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Pumping & Piping Systems

Ornamental Insect Guide

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Introduction: Due to the hot, humid conditions that exist in South Carolina, insects can produce multiple generations throughout the year. Many of these insects feed on ornamental shrubs and trees. Because these types of insects can multiply rapidly, it is important to employ control strategies to eliminate potential damage to landscape plants.

This guide outlines some of the most common insects that can cause damage to ornamental shrubs and trees here in South Carolina. Before insecticides are used to control unwanted insects in the landscape, it is important to identify them properly and to understand their life cycle. Proper identification is crucial to managing any pest. Symptoms associated with insects, diseases, and fertility can often appear very similar in plants. By understanding the life cycle of various insects, proper identification and control strategies can offset their potential damaging impact. Most insects are more vulnerable during certain stages of growth. Insecticide applications during these stages will yield better results and may reduce the need for additional applications.

Most insects feed on a variety of different plant material, but often prefer some types over others. When diagnosing insect damage, it is important to know what type of plant material is being affected and the type of damage that is occurring. New varieties of plant material are released every year that are resistant to many types of pests. Check with local nursery growers in your area to determine which types are bred for insect resistance.

The two different types of insecticides used to control damaging insects are contact and systemic. Contact insecticides kill insects directly and must be applied in a manner to thoroughly cover plants to achieve proper control. Many insects reside on the underside of leaves, so good coverage is essential. Sprays should be made to the point of runoff on plant leaves. Contact insecticides have a shorter residual than systemic insecticides and may need to be applied more often before acceptable control is achieved.

Systemic insecticides are usually applied as a soil drench and are taken up by the plant roots. These types of insecticides take longer to control insects as they must be translocated throughout the plant, but usually give longer protection since the chemical becomes locked into the plant. When insects feed on plants that have been treated with systemic insecticides, the plant essentially becomes toxic to the insect. Systemic insecticides may take as long as 30-45 days before they are fully taken up by the plant. The size of the plant and time of year will dictate how long it takes before systemic insecticides are completely taken in. System insecticides applications should be timed prior to insect pressure.

Note: This guide contains recommendations for insecticides used to control insects on ornamental shrubs and trees. Chemical labels are subject to change without notice. Consult current product labels before making any applications. Some insecticides are not labeled for certain types of plant materials. Applicators should consult current labels for exact directions on insecticide applications. W. P. Law, Inc. does not guarantee or warranty the use of insecticides listed in this guide. Please remember, the label is the law.

Whiteflies

Description

Whiteflies are identified by their yellowish bodies with whitish colored wings. Adult whiteflies resemble small moths that are approximately 2mm in length. While these insects are not true flies, their name derives from their overall white appearance. These insects contain a special gland on their abdomen that secretes a waxy substance that coats their body.

Life Cycle

Whiteflies have four stages of growth. Whiteflies begin as eggs on the underside of leaves. Sometimes whitefly eggs are surrounded by a coating of wax. After the egg stage, whiteflies will develop into crawlers and are very small and can usually only be identified by a hand lens. Crawlers will become mobile for a short period of time and then become immobile. As whiteflies begin to mature throughout the next stage, they develop antennae and legs. Their bodies become oval and flattened and resemble small scale type insects. The eggs usually take 10-12 days to hatch, with the overall life cycle taking around 30-40 days for complete development. Hot weather may shorten the time required for whiteflies to complete maturity. Whiteflies feed on the sap of plants throughout all stages.

Damage

Plants suffering from whitefly infestations can exhibit yellowing, stunted, curled, or dying leaves that fall off the plant. Often sooty mold will be present on the leaves when the whitefly populations are high. Sooty mold is a black, sticky fungus that grows on the excreted honeydew from whiteflies sucking on the sap of plant leaves. Sooty mold does not attack the plant but can lead to poor health due to its ability to block sunlight.

Control Options

There are several control options available for treating ornamentals and shrubs for whiteflies. Systemic insecticides such as Dominion Tree and Shrub, Safari, Merit and Zenith WSP offer systemic long term protection for plants. Because these types of insecticides are usually applied as a soil drench, application timing should be made 30-45 days before whitefly pressure is encountered. A combination of foliar spray and soil drench can provide immediate and long term control against whiteflies. Merit can be applied as a preventative dry application around the base of plants. Merit applications should be made 30-45 days in advance of whitefly hatches to allow the insecticide to be translocated throughout the plant.

Contact insecticides such as Bifen I/T, Malathion, Cyzmic and Permetrol are a good solution for a quick knock down on adult whiteflies, but may need to be applied more often for acceptable control. In case of severe infestation, it is recommended to treat with a contact insecticide to control existing adults and then follow up with a systemic insecticide for long term control. Insecticidal soaps can be applied as a contact insecticide and control adults by causing dehydration of their soft body. Horticultural oils and neem oil work by smothering whiteflies. When using these types of products, pay close attention to label as they have temperature restrictions for when they can be applied.

When using contact insecticides, it is important to completely spray the plants as most whiteflies reside on the underneath side of the leaves. If the leaves are not thoroughly covered, sufficient control may not be achieved.

