects may inhabit them. Remove wood piles or other debris where codling moth larvae may find shelter for the winter.

## Trunk Banding

Place corrugated cardboard (cardboard with ridges) bands (2-4 inches wide) around trunks of apple and pear trees to trap codling moth larvae that cocoon under tree bark in June and again in August. Remove and destroy bands before moths emerge in late June/early July (for first generation) and in October (for over-wintering generation). This method is most effective on smooth-barked varieties and in smaller, isolated orchards.

## Fruit Bagging

To exclude codling moth, peach twig borer or oriental fruit moth from infesting pome and stone fruits, place small paper bags over developing fruits. Bags should be secured well, but not constrict the twig. Cut a small slit in the bag bottom, slip the slit over the fruit, and close the bag opening with a twist-tie. Remove the bags a short time before the fruit is mature to allow the fruit to color.

## Ground Covers

Ground covers or cover crops can be interplanted between fruit trees. Orchard floor vegetation can have both positive and negative effects on pest problems. Orchards with ground covers may have higher populations of certain natural enemies, largely due to increased habitat and alternate food sources for beneficial insects and mites; they also may have fewer problems with mites because of reduced dust. However, if not properly managed, a ground cover can be a source of pests as well as natural enemies. Rodent, crown rot, ant, stink bug and lygus bug problems have been associated with ground covers that get too overgrown. Piercing-sucking insects such as lygus and stink bugs should be especially discouraged in peach and apricot orchards because they can cause “cat-facing” (scarring and marking) damage to the exterior of fruits. “Cat-facing” insects are attracted to clovers, alfalfa and many broadleaf weeds. Therefore, a hardy grass mixture of perennial ryegrass plus red fescue or a tall fescue can be planted to compete with weeds and minimize dust problems. Ground covers have also been shown to decrease pupation success of western cherry fruit fly.

## Biological Control

Biological control is any activity of one species that reduces the adverse effect of another. Predators, parasites and pathogens of pest species can occur naturally in fruit orchards or may be purchased from commercial suppliers and released for supplementary control of pests. Most biological control occurs naturally without assistance from the grower or homeowner. Often its importance is not appreciated until a broad spectrum pesticide, which kills many of the beneficials as well as the targeted pest, is applied and a new pest—suddenly released from biological control—becomes a serious problem. There are several things you can do to encourage the activities of biological control agents already present in your orchard. The most important is to avoid the use of broad spectrum pesticides unless necessary. You can also provide a habitat that is more favorable for biological control agents (see Ground Covers section) by choosing adjacent plants that supply nectar, pollen, alternate hosts, and habitat for natural enemies. There is evidence that providing adequate organic content in soil may be important in ensuring a good habitat for soil microorganisms that can control a variety of pests, particularly soil pathogens and nematodes. You can buy biological control agents to release for controlling pest species; however, mass release of natural enemies is really a minor part of biological control. Most commercially available biocontrol agents are directed against insect and mite pests. Predatory mites have been successfully mass released for control of plantfeeding spider mites in orchards. *Steinernema* and *Heterorhabditis* nematodes, which parasitize insects, show great promise for use against certain boring insects, soil dwelling insects, or insects in other types of moist, confined habitats. Release of *Trichogramma* wasps for control of numerous caterpillars, and release of lacewings for aphids and other small insects have potential, but results have been mixed because of variation in the quality of

agents available and lack of reliable release procedures.

## Bait Traps

A mixture of molasses and yeast (1 part molasses,10 parts water, plus ¼ package dry yeast) can be placed in a plastic tub or small bucket, and hung in apple and pear trees to catch adult codling moths. This bait is attractive to both sexes. It can help reduce local populations of codling moths in your backyard trees, and may help reduce worm damage to fruit, but it likely will not completely eliminate damage. The success of this method will depend on the level of codling moth populations in your area.

## Pheromones

Pheromones are chemical cues that insects use to communicate. The most common are sex pheromones, typically released by the female of a species to attract a male mate. You may be familiar with pheromones that are used as attractants or lures in insect traps. These traps can be extremely helpful in determining the proper time to apply control sprays for certain orchard insect pests. In most fruit producing counties in Utah, USU Extension Agricultural County Agents place insect traps in representative orchard areas. You can obtain this insect trapping information from your local USU Extension County Office to assist with proper timing of controls. Also, check your local newspaper and radio stations for updated information on pest control from your local Extension agent. Pheromone traps are not an effective control tool because for most pests, only the male insect is attracted and caught. Pheromones have recently been registered for control of some orchard pests (e.g, codling moth, peach twig borer, oriental fruit moth). In these products, pheromones are enclosed in a dispensing device (plastic rope, foil packet). Pheromone dispensers can be placed in fruit trees to help control the insect pests by releasing such a high concentration of pheromone that the males are confused or disrupted from locating females for mating. However, these products have **NOT PROVEN SUCCESSFUL FOR HOME ORCHARD SITUATIONS**. These products have been successful in large commercial orchards where a large enough area is treated to develop a block or curtain of pheromone. Pheromones do not kill the insects, they only disrupt their mating behavior. Where only a few trees are involved, the pheromone concentration is too low, and mated female moths fly in from nearby sources to lay fertile eggs on your trees. Therefore, these pheromone products are not recommended for use in home orchards.

## Attract-and-Kill

A pheromone-based control method with greater merit for home yard fruit trees is attract-and-kill. One product, Last Call®, contains the codling moth sex pheromone and very small doses of the insecticide, permethrin, formulated in a sticky tar-like carrier. Drops of the product are dispensed onto limbs of pome fruit trees with a hand-held “squirt gun.” Male codling moth are killed when they alight on the drops expecting to find a female. The attack-and-kill method works best in orchards with low codling moth populations and isolation from codling moth infested pome fruit trees.

Another attract-and-kill product, GF-120®, is a mixture of attractant for fruit flies (e.g., cherry fruit fly, apple maggot, walnut husk fly) and a very low concentration (0.02%) of a bacterial insecticide, spinosad. Squirting this product on the leaves and fruit of cherry and walnut trees can substantially reduce populations of fruit flies and fruit injury. Currently DF-120 is only available is larger quantities more appropriate for commercial orchards.

## Pesticides

Any substance applied to control insects, fungi, weeds or other pests is called a pesticide. Since the advent of “synthetic” pesticides over 50 years ago, growers and gardeners have become more and more reliant on pesticides to manage pest problems. The grower and homeowner should become more familiar with the alternative pest management options discussed above rather than rely on pesticides as the sole means of pest control. Although

pesticides have perhaps been overused in recent decades, they still remain an important pest management tool. Many chemicals used before the development of synthetic pesticides are now being used as alternative choices for control of pests. In addition to "synthetic" chemicals there is increased use of "organic" chemicals. These include chemicals derived from plant, animal or naturally occurring rock sources (e.g., lime, nicotine sulfate, horticultural oils, pheromones, pyrethrum, rotenone, ryania, sabadilla, and soaps). Another category of chemicals, called "biological" pesticides, are naturally occurring microbial agents, such as *Bacillus thuringiensis*, that cause diseases in certain pests.

### Using Pesticides Safely

Be aware that using a pesticide, except as registered by the manufacturer, is a violation of the law. The risks to your orchard associated with misusing a pesticide include failure to achieve control, unacceptable residues on the fruit, killing of beneficials or damaging your trees through phytotoxicity. Whenever you use a pesticide, pay special attention to the health and safety recommendations of the manufacturer. You must take special precautions to assure the safety of people who may come in contact with the spray and to prevent environmental contamination. Always read the pesticide label. Read it before you buy the pesticide to be sure it is legally allowed for your situation. Then read it again before opening it to be sure you properly mix and apply the material and are prepared to handle emergencies. Wear the proper clothing, choose a sprayer that is appropriate for your situation and the pesticide you are applying, and choose a pesticide material that is appropriate for managing your pest problem and will cause the least amount of disruption to beneficials.

