EXTENSION

Utah State University

Tree Boring Insect:
Ips Beetle

Liz Hebertson, US Forest Service
Diane Alston, USU Extension Entomologist

Ips bark beetles in Utah primarily attack pine and spruce trees. Adult beetles colonize and reproduce immediately under the bark in the conductive tissues of trees. Feeding adults and larvae destroy conductive tissue preventing transportation of water and nutrients – eventually killing the tree.

SYMPTOMS

Beetles chew through the bark producing red or orange dust that may collect in bark crevices and/or around the base of the tree. Insects are attracted to dying or stressed trees. They prefer to attack trunks or branches that are one to four inches in diameter, which would include the top of larger trees. Adult beetles attack in mass. This allows them to overcome the natural defenses of a tree. They are most successful in overcoming the defenses of stressed trees, but when high populations have developed in an area, they may attack seemingly healthy trees. Drought conditions are conducive to greater problems with bark beetles. Needles on branches or trees killed by the beetle will generally turn from yellow or light green to red before turning brown, within a year of attack.

CONTROL

The best defense against *Ips* beetle attack is to maintain the health and vigor of trees. The main stress factor for trees is usually water related. Soil of newly planted trees needs to remain moist, but not wet, for the first few years until a good root system is established. Larger, established trees, should receive a deep watering (2-4” of water) once every 2-6 weeks, depending on soil and climatic conditions. Apply water from the trunk of the tree outward to where rain would normally drip from the edge of the branches. The top 18” of soil should remain slightly moist, but not soaked. Over-watering trees may be just as damaging as under-watering.

Heavily infested trees and branches should be removed or treated to prevent beetles from exiting and attacking nearby hosts. Dispose of infested material in an area at least 2-3 miles away from susceptible trees. Treatment of infested material may include either 1) removing all the bark; 2) chipping and spreading the chips in the sun; 3) burning wood to kill insects; and 4) placing pieces in a sunny location and covering with 10 ml or thicker clear plastic sheeting to create lethal temperatures.

Uninfested trees may be protected by spraying them with an insecticide. Insecticides with an active ingredient of carbaryl and permethrin (Astro, etc.) are quite effective. Some brand names include but are not limited to Carbaryl 4L, Chipco Sevin SL, and Sevin SL. The insecticide must cover all sides of the trunk and branches as high as possible preferably to the top of the tree to the point that the insecticide begins to drip from the branches. Any portion of the tree left untreated is susceptible to insect attack. These sprays, when applied as a 1-2% solution, should provide protection from *Ips* beetles for just over one year. Treat in spring before beetle flight (late April to early May) or treat in fall (late September to mid-October).

EXTENSION

Utah State University

Tree Boring Insect:
Ash/Lilac Borer

Jay Karren, USU Extension Entomologist

The ash, or lilac borer, belongs to a group of insects known as clear-winged moths. They look like the common paper wasp in color, size, shape and flight habit, but unlike most moths, fly during the day. The larvae feed in the trunks and larger limbs of lilac, ash, and privet. Damage in Utah has bee reported mainly in European, blue, and green ash. Adults emerge from infested hosts from late May to July. Within 7-14 days after females emerge, they begin to deposit eggs in cracks, crevices and wounds in the bark. Eggs hatch within 14 days and the larvae bore into the tree.

Larvae begin feeding just beneath the bark and later extend into the sapwood as the summer progresses. Larvae enlarge their tunnels as they grow, frequently pushing frass (wood fiber mixed with excrement) out of the burrow opening. They pass the winter as mature larvae in the heartwood of the tree, emerging in the spring through a hole cut through the bark. There is one generation produced each year in Utah.

SYMPTOMS

Newly infested plants are distinguished by the frass which is pushed out of the burrows by the larvae. Older infestations are characterized by burrow exit holes and protruding empty pupal cases. Heavy infestations decrease plant vigor, increase the potential for wind damage, and may kill individual braches or even entire plants.

The ash borer is more severe when plants are growing under stressful conditions. Proper care and planting to relieve future stress may limit attacks. Fresh pruning wounds are attractive to egg-laying adults. It is important to avoid pruning prior to periods when moths fly.

CONTROL

Apply preventative insecticide sprays to the trunk and larger limbs during the egg-laying period to kill newly hatched larvae before they bore into the bark. Initial application should be made within 10-14 days after adults emerge. In northern Utah the first application ranges from May 1 to late June. Suggested insecticides include: carbaryl (Sevin), endosulfan (Thiodan), pyrethroids (permethrin, bifenthrin).

Preventative applications for control of ash borer in lilac and privet have rarely been justified in Utah. Removal of stems larger than 1-inch in diameter will eliminate the moths' egg-laying sites on these plants. Avoid planting trees with borer problems.

