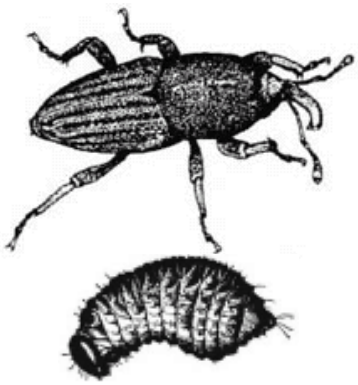
RUTGERS COOPERATIVE EXTENSION AT THE NEW JERSEY AGRICULTURAL EXPERIMENT STATION

PLANT & PEST ADVISORY

LANDSCAPE, NURSERY & TURF EDITION $1.50 JUNE 12, 2003



Bluegrass billbug adult and larva
Source: Ohio State University Extension

INSIDE

Billbug Management in Turfgrass

Albrecht M. Koppenhöfer, Ph.D., Specialist in Turfgrass Entomology

Billbugs are considered an occasional pest of turfgrass in New Jersey. However, billbug damage is often confused with symptoms of **drought stress**, diseases like **dollar spot** or **brown patch**, or injury from **white grubs** or **greenbugs**. Billbugs are more common in Kentucky bluegrass, but can also be found in perennial ryegrass, most fescues, and Zoysia. Species common in New Jersey are **bluegrass billbug**, **hunting billbug**, **little billbug**, and **uneven billbug**. They can be found in various combinations of almost equal abundance. High populations can cause significant injury to home lawns, athletic fields, golf turf, and commercial grounds.

Damage is caused by the larvae initially tunneling the stem and later feeding externally on the crowns and roots. Low billbug populations result in scattered small patches of brown turf that may be misdiagnosed as dollar spot. Large populations cause larger areas of turf to decline as the smaller patches coalesce. The damage normally occurs during late June and July, but will continue into August when the turf is under temperature and moisture stress.

Adult beetles have a distinct beak-like snout or bill, are oval shaped, and 5-7/16″ long. Recently emerged adults are reddish-brown but soon turn grayish to black. The snout, head, and thorax are about as long as the wing covers. The elbowed antennae are attached near the base of the snout. The thorax and wing covers are ornamented with rows of tiny pits that are characteristic for different species. Billbug eggs are oblong and white and about 1/16″ long. Larvae are fat, legless grubs, slightly curved and creamy white with a brown head. There are five larval instars. Mature larvae are about 3/8″ long. Pupae are initially creamy white but turn brown as they mature and resemble the adult.

Billbugs have one generation per year. The adults overwinter in protected areas around the turf stand. During the first warm days in spring the adults migrate from the overwintering sites to suitable feeding areas. In New Jersey this takes place in April to mid May when soil temperatures reach 65°F. After a brief feeding period, the adult beetles mate and the females start laying eggs in holes chewed into the grass stems. They lay around 200 eggs mostly through early July. The eggs hatch in 6 days.

The young larvae tunnel up and down the grass stem and then burrow into the crown. Once the stem becomes hollowed out, the

SEE BILLBUGS ON PAGE 2

BILLBUGS FROM PAGE 1

larvae may exit and bore into other stems. Older larvae migrate into the thatch and soil and feed externally on crowns, roots, and rhizomes. Bluegrass billbug larvae are most abundant in the soil from early July to early August, but other species may occur at later times. Larval development takes 35 – 60 days. Then the larvae burrow 1-2″ into the soil to pupate in small earthen cells. Pupation takes 8-10 days. New adults are abundant in late summer and fall. Adults can be found wandering around on warm afternoons in fall looking for an overwintering site.

Adults crawling over paved areas during May and June, and again in the fall, may signal a potential problem building up in nearby turf. Pitfall traps are an excellent tool for monitoring the spring migration of overwintered adults. The traps have to be set in a hole in the ground with the lip of the cup just below ground level. If billbug counts reach 7-10 every 3rd day, an insecticide treatment targeted against the adult beetles should be considered. Early detection of the larvae is tricky because the young larvae are hidden within the stems. Watch for scattered patches of dead or dying grass beginning in early summer. The presence of billbug larvae can be confirmed using the "tug test", which involves gently tugging yellowing grass stems. If the stems break off easily at the crown and are hollowed out or filled with saw-dust like frass, then larvae are present. Use a knife to check the crown and roots for the larger larvae. A degree-day model is available to predict the presence of the different stages and optimal timing of controls.