## Comments about this Guide and Pesticide Recommendations

DO NOT use this bulletin as the final answer for which pesticides to use, how to use them, or when to apply them to your fruit trees. The manufacturer's printed label must be your guide to formulations, timing, rates, the type of equipment and safety protection you need, and the required interval from application to harvest.

DO use this bulletin as an initial guide to the kinds of problems you may experience with insect pests and diseases and the types of pesticides that are recommended for that problem.

Non-commercial uses for pesticides are often limited. Pesticides that are available depend on what is stocked by garden centers, nurseries, and other businesses. Some chemicals are considered undesirable or unsafe for use in urban areas. Others may lead to mite or other pest problems, or may burn foliage if used incorrectly. Persons with a modest or small investment in fruit production usually cannot afford the equipment for proper treatment of large trees, but this can be partly solved by planting dwarf varieties. When large trees already exist, pruning may help reduce their size and open their canopies for better spray coverage. When you purchase a pesticide product, you must be certain of the type of chemical it contains, how it is formulated, and its concentration. The names of pesticides are either "generic," "brand," or "chemical." In some cases, the "generic" and "brand" names are the same, and in other cases they differ. "Generic" names of pesticide products are used in this bulletin as there may be several "brands" of an acceptable product. A listing of generic chemical names and common brand names appears at the end of this bulletin. The "generic" name will always be printed on the pesticide's label under the heading "Active Ingredients." There may be more than one active ingredient in a product. The concentration of the active ingredients will also be indicated, usually as a percentage. The "brand" name will usually indicate the

formulation (EC = emulsifiable concentrate; L = liquid; WP = wettable powder; granules; dusts; dormant oils). This guide does not specify the formulations, concentrations, rates of application, or time to harvest allowed (pre-harvest interval) for most of the pesticides listed. There are too many variations of formulation, active ingredient concentration, and suppliers for it to be practical to list them all.

You must follow label directions explicitly to achieve the product's intended effects and margin of safe use. Also be aware that manufacturers frequently modify their labels and active ingredients in products. Refer to the USU Extension Service in your county or a reliable nursery or garden supplier for more detailed pesticide choice advice.

## Recent Changes in Tree Fruit Insecticides

Due to a recent pesticide re-registration process with the U.S. Environmental Protection Agency (EPA), and a concerted effort to reduce pesticide exposure in the home environment, especially for children, a number of formerly common home-use insecticides have lost or are losing their registrations for home garden and orchard uses. New packages of the following insecticides will no longer include tree fruits on their label. Previously purchased products, with the tree fruits on the label, may continue to be used according to their label.

- Chlorpyrifos (Dursban)
- Diazinon
- Dicofol (Kelthane)
- Dimethoate (Cygon)
- Endosulfan (Thiodan)
- Phosmet (Imidan)

# Predator and Pollinator Toxicity Guide

The predator and pollinator toxicity table is intended as a guide to the relative toxicity of orchard pesticides to beneficial predators and pollinators. If possible, select chemicals with the lowest toxicities: L = Low; M = Moderate; H = High, ** = Undetermined.

| Chemical | Toxicity Rating | | | | | Comments: |
|---|---|---|---|---|---|---|
| | **Mite Predators** | | **Aphid Predators** | | **Honey Bees** | |
| | Stethorus Lady Beetle | Predatory Mite | Lady Beetles | Lace-wings | | |
| Azadirachtin (Bioneem, Azatin) | L | L | L | L | L | |
| Bacillus thuringiensis (B.t.) (Dipel, Thuricide) | L | L | L | L | L | |
| Benomyl (Benlate) | L | H | L | ** | ** | |
| Carbaryl (Sevin) | H | H | M | H | H | Best if used early-season or post-harvest. |
| Dicofol (Kelthane) | L | H | L | L | L | Only use if spider mites are a problem and predatory mite numbers are low. |
| Endosulfan (Thiodan) | M-H | L | M-H | L | M | |
| Esfenvalerate | ** | H | ** | L | M-H | Best if used in early-season. |
| Fatty Acids (Soaps) | L | M | L | ** | L | |
| Fenbutatin-oxide (Vendex) | L | H | L | M | M | Use only if spider mites are a problem and predatory mite numbers are low. |
| Kaolin Clay (Surround) | ** | M-H | M-H | ** | L | |
| Malathion | ** | L | ** | L | M | |
| Oil (dormant) | L | L | M | M | L | |
| Oil (in season) | L | L | L | L | L | |
| Permethrin (Astro) | H | H | L-M | ** | M-H | Best if used early-season. |
| Phoset (Imidan) | M | L | H | L | L-M | |
| Pyrethrin | L | L | L | L | L | |
| Spinosad (Success, Entrust) | L | L | L | L | L | |
| Sulfur | L | M | L | L | L | |

**No information available.

# Fruit Pest Control Guide

Refer first to General Orchard Management Practices (page 1) for non-chemical options. For successful control of fruit worm pests, a combination of cultural and chemical methods is recommended.

## APPLES

| Pests | When to Spray | Materials |
|---|---|---|
| Aphids, Mites, Scale Insects and Leafrollers | Apply delayed dormant spray at first sign of green on bud tips to half inch green stage (about 2-3 weeks before bloom). | Dormant oil + malathion, permethrin, or esfenvalerate |
| Powdery mildew (On susceptible varieties such as Idared, Jonathan, Gala, Jonagold, or Rome. Occasionally on McIntosh, Red Delicious, and Golden Delicious) (1) | Before bloom (half inch green to pink). Repeat every 14 days until terminal growth ceases in June. Sulfur must be applied every 7-10 days to be effective. | Bayleton, Benomyl, triflumizole (Procure), Boscalid + Pyraclostrobin (Pristine) propiconazole, triforine, sulfur |
| Fire blight is more serious on Gala, Jonagold, Jonathan, Rome Beauty, Idared, Winter Banana, Yellow Transparent and PaulaRed.(2) | During bloom (2). | Streptomycin or fixed copper |
| White apple leafhopper | Treat at petal fall (postbloom) when nymphs are present on the undersides of leaves. May need to repeat application in August. | Kaolin clay, carbaryl, horticultural mineral oil, or malathion |
| Codling moth (worms), Leafrollers | Starting 10 days after petal fall or based on trapping and temperature information (3). Reapply sprays based on protection interval (see materials) through first week of September. | Carbaryl (reapply every 7 days)<br>Spinosad (reapply every 7 days)<br>Codling moth virus (CydX, Virusoft, or Carpovirusine; reapply every 7 days)<br>Permethrin (reapply every 7-10 days)<br>*Warning: permethrin kills predatory mites and can cause spider mite outbreaks<br>Malathion (reapply every 5-7 days)<br>Pyrethrin or Pyrethrum (reapply every 5-7 days)<br>B.t. (reapply every 5 days)<br>Azadirachtin (reapply every 5 days)<br>Horticultural mineral oil (suppressant)<br>Kaolin clay (suppressant)<br>Last Call (suppressant)<br>Trunk banding (see p. 3)<br>Fruit bagging (see p. 3) |

| Pests | When to Spray | Materials |
|---|---|---|
| Apple Maggot (4) | Not generally a pest in backyard trees. Based upon trappings with Pherocon AM traps through period of fruit set and maturation; last week of June may be an average date to start. | Carbaryl<br>Spinosad<br>Malathion |
| Aphids (5) | During late spring and summer if necessary. Look for curled leaves on limb terminals and sticky honeydew. | Insecticidal soap, horticultural mineral oil (1-1.5%), azadirachtin, or malathion. |
| Spider mites (6) | Only if necessary. Summer sprays when needed. | Wash down leaves with stiff spray from hose. Horticultural oil, insecticidal soap, dicofol, or fenbutatin-oxide. |
| Root and crown rot | Summer sprays as needed. | See section on pest biology. |
| Tree and root borers | Depends on borer species. Soil application of systemic insecticide in late spring/early summer or trunk sprays in June and July. | Imidacloprid (apple and pear only, systemic), permethrin or carbaryl |

1. On mildew-susceptible apples, post-bloom fungicide sprays may be combined with codling moth sprays. Sulfur may cause foliar damage on some varieties, especially when temperatures exceed 90˚ F.