EXTENSION

Utah State University

Chewing Insect:
Strawberry Root Weevil

W.S. Cranshaw and J.R. Feucht
Diane Alston, USU Extension Entomologist

There are three species of root weevils commonly found in Utah. These species are part of a complex called is the strawberry root weevil. Weevils are beetles with snouts. Strawberry root weevils are shiny, brownish-black and about 1/4 inch long. When disturbed, root weevils drop to the ground and play dead.

Strawberry root weevils over-winter as adults in protected sites and as nearly full-grown, pale, legless larvae in the soil feeding on the roots of a host of weedy plants. They have a broad host range that includes strawberry, raspberry, lilac, dogwood, privet, and many woody shrubs. Development and pupation of root weevils is completed in the soil. Adults become active in spring (commonly May) and begin notching the edges of leaves. Eggs are laid near the crowns of plants throughout the summer. The larvae cause the major damage to plants by chewing on the roots and crown and reducing nutrient and water uptake.

SYMPTOMS

Root weevil feeding produces characteristic notches along leaf margins. Strawberry, privet, cotoneaster, arborvitae,Japanese yew, peony, lilac and ash are some of the plants frequently damaged by adult root weevils. This damage typically is mistaken for grasshopper feeding.

CONTROL

Adult root weevil damage to plants can be severe. Acephate (Orthene) or use of pyrethroids such as permethrin or cyhalothrin is recommended for damage-control treatment. Treat as soon as leaf notching is observed. If needed, continue at three-week intervals through August.

Where root injury is important due to larval feeding, Orthene may be used to kill adults before egg-laying. Larvae may also be controlled by soil drenches of Merit, beneficial nematodes, particularly those of the genus *Heterorhaditis.* Start treatments in early June. Thoroughly wet both the soil underneath the plants and the foliage.

EXTENSION

Utah State University

Chewing Insect:
European Earwig

Diane Alston, USU Extension Entomologist

Although seen in most gardens, earwigs are usually only minor pests unless populations are high. They feed predominantly on decaying plant material and other insects, feeding at night. Earwigs are about 5/8 inch long, brown with a reddish head. Immature insects are similar in appearance only smaller. Both male and female earwigs have a prominent set of forceps on the rear of their abdomen, the males' strongly curved. Adults lay eggs in the soil in late winter to early spring in below-ground chambers. Earwigs develop from egg to adult through gradual metamorphosis with 4-5 instars or stages, with the female moving, cleaning and providing maternal care by protecting the eggs and new young until the first molt. The young that leave the nest fend for themselves and may feed on green shoots and eat holes in leaves.

SYMPTOMS

There are no insects seen feeding on plants during the day, however, when affected plants are inspected at night with a flashlight, insects may be seen feeding on foliage and flowers. During the day earwigs hide in almost any dark, confined space, particularly if it's rather moist. They are commonly found under rocks or stacked wood, in eartips of sweet corn, and under other debris. They're particularly a problem from mid-July through mid-September.

As young earwigs mature, they may feed on blossoms, leaves and ripening fruit. Seedlings may be destroyed. Leaves and flowers may become riddled with irregular holes and notches. This damage should not be confused with that of other pests such as snails, slugs, and certain caterpillars and weevils which also feed at night. At certain times of the year, earwigs may become a nuisance by wandering into homes in large numbers.

CONTROL

Avoid too much mulch and other damp debris where they hide during the day. Place rolled newspaper or corrugated cardboard for them to hide in, remove paper daily and destroy. Place tuna cans with bacon grease, soy sauce or tuna oil in flower beds late in the day, Remove earwig filled cans the next morning. Creating a dry barrier zone around the house, disagreeable to earwigs, may discourage them from entering the home.

Use of a product, such as Tanglefoot, around the base of trees may prevent them from crawling into fruit trees. Insecticides applied directly to food crops is not recommended unless used in strict accordance with label directions. Chemicals containing pyrethroids and carbaryl applied during late spring and early summer control young insects, effectively decreasing the number of mature earwigs becoming a problem later in the season. Treat earwig nests. Look under flagstones, mulch, and other protected sites for nests in early summer.

EXTENSION

Utah State University

Chewing Insect:
Tobacco Budworm

Whitney Cranshaw, CSU Extension Entomologist

In areas of Utah the tobacco budworm is a serious pest of many landscape flowers. Geranium, petunia and nicotiana are commonly affected, while rose and other flowers are occasionally damaged. Caterpillars of the tobacco budworm usually attack the flower buds and developing flowers. The damaged buds fail to open. Petals of the emerged flowers are also chewed, giving the flowers a ragged appearance. Damage progresses through the growing season, becoming most noticeable in late summer.

Adults are a moth with a wingspan of about 1 ½ inches. Wings are light green with brown and cream-colored bands. Females lay single eggs on flower buds or leaves of plants in the early evening. Larvae have several stripes but can be quite variable in overall color, depending on the color of flowers on which they are feeding.