The damage from low populations of billbug can be masked with irrigation and good plant nutrition. Endophytic perennial ryegrass and tall fescue are quite resistant. Kentucky bluegrass cultivars that are thinner-leaved, aggressive creepers, or that tolerate heat and drought have been reported as resistant to billbug feeding.

On sites with a history of billbug infestations or where large numbers of adults were observed in spring or the preceding fall, an application against the overwintered adults before they start laying eggs may be considered. This should be done no later than 3 weeks after the adults become active, typically around late April. Effective insecticides for this approach include the diazinon (Diazinon®; not for golf courses, sod farms, turf areas > 1 A) and chlorpyrifos (Dursban®; not for residential turf or where children may be exposed), and the pyrethroids bifenthrin (Talstar®), cyfluthrin (Tempo®), deltamethrin (Deltagard®), lambda-cyhalothrin (Battle®, Scimitar®), permethrin (Astro®). Chlorpyrifos, deltamethrin, and lambda-cyhalothrin are available only for commercial pesticide applicator use. For adult control, apply liquid formulations in 1.5-2 gal/1,000 ft^2. A light post-treatment irrigation (1/8″) before the spray dries may enhance control if low spray volumes are used. After spraying, withhold deep irrigation and mowing for 1-2 days to leave the residues in the upper thatch layer.

For sites with a history of billbug problems, or where heavy adult activity has been observed, the systemic long-residual insecticides imidacloprid (Merit®) or halofenozide (MACH 2®) can be used. Imidacloprid should be applied soon after the adults become active in spring to kill the larvae inside the plants. Halofenozide may work better if applied around early June.

The third approach is the curative control of the larvae once they have moved out of the plants into the root zone. This occurs about 6 weeks after adults become active (around mid-June). However, at this time the crowns may already be severely damaged. Insecticides for this approach include diazinon, carbaryl, and the nematodes *Steinernema carpocapsae* (e.g. Ecomask™, Millenium®, No Flea™) and *Heterorhabditis bacteriophora* (e.g. Heteromask™, Grubstake™ Hb). Applications against the larvae can be done as for the adults except that post-treatment irrigation or rainfall (0.25-0.5″) is essential to move the insecticide into the thatch/root zone, where the larvae are feeding.

For more details check the Rutgers Cooperative Extension billbug fact sheet (FS1015) available through your County Extension Office or on the web at:

http://www.rce.rutgers.edu/pubs/pdfs/fs1015.pdf. ❑

Nutrient & Water Management Workshop for Nurseries

Rutgers Cooperative Extension, the New Jersey Agricultural Experiment Station and the New Jersey Nursery & Landscape Association cordially invite you to a joint Workshop/In-Service Training to be held on June 17 and 18, 2003 at the RCE of Cumberland County Extension Education Center in Millville, NJ. The program is intended to provide an overview and discussions on research/extension work done on nutrient water management for nursery operations. Led by Dr. Gladis Zinati, Rutgers Cooperative Extension Specialist in Nursery Management, the workshop also includes speakers from Maryland, North Carolina, Florida and New Jersey. The event includes: presentations, tours to nurseries, and discussions.

For information on this workshop/in-service training visit the RCE web page at: http://www.rce.rutgers.edu/ under News and Features or under Calendar.