Contact Insecticides		Systemic Insecticides	
Insecticial Soap	(potassium salts)	Dominion	(imidaclopyrid)
Horticultural Oil	(parraffinic oil)	Zenith WSP	(imidaclopyrid)
Neem Oil	(neem oil)	Merit	(imidaclopyrid)
Malathion	(malathion)	Safari	(dinotefuran)
Permetrol	(permethrin)		
Bifen I/T	(bifenthrin)		
Cyzmic	(lambda-cyhalothrin)		

Aphids

Description

Aphids are a common pest in the home landscape and can be found on a variety of shrubs and plants. There are different species of aphids and their color can vary from green, yellow, black, red, and gray. Aphids are generally pear-shaped and are 1/8" or less in size. Aphids can be either winged or wingless with wingless being the more common. Aphids have tube like structures (cornicles) projecting from the rear of their body that are a key to their identification. Aphids are soft bodied and usually found in masses on the under side of leaves, but can be found on flowers, buds, and stems. Each aphid contains six legs and a pair of antennae. Aphids also contain a slender, piercing structure for sucking sap from leaves.

Life Cycle

Aphids hatch from eggs in the spring after over-wintering from the previous year. New hatches contain all females as male fertilization is not necessary for reproduction. New generations can be produced in as little as 1-2 weeks during hot weather. During warmer months of the year, females give birth to live young. Due to this short reproductive cycle, aphid populations can increase exponentially in a short amount of time. During the fall months, generations of both male and females appear. Once the mating occurs, females will then lay eggs that remain dormant on the bark of trees and shrubs until the next spring.

Damage

Damage from aphids usually appears as yellow, curled, or wilted leaves. Smaller plants such as succulent flowers may be killed by aphids. Larger plants such as trees are not as prone to dying from aphid attacks, but their health can be severely affected if infestation levels are high enough. Often sooty mold will be present on leaves when aphid populations are high. Sooty mold is a black, sticky fungus that grows on the excreted honeydew from aphids sucking on the sap of plant leaves. Sooty mold does not attack the plant but can lead to poor health due to its ability to block sunlight. Some trees such as crape myrtles will have sooty mold build up on the trunk when suffering from aphid infestations.

Control Options

There are several control options available for treating ornamentals and shrubs for aphids. Systemic insecticides such as Dominion Tree and Shrub, Merit, and Zenith WSP offer systemic long term protection for plants. Because these types of insecticides are usually applied as a soil drench, application timing should be made 30-45 days before aphid pressure is encountered. A combination of foliar spray and soil drench can provide immediate and long term control against aphids. Merit can be applied as a preventative dry application around the base of plants. Merit applications should be made 30-45 days in advance of aphid hatches to allow the insecticide to be translocated throughout the plant.

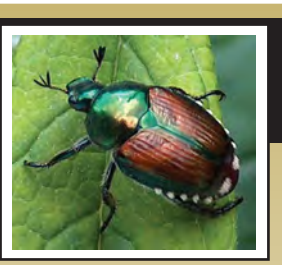
Contact insecticides such as Bifen I/T, Cyzmic, Malathion, and Permetrol are a good solution for a quick knock down on aphids, but may need to be applied more often for acceptable control. In case of severe infestation, it is recommended to treat with a contact insecticide to control existing adults and then follow up with a systemic insecticide for long term control.

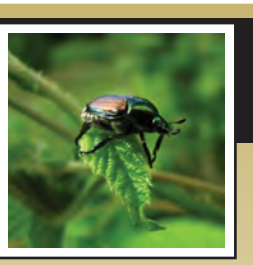
Insecticidal soaps can be applied as a contact insecticide and control adults by causing dehydration of their soft body. Horticultural oils and neem oil work by smothering aphids. When using these types of products, pay close attention to label as they have temperature restrictions for when they can be applied.

When using contact insecticides, it is important to completely spray the plants as most aphids reside on the underneath side of the leaves. If the leaves are not thoroughly covered, sufficient control may not be achieved.

Contact Insecticides		Systemic Insecticides	
Insecticial Soap	(potassium salts)	Dominion	(imidaclopyrid)
Horticultural Oil	(parraffinic oil)	Zenith WSP	(imidaclopyrid)
Neem Oil	(neem oil)	Merit 2.5G	(imidaclopyrid)
Malathion	(malathion)		
Permetrol	(permethrin)		
Bifen I/T	(bifenthrin)		
Cyzmic	(lambda-cyhalothrin)		

Japanese Beetles





Description

Japanese beetles are generally 1/3" to 1/2" in length. They are metallic green in color with copper-brown colored wing covers. They are similar in appearance to several other beetles, but can be distinguished by their white dots along their sides and two at the back of their abdomen.

Life Cycle

The life cycle of the Japanese beetle last for about one year. Japanese beetles will go through four stages of growth including egg, larva, pupa, and adult. Adults begin to appear in South Carolina around mid-May. Soon after their appearance, adult Japanese beetles begin to mate. Mated females will seek grassy areas to begin depositing eggs. After burying down 2 to 4 inches in the soil, females will deposit 1-3 eggs. This process may be repeated up to 16 times throughout the average life span of 30-45 days for females.