Caterpillars are full-grown in about a month, drop to the soil and pupate. Adults emerge to repeat the cycle, generally with two generations per year. At season's end, insects go into a state of suspended development, which they maintain through winter. Overwintering pupae generally are killed if exposed to temperatures below 20 degrees F. However, warm soil microclimates (around foundations of heated buildings) can allow many to survive.

Control

Monitor for budworm to detect early stages of infestation. In small plantings, the most practical control is hand picking the caterpillars. Larvae are most active during dusk, hiding around the base of the plant during the day.

Insecticides containing *Bacillus thuringiensis*/Bt (Thuricide, Dipel) effectively kill small larvae on some plants. The insect must eat the Bt in order for it to be effective. On plants such as geranium, where the caterpillars drill into the buds and eat little of the outside surface, Bt is not effective. On petunia, where caterpillars eat a great deal of the blossom, Bt is more effective. Pyrethrin (pyrethroid) insecticides may provide control and are commonly available at most garden centers. Trade names include the active ingredient permethrin, esfenvalerate, cyfluthrin, bifenthrin. Also spinosad (Conserve, Success, Entrust) is very effective. Other controls include neem oil and Orthene.

Developing varieties of bedding plants resistant to tobacco budworm may provide a long term means of managing tobacco budworm. For example, some variation in susceptibility to this insect has been observed among petunia cultivars. Also, ivy geraniums are much less frequently damaged than standard types.

Maintaining potted plants in protected areas, such as garages, between seasons can allow tobacco budworm pupae to survive in the soil. If potted geraniums or other tender plants are kept between seasons, remove the soil and repot the plants before over-wintering.

EXTENSION

Utah State University

Chewing Insect: **Grasshoppers**

Alan Roe, Insect Diagnostician

Of the hundreds of different species of grasshoppers in the United States, four grasshoppers species are responsible for about 90% of all grasshopper injury to cultivated crops. Like most insect populations, grasshopper numbers fluctuate widely from year to year due to environmental conditions and other variables.

LIFE CYCLE

Grasshopper eggs laid in the fall overwinter in the soil in egg pods. The period of egg hatch varies with the species and temperature. Most eggs hatch from late May through early July. The young grasshoppers (nymphs) resemble small adults without wings. Nymphs pass through 4-5 growth stages (instars) before they reach the adult stage and obtain functional wings. Eggs are deposited in pods in the soil in August, through October, producing one generation per year. Egg pods are laid in non-disturbed soil sites. Common egg-laying sites are rangeland, the foothills and undeveloped lots.

DAMAGE

Grasshopper injury is most often associated with rangeland, corn, small grains, and vegetable crops. However, during heavy infestations almost any type of plant may be attacked including trees, shrubs, flowers, and lawn grasses. Grasshoppers have chewing mouthparts, and their feeding results in removal of the plant tissues. They are commonly thought of as foliage feeders but will also feed on flowers, fruits, seed heads, stems, and essentially all above ground plant parts.

CONTROL

Most grasshopper species prefer to lay eggs in undisturbed, sparsely vegetated sites. Therefore, immediately after egg hatch the heaviest infestations will occur in rangeland, roadsides, ditch banks, terraces, waterways, fence rows, field margins, thin stands of perennial forage crops, etc. The young grasshoppers will continue to feed in these areas as long as there is suitable food material. When their food is gone, they move to adjacent areas. Once the grasshoppers reach the adult stage and acquire functional wings, they can disperse further and move rapidly.

The ideal time to treat grasshoppers is after egg hatch is complete and before the majority of the population is more than 1/2 grown. Treatments applied before the majority of the eggs hatch may result in the need for an additional application(s) to kill late-hatching nymphs. Grasshoppers tend to be more difficult to control as they get larger. Control measures often drops significantly when applications are made to grasshoppers larger then 1/2 grown.

Grasshopper control products are available in spray, dust, or bait formulations. Dusts and baits have the advantage that they may be applied to small areas without sophisticated application equipment. However, dusts do not readily adhere to foliage and must be reapplied frequently. Since they are ready-to-use formulations, which contain a high percentage of inert ingredients, dusts and baits are relatively expensive ways to purchase insecticides. Baits must

be consumed in order to be effective; consequently, they are often ineffective when applied in heavy vegetation because grasshoppers either have difficulty locating the bait or prefer to feed on the foliage. Baits are most likely to be effective when food plants are scarce, small, or have dried up. For these reasons, insecticidal sprays are generally preferred for grasshopper control.

GRASSHOPPER CONTROL IN YARD AND GARDEN

It is usually not too difficult to control grasshopper infestations originating in a yard or garden. Problems arise when homes are located adjacent to large areas, range, or other prime grasshopper egg-laying sites. When large populations of grasshoppers begin migrating from the surrounding large hatching sites into yards and gardens, there is no practical solution left to the individual homeowner. In such a situation, organized groups of homeowners may be able to coordinate their treatment activities to reduce grasshopper numbers in the immediate vicinity, before grasshoppers begin to migrate.

