Pests susceptible to control-based on degree day forecasts ( )=Degree day ranges
- Taxus mealybug (1800-2100)
- Black vine weevil (500-2100)
- Euonymus scale (900-2100)
- European elm scale (900-1200)
- Fall webworm (1800-2100)
- Japanese beetle (900-1200)
- Leaf crumpler (1800-2100)
- Lecanium scale (900-1200)
- Locust borer (1800-2100) apply final spray
- Peach tree borer (1800-2100)
- Pine needle scale (1600-1700)
- Round headed apple tree borer (500-1700) apply final spray
- San Jose scale (500-2900) repeat applications because of overlapping generations
- Scurfy scale (1300-1500)
- Spruce bud scale (1500-2100)
- Two-spotted spider mite (900-2100)
- White marked tussock moth (1800-2100)
- Willow aphid (1600-2900)
- Yellow-necked caterpillar (1600-2200)

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Businesses with a nursery license (not nursery dealer) need to make sure they have submitted a renewal form for the license year July 1, 2006 – June 30, 2007.
The Hemlock Woolly Adelgid (HWA) is a threat to eastern hemlock forests, and eastern and Carolina hemlock of all sizes are susceptible. Kentucky has a significant hemlock component throughout its eastern forests, all of which could become infested. In addition, ornamental plantings in urban settings are equally susceptible. HWA feeding reduces new shoot growth, and causes grayish-green foliage, premature needle drop, thinned crowns, branch tip dieback, and eventual tree death.

Control Options
Homeowners and private landowners have two treatment options: 1) spray foliage with insecticidal soap or horticultural oil at the proper times during the HWA life cycle, or 2) use a systemic insecticide that moves with the tree sap and is consumed by the adelgids as they feed.

Tree sprays
Several brands of insecticidal soaps and horticultural oils are available at garden centers or from retail stores that sell pesticides. These are contact insecticides that must thoroughly cover the insects to kill them so the foliage, twigs, and branches must be sprayed almost to runoff. Neither product leaves a toxic residue so several applications may be needed. The soaps and oils can be applied to small trees with pump-up garden sprayers but power sprayers are needed to treat larger trees. If coverage is not thorough or trees are too tall for the equipment that is available, surviving HWA soon will reinfest the trees.

Terri Gater, New Inspector for Western KY

Terri Gater began working June 19 as a nursery inspector for the western half of Kentucky. She will be stationed at the Princeton Research and Educational Center.

Terri received a Bachelor of Science Degree in Agriculture from Western Kentucky University in 1995. She received an internship as a Lab Technician with the Citrus Research and Education Center in Lake Alfred and later accepted a position as a Vocational Agriculture Instructor with the Polk County School Board in Polk County.

On March 26, suspect samples of hemlock woolly adelgid were collected from an area of Harlan county near the town of Cumberland by J.D. Loan. These samples were confirmed on April 6 by an official USDA laboratory as hemlock woolly adelgid (HWA). This marked the first time this important pest had been documented in our state.

During the past three months, considerable activity has been underway in Kentucky. Individuals from the Hemlock Woolly Adelgid Update

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These applications will be most effective only during two treatment windows when stages of the HWA that do no have a protective covering are active. One is following egg hatch from March through April, the other is from September to October. Read the product label carefully before purchasing and applying an insecticidal soap or horticultural oil. In some cases, there will be precautions against spraying when temperatures are above or below certain limits, on windy days, or in late spring when the new growth is present on the tree and has not hardened to the dark shade of green.

Insecticidal soaps and horticultural oils can be used in sensitive sites near houses, creeks, or ponds without risk to non-target organisms or the environment. Foliar sprays with other insecticides can be effective but some pose risks to the environment.