Eggs hatch into larvae (grubs) in 10-14 days and feed on grass roots and organic matter through out the warmer months. Grubs will develop through three stages of growth before cooler temperatures arrive in the fall. As soil temperatures decrease, grubs move deeper into the soil until spring arrives and then resume feeding. After four to six weeks of feeding, grubs move closer to the surface and begin to pupate. Pupation last 1-3 weeks before adults begin to emerge in mid-May.

Damage

Japanese beetles first arrived in New Jersey in 1916. As their name implies, Japanese beetles are not indigenous to the US. They have slowly moved south and west at a rate of about 10 miles per year. While they prefer some plant types over others, Japanese beetles are known to feed on over 300 different species of plants. Adult Japanese beetles are most active in June and feed voraciously on leaves of preferred plants. Damage results in leaves that are destroyed, leaving only the veins of the leaves intact.

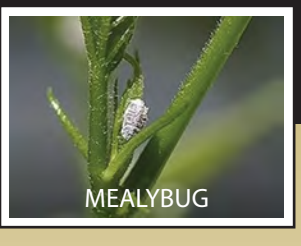
Control Options

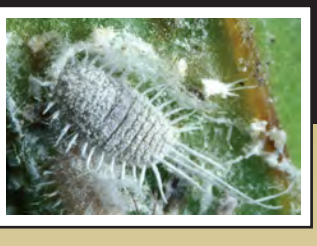
Contact insecticides provide good results for Japanese beetle control. These type insecticides provide quick knock down and are effective for killing adult beetles. Multiple applications may need to be made during prolonged outbreaks to provide sufficient control.

Systemic insecticides such as Dominion Tree and Shrub, Safari, and Zenith provide good protection from adult beetles. Because these types of insecticides are usually applied as a soil drench, application timing should be made 30-45 days before Japanese beetle pressure is encountered. A combination of foliar spray and soil drench can provide immediate and long term control against Japanese beetles. Merit can be applied as a preventative dry application around the base of plants. Merit applications should be made 30-45 days in advance of Japanese beetle hatches to allow the insecticide to be translocated throughout the plant.

Contact Insecticides		Systemic Insecticides	
Insecticial Soap	(potassium salts)	Dominion	(imidaclopyrid)
Permetrol	(permethrin)	Zenith WSP	(imidaclopyrid)
Neem Oil	(neem oil)	Merit	(imidaclopyrid)
Malathion	(malathion)	Safari	(dinotefuran)
Bifen I/T	(bifenthrin)		
Cyzmic	(lambda-cyhalothrin)		

Mealybugs and Scale


MEALYBUG



Description

Mealybugs are scale type insects that feed by sucking the sap out of plants. These small bugs are approximately 1/8" long and pinkish to white in color. Infested plants appear to have strands of cotton attached to them. Mealybugs are mobile throughout their life cycle and infest all parts of the plant.

Scale insects fall into two different categories: soft and armored. There are many species of soft scale throughout the Southeast. Soft scale can vary in color, size, and shape. Scale insects secrete a waxy covering that provides protection while they feed on the sap of plants. On soft scale, this waxy covering is attached to the insect. Armored scale insects differ in that the waxy coating is not attached to the body of the insect.

Life Cycle

Mealybugs and scale insects have similar life cycles. Scale insects either start out as fertilized adult females in the winter or they over-winter in the egg stage. Immobile adult females lay eggs in early spring and then die off. Depending on species, eggs hatch into nymphs known as "crawlers" anywhere from May-June and begin to feed. Males emerge as tiny winged insects and only live for a short time. Once feeding begins, female scale insects start to secrete a protective waxy covering and mature to adulthood. Many soft scale insects do not require mating in order to reproduce and only have one generation per year. Armored scale insects are more likely to produce several generations per year.

Damage

Mealybugs and scale are piercing, sucking insects that feed on the tissue of plants that transport water and nutrients. Leaves can become yellow, curled, and distorted from infestations of these insects. In severe cases, twig death or dieback can occur. Plants that are under stress may show more adverse reactions to insect pressure than those that are healthy. Often sooty mold will be present on leaves when scale or mealybug populations are high. Sooty mold is a black, sticky fungus that grows on the excreted honeydew that is left behind from scale and mealybugs sucking on the sap of plant leaves. Sooty mold does not attack the plant, but can lead to poor health due to its ability to block sunlight. (continued on page 6)


COTTONY CUSHION SCALE


TEA SCALE


OYSTER SCALE


WAX SCALE


ROSE SCALE


HOLLY SCALE


MAGNOLIA SCALE


ARMOREA SCALE


SCALE

Mealybugs and Scale (continued from page 5)

Control Options

Controlling scale and mealybugs can be difficult due to the protective waxy covering they use to protect themselves. Often, conventional insecticides have a hard time penetrating this protective layer which renders them useless. Timing of contact insecticides is important and may require repeat applications. When scale insects are in the "crawler" stage, they are more susceptible to contact insecticides such as bifenthrin, malathion, or permethrin. Scale usually enter this stage from May-June depending on species. The "crawler" stage usually coincides with the first flush of new growth on shrubs.