Grasshopper control insecticides available for homeowner use include formulations of acephate, Beauvaria bassiana, azadirachtin, bifenthrin, carbaryl, cyfluthrin, deltamethrin, dimethoate, lambda-cyhalothrin, malathion, permethrin, and synergized pyrethrins. Agricultural insecticides for grasshopper control include formulations containing the above active ingredients plus some formulations of azinphosmethyl, carbofuran, disulfoton, esfenvalerate, methyl parathion, Nosema locustae, parathion, phorate, and phosmet.

Even products containing the same active ingredients may have different labeling. Check the individual product labels for registered uses, rates, restrictions, and safety precautions.

BIOLOGICAL CONTROL

Grasshopper control products are available which contain Nosema locustae (Canning) spores. Utah-registered products are Nolo Bait by M and R Durango and Semaspore by Bozeman Bio-Tech. These formulations contain spores of a protozoa which infects grasshoppers. The available formulations are both baits. Upon ingestion of the bait, the spores germinate in the grasshopper's midgut and the protozoa infect the fat tissue. Under ideal conditions and with the proper application timing (when the predominate summer species are about 1/2 grown), these materials will result in a 50-70% population reduction with 35-50% of the surviving grasshoppers infected. Infected grasshoppers are weakened, feed less, and produce fewer eggs. Application to older grasshoppers results in substantially lower control percentages.

The main advantage of this material is that it is environmentally safe, infecting only various species of grasshoppers and crickets. The disadvantages are: 1) it is a slow killer - peak mortality occurs within 4-6 weeks after application; 2) it is most effective when applied to large areas with relatively sparse vegetation - experimental plots in which the best results were obtained were 10 acres or larger in size (we are not aware of any research where this material has provided satisfactory control of heavy infestations in small plot situations, such as yards and gardens); 3) control of grasshopper outbreaks still requires the use of conventional pesticides in addition to the Nosema materials; and (4) the Nosema materials are considerable less effective when the application area is subjected to large numbers of grasshoppers migrating from surrounding areas.

Another biological control agent labeled for grasshopper control in various situations is Beauvaria bassiana, an insect-attacking fungus. Specific information about its effectiveness on grasshoppers is not available, but it has been used in conjunction with predators and parasites to control cereal leaf beetle in Michigan without the use of traditional insecticides.

EXTENSION

Utah State University

Chewing Pest:
Snails and Slugs

Pests of the Garden and Small Farm

Snails and slugs are among the most bothersome pests in many gardens, causing damage to vegetable and ornamental plants. They move by sliding along a mucus or slime trail secreted from their single foot. The slime trails dry to form silvery pathways that provide a record of their activities along after they have moved on.

SYMPTOMS

Snails and slugs feed on a variety of living plants as well as on decaying plant matter. They cause the most serious damage to seedlings, tender, low-growing, leafy vegetables, such as lettuce, and ripening fruit, such as strawberries and tomatoes, that are close to the ground. Snails and slugs are most active at night and on cloudy or foggy days. On sunny days they seek hiding places out of the heat and sun.

They eat large irregular holes in large-leafed ornamentals, such as hosta.

CONTROL

The first step to a management program is to eliminate, to the extent possible, all places where the pests can hide during the day. Boards, stones, debris, weedy areas around tree trunks, leafy branches growing close to the ground, and dense ground covers provide sheltering spots. Make a regular practice of removing snails and slugs from shelters that cannot be eliminated, such as undersides of wooden decks, potted plants, etc.

Handpicking and trapping slugs and snails under boards or flower pots are effective if done on a regular basis. To draw out snails and slugs, water the garden in the late afternoon and search them out after dark. Place them in a plastic bag, then dispose of them in the trash. Home made beer or water and yeast baited traps have been used to trap slugs. Place a low pan at ground level, slugs are attracted to the bait and cannot get out of the pan.

Several types of barriers also keep them from the garden. Copper barriers are effective even after rain and sprinkler irrigation, such as trunk banding or copper foil tacked onto raised beds. Barriers of dry ashes or diatomaceous earth heaped in a band 1 inch high and 3 inches wide around the garden are also effective.

Snail and slug baits are effective when used properly in conjunction with a cultural program incorporating other methods discussed. Snail baits can be hazardous and should not be used where children and pets cannot be kept away from the poison. Iron phosphate baits are preferred and not toxic to humans, wildlife and pets. Scatter bails along areas snails and slugs have to cross to get from sheltered areas to the garden. Bail place din ivy or other areas of heavy foliage is usually not very effective. Before applying baits, water the areas well if the ground is not already moist. This will draw out the pests and moi8stens the bait to make it more attractive. Do not water heavily for a t least 3-4 days after bait placement – watering reduces effectiveness.