**Systemic Treatments**

Systemic insecticides containing the active ingredient imidacloprid can be used as soil drenches or injections to control the HWA. Brand names include Bayer Tree & Shrub Insect Control Concentrate or Merit Insecticide. Imidacloprid, which is very soluble in water, is taken up by tree roots and moved in the sap to sites where the adelgids are feeding. This approach eliminates the problem of spray coverage, especially on trees that are too tall to treat using available equipment. This treatment should be applied during spring (mid-March to early June) and fall (mid-September to mid-November). The ground should not be frozen or waterlogged but the soil should be moist. Research indicates that the treatment requires at least 30 days to be taken up by the tree, but it can kill adelgids for about 24 months. Homeowners with infested hemlocks may consider soil treatments if HWA has been reported in their county. There is no preemptive treatment for the hemlock adelgid. There are three methods for applying the systemic insecticide:

1. **Soil drenching.** The appropriate amount of insecticide, based on the product label, is diluted with water and applied evenly to the soil surface or into a series of small holes spaced evenly around the base of the tree at a distance of 6 to 12 inches. This is followed by an equal volume of water to help move the insecticide down into the soil. Surface litter should be raked away prior to treatment to ensure good penetration. Soil should be moist at the time of treatment so the area may need to be watered in advance if it is dry.

2. **Soil injection.** The insecticide solution is injected several inches beneath the moistened soil surface with a hand-powered Kiortiz soil injector. This injector allows good placement of the insecticide that allows for efficient uptake by the roots, and reduces the chances of runoff of the insecticide from the application site.

3. **Trunk injection.** Measured doses of imidacloprid are delivered through a small tube that is inserted into holes drilled into the base of the tree. The number of doses required is determined by the circumference of the tree. Trunk injection is not always effective, much more expensive than the soil drench or injection, causes extensive tree wounding that contributes to overall tree stress, and provides a shorter period of protection. However, this approach provides less chance for environmental contamination in rocky soils near open water. Most trunk injections must be made by professional arborists.

Research has shown dramatic recovery of HWA infested trees following applications of imidacloprid in residential settings. In the study, trees with little new growth but no dieback recovered most quickly; trees in poorest condition showed impressive recovery but it occurred more slowly.

**Other Practices**

Maintain tree health by irrigating trees during prolonged dry periods and remove dead or dying limbs. Adelgid-infested trees should not be fertilized because adelgids thrive on fertilized trees. HWA can be moved from tree to tree by songbirds, so bird feeders should not be placed near hemlocks.

**Life Cycle**

An understanding of the HWA life cycle is useful because foliar sprays are most effective when the newly hatched “crawler” stage is active. Egg laying begins early, before the first wildflowers bloom in early spring. Small reddish brown nymphs (also called crawlers) that hatch from groups of up to 300 eggs in March either disperse from the tree or settle near the base of needles, sink their sucking mouthparts into twigs, and begin to feed on sap. The crawlers have a distinctive white fringe around their sides, their white protective covering is secreted later. Adelgids without the covering are very susceptible to contact with insecticidal soap or horticultural oil. These adelgids mature over the next few weeks and lay 50 to 200 eggs that will hatch in mid-April to early May. These crawlers are present during the spring flush of hemlock foliage. They settle on new growth and are inactive during the summer. Development resumes in September and partially-grown HWA spend the winter on tree branches and twigs covered by the white woolly material that they secrete. Development resumes in late winter and continues until March when these adelgids mature and begin the two generation per year life cycle again. In one year a single adelgid female could produce 90,000 offspring.

**Movement and Dispersal**

HWA was first reported in the eastern US in Virginia in the mid 1950s. Since then, it has spread north to Connecticut and south through North Carolina. It reached eastern Tennessee in 2002, and was first reported in eastern Kentucky in spring 2006. The infested area expands at the rate of about 15 miles per year. HWA can be blown by winds, carried by birds and other wildlife, and moved on infested nursery stock. It produces several...
Aphids

Lee Townsend, Extension Entomologist
Univ. of Kentucky

Aphids are soft-bodied insects that use their piercing sucking mouthparts to feed on plant sap. They usually occur in colonies on the undersides of tender terminal growth. Heavily-infested leaves can wilt or turn yellow because of excessive sap removal. While the plant may look bad, aphid feeding generally will not seriously harm healthy, established trees and shrubs. However, some plants are very sensitive to feeding by certain aphid species. Saliva injected into plants by these aphids may cause leaves to pucker or to become severely distorted, even if only a few aphids are present. Also, aphid feeding on flower buds and fruit can cause malformed flowers or fruit.

