

Study Manual for Private Applicator Certification

Nursery



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[www.dep.state.ct.us/wst/pesticides/index.htm](http://www.dep.state.ct.us/wst/pesticides/index.htm)

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## Preface

Any person who uses restricted-use pesticides must be licensed in order to be able to purchase such products. Licensing is not required if only general-use pesticides are used, with the exception of commercial applications.

Any person who sprays another's property in exchange for money must possess a commercial applicator's license. However, individuals that are licensed as a private applicator can spray another's property in exchange for services. (ie; he might trade a spray job in the spring for help with harvest in the fall)

A farmer wishing to use restricted-use pesticides would apply for a "private applicator's license." The private applicator may then buy and apply restricted-use pesticides on their own farm, property they rent or on the farms of others, provided that they do not get paid to do so.

It is not necessary for the licensed private applicator to actually perform all pesticide applications. An employee or family member can apply pesticides, however, the license holder is responsible for training the person who actually does the work, and must be available if needed.

Private applicators are required to maintain records with respect to each use of restricted-use pesticide and must file a report of their usage on or before January thirty-first each year for the previous year's applications.

This booklet was prepared as a study guide for those individuals seeking certification as private applicators in Connecticut. It contains brief descriptions of the major pests of each crop, their life cycles and the damage they cause to the host plants.

As a minimum requirement for certification, a private applicator must show that they possess a practical knowledge of laws pertaining to pesticide applications and the pest problems associated with their farming operation. This practical knowledge includes ability to recognize common pests and damage caused by them. Recognition is critical because it is the first step in control. The private applicator must be able to recognize the pest problem before they select among the available pesticides.

This booklet is not to be considered a complete source of information. Information on integrated pest management (IPM) and suggested spray schedules may be obtained from the Connecticut Cooperative Extension Service or Connecticut Agricultural Experiment Station.

## Insects

### Scale Insects

#### Description

Scale insects constitute a very large group of plant-feeders. They occur on shade and ornamental trees, shrubs, flowers and greenhouse plants. They have sucking mouthparts and feed on plant juices. Scales generally are quite small and occasionally become so numerous that they coat the leaves and stems. Scale insects are widely disseminated through the movement of infested nursery stock. They are divided into two groups for convenience: hard scales and soft scales (ex: Tuliptree Scale)

**Hard Scales - (ex: Oystershell Scale)** These insects secrete a waxy, hardened, protective covering which is not attached to the insect's body. This protective covering, under which the insect lives and feeds, is called the scale or armor. The tiny scale may be circular, semi-circular, oblong or pear-shaped. They do not have eyes, legs or antennae. Adult females are wingless. The adult males are tiny, two-winged gnat-like insects.

**Soft Scales - (ex: Fletcher Scale)** The outer scale covering on soft scales is fused to the body of the insect and cannot be separated.

#### Life Cycle

In both groups, eggs or living young are deposited under the female scale.. During part of the nymphal period the scales move about on the plant. This period is usually referred to as the crawler stage. Once the crawlers insert their mouthparts into the plant they cannot move again. The males, however, are an exception; on reaching maturity they develop wings and fly in search of females.

#### Damage

Scales damage plants by sucking the plant juices from the leaves and stems causing dead areas to appear on the leaves. In addition, soft scales excrete honeydew which may collect in great quantities on the stems and leaves. A black sooty fungus develops on the honeydew. If left uncontrolled, defoliation may occur and the plants die.

## **Mealybugs**

### Description

Mealybugs are soft bodied insects which are usually covered with a powdery or cottony, wax-like material. They vary from 1/5 to 1/3 inch in length when mature. The young resemble the adult females, except that they are smaller and have less of a waxy covering.

### Life Cycle

The life cycle of most mealybugs is about the same. The female deposits her eggs in a waxy sac beneath the rear end of her body. The eggs hatch in about ten days and the young crawlers begin to feed by inserting their mouthparts into the plant tissue and sucking out the sap. The adult females are wingless, but the young males form a white case within which they develop wings. Upon emergence, males mate with the females and die soon after.

### Damage

Mealybugs injure plants by sucking sap and by producing large amounts of honeydew which attracts ants and forms a medium for the growth of sooty mold fungus. In heavy infestations, plants may become black with sooty mold and leaves will become yellow, followed by reduced plant vigor and possible dieback.

## **Mites**

### Description

Mites may be distinguished from insects by the absence of discernible body segmentation and the presence of eight (8) rather than six (6) legs.

They are extremely small, most of them being about 1/50 inch or less in length. They are soft-bodied, oval-shaped and colored yellowish, greenish or reddish. Often their presence is not detected until they become very numerous and cause obvious plant damage. Two spotted spider mites favor hot, dry weather while Southern red and Spruce spider mites are more active during cooler weather, in the spring and fall.

### Life Cycle

Some mites, such as the Two spotted spider mite; spend the winter as adults in sheltered places. Others, such as the Southern red mite and the Spruce spider mite over winter in the egg stage. In the spring young mites feed on new foliage and when mature they mate and lay eggs for the next generation. There are several generations each season.

## Damage

Mites have needle-like mouthparts with which they puncture the leaf and suck sap and chlorophyll. Infested foliage becomes mottled or paled and may turn brown and drop prematurely. Some species produce fine webbing that covers the foliage and becomes more noticeable as the population increases.