EXTENSION

Utah State University

Chewing Insect:
Tent Caterpillar

Alan Roe, Insect Diagnostician

The tent caterpillar defoliates both ornamental and fruit trees in Utah. Starting about late July populations become abundant and its webbing and damage become noticeable particularly in some of the more scenic canyons adjacent to populated areas (Little Cottonwood canyon, Logan canyon, Provo canyon, etc.).

Adult moths begin flying about the last part of June. The adult moth has a wing span of 1-2 inches and is primarily white (body and wings) with black spots sometimes found on the wings. The legs and body occasionally have orange markings on them.

Adults lay eggs that are light green to yellow and laid in masses of several hundred. After about 10 days, the egg hatch and the larvae begin feeding. Mature larvae are about 1 inch long and a pale yellow-brown or gray. The body is covered with long, whitish hairs. The larvae feed until about mid-September at which time they form the overwintering pupae. The pupae can be found in the soil litter, tree trunks, or on buildings near infested areas.

SYMPTOMS

Common hosts for tent caterpillars are older ash, oak, chokecherry, poplar, maple, birch, alder, willow and fruit trees. The caterpillars sometimes spin copious amounts of webbing within which they feed. The webbing can sometimes extend until entire large branches of the tree are completely enclosed.

The young larvae feed primarily on the upper and lower epidermis of the leaf, giving the leaves a skeletonized appearance. Older larvae feed on the entire leaf and may completely consume it.

CONTROL

A tachinid fly is a natural enemy to the tent caterpillar and is killed when pesticides are applied. When caterpillars are first detected, single branches may be pruned and burned. Chemical control is sometimes difficult because of their location in the tree (generally up high) and because the webbing reduces pesticide penetration.

The microbial insecticide *Bacillus thuringiensis* (Bt var. *aizawi* or *kurstaki*) provides good control of fall webworm with minimal impact on other insects or wildlife. Spinosad (Conserve, Success, Entrust) are also products considered to have less impact on beneficials. An insect growth regulator, diflubenzuron (Dimilin) prevents the caterpillar from molting to a subsequent stage of development, essentially killing the pest.

Other insecticides labeled for the control of fall webworm on fruit and ornamental trees include formulations containing azadirachtin, carbaryl, malathion, methoxychlor, permethrin, and synergized pyrethrins. Not all formulations containing the above active ingredients are labeled for use on trees. Before purchasing or applying any insecticide, check the label to be sure the type of tree you want to treat is listed on the label.

EXTENSION

Utah State University

Fruit Pest:
Codling Moth

Loralie Cox, USU Extension Horticulture Agent
Diane Alston, USU Extension Entomologist

In the late summer to early fall when codling moth larvae (½-¾ inch) complete their development in apple and pear fruit they emerge from the damaged fruit. They then encase themselves in silken cocoons on tree trunks under the bark, in orchard refuse, or under roughened surfaces or other nearby structures, and stay the winter.

After pupation in the spring, adult moths emerge in search of the opposite sex. Each male will mate with multiple females. Once impregnated, each female moth lays from 30-70 eggs on or near developing fruit. These small, gray/brown moths are primarily active from dusk to a few hours after sundown when temperatures exceed 60°F and are indistinguishable when at rest on tree bark where they spend the daylight hours.

Depending on temperatures, eggs hatch in 6-20 days. Newly hatched larvae bore into fruit within 24 hours and feed on the internal fruit flesh as they develop through five larval stages before exiting. They prefer to feed on the developing seeds in the center of the fruit. Fruit that drops from the tree prematurely during the summer is frequently infested with this first generation of codling moth larvae. Larvae that exit the fruit will seek protected pupation sites, and second generation adults emerge and begin laying eggs on fruit in mid-summer. A third generation may occur in warm areas of the state.

Control

To successfully control codling moth in fruit trees, larvae must be prevented from entering fruit. Consequently controls must be applied at a specific time. Once the eggs hatch and larvae enter the fruit, control measures are ineffective. Pheromone traps placed in the orchard to monitor the appearance of adult insects and subsequent high/low temperatures determine the period of time required for eggs to hatch. Pheromone traps do not effectively control moths because they only lure and capture males. Reduction in the male population will not significantly reduce female mating due to their polygamous behavior.

Throughout Utah, Extension personnel monitor traps and temperatures to determine the specific timing for pesticide application in different areas of the state. Fruit growers are encouraged to contact an Extension office or find this information on the Extension site: http://extension.usu.edu/cooperative/ipm (select “Tree Fruit Advisories” and “Orchard Spray timing” links).