The registration fee is $40 (includes for and beverages for breaks and luncheons for 2 days, transportation fee for nursery tours, binders, bulletins, factsheets, etc. This workshop requires a pre-registration. Please make sure to register before the deadline of June 12. Contact Helen Elwell at RCE of Cumberland County at 856-451-2800. ❑

Update on the White Grub Complex and its Control

Albrecht M. Koppenhöfer, Ph.D., Specialist in Turfgrass Entomology

Last October with the help of the Master Gardener Program, my laboratory and Jim Willmott (Agricultural Agent, Camden County) conducted a second grub survey, larger than the one in 2001. Between the two surveys, a total of 120 sites were sampled in 11 counties from Sussex down to Cape May. Most sites had more than one species present. On average, the grub populations consisted of 61% **oriental beetle**, 14% **Asiatic garden beetle**, 12% **Japanese beetle**, 7% **masked chafers**, 3% **May/June beetles** (*Phyllophaga* spp.), 2% **green June beetle** and 1% **European chafer**. But species composition varied considerably among sites. For each of the 4 most common species, we saw at least 1 site with > 90% of that species. But it is clear that the **oriental beetle** is our No. 1 white grub in turf.

The basic biology of the **oriental beetle** is similar to that of the Japanese beetle and other white grub species. However, there a few but important differences between Japanese and oriental beetle. Adult oriental beetles start emerging about 2 weeks earlier (typically peak in late June in central New Jersey), fly mainly in the evening around dusk (but are not attracted to light), fly only short distances, and don't cause any significant feeding damage. Because they are much less conspicuous than the Japanese beetle, they are more likely to surprise turf managers with sudden damage during dry, hot periods in late summer/early fall.

It's that time of the year again when you should start thinking about white grub management. The question is whether to apply a preventive application that is more expensive and often not necessary, or to take your chances and apply a curative later if it becomes necessary. Between now and late July would be the best time to bring out any preventive application. However, such preventive applications should be restricted to areas with extremely low damage threshold and tolerance, areas with a history of white grub infestations, and areas with high beetle activity (egg-laying) in June-July. The 2 insecticides presently on the market are the neonicotinoid imidacloprid (Merit, Advanced Lawn Season-Long Grub Control, GrubEX) and the insect growth regulator halofenozide (Mach2). Imidacloprid is very effective against oriental beetle, Japanese beetle, and masked chafers (for the latter apply at higher rate: 0.4 lb active ingredient per acre), but provides no control of the Asiatic garden beetle. Halofenozide is very effective against masked chafers and Japanese beetle, but provides only around 50% control of oriental beetle and no control of Asiatic garden beetle.

So, in sites where the oriental beetle tends to be the dominant species, it would appear that Merit is the better choice. But keep in mind that repeated application of the same compound year after year could lead to enhanced microbial degradation of the compound. This would be particularly problematic if the compound is applied several weeks to months before the presence of the target (i.e. before July). Therefore it may be safer to apply Merit only every second year or so. In the other years, halofenozide would provide excellent control of Japanese beetle and masked chafers, and should still take the edge off potential oriental beetle infestations. Because oriental beetles are very susceptible to imidacloprid and take longer to re-infest a site due to their slower dispersal compared to the Japanese beetle, problems with oriental beetle in years following a successful imidacloprid application should also be less likely.

The alternative to preventive applications is the application of curative insecticides when soil sampling has revealed high white grub populations or when damage is starting to show up. This curative control approach works best if applied while the grubs are still smaller (i.e., mid August to early September). Once the grubs have reached the 3rd instar, they are much harder to control. Monitoring and sampling will help you optimize application timing and allow you to restrict treatments to areas that actually have high grub populations.

Only few choices for curative control remain. Trichlorfon (Dylox, Advanced Lawn 24 Hour Grub Control) generally appears to be the best choice with high speed of kill and low binding to thatch. Diazinon (Diazinon) can provide good control but cannot be applied on golf courses, sod farms and generally turf areas > 1 acre (sale of diazinon will stop after 2003). Carbaryl (Sevin, BugBGon Lawn & Soil) appears to be less effective. Nematode products containing the species *Heterorhabditis bacteriophora* (e.g. Heteromask, Grubstake Hb), *Heterorhabditis megidis* (Nemasys H, Grubstake Hm), or *Steinernema glaseri* can be very effective against Japanese beetle grubs, but provide only limited control of most other grub species.