## Aphids

### Description

Aphids, or plant lice, are small soft-bodied sucking insects that infest nearly all types of plants. They live in colonies and are commonly found on the tender growth of infested plants, usually on the undersides of leaves. They may vary in color from yellow, green to pink or reddish brown. The nymphs resemble the adults but are smaller. Adults may be either winged or wingless. Many aphids have pronounced tube-like structures at the end of the abdomen called cornicles. Some aphids produce a white, waxy coating.

### Life Cycle

Most aphids found in Connecticut pass the winter in the egg stage on the leaves and stems of old plants remaining in the field; species not capable of surviving the winter migrate annually from the south. Some may over winter on plants in greenhouses.

In the spring, wingless nymphs hatch from the over wintering eggs. These are all females and they give birth to live young without mating. After a succession of generations, a number of winged females develop, which may fly to other plants and produce a number of winged generations.

A generation of males and females appears in September and October. These will mate and lay over wintering eggs on the primary host plant.

### Damage

Both nymphs and adults suck the sap from the plant, causing discoloration and curling of the leaves. Severe damage may cause stunting or death of the plant. Aphids can also spread viral pathogens. They excrete a clear, sweetish liquid known as honeydew which may collect in great quantities on the stems, fruits and leaves. Honeydew attracts ants in large numbers and makes an excellent medium for the development of sooty mold fungus.

### Monitoring

In the spring, look for curled, discolored leaves of new growth. In the summer, look for honeydew and sooty mold.

## Control

Many beneficial insects feed on aphids. If aphids become noticeable and natural enemies are not present, pesticide can be applied.

## **Cooley Spruce Gall Adelgid (*Adelges cooleyi*)**

### Description

Cooley spruce gall adelgids are also small and not readily seen without magnification. Their feeding causes the formation of elongate, often curved galls about one (1) to three (3) inches long on the end of new growth twigs of Colorado Blue, Norway, Englemann, Sitka and Oriental spruces. Needle damage occurs on Douglas fir but galls do not form.

### Life Cycle

Nymphs over winter at the base of the buds of spruce and Douglas fir and will mature in early spring and deposit their eggs in masses of white, cottony wax. The eggs hatch after new growth is produced and nymphs migrate to the growing shoots. They pierce the tissues at the base of the needles and suck the plant juices. On spruces, this feeding stimulates formation of cone-like galls at the tip of twigs, enveloping the young aphids. Each gall contains many chambers in which there are several adelgids in each. Galls are about 2 1/2 inches long. During the summer the adelgids mature, the galls open, and winged adelgids emerge. These winged females may fly to Douglas fir or spruce and lay eggs on the needles of the tree. The eggs hatch and the nymphs over winter at the base of needles below buds.

### Damage

Damage on spruces will appear as elongated green pineapple-like galls at the end of new growth twigs. The galls will turn brown and open in late June or July.

Douglas fir needles will become twisted and develop yellow blotches, however, galls do not form.

### Monitoring

In late winter, look at the needle base below buds for wax covered nymphs. In spring, look on spruce for green galls. Adults and white egg sacs can be found on Douglas fir in spring and summer.

## Control

Prune out and destroy galls prior to mid summer. Horticultural oil application can be made to control over wintering nymphs in early spring prior to gall formation or in the fall for control of adults and nymphs. Horticultural oil will discolor Blue spruce

## **Eastern spruce gall adelgid (*Adelges abietis*)**

### Description

Eastern spruce gall adelgids are very small and not readily seen without magnification. Their feeding causes the formation of pineapple shaped galls which may vary in length from 1/2 to 1 inch at the base of the twigs on Norway, white, red and blue spruces.

### Life Cycle

The adelgids over winter as tiny nymphs at the base of spruce buds. In early spring, the nymphs develop into wingless females that lay their eggs under a fluffy, waxy covering. After the eggs hatch the nymphs insert their mouthparts into the twigs and begin to feed. This feeding causes the plant to form a gall that envelops the young adelgids. In August, the galls crack open and release the mature winged adelgids. These adelgids fly to nearby spruce and lay eggs for the next generation. There is only one generation each year.

### Damage

This insect rarely causes the death of a tree, however, the brown pineapple shaped galls can make the tree unsaleable.

### Monitoring

In late winter, look at the base of needles below buds for white, wax-covered nymphs. Green galls begin to form in spring, especially on Norway spruce. Sticky traps can be used for monitoring to detect flying adults in late summer/early fall.

## Control

Prune out green galls by mid-summer, as they may disfigure the tree because the galls are at the base of the terminal. Pesticide applications can be performed in the spring to control over wintering nymphs or in the fall to treat for adults and nymphs.

## Lacebug

### Description

Lacebugs are small, flat, delicate insects with lacy wings. The adults are 1/8 to 1/4 inch long, flat, and white to tan with brown or black markings. The nymphs are mostly black, usually covered with long spines and range in size from less than 1/32 of an inch in length to about the size of the adult at the time of the last molt. Lacebugs are serious pests on andromeda, azalea, cotoneaster, laurel, pyracantha, rhododendron and hawthorn.

### Life Cycle

Lacebugs that feed on deciduous trees over winter as adults, while those that feed on evergreens over winter in the egg stage in the plant tissue, along the midrib, on the lower surface of the leaves. Eggs deposited during early fall hatch the following spring. Nymphs of the first generation become full grown by late spring. There are several generations each season.