Aphids produce large amounts of a sugary liquid waste called “honeydew”. The honeydew that drops from these insects can spot the windows and finish of cars parked under infested trees. A fungus called sooty mold can grow on honeydew deposits that accumulate on leaves and branches, turning them black. The appearance of sooty mold on plants may be the first time that an aphid infestation is noticed. The drops can attract other insects such as ants, that will feed on the sticky deposits.

Some aphids are very important vectors of plant viruses. However, it is seldom possible to control these diseases by attempting to kill the aphid vectors with an insecticide. Aphids carrying viruses on their mouthparts may have to probe for only a few seconds or minutes before the plant is infected. Resistant varieties or sequential plantings may be helpful in reducing problems with some viruses that attack annual plants. (con’t)
HOW THE PROBLEM STARTS

Infestations generally result from small numbers of winged aphids that fly to the plant and find it to be a suitable host. They deposit several wingless young on the most tender tissue before moving on to find a new plant. The immature aphids or nymphs that are left behind feed on plant sap and increase gradually in size. They mature in 7 to 10 days and then are ready to produce live young. Usually, all of them are females and each is capable of producing 40 to 60 offspring. The process is repeated several times, resulting in a tremendous population explosions. Less than a dozen aphid “colonizers” can produce hundreds to thousands of aphids on a plant in a few weeks. Aphid numbers can build until conditions are so crowded, or the plant is so stressed, that winged forms are produced. These winged forms fly off in search of new hosts and the process is repeated.

CONTROL

Early detection is the key to reducing aphid infestations. The flight of winged colonizers cannot be predicted, so weekly examination of plants will help to determine the need for control. Examine the bud area and undersides of the new leaves for clusters or colonies of small aphids. The presence of these colonies indicates that the aphids are established on the plants and their numbers will begin to increase rapidly. Small numbers of individual colonies on small plants can be crushed by hand or removed by pruning as they are found. In some cases, this may provide adequate control.

If aphid colonies can be found on about 5% or more of foliage tips of a plant or planting, then a control measure should be considered. Most products used for aphid control work as contact insecticides. This means that the aphids must be hit directly with spray droplets so that they can be absorbed into the insect’s body. Since aphids tend to remain on the lower leaf surface, they are protected by plant foliage. Thorough coverage, directed at growing points and protected areas, is important. It is difficult to treat large trees because of the high spray pressure necessary to penetrate the foliage and to reach the tallest portions of the tree. Hose-end sprayers can be used on 15’ to 20’ trees but they need to produce a stream rather than an even pattern to reach these levels. Skips in coverage are common and there is a significant potential for applicator exposure through drift and runoff. Commercial applicators may have the necessary equipment but these treatments may be very expensive. Aphid control is rarely feasible in these situations.

Summer oils can be used against aphids on some types of trees and ornamental plantings. They kill by suffocating the insects and disrupting their membranes. Check the label for cautions on sensitive plants, oils can injure the foliage of some plants. Weather conditions, especially high temperatures, can increase the potential for foliage burn. Do not spray dormant oils during the growing season. There is no residual effect so additional applications may be necessary. Fatty acid salts or Insecticidal Soaps are very good against aphids. As with summer oils, they apparently work to disrupt insect cell membranes. They require direct contact with the insects and leave no residual effect.

Nervous system insecticides, such as malathion, Dursban (chlorpyrifos), and Orthene (acephate), are labeled for use on many shade tree and ornamental plants for aphid control. As with oils and soaps, coverage is very important and a follow-up application may be necessary. Be sure that the plant or crop that you are treating is listed on the product label. Sevin, (carbaryl) is not effective against many aphid so it is generally not a good choice for control unless recommended specifically. In fact, applications of Sevin may reduce the number of beneficial insects, such as lady beetles, and increase the potential for aphid outbreaks.

WHAT HAPPENS IF NOTHING IS DONE?

Aphid control is most valuable for new plantings, where excessive sap removal is more likely to affect general plant vigor. Established and otherwise healthy plants can tolerate moderate to heavy aphid infestations, although affected leaves may wilt and turn yellow and there may be some premature drop.