2. Treatments are usually only necessary when rain occurs during the bloom period. Start spray applications when the daily mean temperature (average maximum and minimum temperature from midnight to midnight) exceeds 60˚ F. Repeat sprays every 5 days during bloom. Fixed copper and Bordeaux mixture may cause russeting on fruit.

3. Fruit insect trapping and temperature information can be obtained from your local USU Extension County Office, or see http://extension.usu.edu/cooperataive/ipm.

4. The apple maggot is an uncommon pest problem in Utah and may not actually infest apple fruit. Apple maggot is a quarantine pest regulated by the Utah Department of Agriculture. If traps show apple maggots visiting your trees you are required to spray if commercial orchards are within a specified distance. Pherocon AM traps are commercially available. See section on cherries for additional details. Obtain more information from your local USU Extension County Office.

5. If aphid problems appear they will usually occur during May or June on terminal branches. Make sure that you apply a delayed dormant spray the following spring if aphids are a problem. Biological control from lady beetles, lacewings, or syrphid fly larvae will generally clean up aphid infestations if toxic insecticides are avoided.

6. Mites often cause damage during hot weather in July, August and September. Dicofol and fenbutatin-oxide, the usual miticides for homeowner use, are prone to problems with resistance of mites. Homeowners should first be certain that populations are high enough to warrant control. Visible damage should be evident on the leaves before control is attempted. Careful applications of horticultural mineral oil (ensure full emulsification!) or insecticidal soap may help. Burning of foliage may occur. Do not apply soap or oil at temperatures >80º F. Apply them in the early morning. Do not translate recommendations from one plant type to another. Some ornamentals and fruit trees are damaged with oil treatments. Any type of spray treatment will also be harmful to the beneficial predatory mites which feed on spider mites, so only treat when absolutely necessary.

## PEARS

| Pests | When to Spray | Materials |
|---|---|---|
| Pear psylla | Apply dormant application about 6 weeks before bloom if adults are detected.<br><br>At pink to petal fall.<br><br>If pear psylla persist and sticky honeydew is detected on leaves during late spring and summer. | Dormant oil + malathion, permethrin, or esfenvalerate<br><br>Kaolin clay<br><br>Kaolin clay or pyrethrin |
| Scale insects or Mites | Apply delayed dormant before bloom between separation of bud scales and first white. | Dormant oil + malathion |
| Rust mite or Leaf blister mite | Delayed dormant; tight cluster to first white. | Dormant oil + sulfur or carbaryl |
| Fire blight | During bloom (1). | Streptomycin, fixed copper, or Bordeaux mixture |
| Codling moth (worms), Leafrollers | Starting 10 days after petal fall or based on trapping and temperature information (2). Reapply sprays based on protection interval (see materials) through first week of September. | Carbaryl (reapply every 7 days)<br>Spinosad (reapply every 7 days)<br>Codling moth virus (CydX, Virusoft, or Carpovirusine; reapply every 7 days)<br>Permethrin (reapply every 7-10 days)<br>*Warning: permethrin kills predatory mites and can cause spider mite outbreaks<br>Malathion (reapply every 5-7 days)<br>Pyrethrin or Pyrethrum (reapply every 5-7 days)<br>B.t. (reapply every 5 days)<br>Azadirachtin (reapply every 5 days)<br>Horticultural mineral oil (suppressant)<br>Kaolin clay (suppressant)<br>Last Call (suppressant)<br>Trunk banding (see p. 3)<br>Fruit bagging (see p. 3) |
| Spider mites (3) | Only if necessary. Summer sprays when needed. | Wash down leaves with stiff spray from hose. Insecticidal soap, horticultural oil, dicofol, or fenbutatin-oxide. |
| Pear Sawfly (cherry or pear slugs) | When damage appears (4). Usually controlled by sprays for codling moth. | Malathion |
| Pear rust mite or Leaf blister mite | Apply postharvest if mites are still present. Look for russeting of fruit and leaves. | Carbaryl or sulfur |

1. Treatments are usually only necessary when rain occurs during the bloom period. Start spray applications when the daily mean temperature (average maximum and minimum temperature from midnight to midnight) exceeds 60˚ F. Repeat sprays every 5 days during bloom. Fixed copper and Bordeaux mixture may cause russeting on pear fruit.

2. Fruit insect trapping and temperature information can be obtained from your local USU Extension County Office, or see http://extension.usu.edu/cooperative/ipm.

3. Mites often cause damage during hot weather in July, August and September. Both mites and psylla can cause leaves to turn dark. See note 6 under “Apples.”

4. See biology and description of pear sawfly damage at the back of this guide.

## PEACHES, NECTARINES, AND PLUMS

| Pests | When to Spray | Materials |
|---|---|---|
| Peach twig borer (worms), aphids, scale and mites | Apply delayed dormant, i.e., from first bud swell to first pink (peach) or green tip (plum). | Dormant oil + esfenvalerate, permethrin or malathion. B.t. or spinosad alone for twig borer only (apply at pink and then again at petal fall) |
| Powdery mildew (peaches only) (1) | When fruit is the size of a pea. | Benomyl, triflumizole (Procure), or wettable sulfur (1), Azoxystrobin (Abound) |
| Cat-facing insects (Lygus bug, stink bug) | Apply at petal fall to shuck split if cat-facing injury in previous years was severe (2). | Permethrin or malathion |
| Shot hole or coryneum blight (peaches only) | Shuck split<br>Pre-harvest (only if rain is frequent)<br>Leaf fall (most important application) | Chlorothalonil, ziram, or captan<br>Captan, Axoxystrobin (Abound), Boscalid + Pyraclostrobin (Pristine)<br>Chlorothalonil, Bordeaux mixture, fixed coppers, basic copper sulfate, captan, or ziram |
| Oriental fruit moth (worms) | Best timed with traps and temperature (3) or apply at shuck fall. OFM is only a problem in some areas; check with local USU Extension Office. | Carbaryl, spinosad or B.t. |
| Peach twig borer (worms) | Best timed with traps and temperature (3) or apply in mid-June and again in late July to early August. | Spinosad, carbaryl, malathion, pyrethrin, pyrethrum, or permethrin |
| Aphids | Late spring and summer months; try to apply before leaves curl on branch terminals and sticky honeydew appears. | Insecticidal soap, horticultural oil (1-1.5%), azadirachtin, or malathion |
| Peach silver mite | Only if necessary. Summer sprays when needed; look for silvery appearance of leaves. | Wettable sulfur |
| Spider mites (4) | Only if necessary. Summer sprays when needed | Wash down leaves with stiff spray from hose. Horticultural oil, insecticidal soap, dicofol, or fenbutatin-oxide. |
| Peachtree borer (crown borer) | Best timed with traps (3) or apply first week of July (3-4 weeks earlier in Utah's Dixie); spray lower parts of trunks only; reapply first week of August. | Permethrin, esfenvalerate, or carbaryl |
| Walnut husk fly (peach only) | Best timed with trap catches and temperature (3); or apply 2-4 times (7-10 day intervals) beginning in late July if adult files are present. | Malathion, pyrethrin, pyrethrum, or spinosad |
| Perennial canker or cytospora | No sprays recommended. Keep trees growing vigorously. Prune dead branches. | See section on pest biology. |
| Earwigs | Feed in ripe fruit. | Band tree trunk near base with sticky tangletrap. |

1.Powdery mildew causes "peach rusty spot" on some cultivars of peach when grown near mildew susceptible apples. Benomyl is preferable to sulfur for controlling powdery mildew, as sulfur sprays must be repeated, and may cause burning if applied in hot weather.