### Damage

The adult and nymphal stages both live on the underside of the leaves where they feed on sap. This results in whitish-yellow stippling on the upper surface of the foliage. The underside of infested leaves is also discolored with numerous flattened dark, varnish like spots as well as with molted skins. Foliage of severely injured plants is sparse and considerably reduced in size. Heavily infested shrubs may be killed.

### Monitoring

In May, look for signs of newly stippled leaves on plants that are growing on sunny, dry sites. Feeding damage is usually first observed on lower, older leaves. Check on the underside of leaves for the presence of adults, nymphs and tar spots.

### Control

Choose and place plants appropriately. Treat undersides of leaves when a population is detected, usually in late spring through the summer.

## **Birch leafminer (*Fenusa pusilla*)**

### Description

The adult birch leafminer is a tiny, black four-winged insect that is approximately 1/8 inch long. The larvae or miners are flattened, white in color and have three pairs of legs. When mature, they are almost 1/4 inch long.

## Life Cycle

The birch leafminer over winters as a larvae in the soil and the adults begin to emerge in May. Females lay their eggs in newly developing terminal leaves and the larvae feed or mine the plant tissue between the upper and lower surfaces of the leaves. As the larvae grow, feeding increases and the serpentine mines often run together to form characteristic blotches or blisters. When mature, the larvae drop to the ground and enter the soil to pupate. There are 2-4 generations a year in Connecticut, with the first one being the most serious.

## Damage

Damage is confined to the leaves where the larvae feed. Injury is noticeable first as small, irregular, blotch-shaped brown blisters on the surface of the leaves. Infested trees have a scorched or blighted appearance. Repeated losses weaken the tree, making it susceptible to the attack of other insects, particularly the bronze birch borer.

## Monitoring

Check newly expanding leaves for adults and small mines. Yellow sticky cards can be used when monitoring for adults.

## Control

Application of systemic pesticides can be an effective method of control for larvae. Applications of contact pesticides may be an effective method of control for adults in mid to late May. By reducing the first generation of larvae, future generations will be significantly reduced.

## **Holly Leafminer** (*Phytomyza ilicis*)

### Description

The adult holly leafminer is a tiny, black, two-winged fly about 1/8 of an inch in length. The larvae are pale yellow maggots that are about 1/8 inch long when full grown.

### Life Cycle

Eggs are laid singly in small slits or punctures in the lower surface of new leaves along the midrib or leaf margin. Larvae form slender, trail-like mines or blotch mines in the leaf by feeding on plant tissue. Larvae over winter in the mines and pupate in the spring. Adult emergence occurs about mid-May. There is one generation a year. The holly leafminer produces mines only on English holly.

## Damage

Damage is confined to leaves of the current year's growth where the larvae feed inside the leaves. Numerous punctures cause a characteristic stunting and twisting of the leaves. Trees will drop leaves when there is a heavy infestation. Adult females will use their ovipositor to puncture the leaf tissue and feed on the sap that exudes from the wound.

## Monitoring

Look at leaves on the south side of holly for expanding yellowish mines beginning in March. Adults can be observed in May. Short mines may be visible in late summer.

## Control

Pick off and destroy infested leaves in the fall for non-chemical control. Foliar pesticide applications should begin in mid to late May when adult flies are seen around new growth. Treatment should be repeated in 10-14 days. Early spring applications of systemic pesticides control young miners in the foliage.

## **Black Vine Weevil (*Otiorhynchus sulcatus*)**

### Description

The black vine weevil is a serious pest of taxus, azalea, rhododendron and hemlock, especially in nurseries. The adult is a wingless weevil that is black with faint yellowish flecks on their back and is about 1/2 inch long. The larvae are 1/2 inch long, whitish, legless, "C" shaped grubs that live in the soil.

### Life Cycle

Usually larvae of the black vine weevil over winter in the soil, however, adults may over winter as well. Adult females emerge in the spring, feed for a short time. Eggs are laid in the soil and hatch in about two weeks. There is only one generation each year.

### Damage

The adults feed to a slight extent on the foliage, eating out small irregular holes usually near the margin of the leaves. The larval stage causes greater damage feeding on the small roots and girdling larger roots, often resulting in the death of the plant. The greatest amount of damage occurs in the spring. Plants that are severely injured have a yellowish color. The new growth is arrested and there may be a partial shedding of the foliage.

## Monitoring

Look on broadleaved evergreens for notched leaves beginning in June. Interior leaves usually show the most damage. Adult activity can also be monitored with burlap strips or pit-fall traps.

## Control

Carefully inspect plants for damage. Exclusion barriers can be made from aluminum flashing that is buried 2-3 inches in the ground with the top section greased. The area around the plant should be kept free of excess plant debris and mulch. When pesticides are applied, the foliage should be thoroughly sprayed and the soil around the base of the plant wetted to control adults before eggs are laid. The first treatment will most likely be in late May or early June. Applications are most effective if they are made later in the day.

## **White Pine Weevil (*Pissodes strobi*)**

### Description

The adult white pine weevil is a reddish-brown snout beetle about 1/4 inch long, marked irregularly with white scales. Larvae are about 3/8 inches long, curved, legless and white with brown heads.