Good cultural practices, such as watering and fertilization, will help to reduce stress by these insects. Problems with honeydew and sooty mold may have developed but tend to be temporary and disappear after the aphids are gone.

A few aphid species produce cupped or distorted leaves; these plants may lose some of their aesthetic appeal for the season. Once the distortion occurs, the leaves will remain cupped and twisted until they fall off. Usually, the infestation is not noticed until the injury has occurred. Insecticide applications often are less effective because the aphids are protected in the gnarled leaves.

Plants that become infected with an aphid-borne virus may be severely stunted and may die. Preventive sprays are rarely effective in keeping viruses out of plantings but they may reduce the spread within a group of susceptible plants.

NATURAL ENEMIES

Beneficial insects, such as lady beetles and lacewings, will begin to appear on plants with moderate to heavy aphid infestations. They may eat large numbers of aphids but the reproductive capability of aphids is so great that the impact of the natural enemies may not be enough to keep these insects at or below acceptable levels.
Bacterial Wetwood and Alcoholic Flux
Dr. Alan Henn, Associate Extension Professor, Entomology & Plant Pathology, MS State Univ.
Information Sheet 1664

Wetwood, or slime flux, is a bacterial disease. The bacterium usually enters the tree through wounds. It may enter the heartwood and sapwood of the tree. You cannot always see the wound, but you can see the liquid from this disease.

This alcohol based ooze kills the cambium tissue near the cut, preventing proper callusing of wounds. If the ooze continues for months, leaves on those branches may become stunted and yellowed.

This oozing of sap is called “fluxing.” The flux is colorless to tan at first but darkens on exposure to the air. As it dries, a light gray to white crust remains. This is slime flux.

As the flux runs down the branch or trunk, it discolors the bark. As fluxing continues, large areas of the bark become soaked. Grass and other plants may be killed where the flux runs down the trunk and contacts them.

The smell that sometimes develops is usually caused by other rotting organisms. Many different microorganisms grow in the flux, producing a foul or alcoholic smell. Various insects are attracted to the slime flux.

This chronic, rarely serious disease, can lead to general decline in tree vitality but is not known to cause tree death. Although this problem cannot be cured, it is comforting to know that the wet areas are not decayed. Decay generally does not thrive in this water-soaked wood. In the past, correcting this problem included drilling a hole in the tree to relieve the pressure. We now know this causes more damage, spreading the disease, which increases infections. Other recommendations called for installing plastic with holes in it or iron drain tubes in the tree to relieve the gas pressure and to allow continual drainage away from the trunk. The idea was to keep the liquid off the trunk so the cambium is not killed.

Drain tubes often worsen the problem. Trees can compartmentalize injuries or diseased wood. They may "wall off" the wetwood areas. Because drain tubes create a deep wound, they may break the compartment the tree has made to encompass the wetwood, letting the internal discoloration and any future decay spread beyond the contained area.

At this time there is no "cure" for this condition, but this may be helpful: fertilize stressed trees in the spring to stimulate vigorous growth. Removing dead or weak branches, plus promptly pruning and shaping bark wounds, is helpful. Proper pruning encourages rapid callousing of wounds. The sap flow that results from pruned branches is normal and is not the same as wetwood flow. If there is loose or dead bark in the slime flux area, remove all of the loose bark and let the area dry. Do not apply a wound dressing. In recent years many large mature landscape oaks with no apparent wounds or injuries have had problems with slime flux on the trunk or large exposed flare roots just above the soil line. Sap may continue to ooze for several weeks or months, but usually it eventually stops with no treatment and no apparent damage to the tree. This slime flux may be triggered by heat, drought, and other stress.

Alcoholic Flux
Alcoholic or white flux, also called frothy flux, is not related to wet wood. It occurs where microorganisms ferment sap in cracks and other wounds in the bark and cambial region. Alcoholic flux is acidic and nearly colorless and sometimes appears as a white froth. It often emits a pleasant fermentative odor and persists only a short time in summer. The associated microorganisms apparently produce gas and alcohol. Alcoholic flux is common on stressed trees, especially sweet gum, oak, and elm in the Midwest and willow in the Southwest. It has been noted on mimosa or silktree affected by Fusarium wilt. Alcoholic flux is stress related. Heat stress most likely sets the stage for this problem. To help avoid this problem, use good cultural practices. Watering properly during the growing season as well as during winter is critical. If the tree is in a lawn, be careful not to over water or cause other damage, such as that caused by lawn mowers and string trimmers.