Horticultural oils provide good control of scale and are effective throughout all stages of growth. Applicators should pay special attention to the label of these types of products as they have restrictions on the temperatures in which they can be applied. Systemic insecticides such as Zenith, Merit and Dominion Tree and Shrub offer good control of soft scale but only suppress armored scale. Systemic insecticides generally take between 30-45 days to be fully taken up into the plant. The time of year and size of the plant will affect how long it takes for these insecticides to provide complete protection.

For mealybug control, either insecticidal soaps or horticultural oils may be used when insects are present. Insecticidal soaps work by drying out the skin of mealybugs and causing dehydration. Horticultural oils act by smothering mealybugs leading to suffocation. Special care should be taken when using these products as some plants may be sensitive to them. Also both of these types of products have temperature restrictions on when they can be applied. Horticultural oils containing paraffin are less likely to have phytotoxic effects compared to those containing petroleum distillates.

Mealybug control by contact insecticides such bifenthrin, malathion, and permetrol should be made when the insect is in the "crawler" stage. At this immature stage, mealybugs are easier control due to lack of a protective waxy coating. This stage is usually present initially during late spring/early summer. Because mealybugs have more than one generation, they may also be present during the fall as well.

For longer term control on mealybugs, systemic insecticides such as Zenith, Merit or Dominion Tree and Shrub offer good results. Because this insecticide is taken up systemically by the plant, the plant becomes toxic to mealybugs when they begin to feed. This option yields longer control periods and takes the guess work out of application timing.

Mealybugs

Contact Insecticides		Systemic Insecticides	
Horticultural Oil	(Parraffinic oil)	Dominion	(imidaclopyrid)
Insecticial Soap	(potassium salts)	Zenith WSP	(imidaclopyrid)
Malathion	(malathion)	Merit	(imidaclopyrid)
Permetrol	(permethrin)	Safari	(dinotefuran)
Bifen I/T	(bifenthrin)		
Cyzmic	(lambda-cyhalothrin)		

Scale

Contact Insecticides		Systemic Insecticides	
Horticultural Oil	(parraffinic oil)	Dominion	(imidaclopyrid)
Neem Oil	(neem oil)	Zenith WSP	(imidaclopyrid)
Malathion	(malathion)	Merit	(imidaclopyrid)
Permetrol	(permethrin)	Safari	(dinotefuran)
Bifen I/T	(bifenthrin)		
Cyzmic	(lambda-cyhalothrin)		

Thrips

Description

Thrips are very small slender insects that are around 1/16”-1/8” in length. Thrips are known to feed on hundreds of different types of plant material. Thrips cause damage to host plants by piercing and sucking of the plant tissue. Their color can be anywhere from yellowish- brown to black. These insects can usually be found on leaves or between flower petals. Thrips have fringed wings and usually require a magnifying glass to be able to see them. Thrips are fast moving insects unlike scale and mealybugs that don’t move. Immature thrips resemble a smaller version of the adult stage. To help identify thrips properly, shake over a white sheet of paper and use at least a 10X magnifying glass to identify them.

Life Cycle

Thrips have six stages of growth throughout their life cycle. During warmer months, development from eggs to the adult stage can occur in as little as two weeks. The first stage begins as eggs. Eggs are inserted into the tissue of host plants and are not noticeable. Thrips will undergo two larval stages. In the first larval stage thrips appear worm-like and are translucent in color. In the second larval stage, thrips take on the appearance of adults, but still retain their translucent color. During the two pupae stages which occur in the soil or in flowers, thrips begin to form wing buds. In this stage thrips do not feed and closely resemble adults. Adults live for around 28 days. There may be as many as nine generations during a calendar year.

Damage

Thrips feed on flowers, small buds, and expanded leaves by piercing plant tissue and feeding on the sap. Damage on leaves can appear as silvery specs with leaves having a dried out appearance. During severe infestations specs of black excrement may be noticeable on leaves as well. Purplish red dots may appear on the underside of leaves as a result of thrip feeding. Leaves can become distorted and curled in some situations. Flowers are also affected by thrip infestation and may show signs of distorted petals. Petals may turn brown, die, and then eventually fall from the plant. Thrips may also be present in flower buds. Buds can become distorted and fail to open as a result of thrips feeding.

Control Options

Thrips can be difficult to control due to the number of generations that can reproduce throughout the year. Controlling thrips with contact insecticides can also be hard to achieve when thrips are located between flower petals. When spraying contact insecticides, spray to the point of runoff and pay particular attention to spraying the underside of plant leaves. Contact insecticides should be applied every 7-10 days until acceptable control is achieved.

Systemic insecticides such as Dominion Tree and Shrub, Merit, Safari, and Zenith offer longer control of thrips. Applications should be made 30-45 days in advance of thrip pressure to allow sufficient time for plant uptake.