2. See biology and description of cat-facing insect damage at the back of athis guide.

3. Fruit insect trapping and temperature information can be obtained from your local USU Extension County Office, or see http://extension.usu.edu/cooperataive/ipm.

4. Mites often cause damage during hot weather in July, August and September. See note 6 under "Apples" for more control information.

## CHERRIES

| Pests | When to Spray | Materials |
|---|---|---|
| Aphids, San Jose scale, mites, leafrollers | Apply delayed dormant (bud swell to green tip) spray. | Dormant oil + malathion, permethrin, or esfenvalerate. |
| Aphids (1) | After bloom when necessary. | Insecticidal soap, horticultural oil (1-1.5%),or azadirachtin. |
| Powdery mildew | From petal fall to fruit set as needed. | Benomyl, sulfur, triforine, propiconazole Quinoxyfen (Quintec) |
| Western cherry fruit fly, Apple maggot (2) | Best timed with trap catches and temperature (3) or begin treating when cherries begin to change from green to salmon colored, and continue until harvest (note pre-harvest interval of material). | Spinosad (reapply every 7 days)<br>Carbaryl (reapply every 5-7 days)<br>Malathion (reapply every 3-5 days)<br>Pyrethrin (reapply every 3 -5 days)<br>Pyrethrum (reapply every 3 days)<br>Permethrin (reapply every 5-7 days)<br>*Warning: permethrin kills predatory mites and can cause spider mite outbreaks.<br>GF-120 Fruit Fly Bait (only available in large quantities) |
| Perennial canker or cytospora | Maintain tree in good vigor. No sprays applicable. Prune dead branches. | See section on pest biology. |
| Root rots | Avoid excess irrigation. | See section on pest biology.<br>Fosetyl-Al, metalaxyl |
| Spider mites (4) | Only if necessary. Summer sprays when needed. | Wash down leaves with stiff spray from hose. Insecticidal soap, horticultural oil, dicofol, or fenbutatin-oxide. |
| Pear Sawfly (cherry or pear slugs) | When damage appears (5). Usually controlled by sprays for codling moth. | Malathion. |

1. Aphid problems usually appear during spring or late summer on new growth or terminal shoots. Aphids cause leaves to roll and they excrete a sticky honeydew. Best control can be achieved before leaf curl. Make sure that you apply a delayed dormant spray the following spring if aphids are a problem.

2. Both the western cherry fruit fly and apple maggot infest cherries in Utah. The western cherry fruit fly is much more common. Apple maggot is a quarantine pest regulated by the Utah Department of Agriculture. If apple maggot is present, trapping with Pherocon AM traps is required and trees must be protected to prevent spread to commercial orchards. Pherocon AM traps may be commercially available, or inquire of your county Extension agent. See section on apples for additional details. If, for some reason your cherries are infested, pick and destroy them at harvest time. That will help reduce populations next year as the insect pupates in the soil under the tree.

3. Fruit insect trapping and temperature information can be obtained from your local USU Extension County Office, or see http://extension.usu.edu/cooperative/ipm.

4. See note 5 under “Apples.”

5. See biology and description of pear sawfly damage at back of this guide.

## APRICOTS

| Pests | When to Spray | Materials |
|---|---|---|
| Peach twig borer (worms), scale, mites, and aphids | Apply delayed dormant (from separation of bud scales to first sign of white in bud tips). | Dormant oil + permethrin or malathion. B.t. or spinosad alone for twig borer only (apply at first bloom and again at petal fall) |
| Peach twig borer | Best timed with traps and temperature (1) or apply after petal fall and again in early to mid-June, if needed. | Spinosad, carbaryl, malathion, pyrethrin, pyrethrum or permethrin |
| Shot-hole or coryneum blight | Petal fall to shuck-split. | Chlorthalonil or ziram, Azoxystrobin (Abound), Boscalid + Pyraclostrobin (Pristine) |
| Peachtree borer (crown borer) | Best timed with traps and temperature (1) or apply early July and early August, 3-4 weeks earlier in Utah's Dixie. Spray lower trunk only. | Permethrin, esfenvalerate, or carbaryl |
| Shot-hole or coryneum blight | Leaf fall. | Chlorothalonil, Bordeaux mixture, fixed coppers, basic copper sulfate, or ziram |
| Earwigs | Feed in ripe fruit. | Band tree trunk near base with sticky tangletrap. |

1. Fruit insect trapping and temperature information can be obtained from your local USU Extension County Office, or see http://extension.usu.edu/cooperative/ipm.

## GRAPES

| Pests | When to Spray | Materials |
|---|---|---|
| Powdery mildew | When new growth is 6", 12", and 18" long. | Benomyl, Quinoxyfen (Quintec), or sulfur (1) |
| Leafhoppers (2) | Whenever insect appears; immature (non-winged) stages easier to control than adults (winged). | Malathion or carbaryl, two applications at 5 day intervals; kaolin clay; horticultural mineral oil |
| Western grape leaf skeletonizer | When pest is detected; St. George area only | Carbaryl |

1. Sulfur dusts should be applied lightly on both sides of vines. Do not apply when temperatures exceed 90 degrees F.
2. Look on undersides of leaves in late spring to early summer. Target immature nymphs for control.

## WALNUTS AND PECANS

| Pests | When to Spray | Materials |
|---|---|---|
| Aphids | In spring when aphids average 12-15 per leaf. | Malathion, azadirachtin, insecticidal soap or horticultural oil |
| Spider mites (1) | Only if necessary. Summer sprays when needed. | Wash down leaves with stiff spray from hose. Insecticidal soap, horticultural oil, dicofol, or fenbutatin-oxide |
| Walnut husk fly (2) | Best timed with trap catches and temperature (2) or about August 1 and 15. | Malathion, pyrethrin, pyrethrum, spinosad, or GF-120 fruit fly bait (only available in large quantities) |

1. See note 6 under "Apples."
2. If peach fruits on trees adjacent to infested English or black walnuts were infected with husk fly maggots during recent years, spray such nearby peach trees at the same time. Applications to walnuts are not required after husk split.

## STRAWBERRIES

| Pests | When to Spray | Materials |
|---|---|---|
| Leafrollers | Just before bloom. | Malathion or B.t. |
| Powdery mildew | When disease first appears. | Benomyl, Azoxystrobin (Abound) or sulfur |
| Gray mold, blossom blight | When disease appears during wet periods. In areas with a history of disease, begin treating at first bloom and repeat at intervals recommended on the label, especially during wet weather. | Benomyl or captan (1)<br>Boscalid + Pyraclostrobin (Pristine) |
| Root weevils | During late spring and summer when damage appears. | Parasitic nematodes (2) or malathion |
| Spider mites (3) | When mites appear. Only if necessary. | Wash down leaves with stiff spay from hose. Insecticidal soap, horticultural soil, or dicofol |

1. Because the gray mold fungus may become tolerant to benomyl, it is best to alternate between Pristine, benomyl and captan.

2. Check with local USU County Extension Office for list of biocontrol product suppliers. Apply nematodes with volume of water recommended on the label. Good weevil control can be achieved with nematodes.