Flux ooze on oaks; pictures courtesy of David Held, MS State University
Pine Needle Scale
Katherine Mazzey Penn State Extension Program Assistant and Michael Masiuk, Extension Agent, Penn State Univ.

The Pine needle scale, Chionaspis pinifoliae (Fitch) is a native insect and a serious pest of ornamental pines. It affects pines in landscapes, nurseries and Christmas tree plantations, and is spread by the wind, birds, mammals and the touching branches of trees. Heavy infestations, left untreated, can cause twig and branch dieback.

Plants Attacked
The most frequently damaged host plants are the mugho pine (Pinus mugho) and Scotch pine (Pinus sylvestris). Other pines affected to a lesser extent are Austrian pine (Pinus nigra), red pine (Pinus resinosa) and eastern white pine (Pinus strobus). It can also infest spruces (Picea), firs (Abies), Douglas-fir (Pseudotsuga menziesii) and cedars (Cedrus).

Insect Identification
The adult scales are easily recognized by their white, oyster shell-shaped wax covers measuring 1/16” to 1/8” long when fully grown. The male have similar color markings but are usually smaller than the female. Both male and female have a yellowish spot, the exuvim, on one end. Pine needle scale eggs and newly hatched crawlers are bright red changing to pale yellow then tan once they start feeding.

Life History
Over-winter: The reddish eggs over-winter beneath the female scale cover. Spring: The female lays approximately 40 eggs, beneath her scale covering, which hatch in mid to late May. (A second hatching occurs in July). The reddish nymphs crawl to a new site on the host plant or are blown or carried to a new host. The nymphs insert their mouthparts into the needle of the host plant and begin to feed.

Summer: The nymph continues to feed and increase in size. The male molts and emerges as a winged adult. The female molts into a wingless nymph-like adult. The male mates with the female and then dies. The female continues to grow for a few weeks before laying her eggs.

There are two generations of pine needle scale per year.

Damage Symptoms
The scale uses its piercing-sucking mouthparts to feed on juices from the needles of the host causing the needles to turn yellowish brown. Heavy infestations can give the plant a frosted appearance. Untreated infestations may result in sparse foliage and the eventual death of the tree.

Management Options
Biological Several species of lady beetles (including the twice-stabbed lady beetle) and wasp parasitoids feed on the pine needle scale. If beneficial predators are present, the use of “predator friendly” insecticides such as insecticidal soap or horticultural oils should be used, and pest populations closely monitored.

Mechanical In nursery and Christmas tree farms, the removal of mature trees that act as infestation sources may prohibit the spread of the scale and reduce the need for spraying entire plantations.

Disinfecting Tools And Equipment
Gary Moorman, Woody Ornamental Insect, Mite & Disease Mgmt Penn State Univ. woodypestguide.cas.psu.edu

Wash or thoroughly wipe tools and equipment to remove heavy deposits of soil and plant debris because disinfectants do not penetrate these waxy coverings have begun to form.

Crawlers may be managed with formulations of acephate, aceamiprid, azadirachtin (Ormaniz 3% EC only), bifenthrin (Bifenthrin Pro Multi-Insecticide, Onyx Insecticide, Talstar F, Talstar Lawn & Tree Flowable, Talstar GC Flowable, Talstar Nursery Flowable, and TalstarOne Multi-Insecticide only), but profen, carbaryl, chlorpyrifos, cyfluthrin, cyfluthrin and imidacloprid, deltamethrin, dinofeturan, horticultural oil, hydrophobic extract of neem oil, insecticidal soap, lambda-cyhalothrin (Battle GC, Demand CS, Scimitar CS, Scimitar GC, and Scimitar WP only), malathion, methidathion, and oxydemeton-methyl (on field-grown nursery stock).