Many products and methods for controlling codling moth in fruit trees are available. The most important spray is the first one of the season targeting the first hatching eggs of the first generation. If the first generation is substantially suppressed, the subsequent generation may be smaller. From the first cover spray date (available from Extension sources), fruit must be protected for approximately 6 consecutive weeks. Fruit must be protected for another 6 weeks each for the second and third generation.

Effective Insecticides

Conventional insecticides include products such as Imidan, Sevin, Permethrin and Malathion. Each has a particular number of days the product effectively kills the insect. Product labels must be read and followed for reapplication timing and the number of days to wait following the final application before the fruit may be safely harvested.

Reduced-risk products (i.e., lower toxicity for humans and other mammals) are available from local nurseries or from mail order suppliers. Products include insect growth regulators, such as Intrepid (methoxyfenozide) and Esteem (pyriproxifen), which must be applied about 10 days before conventional insecticides so that residues are in place as eggs are laid. Newly hatched larvae feed not only on the plant, but also on the egg chorion, thus ingesting a double dose of insecticide before attempting to enter the fruit.

Another reduced-risk product that has a different mode of action than conventional pesticides is Assail (acetamiprid), a neo-nicotinoid. Its efficiency makes it an excellent option to normal pesticide applications. Success (spinosad) is a bacterial product that has a short residual for killing codling moth larvae (7 days). The attract-and-kill method, such as Last Call, uses pheromone to lure male moths to a tiny particle with insecticide that kills the male upon contact. Use of pheromones in mating disruption dispensers, such as Isomate and CheckMate, disrupt and delay codling moth mating. Mating disruption is only appropriate for orchard-sized and regularly shaped blocks of apple and pear trees.

Products considered for organic production are generally lower in toxicity than conventional insecticides and have shorter protection intervals. Organic materials include the organic version of spinosad, Entrust, a bacterial product which must be reapplied every 7 days. Dipel, Crymax Bt, and Javelin contain the endotoxin of the bacterium, *Bacillus thuringiensis* var *kurstaki*. These products are very specific to caterpillars and soft bodied insects and should be applied weekly. A virus specific to codling moth (Cyd-X andCarpovirusine) must also be reapplied weekly to prevent infestation of fruit.

Surround (kaolin clay) acts as a suppressant to codling moth. It must be applied before moths arrive in the orchard and reapplied every week or two. Pyrethrin (Pyganic) is produced from African chrysanthemum flowers and also has a short residual of protection, 5-7 days.

Horticultural mineral oil, which is highly refined oil, can be used on trees during the growing season. Horticultural oil suffocates codling moth eggs, and when applied several times at the beginning of each generation can help suppress egg hatch. However, more than 3-4 applications of oil (diluted 1-1.5% solution) per season can reduce fruit size, tree growth and fruit set for the next year.

Cultural Controls

Since codling moth larvae continue to develop in fruit that has dropped from the tree, it's important to remove windfall fruit throughout the season. Mature larvae emerging from fruit search for places to build a cocoon on tree bark. Corrugated cardboard strips, secured snuggly around the tree trunk, provide secluded places for larvae to spin their cocoon and pupate. However, corrugations must be large enough for larvae to enter. The strips must be checked often from June through September (every 10-14 days), destroyed and replaced to effectively eliminate insect larvae. Individual developing fruits may also be covered with paper bags. Bags should be secured well, but not constrict the twig. Remove the bags a short time before the fruit is mature to allow the fruit to color. More information on home use pesticides and suppliers of traps, lures, apple bags and IPM products can be found at
http://extension.usu.edu/cooperative/ipm

EXTENSION

UtahState UNIVERSITY

Turf Insect Pest:
White Grubs

Diane Alston, USU Extension Entomologist
Loralie Cox, USU Extension Horticulture Agent

White grubs are one of the most destructive insect pests of turf. Adults are active in the spring, are generally attracted to lights and often seen around windows or porch lights in May and June. White grubs are the larval form of several species of scarab beetles. Mature larvae are between ½ to 1 inch long and rest in a C-shape in soil and other plants beneath turf. They are creamy white with 3 pair of legs, a hard yellow-brown head, and have a dark-colored posterior.

The life cycle of white grubs ranges from one to three years. Eggs laid near the soil surface hatch and young larvae begin feeding on the crown and roots of grass plants. Most damage occurs in late summer and early fall when grubs have increased in size. With the onset of cold weather, they move deeper in the soil to overwinter. As soil temperatures warm in the spring they move upward in the soil to feed on grass roots before pupating.

SYMPTOMS

White grubs feed on grass roots, causing brown areas in the lawn that don't green-up with watering. Patches of grass pull up easily because they have been chewed off at the roots. Dead patches are small at first, but enlarge as grubs grow and expand their feeding site. When populations exceed the amount the turf can support, lawn areas can be rolled back like carpet to reveal the insects beneath. Generally, 4-5 white grubs must occupy a square foot of turf before injury becomes apparent.