### Life Cycle

The adults over winter in litter on the ground and resume activity in April. In the spring, the adults go to the terminal shoots and feed on the bark tissue, causing pitch flow. Tiny glistening drops of resin on the bark or leader indicate adult feeding or egg laying. Eggs are deposited in small punctures in the bark of the leader. The eggs hatch and the legless grubs feed on the inner bark and tissues that produce tree growth. When several larvae are feeding, the shoot is soon girdled and dies. The grubs mature and pupate inside the leaders. Adult beetles emerge from late June to early September. There is one generation per year.

### Damage

Grubs girdle the leader, causing it to curl, turn brown and die. Crooked trunks and trees with two leaders develop, making the trees unsaleable.

## **Lilac Borer (*Podosesia syringae*)**

### Description

The adult lilac borer is a clear-winged moth that resembles a wasp and measures about 1/2 inch long. The body varies in color from dark brown to black with red marks on the thorax and abdomen. Larvae are 3/4 to 1 1/2 inches long and are whitish with a light brown to chestnut colored head capsule.

### Life Cycle

Full-grown larvae over winter in tunnels within the trunk of the host plant. They pupate in early spring and the winged adults emerge in early May, leaving their pupal cases protruding from emergence holes. Eggs are laid on the rough bark and hatch in about one week. The larvae bore into the heartwood, feeding throughout the summer and fall. In late fall larvae plug their tunnels with borings to form cells in which they over winter. There is one generation per year. Plants that are stressed due to environmental factors and/or injury are more susceptible to borers.

### Damage

Larvae bore into the main stem, causing leaf wilt and weakening shoots so that they break off. Older, rough barked stems are most susceptible to attack, particularly those with wounds or grafting scars. The presence of dead canes in the center of a lilac bush is indicative of their activity. Preferred host plants include Lilac, ash and privet.

### Monitoring

Look for dead canes and signs of cracked bark on live canes as well as holes containing frass or seepage. Entrance holes are irregular in shape and contain frass while exit holes are circular and clean. Monitoring with pheromone traps that are set up in early April may aid in identifying activity.

### Control

Drench bark with residual insecticide sprays in mid-May, about 10 days after the first trap catch.

## **Dogwood Borer (*Synanthedon scitula*)**

### Description

Adult dogwood borers are blue-black clear-winged moths that resemble a wasp and are about 3/8 to 1/2 inch long with a wingspan of about 1 inch. They have two gold bands

on a bluish-black abdomen. Larvae are up to 1/2 inch long and are white with pale brown heads.

### Life Cycle

Adult dogwood borers are active from late May throughout the summer. They deposit eggs on the bark, preferring rough bark or injured areas. After hatching, white larvae with pale brown heads gain entry to the cambium to feed through mechanical wounds or cracked bark. These larval galleries destroy parts of the cambium and often girdle limbs or the trunk of the tree. The larvae mature by fall, over winter as pupa in their galleries. There is one generation per year.

### Damage

The dogwood borer causes swollen, irregular, canker-like areas on the bark of the trunk. Loose bark may slough off, the crown may dieback or new shoots might form at the base of the tree or on limbs. Most frequently the damage occurs at the root collar where bark is cracked in the crotches. Breaks in the bark that are caused by damage from machinery are a frequent source of entry. The tree can die if the damage is severe enough. Other landscape trees such as apple, oak, hickory, cherry, birch, willow, ash and hazel may be susceptible. Kousa dogwood appears to be resistant.

### Monitoring

Look for brown frass around wounds and cracks in the bark of the tree. Use of pheromone traps may not be an effective monitoring tool.

### Control

Maintain the health of the tree by avoiding mechanical injury and establishing a band of mulch around the tree. Drench the bark with residual insecticide sprays several times from mid-May throughout the summer.

## **Japanese Beetle (*Popillia japonica*)**

### Description

Adult beetles are oval shaped; metallic green with coppery colored wing covers and are about 1/2 inch long. Mature larvae (grubs) are about 1 inch long and are grayish-white with brown heads and are usually found in a "C" shaped position in the soil. They resemble other scarab larvae but can be identified by the shape of the raster (hairs on the underside of the abdomen).

## Life Cycle

Adult beetles emerge from turf areas in July and early August, feed on the foliage and flowers of a wide variety of plants before mating. Eggs are deposited in turf areas in July and early August. Larvae hatch from the eggs in August and begin feeding on turf roots until October when temperatures begin to drop, causing the grubs to move deeper into the soil. The following April or May the grubs will move closer to the surface and feed on turf roots until sometime in June when they pupate. They remain in the pupal stage for several weeks until emerging as adults.

## Damage

Adult beetles feed on foliage of a wide variety of plants, which may be completely skeletonized or defoliated. Larvae may seriously damage lawns and small plants by chewing off roots.

## Monitoring

Look for adults on preferred host plants such as wild grapes and roses. Look under dead, brown areas of turf for grubs.

## Control

Foliar applications of pesticides may be effective to control adults when they are seen, however, numerous applications may be necessary. The most effective strategy is to control the larvae. Use of nematodes may be an effective method of control. There are also low toxicity pesticides that can be used to achieve good control.

## **Sawflies**

### Description

Adults resemble bees or small wasps. Larvae resemble caterpillars that have dark heads with whitish bodies that may be striped or spotted and can be up to 1 1/4 inches long. They are frequently found in clusters nearby to areas where damage symptoms occur.