3. See note 6 under "Apples."

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## RASPBERRIES

| Pests | When to Spray | Materials |
|---|---|---|
| Powdery mildew (uncommon) | Dormant season<br><br>When mildew appears. | Lime sulfur. Do not use this product during warm weather, as burning will occur.<br>Benomyl, Azoxystrobin (Abound), Boscalid + Pyraclostrobin (Pristine) |
| Rose stem girdler (1) | Late April to early June (first application just before bloom); repeat in 7-10 days. | Carbaryl, malathion, esfenvalerate, azadirachtin or rotenone |
| Raspberry crown borer (2) | April to May (at first sign of bud break) or preferably September to mid October to prevent egg-laying. | Carbaryl, malathion, or esfenvalerate |
| Raspberry horntail (3) | April to May (at first sign of bud break); repeat 14 days later. | Carbaryl, malathion, or esfenvalerate |
| Spider mites (4) | When mites appear. Only if necessary. | Wash down leaves with stiff spray from hose. Insecticidal soap or horticultural mineral oil. |
| Earwigs | Feed on ripe fruit | Band canes near base with sticky tangletrap. |

1. Infested canes show wilted top growth during June and July. Gall-like swellings with spiral grooves occur at base of wilted growth. Apply materials as full cover sprays or dusting to entire canes. If applications are made during bloom, wait until late evening when bee activity has ceased.

2. Wilted or dead canes have hollowed out tunnels near the base. Remove and burn wilted canes during summer as they occur. Apply insecticide at first sign of bud break in the springor preferably in early fall as a crown drench or heavy spray around the base of plants.

3. Attacks cane near top. Prune canes 2-3 inches below wilted tip and destroy tips. Apply materials as full cover sprays to canes.

4. See note 6 under "Apples." Oils should not be used on raspberries.

## Common Home Orchard Insect and Mite Pests

*Codling moth damaged apples.*

*Cherry with Western cherry fruit fly larvae inside.*

*Peach twig borer damage to peach tree shoots.*

*Peach twig borer damage to peach fruit.*

*Lady beetle feeding on apple aphids on young apple shoot.*

*Sticky honeydew on pear produced by pear psylla.*

*Pear leaf with pear (cherry) slug and feeding injury.*

*Twospotted spider mite adults and eggs.*

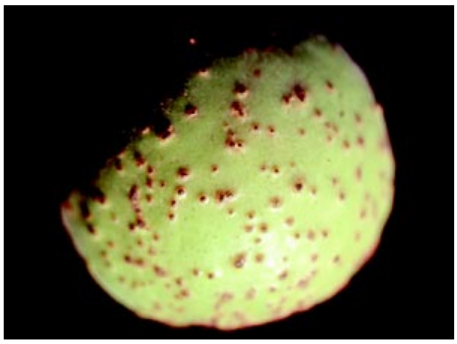
## Common Home Orchard Diseases

*Blackened flower spur infected with fire blight.*

*Infected branch on right shows twisted and distorted leaves with powdery mildew.*

*Apple scab causes dark, olive green scabs, distorts fruit and may cause pre-mature fruit drop.*

*Crotch of peach tree with cystopora infection and gumming.*



*Raised spots on fruit of apricot infected by coryneum blight.*

*Gumming and death of buds on peach branch infected with coryneum blight.*

*Strawberry leaf showing yellow leaf blade with green veins typical of iron deficiency.*

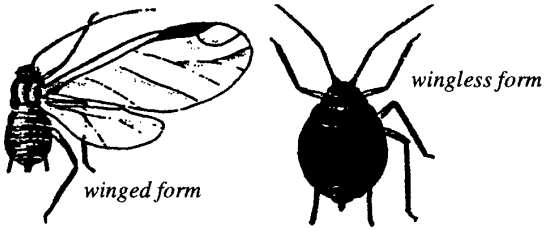
*Strawberry fruit infected with gray mold.*

# PEST BIOLOGY AND DESCRIPTIONS

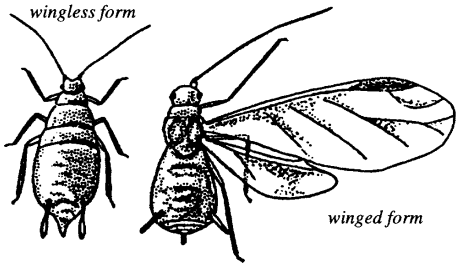
(in alphabetical order)

## Aphids

Many species of aphids attack foliage of fruiting plants, but few attack the fruit themselves. Watch for curled and sticky leaves, due to the honeydew excreted by the aphids. Ants in trees may also indicate an aphid infestation. Aphids are small, soft-bodied, and often occur in clusters. The homeowner can sometimes ignore aphid infestations.



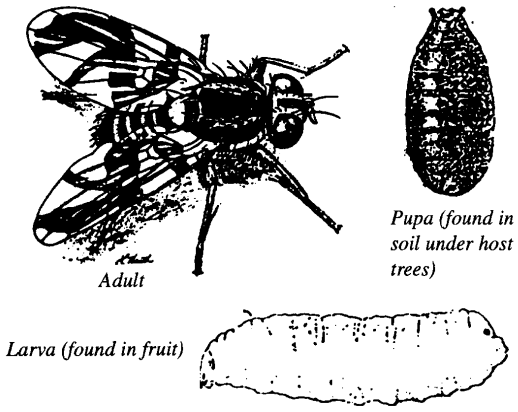

***Black Cherry Aphid (actual size: 1/16 - ⅛ inch)***




***Green Peach Aphid (actual size: 1/16 inch)***

## Apple Maggot

The apple maggot belongs to a family of fruit flies that can infest a wide variety of fruits. Its native host in the western U.S. is the wild or black hawthorn. In Utah, the apple maggot is usually a pest of cherries, and occasionally may become a pest of apples as well. This is particularly important to the commercial orchard industry and home orchardists are required to adequately trap for apple maggots and to protect their trees in regions where it poses a threat to the commercial fruit industry. Because the insects drop out of unpicked fruit and go into the ground to pupate until the following spring, it is a serious mistake to leave unpicked fruit. The flies are most easily detected by the home orchardist with the Pherocon AM trap. This is a yellow card covered with a sticky material and bait. Even if only a few flies are caught, one must assume an infestation and spray. Use at least three Pherocon AM traps even in small orchards; more in larger. Follow directions carefully for placement of the trap. Watch for very small flies, about 1/8" long, with 1/4" wing spreads and clear wings with brown to black patterns in them. Your Extension agent has bulletins illustrating these patterns. If you have hawthorns nearby, you will see some apple maggots until quite late in the growing season. The proper procedure for removal of hawthorn is given in fact sheet #6 “Hawthorn Removal for Apple Maggot Control Near Commercial Orchards” available from your County Extension Office. See also Western Cherry Fruit Fly.




***Apple Maggot (adult actual size: ⅛ - ¼ inch)***

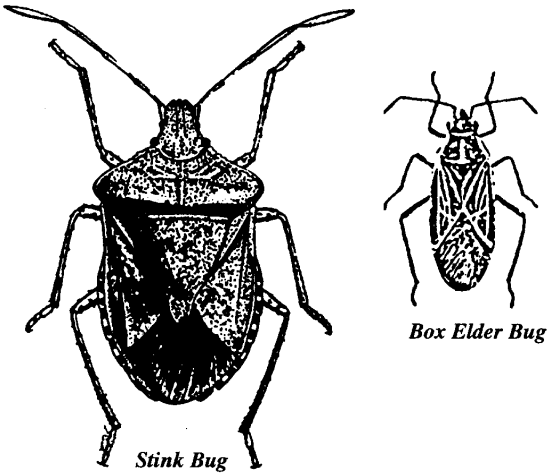
## Blossom Blight

An infection of blossoms caused by various fungi including Botrytis on strawberries, and Botrytis and Monilinia on stone fruits. See also gray mold.

***Blossom Blight and Rot***

## Cat-facing Insects

True bugs (lygus bugs, box elder bugs, stink bugs) feeding on embryonic fruit just before or after petal drop can affect fruit development and leave deep, unsightly depressions in the fruit. The problem is particularly important with stone fruits such as peaches and nectarines.