Conserve is a microbial insecticide that provides good control of thrips. Conserve is a safer option than other insecticides and can be used as a rotation insecticide to prevent resistance.

Contact Insecticides		Systemic Insecticides	
Insecticial Soap	(potassium salts)	Dominion	(imidaclopyrid)
Permetrol	(permethrin)	Zenith WSP	(imidaclopyrid)
Conserve	(spinosad)	Merit	(imidaclopyrid)
Malathion	(malathion)	Safari	(dinotefuran) *
Bifen I/T	(bifenthrin)		
Cyzmic	(lambda-cyhalothrin)		
		* Suppression only	

Bagworms

Description

Bagworms can infest many different types of plant material but are most devastating on evergreens such as juniper, Leyland cypress, arborvitae, spruce, pine, and cedar. Bagworms are the larval stage of a moth. Bagworms are ½”-2” in length depending on maturity when in the caterpillar stage. The caterpillars have a darkened head while their body is lighter in color. Bagworms are most easily identified by their bag-like structure that they carry with them as they feed. This cone shaped bag is composed of plant material and silk. Because the bag contains pieces of plant material, it is often confused as a small pine cone. Bags attached to bagworms measure anywhere from 1/4 - 2” in length. Once male bagworms mature into adults, they are present as moths and appear black and furry with a clear colored 1” wingspan.

Life Cycle

Bagworms start out as eggs that are contained inside a bag from the previous year’s female. In May, eggs hatch into small larvae that crawl out from the bag. As the larva start to feed they form an attached bag that surrounds them. The female larva never leaves the bag and remains wingless. As males mature throughout the summer months, they will pupate and develop into moths. Adult male moths will take flight and then mate with existing females that remain in the bag. Females will give birth to anywhere from 500-1000 eggs. Females will then die off inside the bag and their eggs will over-winter until May.

Damage

When bagworms are in the first larval stage, damage is light and may only affect the epidermis of leaves in a small area. As the larva mature throughout the summer months, bagworms begin to consume whole leaves and damage is more noticeable.

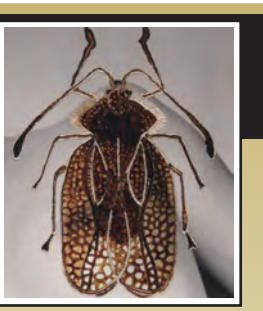
Control Options

For small infestations, picking the bags and destroying them may provide suitable control. Harvesting of the bags during winter and early spring can prevent the eggs from hatching and infesting plants during summer months.
Once eggs hatch in May and the larval stage is present, applications of insecticide will be necessary to prevent further damage. Conserve can be used when larvae are small and young during the early summer. As the larva mature, contact insecticides such as Bifen I/T, Cyzmic, Malathion, and Permetrol should be used to gain acceptable control.

Contact Insecticides

Permetrol	(permethrin)
Conserve	(spinosad)
Malathion	(malathion)
Bifen I/T	(bifenthrin)
Cyzmic	(lambda-cyhalothrin)

Lacebugs



Description

Lacebugs are 1/16”-1/8” in length and have transparent lace-like wings with black markings. Lacebugs are a major pest on azeleas and rhododendrons. Eggs are partially embedded into the tissue of plants covered up with a black tar-like secretion. Lacebugs overall are brownish to black in color and have many spines projecting from their body.

Life Cycle

Lacebugs over-winter in the egg stage that gives way to three or more generations in South Carolina. Eggs hatch in the spring producing nymphs. Nymphs are dark colored, spiny and resemble a smaller version of adults.

Damage

Lacebugs can be detected by a black fecal spec located on the underside of the leaf. Severe infestations leave silvery blotches on the upper surface of plant leaves. Leaves under heavy lacebug pressure become grayish in appearance. Plants under stress from other factors may show more signs of damage.

Control Options

Controlling lacebug depends on the level of cosmetic damage one is willing to tolerate. Insecticide applications should be made under severe conditions as lacebugs can interfere with photosynthesis. Applying insecticides during the early season (March-May) significantly help to control lacebugs. Treating first generation lacebugs often reduces the population to acceptable levels for the remainder of the year. Under high insect pressure, a second application later in the summer can be made to help against second generation lacebugs.

Contact insecticides can be used to provide good control of lacebugs. Applicators should spray leaves to the point of runoff making sure to pay particular attention to coating the underneath side. For longer control of lacebugs, systemic insecticides applied to the soil provide good results as well. Systemic insecticides should be applied 30-45 days in advance of lacebug hatches to provide enough time for the chemical to be taken up by the plant.