### Life Cycle

Eggs that appear as rows of spots are often deposited on the foliage of coniferous and deciduous trees and shrubs. Larvae will often feed in groups on terminal twigs and branches. Most species have one to two generations per year and pre-pupae will overwinter in cocoons in duff or in the soil.

## Damage

Light infestation may appear as skeletonization or defoliation of leaves or needles of branches or shoots. Heavy infestations may cause complete defoliation of trees or shrubs.

## Monitoring

Look for rows of yellow spots in needles which mark where eggs have been laid. Watch for larvae in May.

## Control

Application of horticultural oil can be effective for control of small larvae. Otherwise, there are other pesticides that are registered for control of sawflies, however, the potential for negative environmental impact should be considered. *Bacillus thuringensis* is not an effective method of control.

## General Diseases

### **Anthracnose**

Early in the spring, anthracnose fungi attacks and kills twigs and newly expanding leaves causing symptoms that appear to be frost injury, particularly on Sycamore, Oak and Maple trees. Later infections will cause dead blotches along the leaf veins. Defoliation may occur in severe circumstances, however, new leaves will usually develop following this defoliation. Anthracnose fungus over winters in fallen leaves and twigs, as well as branch cankers, therefore, pruning of infected areas and removal of fallen debris is recommended. The fungus produces spores in the spring that infect leaves and twigs. Cool wet weather favors twig infection, whereas, warmer wet weather favors leaf infection.

### **Botrytis Blight**

Characteristic signs of *Botrytis* are fuzzy gray spore masses that develop on infected tissue. *Botrytis* can infect healthy plant tissue if they come into contact with infected plant tissue. Immature and wounded tissues are very susceptible. Cool, moist conditions are favorable for *Botrytis* to become established. Spores are spread by air currents and splashing water. This fungus over winters in soil and plant debris.

### **Canker and Diebacks**

A canker is a diseased area that occurs on twigs, stems or the trunk of woody plants. At first symptoms may not be obvious and may include general lack of vigor or dieback of twigs. They are usually definitely marked sunken areas oval to irregular in shape. The cankers may be discolored and crack open exposing the wood beneath. They may enlarge or girdle the entire stem. They only control is to prune out infected areas and destroy them. Cankers on the limbs of small branches can be pruned out. There is no control if the cankers are located on the main stem.

### **Crown Gall (*Agrobacterium tumefaciens*)**

Crown gall is a bacterial disease, which often can affect many species of plants. It is characterized by the formation of rough surfaced, knobby galls that are usually found near the soil line. The galls may be hard or soft and spongy and up to several inches or more in diameter. They occur on roots but may also appear on the crowns and upper

stems of some plants. Infected plants gradually decline and appear stunted. Foliage is often chlorotic and the plant may fail to produce flowers.

Infection takes place only through wounds on the plant. In most cases, introduction of the crown gall bacterium into an area is by way of infected or contaminated plants. The infection is capable of persisting in the soil for many years.

### **Fire Blight (*Erwinia amylovora*)**

This disease is common in flowering crab, pear, quince, cotoneaster, hawthorn and mountain ash. Leaves of affected twigs suddenly wilt, turn brown to black but remain attached to the twigs. Blighted branches appear to have been scorched by fire.

Rapidly growing shoots are especially susceptible. Infection usually starts in tips and progresses downward. The bacteria live over in cankers in older trees through summer and winter in dormant periods. In the spring bacteria ooze from the cankers and are disseminated by windblown rains, insects and pruning tools.

### **Leaf Spots**

Leaf spots, such as Blackspot or Tarspot, are one of the most common diseases of plants. They are caused by various fungi and bacteria, the size, shape and color of the spot being generally rather constant for the causal agent. The spots often have a definite margin and may have conspicuous concentric zones. If numerous, the spots may coalesce forming blotches.

Most leaf spot diseases flourish in wet seasons. Some may be serious enough to call for control measures other than sanitation.

### **Powdery Mildew**

Powdery mildew is caused by several different species of fungi. The disease appears as a white to light grayish powdery coating on the surface of the leaves, stems and fruits. Infected leaves may be curled or twisted or turn yellow and die.

Unlike those of most other fungi, powdery mildew spores do not require free water for germination. High humidity at the leaf surface is sufficient. This occurs when cold nights change to warm days, when plants are crowded in low areas in gardens, or grown without sufficient air circulation.

Avoid watering late in the day, promote good light and air circulation and remove and destroy fallen leaves to reduce conditions that favor disease.

### **Scab (*Venturia inaequalis*)**

Scab is generally found on apple trees. Olive drab spots 1/4 inch in diameter appear on crabapple leaves and smaller ones on the fruits. Leaves drop prematurely and the fruits are disfigured. The fungus may over winter on the twigs.

If necessary, infected trees may be sprayed with a fungicide 4 or five times at 10 day intervals starting when the leaves are half grown. There are resistant cultivars.

### **Leaf Blight (*Diplocarpon*)**

This fungus causes small, angular, reddish-brown spots on the leaves. Infected leaves may turn yellow and fall. The tree may lose nearly all of its leaves. The English hawthorn and Paul's Scarlet hawthorn are very susceptible.