CONTROL

Proper fertilization, watering, and cultural management are the best defense against insect problems. A vigorous turf will also recover more rapidly than a poorly managed lawn. The effectiveness of insecticides is greatly reduced when a thick thatch layer prevents water and insecticides from infiltrating into the soil.

Insecticidal control of grubs will only be successful if the chemical reaches the area where the grubs are feeding. Surface applications that do not penetrate in to the soil will not be effective. Apply chemical pesticides to lawn and water in (1/2 inch) if significant injury occurs. During hot, dry weather conditions, a pretreatment irrigation applied 48 hours prior to insecticide application encourages grubs to move closer to the soil surface, increasing the level of control.

The following products have provided control for white grubs with timely applications and following recommendations:

Merit (imidacloprid)
Carbaryl (Sevin)
Mach II
Beneficial nematodes
Fungus (Botanigard, Naturalis)

EXTENSION

Utah State UNIVERSITY

Piercing/Sucking Insect: Aphids

Jay Karren, USU Extension Entomologist

Aphids are small, soft-bodied insects that are frequently found in large numbers sucking the sap from the stems, leaves and roots of plants. These groups of aphids often include individuals in various stages of development. Most are about 3/16 inch long when fully grown. They have a characteristic pear shape with a pair of cornicles (tail pipes) near the end of their abdomen.

SYMPTOMS

Nearly every plant is attacked by one or more species of aphids. They come in all colors including white, black, gray, yellow, red, pink, green, blue and brown. All species secrete sugary droplets of excrement called honeydew. The honeydew consists mainly of excess sap ingested by the insects. This falls onto leaves, twigs, sidewalks and cars attracting ants, flies and wasps. Ants herd aphids like cows, often protecting them from predators and parasites.

Aphids feed by sucking fluids from their host plants, causing wilted, stunted, curled leaves; decreased fruit size, yield and quality. There are species of aphids that vector various plant diseases causing far more damage than does the aphid's feeding. Honeydew that collects on leaves serves as a growing medium for various molds that may reduce the quality of fruit, and reduce photosynthesis in plant leaves.

CONTROL

Aphids may be controlled by various means. Lady beetle larvae voraciously feed on aphids, as do lacewing larvae, syrphid flies and parasitic wasps. However, aphids must be present for these beneficial insects to inhabit a plant or landscape and pesticide use counteracts their usefulness. A strong spray of water will dislodge the pests from sturdy plants, killing some and disorienting others.

A delayed dormant spray of dormant oil in combination with an insecticide at bud break will decrease aphid egg populations that have spent the winter on woody plants. Spring time applications of a systemic insecticide, such as Merit, kills insects such as aphids that feed directly on plants. Also, spinosad (Success, Conserve, Entrust) and azadirachtin have been successful. Insecticidal soap and horticultural oils are also effective, however all insecticide use should be rotated due to resistance that aphids develop when the same insecticides are routinely used.

EXTENSION

Utah State University

Vegetable Garden Pest: Squash Bug

Diane Alston, USU Extension Entomologist

The squash bug is a common pest of curcurbit crops, especially squash and pumpkins. Adults overwinter in plant debris and in the spring fly into gardens and mate. The dark brownish-gray oval adults (about 5/8 inch long) are often found in pairs on the undersides of leaves or around the base of plants. Females deposit groups of bronze colored eggs on the undersides of leaves, usually in the angles formed by leaf veins. Eggs hatch in one to two weeks and small green/rose-colored nymphs begin to feed on plants. As they pass through several instars they develop into a grayish white color similar to the mature adult.

SYMPTOMS

Adult and young squash bugs feed in colonies, extracting sap and causing leaves to wilt and eventually die. When infestations are heavy, small plants and runners may be destroyed. In addition, we speculate that squash bugs vector a newly recognized disease of cucurbit crops, Yellow vine disease which affects melons and squash. The bacteria that causes the disease is injected into the plant while squash bugs feed. It results in yellowing, wilting and death of the plant. The bacteria overwinters with mature squash bugs.

CONTROL

Early detection and intervention are essential to prevent problems from squash bugs. Cultural practices may also lesson damage from the bug, including proper fertilization, destruction of crop debris, growing resistant varieties such as Butternut and Acorn squash and use of row covers, tightly secured around plants.

Organic pesticides for squash bug control include Surround (kaolin clay), sabadilla, rotenone and ryania. Conventional products used for control include Sevin, thiodan, permethrin, esfenvalerate and methoxychlor. Always check product labels for the number of days from application until the crop may be harvested. Young nymphs are the most susceptible to insecticides, while adults are very difficult to kill.