Contact Insecticides		Systemic Insecticides	
Insecticial Soap	(potassium salts)	Dominion	(imidaclopyrid)
Permetrol	(permethrin)	Zenith WSP	(imidaclopyrid)
Malathion	(malathion)	Merit	(imidaclopyrid)
Bifen I/T	(bifenthrin)	Safari	(dinotefuran)
Cyzmic	(lambda-cyhalothrin)		

Tent Caterpillars

Description

Tent caterpillars are almost two inches in length and have fine hairs located on the sides of their body. Tent caterpillars are most noticeably identified by a light colored line down the middle of their backs. This light colored line is bordered by reddish-brown lines on either side of it. The sides of the tent caterpillar are mostly dark colored but have blue vertical bars that are bordered by tan colored margins. The head of the tent caterpillar is black. When these insects mature into moths, they measure 1-2" in diameter and are brownish to tan in color.

Tent caterpillars form silky webs in the crotches or forks of tree limbs. These grayish-white nests will enlarge as the tent caterpillars begin to grow.

Life Cycle

Tent caterpillars produce one generation per year. Tent caterpillars start off as eggs that hatch in the spring. Egg hatch usually coincides with bud break on trees during the months of February and March. During the larva stage, tent caterpillars begin to move around and form silky web-like tent structures in the crotch of tree limbs. Tent caterpillars feed primarily at night on the host plant for a period of about six weeks. Feeding usually lasts until May most years. At this point they begin to pupate by constructing white cocoons attached to trees and various structures. Pupation last for about 3-4 weeks until adult moths exit the cocoon. After mating, females will lay an average of 300 eggs. Eggs are dark and shiny in appearance and are laid in bands around twigs. Eggs will over-winter until late winter to early spring.

Damage

Damage from tent caterpillars consist of stripping of leaves from host plants. Host plants include cherry, plum, peach, apple, crabapple, hawthorn, and pear. Cherry and plum trees are the preferred host plants. Tent caterpillars cause damage much earlier in the growing season than most other insects.

Control Options

Tent caterpillars can cause significant damage on host plants by stripping leaves and causing excessive defoliation. Trees are usually not killed as a result, but can become weaken and new growth is often stunted. One method of dealing with tent caterpillars is to remove their web or tent from host trees. Tents should be destroyed to prevent further infestation.
Microbial products such as Conserve can be used to control larvae when they are young. Conserve is a very safe insecticide that does not harm beneficial insects. As larvae mature throughout the growing season, contact insecticides such as Bifen I/T, Cyzmic, or Malathion can be used for better control. Insecticides should be applied with a high pressure sprayer to cover the entire tree and tents.

Contact Insecticides

Insecticidal Soap	(potassium salts)
Conserve	(spinosad)
Malathion	(malathion)
Bifen I/T	(bifenthrin)
Cyzmic	(lambda-cyhalothrin)

Fall Webworms

Description

Fall Webworms form silky webs at the end of tree branches that usually appear during late summer to fall. There may be as many as four generations produced in a year here in South Carolina. Fall webworms are often confused with tent caterpillars. Tent caterpillar webs are present earlier in the year and are located in the crotch or forks of tree branches. Fall webworms worms measure up to one inch in length and are covered with long, soft gray hairs. Fall webworms can differ in appearance when in the larva stage. Some types of fall webworms have a yellowish white body with black heads and others have brownish bodies with red heads. Adult moths are white in color with a wingspan around 1 ¼".

Life Cycle

Fall webworms survive the winter in cocoons in the pupae stage. Cocoons can be found on the underside of leaf debris on the ground or in the crevices of tree bark. Adult moths emerge in the spring. After mating, females lay between 400-500 eggs in masses on the underneath side of leaves in early to mid-summer. Eggs take about one week to hatch. Caterpillars feed for around six weeks. After feeding, fall webworms will drop to the ground and begin to pupate. Fall webworms usually have between 2-4 generations per year.

Damage

Fall webworms feed on foliage within their webs. Host plants include pecan, hickory, persimmon, black walnut, sweetgum, ash, mulberry, willow, apple, and oak with pecan and hickory being the preferred. Damage is seldom bad enough to cause severe damage to the health of host trees. Highly valued ornamental trees may require treatment for aesthetic purposes.

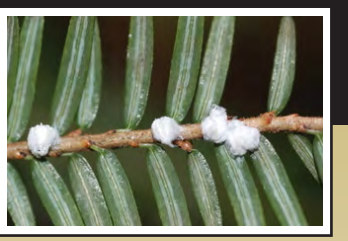
Control Options

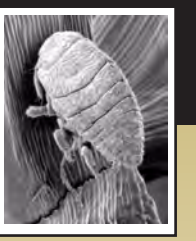
Control options are similar to those of tent caterpillars. Webs can be removed and destroyed to prevent further infestations. Conserve insecticide can be used when caterpillars are small. Conserve is a very safe insecticide that will not harm beneficial insects that feed on fall webworms. Insecticide treatments should be directed into fall webworm webs. Penetrating the webs with the spray will provide effective control. As caterpillars mature and become larger, insecticides such as Bifen I/T, Cyzmic, and Malathion can be used to achieve sufficient control.