To optimize any grub controls you need to apply the right stuff against the right pest at the right time. Again, you might have to learn those grub raster patterns after all. For more details on white grub biology and management check out my white grub fact sheet (FS1009) available at your County Extension Office or on the web at: http://www.rce.rutgers.edu/pubs/pdfs/fs1009.pdf. ❑

Plant Diagnostic Lab Highlights

Richard J. Buckley, Lab Coordinator

Turf

Believe it or not, as late as last Friday, **pink snow mold** samples were still being diagnosed by laboratory diagnosticians. Samples with **pink snow mold** were submitted from golf courses in Virginia and New York, as well as from Salem, Sussex, Hunterdon, Essex, and Cape May Counties in New Jersey. **Anthracnose** is finally starting to show up in the lab with two samples of annual bluegrass with the disease that were submitted from two Monmouth County Golf Courses. Also of interest, we got our first **annual bluegrass weevils** (small larvae) from a Connecticut golf course, and a sample of **take-all patch** from Philadelphia.

On landscape turf, **dollar spot** and **red thread** are active on low input lawn areas. We are also seeing lots of minor or inconsequential **leaf blight diseases** in residential lawns. These diseases, caused by fungi like *Ascochyta*, *Septoria*, and *Spermaspora* can cause superficial leaf blight during periods of cool, wet weather in the spring and fall. Kentucky bluegrass is the primary host.

Ornamentals

Shade tree anthracnose, once again was the disease most identified this period. Several samples of maple were diagnosed with the disease, as well as ash from Atlantic County, beech from Mercer County, and oak from Passaic County. Have you checked out the sycamore trees around town? Not too many leaves! **Spot anthracnose**, which is caused by the fungus *Elsinoe corni*, was evident on dogwood samples from Cape May County. The fungus *Botrytis* was busy over the last couple weeks. *Botrytis* was diagnosed as the cause of **elliptical leaf spots** on lily samples from two Ocean County residents. **Botrytis blight** was also problematic for Kousa dogwoods submitted from Cape May and Ocean Counties. Finally, the most awesome **pine-pine gall rust** aecial gall was identified on a black pine branch sent to the lab from Atlantic County. **Pine-pine gall rust** is caused by the fungus *Endocronartium harknessii*. ❑

Diseases of Turfgrass

Bruce B. Clarke, Ph.D., Specialist in Turfgrass Pathology

Brown Patch

This disease, caused by the fungus *Rhizoctonia solani*, will develop soon on golf and landscape turf with a return to the hot, humid weather To reduce the incidence and severity of brown patch, avoid large applications of quick release nitrogen sources (e.g., more than ¼ lb actual N/1000 sq. ft) during hot weather, irrigate between midnight and 8 a.m. to minimize the leaf wetness period, and spray turf now with Banner (preventive only), Chipco 26GT, chlorothalonil, Compass, ConSyst, Eagle, Endorse, Heritage, mancozeb, Medallion, Prostar, Spectro, thiophanote-methyl, or Touche per manufacturer's recommendations.

Fairy Ring

This disease, caused by a group of fungi known as *basidiomycetes*, is starting to show up on golf greens and home lawns at this time. Symptoms typically appear as continuous or interrupted rings of dark-green turf. Mushrooms, which are often associated with fairy ring, usually develop in the spring and the fall. Although fungicides are not effective against all species of the fungi that cause fairy ring, Prostar and Heritage have prohibited good control in many university tests. For best results, maintain adequate soil moisture and fertility to mask symptom expression. Spike affected turf prior to irrigation or the application of fungicides to enhance water movement into the soil profile. The use of surfactants may enhance fungicide efficacy and aid in symptom suppression.

Pythium Blight

We will start to see pythium blight soon on golf and landscape turf with a return to hot, humid, weather. Pythium thrives in low or poorly drained areas, especially when the night temperatures are above 70^0F. For best results, improve drainage, water in the early morning hours, avoid over-fertilization, and apply Banol, Chipco Signature, Heritage, Koban, Magellan, mancozeb, Prodigy, Quell, Subdue MAXX, or Terrazole, according to the manufacturer's recommendations.