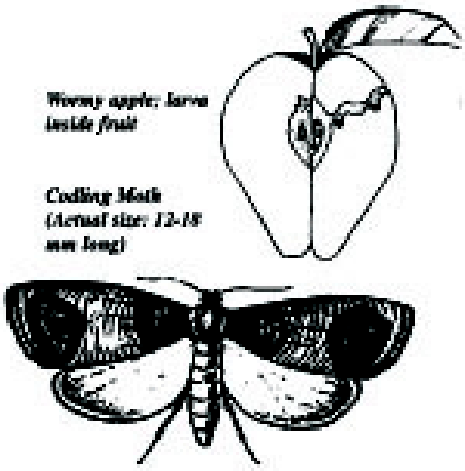
***Box Elder Bug***

***Stink Bug***

***Stink bug is green to brown in color, ca. ½ inch long; Box Elder bug is black with red lines on back, ca. ½ inch long***

## Codling Moth

Codling moths are the adults of the common "worms" which infest apples and pears. These moths become active in the late spring when they lay their eggs. The key to successful control is the proper timing of the sprays. Such timing is related to temperature and varies from year to year. The first spray in northern Utah should be during late May or early June. The home orchardist should contact the county agent to learn more precisely when sprays should be applied. For additional details on the life cycle of the codling moth and method of trapping adults, see the fact sheet entitled "Biology & Control of Codling Moth on Apple in Utah." This fact sheet is available from County Extension offices.




***Full grown larva: ½ - ¾ inch long; creamy white to pink; Codling Moth adult is ½ inch long, tree bark-colored gray with bronze spots on wing tips***

## Coryneum Blight

This is a fungal disease affecting peaches, apricots, and occasionally sweet cherries. Attacks dormant leaf buds, blossom buds, leaves, fruit, and twigs. First lesions are small, round, purplish-black spots, becoming raised and scruffy on fruit as it develops. On peaches, affected buds may die and appear to be "varnished." Infections may girdle twigs resulting in dead terminals. The infections in

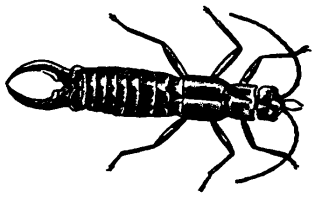
leaves fall out, leaving “shot holes.” Apricot fruit is commonly affected, with dark brown raised spots, whereas peach fruit is only occasionally infected.

## Crown Rot

Caused by a water mold fungus, Phytophthora, which attacks fruit trees as well as many woody ornamentals. Extensive root above-ground symptoms appear: slow growth, sparse foliage, yellowing of foliage, small fruit, wilting in hot weather or death of the plant. The disease can be confirmed by exposing large roots or crown and looking for a dark, sunken canker. Root rot is favored by high soil moisture or standing in water. Plant only in well drained areas with good quality trees. Do not replant in areas where root rot occurred previously. Select rootstocks with known resistance such as dwarfing apple root stocks M-7A, M-9 and M-26; avoid M M 104 and M M 106. Mazzard root stocks for sweet cherry are more resistant than Mahaleb rootstocks. Infected trees are difficult to cure, but treatment of the exposed infected area with fixed copper at 2 TBS per gallon or painting with 2% copper in water soluble latex paint may stop progress of the canker. Ridomil or Aliette are systemic fungicides that work effectively if excessive soil moisture is prevented. They are only available in commercial quantities.

## Earwigs

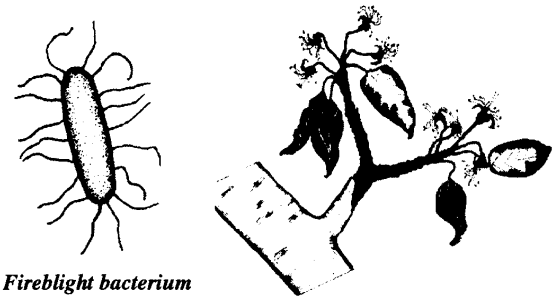
Earwigs may be responsible for eating parts of fruit, especially berries. They usually gain entry by wounds or openings caused by other pests or factors. However, on deciduous fruit they are common predators of other insects.



***Earwig (actual size: ½ inch long), dark brown body***

## Fire Blight

Pears and some varieties of apples are very susceptible to the bacterial disease, fire blight. Blossoms, terminal twigs, and sometimes entire limbs or trees are killed. The bacterium overwinters in sunken cankers, which should be removed during regular pruning operations. Cut 12 inches below the canker into healthy wood to be certain that the bacteria are removed. Bloom time is the most susceptible period and flowers should be protected with streptomycin or fixed copper. Environmental conditions favoring infection are rainy days during bloom when mean temperature (average of daily maximum and minimum) exceeds 60˚ F.



***Fireblight bacterium***

***branch infected by fireblight***

***Fire Blight***

## Flathead Apple Borer

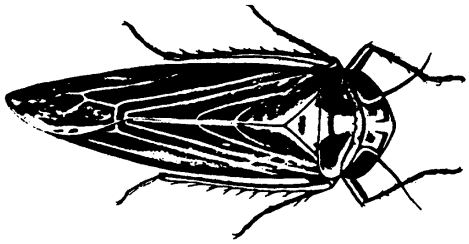
More of a problem under drought conditions. Cause tree decline and larvae can girdle and kill young trees. Soil treatment with systemic insecticide in the late spring/early summer. Otherwise, trunk sprays in summer.

## Gray Mold

A disease caused by the fungus Botrytis that infects flowers or fruits of strawberries, stone fruits and grapes. High humidity, poor air movement, rain or sprinkler irrigation favor the development of a fuzzy gray mold. It can usually be controlled by increasing air circulation. Fungicide sprays may be necessary in some plantings.

## Leafhoppers

The white apple leafhopper, rose leafhopper, and grape leafhopper are among those that suck leaf sap reducing plant vigor and sometimes spotting fruit with excrement. They can also be a severe nuisance to fruit pickers when present in high numbers in the late summer to early fall. The adults are usually wedge-shaped with the wings meeting in a sharp peak over the back. Best control is achieved when leafhoppers are still in the immature stage (nymphs), before they reach adulthood. Look on undersides of leaves for leafhopper nymphs.



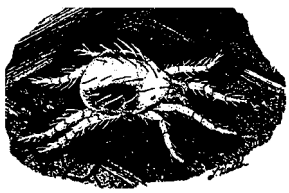
***Leafhopper (adult ca. ⅛ inch long); White apple leafhopper is yellow green***

## Leafrollers

Leaves which are folded over and tied with silk, and have a feeding caterpillar or a pupa inside may be leafrollers, a member of the moth family.

## Mites

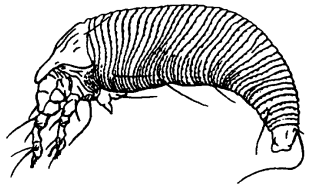
Mites are very small arthropods that can cause serious problems for your fruit trees. Few pesticides are available; resistance makes others ineffective. There are many helpful, beneficial, predatory mites, but some mites are damaging to fruit production. It takes a specialist to distinguish between them. Pest mites feed on the leaves, either the upper or lower surface. The leaves may become bronze or covered with fine silk webbing. Low populations may be ignored by the homeowner and may, in fact, be kept in control by predators. Mite outbreaks often follow insecticide applications. Defoliation may result from severe attacks. Miticides should not be used repeatedly. Resistance in mites is a serious problem and there are few available miticides. Several applications of insecticidal soaps or summer oils spaced ca. 7 days apart may provide satisfactory control. Avoid applying soaps or oils during the hot part of the day as some leaf burn may result.