Contact Insecticides

Insecticidal Soap	(potassium salts)
Conserve	(spinosad)
Malathion	(malathion)
Bifen I/T	(bifenthrin)
Cyzmic	(lambda-cyhalothrin)

Hemlock Woolly Adelgids





Description

Hemlock woolly adelgids cause extensive damage to hemlocks that are found in the mountainous areas of South Carolina. Both the Eastern hemlock and Carolina hemlock are susceptible to this damaging insect. Hemlock woolly adelgids are small insects only measuring about 1/32" in the adult stage. They are blackish gray in appearance and oval shaped as adults. Crawlers have a reddish brown color. Hemlock woolly adelgids somewhat resemble aphids. During fall months, hemlock woolly adelgids produce a fluffy wool-like secretion that covers and protects their body. During spring months, cottony white egg masses are present under hemlock needles and are easily identified.

Life Cycle

There are two generations of hemlock woolly adelgids produced in South Carolina each year. The crawler stage is present during early summer months from eggs deposited in the spring. During this stage of growth, hemlock woolly adelgids spread out to infest neighboring hemlock trees. Once feeding begins on host trees, hemlock woolly adelgids remain stationary during the summer months. Once fall arrives, these insects become active and begin to secrete the woolly, fluffy cover that is used for protection. Hemlock woolly adelgids reach the adult stage around mid-winter. Females produce eggs without mating that are laid from late winter into spring. The next generation will hatch into crawlers and begin feeding soon after. Crawlers reach adulthood by late spring. The next generation of wingless females are also able to produce eggs without mating. Eggs will hatch in early summer.

Damage

Hemlock woolly adelgids cause damage by feeding on the phloem tissue of hemlocks. These insects use their mouth parts to pierce the base of hemlock needles. Early damage results in needles turning yellow and falling from the tree. Over the course of two years, entire tree limbs may start to die back. Complete tree death can take anywhere from four to ten years depending on the level of infestation. Environmental factors and overall health will also affect the severity of damage from hemlock woolly adelgids.

Control Options

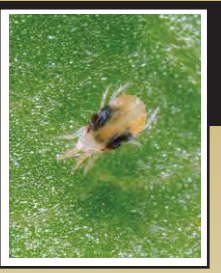
There are both contact and systemic insecticides available for controlling hemlock woolly adelgids. Contact insecticides should cover the entire tree which may be difficult on larger hemlocks without specialized spraying equipment. Horticultural oil and insecticidal soap can be used as a control option when hemlock woolly adelgids are in the crawler stage. These types of insecticides have temperature restrictions on when they can be used. Applications of insecticidal soaps and horticultural oil should be made during the fall months before freezing to limit potential burn and to coincide with the crawler stage. Neither chemical offers residual control, so they should not be used as a preventative.

Bifen I/T or Zenith WSP can be applied as a spray to control hemlock wooly adelgid crawlers during the growing season. These products do not have heat restrictions and give fairly good residual control for potential future infestations.

Systemic insecticides such as Zenith WSP, Safari, Dominion Tree and Shrub, and Merit can be applied to the soil in either spring or fall. These insecticides are taken up by the roots of hemlock trees and give good long term protection. Systemic insecticides should be applied during times of high soil moisture to ensure they are taken up by the plant. Timing is not as critical with systemic insecticides due to their long residual effect. These insecticides cover several stages of development.

Contact Insecticides		Systemic Insecticides	
Insecticial Soap	(potassium salts)	Dominion	(imidaclopyrid)
Horticultural Oil	(parraffinic oil)	Zenith WSP	(imidaclopyrid)
Bifen I/T	(bifenthrin)	Merit	(imidaclopyrid)
		Safari	(dinotefuran)

Spider Mites



Description

There are many varieties of spider mites found in South Carolina. The most common spider mites that cause damage to ornamentals are two spotted spider mite, southern red mite, spruce spider mite, European red mite, boxwood mite, and clover mite. In general, spider mites are very small and measure around 1/50". A 10X hand lens should be used when identifying spider mites. Shake plant material over a white piece of paper for easiest detection. Spider mites are more closely related to spiders and ticks than other insects. Spider mite adults have eight legs and can range in color. Some spider mites are translucent and appear to have spots. The underside of plant leaves may have a grayish cast to them when spider mites are present. This residue stems from spider mite castings that are left behind as they mature. Most spider mites produce a fine, silk webbing found on leaves. In some cases this webbing may cover the entire plant.