Summer Patch

In areas with a previous history of summer patch, now is a good time to apply a second application of a fungicide for the control of this disease. For optimum results, apply Banner, Bayleton, Compass, Eagle, Heritage, Rubigan, or thiophanate-methyl in 4 to 5 gal of water/1000 ft^2. Repeat every three to four weeks (every two weeks if using thiophanate-methyl). If fungicides cannot be applied with this much water, irrigate them into the thatch immediately with 1/16 to 1/8 inch of water. Aerification and improved drainage will also aid in disease suppression. Soil pH should be maintained at or slightly below 6.0 for optimum disease suppression.

Turf Field Day

Mark your calendars now for this year's field days. The **Rutgers Landscape Turf Research Field Day** has been set for July 30, 2003 at the Plant Science Research Farm in Adelphia, N.J. Registration will begin at 8:00 AM. Guided tours will commence at 9:00 AM and will conclude at 3:30 PM, "rain or shine." The **Rutgers Golf Turf Research Field Day** will be held on July 31, 2003 at the Turf Research Farm (Ryders Lane) in New Brunswick, N.J. This event starts at 8:30 AM (registration); field tours will run from 9:30 AM to 2:30 PM, "rain or shine." The cost of registration for each day will be $35 (including lunch). Recertification credits will be available at the conclusion of each program. Call Marlene at (732) 932-9400 Ext. 339 for further information or directions. ❑

Diseases of Ornamental Plants

Ann B. Gould, Ph.D., Specialist in Plant Pathology

Why so many foliar diseases this spring?

This spring has been exceptionally wet, and as a result, exceptionally conducive to diseases that affect foliage. You may have noticed spectacular leaf lesions and falling leaves on many landscape ornamentals, including sycamore, London plane, beech, maple, ash, and dogwood. **Botrytis blight**, a fungus that causes a gray fuzzy growth on affected tissue during humid weather, is also rampant in outdoor and greenhouse plantings.

Why is all this wet (and recently humid) weather so important in the disease development process? As you know, living organisms consist chiefly of water, so the presence of water is critical if organisms, both plant pathogens and their hosts, are to grow. Water is also important, however, for the infection process in fungal diseases, which is a series of steps that includes spore germination, penetration through the host epidermis, and fungal growth within the plant tissues. The fungal pathogen (or disease agent) can be particularly vulnerable to drying while it is in the process of trying to infect a plant. For aerial plant pathogens, free moisture and high relative humidity is important for infection of leaf and other above-ground tissues (such as petals, stems, branches, or fruit). This process requires a period of continuous leaf wetness, and this "duration of leaf wetness" varies with the fungus. For example, spores of *Venturia inaequalis*, the pathogen that causes **apple scab**, require 9 hours of continuous leaf wetness to infect leaves and fruit. It stands to reason, therefore, that the amount of natural rainfall would have a great impact on the development of this disease. The excessively rainy weather we've had this spring has assuredly supplied enough moisture for the infection process of many aerial plant pathogens!

Botrytis Blight on Ornamental Plants

As mentioned above, Botrytis blight (or gray mold) is very common on landscape, nursery, and greenhouse ornamentals this year. The very common and widely distributed cause of this disease, *Botrytis cinerea*, readily colonizes dead organic matter and, under the right conditions, attacks many different species of plants. On many greenhouse ornamentals, flowers, leaves, stems, buds, and roots can be affected by the pathogen. Spores may also lodge on surfaces of stems on stock plants, and when cuttings are taken and stuck in the propagating bench, the spores germinate and cause a basal cutting rot. The fungus persists as small hardy structures called microsclerotia and in plant debris as well.

Under the right conditions (high humidity and cooler temperatures), Botrytis blight is often troublesome on flowers or leaves of begonia, carnation, chrysanthemum, cyclamen, geranium, impatiens, marigold, peony petunia, and tulip. Infected petals or leaves may appear faded or have tan, irregular spots. If infected during the bud stage, tissues appear water soaked and the buds will fail to open. Under conditions of high humidity (> 85%), the fungus produces a characteristic gray, fuzzy mycelium on infected tissue. Spores produced on the mycelium move throughout the greenhouse or outdoor planting on air currents. The spores penetrate tissues most often through wounds.