### **Juniper Blight (*Phomopsis juniperovora*)**

The fungus makes the tips of infected twigs turn brown and gradually die back. Small black pinpoint-like fruiting bodies of the fungus may appear on the leaves and stems of blight-affected twigs. During wet weather, wind, rain, insects and workers spread spores that ooze out of the fruiting bodies.

### **Rust**

The three *Gymnosporangium* fungi which are found on junipers in Connecticut cause reddish-brown round galls up to 1 1/2 inches in diameter on the twigs or slight swellings on the branches or trunks. During rainy weather in the spring, sticky orange spore masses protrude from the galls or from the swellings. The spores are carried by wind and insects to leaves or fruits of nearby alternate host plants, such as apple, pear, ornamental crab, hawthorn or chokeberry. The alternate host plants are needed for the completion of the life cycle of the rust fungi, since the spores produced on juniper are not able to re-infect the juniper. If the alternate hosts are removed, the rust fungi cannot survive.

Mature galls release their spores after warm spring rains. Air currents carry the spores to crabapple leaves where the infection produces another spore stage that re-infects the cedar, thus completing the cycle.

The fungus, *Gymnosporangium clavipes*, causes severe deformation of the leaves, twigs and fruit. The orange colored spores of the causal fungus are produced in tiny whitish tubes that are found on the surface of the fruit, swollen parts of the twigs, and the lower surface of the leaves.

*Gymnosporangium globosum* is a fungus that infects the leaves causing gray to brown spots on the underside of which are formed the fruiting bodies.

Both of these fungi require the presence of red cedar for the continued spread of the disease.

### **Leaf Spot** (*Mycosphaerella colorata*)

This fungus produces irregular or circular, light gray spots with a purplish-brown border. They vary from the size of a pinhead to 1/2 inch in diameter. The black fruiting bodies are usually present on these gray spots. Leaves on which many spots occur fall prematurely.

Destroy all fallen and infected leaves. If necessary, apply a fungicide when the buds break in the spring and repeat twice at two-week intervals.

### **Tar Spot** (*Phacidium curtisii*)

This fungus causes small, yellow spots on the leaves in early summer. The spots grow larger through the summer and turn reddish-brown. A narrow, yellow border surrounds them. In the fall, flat, black, cushion shaped masses of the causal fungus develop just beneath the surface of the leaf. The leaves do not fall, but the diseased area falls out, giving the plant a shot hole appearance.

## **Pine**

### Dieback or Tip-blight

The fungus *Diplodia pinea* may seriously attack seedlings of young trees from 3 to 5 years old in nurseries. It causes a rot that extends upward from the collar below the surface of the soil. The disease may be recognized by the deep red color of the bark and by the black streaks, which may occur in the wood. The fungus also causes dieback of the branches of older trees. The new growth of such branches is stunted, the needles turn brown, and the terminal buds exude an excessive amount of resin.

## Worker Protection Standard

Below is a *brief summary* of the Worker Protection Standard (WPS). The WPS is a federal regulation that is aimed at reducing the risk of pesticide exposures for employees of agricultural operations. Pesticide labels for all products that are used in agricultural production now refer to the WPS and, therefore, compliance with the entire regulation is required. Agricultural business owners and managers should familiarize themselves with these requirements by reading the "How To Comply Manual" or by going to EPA's website (<http://www.epa.gov/oppfead1/safety>). You may also direct any questions that you may have to the State of Connecticut, DEP, Pesticide Management Program by calling 860/424-3369.

Under the Federal Insecticide Fungicide and Rodenticide Act (FIFRA) it is unlawful for any person to use a pesticide in a manner inconsistent with its labeling. When the WPS is referenced on a pesticide label, users must comply with all of its requirements or be subject to enforcement action, which may include monetary penalties.

### Basic Principles of the Worker Protection Standard

EPA's Worker Protection Standard (WPS) is intended to reduce the risk of pesticide poisonings and injuries among persons who are employed at farms, forests, nurseries or greenhouses. The WPS contains requirements for pesticide safety training, notification of pesticide applications, use of personal protective equipment, restricted entry intervals following pesticide application, decontamination supplies, and emergency medical assistance.

The WPS identifies almost all agricultural employees as agricultural workers, early-entry workers or pesticide handlers depending upon the duties they perform. They are distinguished as follows;

**Agricultural Workers** are those who perform hand labor tasks related to the planting, cultivation and harvesting of plants on farms or in greenhouses, nurseries, or forests. Workers include anyone employed for any type of compensation (including self-employed) doing tasks, such as carrying nursery stock, repotting plants, or planting, weeding, hoeing or watering, related to the production of agricultural plants on an agricultural establishment.

Workers do NOT include employees such as office employees, truck drivers, mechanics, and any other workers not engaged in worker/handler activities.

**Early-Entry Workers** are workers that, under limited circumstances, may be asked to enter a pesticide treated area before the expiration of the restricted entry interval to perform limited tasks. Employers must provide special protections to early entry workers such as additional training and instructions, decontamination sites and label specific personal protective equipment.

**Pesticide Handlers** are those who mix, load, assist with or apply agricultural pesticides; clean, maintain or repair equipment that is used pesticide applications; or perform other tasks that may bring them into direct contact with pesticides.