Management Hints: Apply horticultural spray oil according to label directions. Crawlers may start to emerge from eggs during late April through May. Emergence of second-generation crawlers occurs during mid- to late July. Crawler activity will vary from year to year due to weather conditions. To obtain maximum control, monitor infested trees on a regular basis. Two applications of a registered insecticide may be necessary to manage heavy populations. Be aware that the adult female has a fairly long egg-laying period, and newly hatched crawlers will remain beneath the protective scale cover, especially on overcast days. Malathion may cause slight injury to white pine.

Chemical Horticultural oil, soap sprays and insecticide sprays have been effective if used after the eggs have hatched but before new white waxy coverings have begun to form.

The reddish eggs crawl to a new site on the host plant or are blown or carried to a new host. The nymphs insert their mouthparts into the needle of the host plant and begin to feed. Winter: The nymph continues to feed and increase in size. The male molts and emerges as a winged adult. The female molts into a wingless nymph-like adult. The male mates with the female and then dies. The female continues to grow for a few weeks before laying her eggs.

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Wash or thoroughly wipe tools and equipment to remove heavy deposits of soil and plant debris because disinfectants do not penetrate these waxy coverings have begun to form. Then disinfect as noted below. Rest clean tools in a bucket of disinfectant or on clean newspaper or plastic sheeting or in an empty, clean container. Or hang them up so that they do not become contaminated with soil or plant debris.

When using pruning tools, disinfectant can be carried in a squeeze, spray, or mist bottle. Thoroughly wet the cutting surfaces with the disinfectant and allow the tool to drain and air-dry. If sap or resin builds up on the tool, scrub this off with a rag kept in the disinfectant. Then dip, pour, or spray more disinfectant onto the tool. Let it drain and air-dry or let it soak in the disinfectant for 10 minutes. Wash or thoroughly wipe tools and equipment to remove heavy deposits of soil and plant debris because disinfectants do not penetrate these waxy coverings have begun to form.

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plant parts, alternately using two tools is best so that one can soak in disinfectant while the second is in use.

Steam or dry heat: Heat materials to 180 to 200°F for 30 minutes under a cover to retain the heat.

70 percent alcohol (grain, rubbing, wood): Dip or swab object and let dry.

Ammonium chloride (Green-Shield, Triathlon): Dip or swab object and keep the tool wet for 10 minutes.

Hydrogen dioxide (ZeroTol): Dip or swab object and thoroughly wet the surface.

Sodium hypochlorite (Clorox, 1 gallon diluted with 9 gallons of water): Dip, spray, or brush on and keep the tool wet for 10 minutes. Let drain and rinse with clean water immediately. Caution—causes severe corrosion of metal items.

**Fall Webworm Tents Appearing**

Lee Townsend, Extension Entomologist, Univ. of Kentucky

The light gray silk tents of fall webworm caterpillars, recently hatched from masses of 400 or so eggs, are beginning to appear at the ends of tree branches. These caterpillars are covered with long white to yellow-tan hairs. They feed on over 100 species of deciduous trees but black cherry, walnut, hickory and mulberry are favorites. The larvae incorporate the leaves they are eating into their tent. The tent is expanded to include more leaves as needed. They can be numerous enough to completely defoliate trees but this is not common. Usually, little real damage is done to trees but the ugly webs detract from aesthetic value of the tree.

Accessible nests can be pruned out and discarded. Bt insecticides are effective on small larvae if chemical control is necessary and the sprayer can reach foliage around the nest.

There are two generations in Kentucky each year; from mid-June to early July and again in August.

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**Degree Day Totals through June 27, 2006**

- Bardstown—1418
- Bowling Green—1690
- Covington—1256
- Henderson—1457
- Huntington WV—1453
- Lexington—1365
- London—1447
- Louisville—1413
- Mayfield—1436
- Paducah—1845
- Princeton—1783
- Quicksand—1451
- Somerset—1334

**Degree Day Totals through June 27, 2005**

- Bardstown—1393
- Bowling Green—1506
- Covington—1257
- Henderson—1489
- Huntington WV—1444
- Lexington—1341
- London—1355
- Louisville—1396
- Mayfield—1424
- Paducah—1598
- Princeton—1608
- Quicksand—1431
- Somerset—1379