To manage Botrytis blight, keep relative humidity below 85%. Ensure good air circulation and adequately space plants (both in the greenhouse and in outdoor plantings). Remove infected blossoms and other plant parts as part of a regular sanitation program - senescent and dead plant tissues are readily colonized and may serve as a "base" from which the fungus spreads to healthy tissue. Avoid mechanical injury. For bulb crops such as tulip, look for diseased bulbs and discard them.

For chemical control of Botrytis blight, products such as chlorothalonil, copper, Exotherm-Termil (foliage only), fenhexamid, ferbam, fludioxonil, iprodione, mancozeb, Manhandle, myclobutanil, Mycostop, Phyton 27, *Streptomyces griseoviridis*, thiophanate-methyl, Spectro, SysStar, trifloxystrobin, or Ziram may be used. Some of these products are for use in enclosed structures (greenhouses) only; check label for hosts, timing, and rates. No endorsement or preference of pesticides is implied. Follow all label directions carefully when applying pesticides.

NOTE: Although compounds containing thiophanate-methyl or iprodione are registered for control of Botrytis blight or gray mold, isolates of *Botrytis* that are resistant to these compounds may be present. If a treatment applied as per label recommendations is not effective, shortening the interval or increasing the rate will not improve disease control. As a result, another fungicide should be used. To reduce the possibility of fungal resistance in the future, avoid the sole use of any fungicide for extended periods of time when other reliable products are available. ❑

Getting to Know a Few "Backyard Beneficials"

Steven K. Rettke, Ornamental IPM Program Associate

Too often, landscape plant managers ignore or confuse beneficial organisms with insect pests and inappropriately apply control materials. This is especially the case with the larvae or immature stages of beneficial insects. An observant and knowledgeable IPM scout needs to learn how to recognize and conserve these "good guys" so they are not needlessly destroyed. Remember, "*we must look before we shoot*," when spraying pesticides and take advantage of natural pest control that works for free!

The classical definition of biological control is the use of natural enemies to control insect pests. These natural enemies include predators, parasitoids, and pathogens. Pathogens are microorganisms (bacteria, viruses, fungi, protozoan and nematodes) that kill pests. Parasitoids are actually parasites that kill their hosts by their feeding activities. The vast majority of parasitoids of land-scape pests are wasps and flies. This article will discuss some of the more valuable ornamental landscape predators.

Predators

The most common insect predators typically encountered in the urban landscape are ladybeetles, lacewings, and flower flies. These insects are usually, but not always, larger than their prey. They generally are active and fast moving, since they must hunt and capture other insects in order to survive. Each of the three predators listed above must consume much prey to complete their life cycles. With some species, hundreds of individual prey must be consumed before development of the predator can be completed. Although technically not insects, another common but excellent "backyard beneficial" are the predatory mites or *phytoseiids*. The best predators of pest mites (e.g., **two-spotted spider mites**) are often these tiny, but mighty predacious mites.

Lady Beetles

Ladybeetles have been incorrectly called ladybugs by so many for so long, that this common name has become generally accepted, except by entomologists. We have all been able to recognize the adult stage since we were kids, but there are still too many of us who cannot identify the larva stage of the lady beetle. The larvae are 1/8" to ¼" long and are elongate in shape. The segmented body tapers from the front to the back end with many of the body segments containing spines. The color is variable, often showing bright yellow to orange markings, with a black background. Generally, the larger and more brightly colored larvae are those species that feed most heavily upon **aphids**. Alternatively, the smaller, darker and less colorful larvae are species that feed primarily on **scale insects**.

The eggs can be up to 1/8" long, are elongate oval, and yellow or white. Easily observed by those with a keen eye, they are most commonly seen as yellow eggs laid on end in clusters of 10 to 20. Single, white eggs are laid by lady beetle species that prey upon scales and mites.

The most common prey of ladybeetles are **aphids**, **scale insects**, and **spider mites**. Since the larval stage of the ladybeetle feeds most voraciously amongst these prey, it is important to identify this predator. Research has shown 3 to 4 larvae controlling over 300 aphids per 2-foot branch terminals on apple trees. However, when all prey are consumed, ladybeetle larvae may turn cannibalistic and devour one another. Although this behavior limits some of their potential benefits, it does ensure that some individuals will have enough prey to develop to become adults and reproduce to create a next generation. If there is not enough of a food source to supply another generation, the second-generation adults will then leave that area without laying eggs. Once fall temperatures consistently drop below 65°F. most ladybeetles stop activity and search for protected overwintering sites.