The WPS does not apply when pesticides are applied on an agricultural establishment in the following circumstances:

- For mosquito abatement, Mediterranean fruit fly eradication, or similar wide-area public pest control programs sponsored by governmental entities. The WPS does apply to cooperative programs in which the growers themselves make or arrange for pesticide applications.
- On livestock or other animals, or in or about animal premises.
- On plants grown for other than commercial or research purposes, such as home fruit and vegetable gardens, and home greenhouses.
- On plants that are in ornamental gardens, parks, and public or private lawns and grounds that are intended only for aesthetic purposes or climatic modification.
- By injection directly into agricultural plants. Direct injection does not include "hack and squirt," "frill and spray," chemigation, soil-incorporation, or soil-injection.
- In a manner not directly related to the production of agricultural plants, such as structural pest control, control of vegetation along rights-of-way and in other noncrop areas, and pasture and rangeland use.
- For control of vertebrate pests.
- As attractants or repellents in traps.
- On the harvested portions of agricultural plants or on harvested timber.
- For research uses of unregistered pesticides.

## **Summary of WPS Requirements**

### **Protection During Applications**

Pesticide handlers (applicators) are prohibited from applying a pesticide in a way that will expose workers or other persons. Workers are not allowed to enter areas where pesticides are being applied. In some circumstances, workers must remain outside of prescribed buffer zones that may be from 25 to 100 feet, depending upon where a pesticide is applied and the method of application, until the application has been completed.

### **Restricted-entry Intervals (REI)**

Restricted-entry intervals are specified on all agricultural plant pesticide product labels. Usually REI's are 12, 24 or 72 hours, although some low toxicity products may have a zero hour REI. Workers are excluded from entering a pesticide treated area during the restricted entry interval.

### **Personal Protective Equipment**

Personal protective equipment (PPE) that is specified on the pesticide label must be provided and maintained for handlers and early-entry workers. PPE must be inspected and cleaned prior to each use.

### **Notification of Workers**

Workers must be notified about treated areas either orally, by posting of signs or both, as indicated on the pesticide label, in order to avoid inadvertent exposures. Workers that are on the premises at the start of the applications must be orally warned before the application takes place. Workers that are not on the premises at the start of the application must be orally warned at the beginning of their first work period if (1) the application is still taking place or (2) if the REI for the pesticide is still in effect.

### **Pesticide Safety Training**

Specific training is required for all workers, early-entry workers and handlers and must be conducted in a language that they understand. Generally, certified private applicators, commercial supervisors or persons that have attended a state approved train the trainer session can train workers and handlers. Those that have been trained as "handlers" can also train workers. EPA has developed WPS training materials for workers and handlers that are available as booklets, flip charts and videotapes, some of which is available in languages other than English. The training must contain at least the concepts as described in the "How To Comply Manual - Criteria for Worker and Handler Training".

### **Central Posting**

Agricultural employers must post specific information at a central location that is accessible to their employees. The information that is required to be posted is as follows:

- **Application list**, which must include the location and description of the area to be treated, the product name, EPA registration number, and active ingredients of the pesticide, the time and date the pesticide is scheduled to be applied and the REI.
- **Emergency information**, which must include the name, telephone number and address of the nearest emergency medical facility.
- A **pesticide safety poster**, which must be either the WPS safety poster developed by EPA or an equivalent poster as described in the "How To Comply Manual - Criteria for Pesticide Safety Poster"

### **Access to Labeling and Site-Specific Information**

Handlers and workers must be informed of required pesticide label information. Central posting of recent pesticide applications is required.

### **Decontamination Supplies**

Handlers and workers must have an ample supply of water, soap and towels for routine

washing and emergency decontamination, and a change of clothes as specified in the regulation and the How to Comply Manual.

### **Emergency Assistance**

Transportation must be made available to a medical care facility if there is a reason to believe that a worker or handler may have been poisoned or injured by a pesticide used on the agricultural establishment. Information must be provided to medical personnel about the pesticide to which the person may have been exposed.

## **Revisions of the Worker Protection Standard**

The Environmental Protection Agency made several revisions to the WPS in April 1995. The revisions that are pertinent to Connecticut applicators are summarized below.

### **I. Training Requirements**

As of January 1, 1996, employers must provide brief pesticide safety training to untrained agricultural workers before they enter pesticide treated areas. Employers must be able to verify compliance with this requirement. The brief pesticide safety training must consist of those components highlighted on the WPS safety poster and a statement to workers that complete Pesticide Safety Training will be provided before the end of the 6th day of entering a treated area. This differs from the original 1992 WPS, which allowed a 15-day grace period for complete WPS worker training until October 1997.

The basic pesticide safety information must include the following concepts:

- Pesticide may be on or in plants, soil, irrigation water, or drifting from nearby applications.
- Prevent pesticides from entering your body by:
  - \*Following directions and/or signs about keeping out of treated or restricted areas
  - \*Washing before eating, drinking, using chewing gum or tobacco, or using the toilet
  - \*Wearing work clothing that protects the body from pesticide residues
  - \*Washing/showering with soap and water, shampoo hair and put on clean clothes after work
  - \*Washing work clothes separately from other clothes before wearing them again
  - \*Washing immediately in the nearest clean water if pesticides are spilled or sprayed on the body and, as soon as possible, showering, shampooing, and changing into clean clothes.
- Further training will be provided before the 6<sup>th</sup> day that a worker enters any area on the agricultural establishment where within the last 30 days, a pesticide has been applied or a REI has been in effect.