EXTENSION

Utah State UNIVERSITY

Gall Forming Insect:
Cooley Spruce Gall Adelgid

Loralie Cox, USU Extension Horticulture Agent
Diane Alston, USU Extension Entomologist

The Cooley Spruce Gall Adelgid is found throughout the United States and requires two years to complete its life cycle, alternating between Douglas fir and spruce plant hosts. Usually, immature females over-winter, maturing in the early spring, and subsequently begin laying eggs. The eggs, in white cottony tufts, are laid near the tips of spruce branches.

SYMPTOMS

After hatching, the larvae migrate and begin feeding on the new spring growth at the base of growing needles. Their feeding initiates the formation of a gall that soon envelopes the young insects. By midsummer the nymphs emerge from openings at the base of each needle on the gall, molt into a winged form of the insect, and migrate to Douglas fir or other spruce trees.

Galls are not produced on Douglas fir trees but insects may cause needles to swell, die and shed. Galls may become numerous on spruce trees, however, they are harmless and can be ignored unless the trees are young or galls become too numerous.

CONTROL

Effective treatments must take place when the insects are hatching and very young larvae are finding their way to branch tips. Product application must be made when new growth is first noticed on the tree – when tips begin to swell. Chemicals used for treatment include imidacloprid, Orthene and malation. Once insects are enclosed within the gall, insecticides have no effect.

A forceful stream of water may dislodge and kill many adelgids when they first hatch. Simply clipping and disposing the infested galls while still green and before the insects have emerged provides some control in small trees. Excess fertilization, especially in quick-release formulations, also promotes adelgid populations.

EXTENSION

Utah State University

Gall Forming Insect: **Honeylocust Podgall Midge**

Loralie Cox, USU Extension Horticulture Agent

The honeylocust podgall midge is a small fly that is primarily active from the time early spring through midsummer. Adult midges deposit eggs on new foliage on the edges of developing leaf buds. The eggs usually hatch in two days. The young larvae crawl along the leaf and begin feeding. Only one larva is required to initiate gall formation of a leaf. The first generation of insects appears in spring and subsequent generations follow at about 3-4 week intervals. The midge over-winters as late instar larvae or pupae in cocoons in the soil, mostly in the upper two inches near the base of tree trunks.

SYMPTOMS

Larva causes leaves on honeylocust trees to become distorted and take on a reddish appearance. The adult fly lays eggs where new leaves will grow. The developing larvae cause the leaflets to curl and thicken around them, forming small galls instead of growing normally. Inside each pod gall, two to eight white larvae are found. As the adult midge emerges, the galls drop, leaving bare leaf stalks.

Generally a problem isn't apparent until the unusual growth is noticed, but once the insect is encased within the gall, pesticides are ineffective as a control method. Leaves that have already expanded and grown are not injured. Only newly emerging leaves are susceptible to infestation.

The pod gall midge rarely causes anything but cosmetic damage to the tree. Careful consideration must be given whether to treat with pesticides or not. Any treatment for this insect must be applied before the damage appears, so chemical controls have been only moderately effective. All cultivars of *Gleditsia triancanthos* grown commercially are susceptible in both nursery and landscape situations.

CONTROL

New foliage may be protected with an insecticide product that contains cyfluthrin applied in late spring. Repeat applications every two to four weeds until growth ceases. Applications of a systemic insecticide may have some affect on the insects, but products containing dimethoate are extremely phytotoxic to honeylocust and can cause serious leaf injury.

Oil or oil/insecticide applications targeting the time when the first eggs are laid should suppress the population, possibly reducing the frequency of subsequent pesticide applications.

EXTENSION

Utah State University

Gall Forming Insect:
Eriophyid Mites

Loralie Cox, USU Extension Horticulture Agent
Pests of the Garden and Small Farm

Eriophyids are a group of mites that are very tiny, much smaller than spider mites or red mites. They have four legs, which appear to come from their heads. Most are light pinkish or yellow to white, shaped like a wedge or cigar shaped. They are pests primarily on trees and vines and may produce galls of unusual shapes and colors.

SYMPTOMS

Most eriophyid mites cause damage that distorts or russets leaves or fruit. Names of particular mites indicate the damage they cause. The rust mites cause leaf or fruit surfaces to turn brown or rusty. Peach silver mite produces leaves with a silver appearance in peaches, nectarines, and cherries. Blister mites cause red blisters to develop on leaves, which later turn black. Fruit will have russetted spots and are bumpy and misshapen.

CONTROL

Most of the natural enemies that attack spider mites also feed on eriophyid mites. In most backyard situation, no further controls should be taken because damage by these pests is cosmetic and not very serious. Water, soap sprays or predators are likely to provide some control of species that feed on exposed areas of leaves and fruit, although they would be less useful against species that remain in protected areas such as buds and blister.

Pear leaf, pear rust, and apple leaf blister mites may be treated in the fall when about half of the leaves have fallen with Thiodan, Sevin or sulfur, and again in the spring with a delayed dormant oil in combination with Sevin covering all the tree thoroughly including small limbs and shoots.