*Two-spotted spider mite, (actual size: ca. 1/60 inch long); light yellow body with two dark spots on back*

## Peach Silver Mite

These mites cause yellow spotting of leaves and upward curling of leaves along their length. Peach trees with glands that secrete a syrup over new leaves are less susceptible when the leaves are young, but after gland secretions halt, both glandless and glanded varieties are susceptible. The leaves are silvered by the feeding which may have occurred up to 10 days earlier. Trees are stressed, fruit size reduced, and the fruit may drop due to peach silver mite damage.



***Peach Silver Mite (too small to be seen without the aid of a microscope)***

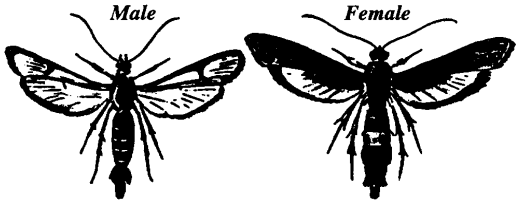
## Peach Twig Borer

The damage is caused by small brown worms that burrow inside the twigs at about blossom time. A second generation of these worms enters the fruit later in the season. Infested twigs die back and small masses of gum exude from the tunnel openings. Control is required only if twig die back is noted in May.

***Peach Twig Borer Moth, gray (adult moth ca. ½ inch long)***

## Peachtree Borer

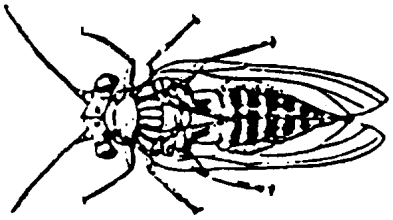
The peachtree borer destroys the cambium, just below the bark of the peach, plum, prune, cherry, almond, or apricot trees. They can be difficult to control because of the protection given them once they have entered the tree. Homeowners should watch carefully for damage caused by these pests. The adults are clear-winged moths which begin activity in late June or early July. The females lay their eggs near the base of the tree. Trees may be girdled and may die due to the boring activity of the larvae. Holes with oozing tree sap will be seen on the lower trunk if larvae are inside.




***Peach Tree Borer Adults, Clear winged moths; dark-blue body with orange stripes; few scales on wings***

## Pear Psylla

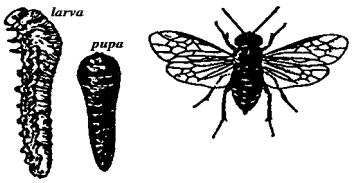
The adults are 1/10 - 1/12 inch long and resemble small cicadas. Nymphs may suck and secrete enough honeydew to stimulate growth of sooty fungus (black) on the leaves and fruit. Leaf drop and damage to buds may occur in heavy infestations. The pear psylla may transmit pear decline, a disease of pears that may eventually kill the tree. Root stocks resistant to pear decline are available. Sample for psylla early in the spring by beating the branches over a light colored pan. Resistance to many insecticides has occurred in pear psylla. Best control is achieved with dormant spray to kill overwintered adults before new eggs are laid.



***Pear Psylla, dark brown to yellow body, 1/10-1/12 inch long***

## Pear Sawfly (Also Known as Cherry Slug or Pear Slug)

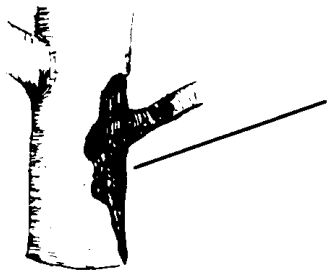
Cherry or pear slugs feed on the leaves and remove one layer of the leaf tissue to create membranous, dried skeletonizing of the leaf. The slugs are larvae of sawflies and are often controlled by insecticides applied for other pests. Trees can tolerate low populations reasonably well. Cherry or pear slugs may infest pears, cherries, plums and several ornamentals.




***Cherry or Pear Slug: the larva resembles a small slug covered in green-brown slime; adult is a glossy black wasp ca. 1/5 inch long***

## Perennial Canker

Also called Cytospora canker, die back, or gummosis. The disease is caused by a fungus usually on peach, cherry, apricot, plum, and many ornamentals. Light amber gum may exude from cankers on infected limbs. Cankers are usually oval on large limbs and enlarge yearly or advance down branches. Tiny black fruiting bodies appear on the canker in wet weather. A healthy, vigorous tree resists infection. Water, fertilize, and prune, removing dead branches by cutting at least 4 inches into healthy wood. Remove abandoned trees or orchards. Avoid injury to trees. Control twig and tree borers since their damage may allow entrance of the fungus.



***Perennial Canker***

## Powdery Mildew

This fungus attacks leaves, flowers and fruit causing a white powdery residue, distortion, stunting, russeted fruit and reduced yield. Certain apple varieties (Jonathan, Idared, Gala, Jonagold, Winesap, Rome) are commonly attacked but others may be affected in bad years. Berries, grapes, peaches and cherries may also be affected. Expression of the disease may depend upon the type of fruit affected. Warm days and cool nights favor the disease. The spores are spread by wind, dripping dew, rain and irrigation. Pruning affected twigs may be helpful, but fungicides are usually necessary. Plant fruit species or varieties that are known to be resistant. Control is effective if justified by the expense and started before mildew is present and continued on a regular basis.

## Raspberry Crown Borer

The moths lay eggs in the summer and fall and the larvae burrow into canes to spend the winter. Damage occurs too far down the cane for pruning to help. Good sanitation, such as removing and burning wilting canes in June and July can help prevent future problems in healthy plants, in addition to chemical control. The pest has a 2 year life cycle.

## Raspberry Horntail

The raspberry horntail is a member of the wood wasp group. Canes are attacked in their upper third. Prune canes 2-3 inches below wilting and damage throughout the summer to remove the insect. Destroy the prunings. Apply insecticide treatments in the spring at bud break.

## Root Borers

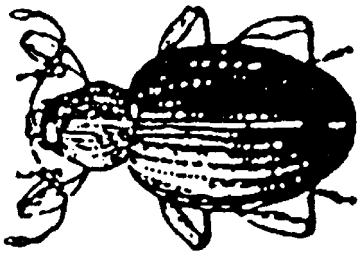
Prionus root borer and Ten-lined June beetle grubs feed on roots and cause tree decline. Soil application with systemic insecticide is best treatment if labeled for tree fruit crop. Insect parasitic nematodes effective on June beetle larvae.

## Root Rot

See crown rots.

## Root Weevils

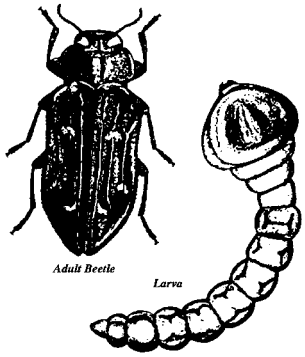
The adults are very hard, often seemingly hollow beetles with pronounced “snouts.” They feed on foliage, often at night, causing scalloping of leaf edges. The larvae feed on roots and have a typical grub appearance.



***Strawberry Root Weevil, adult 1/2-3/4 inch long***

## Rose Stem Girdler

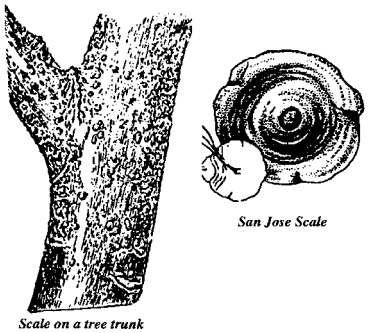
The rose stem girdler is a flatheaded beetle, the larva of which burrows in either first year (vegetative) or older (fruiting) raspberry canes. If the bark is pulled away, the tunnels dug by the girdling beetles will be exposed. The adult beetles fly in early spring (April-May), lay their eggs, and when the young larvae reach the fourth instar (stage) they start to burrow upward in the canes to spend the winter. The canes are killed and break off easily during July and September. Pruning helps.