To clarify: before working in an area treated with pesticides, an agricultural worker must receive basic pesticide training. Prior to day 6, he must receive complete worker training as described in the "How To Comply Manual." The complete training information is included in EPA's manual entitled, "Protect Yourself from Pesticides-A Guide for Agricultural Workers", or various EPA approved videotapes. Once a worker receives complete WPS training, he will not be required to be retrained for a period of 5 years.

Nothing in this exception changes the WPS training requirements for agricultural pesticide handlers.

## **II. Exception for Limited Contact Tasks/Early Entry Workers**

Agricultural pesticide labels specify a restricted entry level (REI), usually ranging from 12 to 72 hours. The WPS had limited early entry worker activity in treated areas under an REI to 1 hour in a 24-hour period. EPA granted an exception to the WPS that would allow, under specified conditions, workers to enter pesticide treated areas during an REI to perform limited contact tasks that could not be foreseen and which, if delayed until the expiration of the REI, would cause significant economic loss. Some examples of limited contact tasks that qualify for the exception include: the operation and repair of weather monitoring and frost protection equipment; the repair of greenhouse heating, air conditioning and ventilation equipment; the repair of non-application field equipment; the maintenance and moving of beehives. Some examples of hand labor activities and other tasks which would not qualify for this exception include: harvesting; thinning; weeding; topping; planting; sucker removal; packing produce into containers in the field; operating, moving or repairing irrigation equipment; and performing the task of a crop advisor.

This exception increases the time workers will be able to remain in treated areas under an REI for early entry activities from 1 hour to 8 hours within a 24-hour period providing the following conditions are met:

- 1) The worker's contact with treated surfaces is minimal and is limited to the feet, lower legs, hands and forearms.
- 2) The pesticide product does not have a statement in the labeling requiring workers to be notified both orally and by posting;
- 3) Personal protective equipment for early entry is provided to the worker and must either conform with the label requirements or include at least coveralls, chemical resistant gloves, shoes plus socks, chemical resistant footwear, and protective eyewear (if protective eyewear is required for handlers by the product labeling);
- 4) No hand labor such as hoeing, picking, pruning, etc. is performed;

5) The workers do not enter the treated area during the first 4 hours, and until applicable ventilation criteria have been met, and until any label specific inhalation exposure level has been reached;

6) Before early entry workers enter a treated area under an REI, the agricultural employer shall give them oral or written notification of the specifics of the exception to early entry as indicated on the pesticide label in a language the workers understand.

NOTE: Since this exception allows tasks to be performed during the REI, all persons engaged in the tasks under this exception must be trained as early entry workers as described in the How To Comply Manual or as a Handler prior to performing the tasks, in accordance with WPS.

### III. Exception for Irrigation Tasks

EPA completed an exception to the WPS that allows early entry workers under specified conditions, to enter pesticide treated areas during a REI to perform irrigation tasks related to operating, moving or repairing irrigation or watering equipment. This exception extends the time that a trained early entry worker may remain in a pesticide treated area to perform irrigation tasks from one hour to 8 hours within a 24 hour period.

The terms of this exception further require that the need for the task could not have been foreseen and cannot be delayed until after the expiration of the REI. A task that cannot be delayed is one that, if not performed before the REI expires, would cause significant economic loss, and there are no alternative practices, which would prevent significant loss. (Discussions are currently underway with EPA to address watering needs in the greenhouse setting. At present, **this exception does not apply to routine watering needs in a greenhouse** since the need is not viewed as one that could not have been foreseen)

In addition to the above criteria, the terms of the exception for irrigation activities requires compliance with items 1 through 6 listed above for the limited contact exception.

### IV. Reduced Restricted Entry Intervals for Low Risk Pesticides

The WPS established an interim minimum REI of 12 hours for all end use pesticide products for agricultural uses. However, EPA had been asked to consider reducing the minimum 12-hour REI for certain lower toxicity products. EPA determined that the reduction of the REI for specific low risk pesticides can be accomplished without jeopardizing worker safety and would also promote the use of less toxic products over those with greater risks and longer REI's. Therefore, EPA established a regulation to reduce the REI on 114 lower toxicity products to 4 hours or, in some cases, zero hours. EPA has instructed registrants to revise the labels of affected products to meet certain

criteria. Pesticide users should examine labels closely for stickers or other indications of a reduced REI in accordance with this regulation.

The affected lower risk pesticides generally consist of microbial pesticides, biochemical pesticides and certain conventional agricultural pesticides.

## V. Warning Signs

EPA amended the WPS to modify the warning sign size and language requirement. The amendment allows the substitution of the language commonly spoken and read by workers for the Spanish portion of the warning sign. The sign must be in the same format required by WPS and it must be visible and legible. Use of alternative languages is optional and the use of Spanish/English is always acceptable.

The amendment also allows the use of smaller signs provided that the minimum letter size and posting distance requirements are observed. In nurseries and greenhouses, smaller signs may be used at any time. A small sign may be used on a forest or farm if the treated area is too small to accommodate the standard sign.



For more information on the scope of the WPS, consult the How to Comply Manual or on the Internet at [www.epa.gov/pesticides/safety](http://www.epa.gov/pesticides/safety).

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