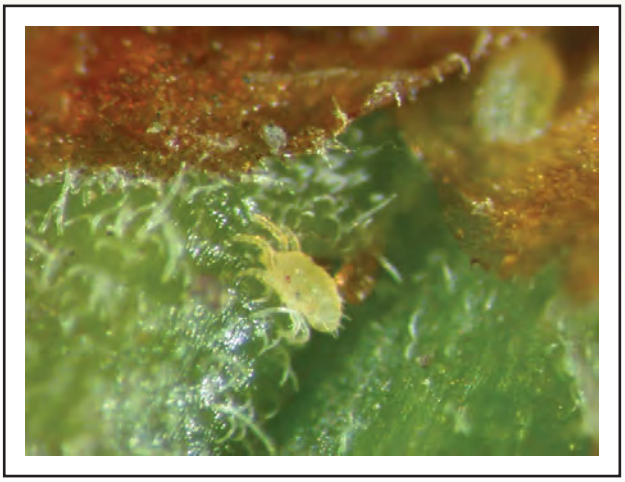
Life Cycle

Female spider mites over-winter as adults in the soil or anywhere they can find protection. As temperatures warm in the spring, females become active again and start to lay eggs. Spider mites go through several stages of development throughout their life cycle. Eggs hatch into larvae anywhere from 3-10 days depending on temperature. Larvae mature into nymphs that undergo various stages of growth. As nymphs molt they shed their chrysalis that remains attached to the plant. Spider mites contain six legs when in the larvae stage and will have eight legs once they reach the nymph stage. Complete development can take anywhere from 5-20 days depending on temperature. Adult females live anywhere from two to four weeks. Multiple overlapping generations occur throughout the year. Spider mite populations peak during hot summer months and into the fall.

Damage

Spider mites cause considerable damage to ornamentals throughout South Carolina each year. Spider mites infect 180 different species of plants and are a major pest due to their quick reproductive ability. Due to their small size, these insects usually go undetected until host plants show considerable signs of injury. Spider mites pierce the epidermal layer of plant leaves and feed off the sap by extraction through specialized mouthparts. These areas of the plant where spider mites feed will produce a chlorotic spot or yellow spot from the collapse of the leaf tissue. During hot, dry weather plant injury is most noticeable. Under severe infestation, plants may appear yellow, bronzed, or dead.

(continued on page 14)



Spider mite damage on oak leaf.

Spider Mites (continued from page 13)

Control Options

There are several different insecticides labeled for the control of spider mites. Rotating different types of insecticides is crucial as spider mites can develop resistance very easily. Contact insecticides such as horticultural oil and insecticidal soaps provide good control without harming beneficial insects that feed on spider mites. The drawbacks to these types of insecticides are that they do not have any residual effect and cannot be used to prevent infestation. Some plants may be sensitive to horticultural oils and insecticidal soaps. Read labels carefully as these types of insecticides have temperature restrictions pertaining to when they can be applied.

Broad spectrum insecticides such as bifenthrin, permetrol, and malathion can be used to control spider mites. These products do a good job of controlling immature and adult spider mites but may harm beneficial insects that help limit spider mite populations. A surge in spider mite populations may occur after using these types of insecticides as eggs from the existing population begin to hatch.

A specialized class of insecticides known as miticides provides excellent control of spider mites. Miticides are very effective because they are specific to mite control. These types of products control mites during many stages of growth and do not target beneficial insects. The only downside to miticides is the cost associated with them.

Contact Insecticides

Insecticial Soap	(potassium salts)
Malathion	(malathion)
Permetrol	(permethrin)
Bifen I/T	(bifenthrin)
Cyzmic	(lambda-cyhalothrin)
Avid	(abamectin)
Floramite	(bifenazate)
Sirocco	(bifenazate) + (abamectin)
Hexygon	(hexythiazox)
Forbid	(spiromesifen)

Ornamental Insect Damage

Japanese Beetle Damage on Grape Leaf

Sooty Mold on Gardenia from Whitefly Feeding

Sooty Mold on Crape Myrtle from Aphid Feeding

Scale Damage on Pittosporum

Thrip Damage on Rhododendron

Bagworm Damage on Leyland Cypress

Lacebug Damage on Azelea

Hemlock Woolly Adgelgids

Spider Mite Damage

Fall Webworms

Tent Caterpillars

Aphids on Rose

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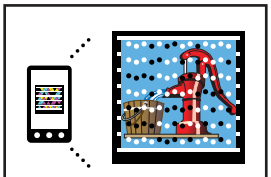

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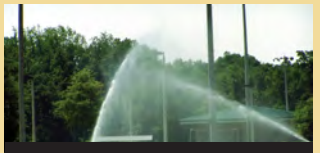
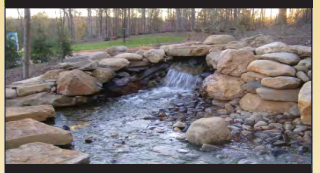
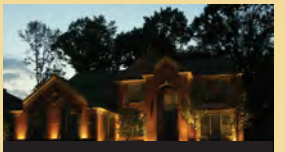


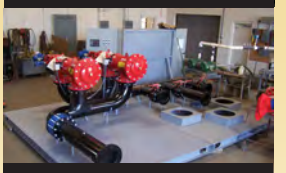
IRRIGATION



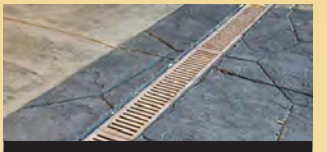
WATER FEATURES



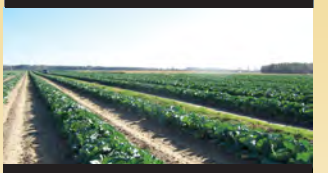
LANDSCAPE LIGHTING



INDUSTRIAL



DRAINAGE



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