***Rose Stem Girdler: adult beetle is flattened, metallic, ca. 1/5 inch long; larva is milky white***

## San Jose Scale

Look for crusted scales on branches and tiny red circles with white centers on apple and pear fruits. The insect hidden under the armored shield feeds on plant sap. They disperse after overwintering as young crawlers. Females produce young that crawl from under the scale before settling to feed. Feeding can reduce tree vigor and blemish fruit. If heavy infestations are not controlled, a tree can be killed.




***San Jose Scale (sooty color, about the size of a pin-head)***

## Shot-hole Blight

See Coryneum Blight.

## Strawberry Blossom Blight

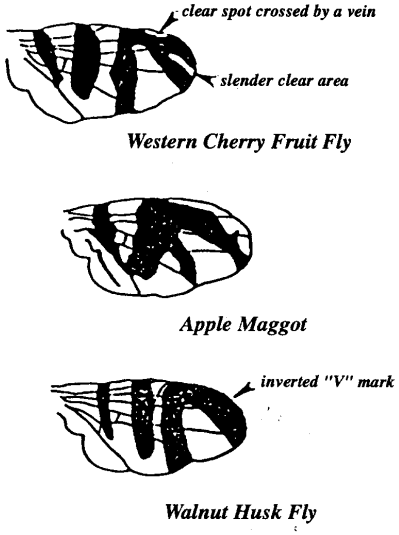
See blossom blight and gray mold.

## Walnut Husk Fly

The walnut husk fly is a tephritid fruit fly like the apple maggot and western cherry fruit fly. It lays eggs in the husk after the husk has softened a bit. There is a 2 week period between fly emergence from the soil pupation site and the start of egg deposition, which typically begins in August. The flies are about the size of a house fly and have patterned wings with slightly different markings than the other tephritids.

## Western Cherry Fruit Fly

Western cherry fruit fly maggots are now common in cherries in Utah and without treatment an entire crop can be lost. A very




***Wing Patterns***

similar fly, the apple maggot, also infests cherries. The adults can be distinguished by wing pattern. It is not possible to tell apple maggot from western cherry fruit fly maggots by simple examination. The same Pherocon AM trap used for apple maggots appears best for use by home orchardists. Cherry growers must spray if they see adults of either fly, but apple growers need be concerned only with apple maggot.

## Western Grape Leaf Skeletonizer

The moth's larvae often feed side by side on the leaf. Either one surface of the leaf or entire leaf may be consumed. If other grape pests are being controlled, the skeletonizer usually does not appear as a problem. The insect is a problem only in southern Utah.

# Pesticides Listed by Generic and Common Brand Names
## (Listed in Alphabetical Order)

Generic pesticide names have been used in this bulletin. The following list indicates at least some of the trade or brand names that the product may bear. Be sure to check the active ingredients because some products have retained their trade name, but changed the ingredients. The chemical formulation you buy and use must be properly labeled for the crop you treat.

**B = bactericide, F = fungicide, I = insecticide, and M = miticide**

**Attract-and-Kill:**
Last Call. **I**

**Azadirachtin:**
AZA-Direct, Bioneem, Azatin, Align (botanical, caution label). **I**

**Azoxystrobin:**
Abound (strobilurin, caution label). **F**

**Bacillus thuringiensis (B.t.):**
Dipel, Javelin, Thuricide, Worm Ender, Caterpillar Killer (biological insecticide). Kills caterpillar insects by acting as a stomach poison. Good coverage of foliage is required to be effective. **I**

**Bait:**
A type of formulation to be placed to attract feeding pests. The pests for which the bait is effective will be listed. Pay special attention to any directions or placements of the baits as they may be designed to take advantage of important behaviors of the pests.

**Benomyl:**
Benlate (benzimidazole; caution label). **F**

**Bordeaux mixture:**
Mixture of hydrated lime, copper sulfate, and water (caution label). **F**

**Boscalid:**
Pristing (boscalid + pyraclostrobin, caution label). **F**

**Captan:**
Orthocide (chlorinated dicarboximide; danger label). **F**

**Carbaryl:**
Sevin, Bonide Tree Fruit Spray (carbamate; caution or warning label). **I**

**Codling moth virus:**
CydX, Virusoft, or Carpovirusine. **I**

**Dicofol: K**
Kelthane (chlorinated hydrocarbon, caution or warning label). **M**

**Dormant Oils:**
Volck, SunSpray, Orchex, Saf-T-Side, Horticultural Spray Oil (see spray oils). Dormant oils have viscosities of 90-150 seconds (Saybolt). **I, M**

**Dusting Sulfur:**
Finely ground sulfur mixed with 1-5% clay or talc to improve flowing and dusting properties (elemental sulfur; caution label). **F**

**Esfenvalerate**:
Ortho Bug-B-Gon, Ortho Max (pyrethroid, caution label). **I**

**Fenbutatin-oxide:**
Vendex (caution or warning label). **M**

**Fixed Copper:**
Basic copper sulfates, copper oxychlorides, and oxides of copper (inorganic derivatives; caution label). **F**

**Fosetyl-Al**:
Aliette (fungicide; caution label). **F**

**Fruit bagging:**
See page 3. **I**

**Funginex:**
Triforine (caution label). **F**

**GF-120:**
Fruit fly bait. **I**

**Horticultural Mineral Oil:**
Summer Oil Sunspray, Ultrafine, Orchex. **I, M**

**Imidacloprid:**
Bayer Advanced Garden Tree and Shrub Insect Control (nicotinoid; caution label). **I**

**Insecticidal Soaps:**
Safer Insecticidal Soap, M-Pede. Chemical salts of fatty acids, harmless to humans but capable of burning plant foliage. Requires good coverage to be effective. Apply when temperatures are below 80 degrees F. **I, M**

**Kaolin clay:**
Surround. **I, M**

**Malathion**:
Cythion (organophosphate; caution label). **I**

**Metalaxyl:**
Ridomil (fungicide; caution label). **F**

**PDP Crystals:**
1,4-paradichlorobenzene, Paracide, Tree Borer Crystals (chlorinated hydrocarbon: warning label)**. I**

**Permethrin:**
Astro, Ortho Basic Solutions, Spectracide (pyrethroid; caution label). **I**

**Propiconazole:**
Liquid systemic fungicide (fungicide; caution label). **F**

**Pyraclostrobin:**
Pristine (pyraclostrobin + boscalid, caution label). **F**

**Pyrethrin:**
Pyrellin, Bug Buster-O (botanical; caution label). **I**

**Pyrethrum:**
Pyganic (botanical; caution label). **I**

**Quinoxyfen:**
Quintec (caution label). **F**

**Rotenone:**
Bonide Liquid Rotenone. **I**

**Spinosad:**
Success, Conserve, Entrust. **I**

**Spray Oil**:
Albolineum, mineral oils, white oils, 90-par, Volck oils. Oils are classified according to viscosity as dormant or summer oils (petroleum oils; caution label). **I**, **M**

**Streptomycin:**
Fire blight spray, Agri-Mycin 17, Agri-Strep, Plantomycin (caution label). **B**

**Summer Oil:**
Horticultural spray oil, Sunspray ultrafine oil (see spray oils). Summer oils have viscosities of 60-90 seconds (Saybolt). **I, M**

**Triforine:**
Funginex (danger label). **F**

**Triflumizole:**
Procure (caution label). **F**

**Trunk banding:**

See page 3. **I**

**Wettable Sulfur:**

Sulfur, Wettable Dusting Sulfur, are ground elemental sulfurs mixed with wetting and emulsifying agents to allow mixture with water (elemental sulfur; caution label). **F, M**

**Ziram:**

Ziram (dithiocarbamate complex with zinc; caution label). **F**



This publication is issued in furtherance of Cooperative Extension work. Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Noelle Cockett, Vice President for Extension and Agriculture, Utah State University.