Do not always expect outstanding results by purchasing ladybeetles from catalogs (often collected in California) and releasing them in the Northeast in an attempt to provide pest control for landscape ornamentals. They may not find the proper conditions for feeding and egg production, and therefore will provide little to no value. Plus, they typically fly away upon release! Simply conserving the activity of those naturally present can provide meaningful pest control for outdoor ornamental plants.

Lacewings

The larvae of lacewing insects are some of the most useful beneficials found in the landscape. These voracious creatures are sometimes called aphid-lions, and have been described as the "*psychopaths of the insect world*," because they are truly "killing machines." The larvae are 1/8" to 3/8" in length, have a flattened elongated shape and are rather drab brown to gray in color. They have large, deadly fang-like mandibles that are used to impale their victims in order to suck out body fluids.

Lacewings can often be found attacking prey larger than themselves and appear to have nearly insatiable appetites. One larva, for example, may eat 1,000 **spider mites** a day for a period of 15 days. Observations in apple orchards have shown that lacewing larvae have controlled **apple aphids** at a ratio of 1 to 70, and at rates of up to 60 aphids per hour (Note that if this ratio reaches a 1 to 150 level, the predator is overwhelmed and suppression is not achieved). Lacewings prefer mostly soft-bodied insects such as **mealybugs**, **scale insects**, **whitefly** and the eggs of **caterpillars** and **thrips**.

Lacewing eggs are oval, white and are laid on long delicate stalks in groups or individually. The eggs are placed on the ends of the stalks to reduce cannibalism

See Beneficials on page 7

Beneficials from page 6

from siblings. Eggs generally hatch after 6 to 14 days. Since this egg laying appearance is relatively unique within the landscape, they are easily identified when monitoring. After egg hatching, the larvae feed for 2 to 3 weeks before they spin whitish, pea-sized cocoons and pupate while attached to a leaf. The last generation of the season will overwinter as cocoons in the pupal stage.

The adults of lacewings are weak flyers with fragile bodies and are not usually considered to be effective predators. The more common lacewing species in the landscape have greenish bodies, heavily veined wings and are ½″ in length. They primarily feed on honeydew, nectar, pollen and aphids. Lacewing adults can live for approximately 3 to 5 weeks. Although not a great predator, the adult females of some species do require aphids as food in order to stimulate egg production.

Flower Flies

The flower fly (or *syrphid* fly) is an insect that many landscapers have seen but incorrectly identified as a type of wasp or bee. Their hovering flight and yellow to orange band markings on the abdomen help cause this misidentification. Although these beneficial insects are predacious only in the larval stage, they are another important group of predators that rival the abilities of ladybeetles and lacewings. The larvae of flower flies are unknown allies to many landscape plant managers. It is rare not to find at least a few of these 1/8″ to ¼′ long tan or greenish maggots feeding within an **aphid** colony. The larvae also have black markings on their bodies and have pointed anterior and blunt posterior ends.

These larvae will quietly meander over the plant surface methodically grasping one aphid after another. Once this predator spears an aphid with its pointed jaws (i.e., their mouthparts consist of 2 retractable hooks), it raises the prey up into the air and sucks out the fluid contents. A flower fly can destroy aphids in this manner at a rate of one per minute over an extended period of time. It is also significant to note that they are usually the major predator in the fall, since they can function at cooler temperatures than either the ladybeetle or lacewing can. Other than aphids, flower fly larvae also prey upon **leafhoppers**, **scales**, **mealybugs** and **thrips**.

The adults closely mimic the flight pattern of hummingbirds as they hover over flower heads. The adults only feed upon pollen and nectar and are themselves valuable pollinators. In fact, females require pollen from flowers or weeds before they can produce eggs. Adults often require the presence of a couple dozen aphids per leaf before egg laying will be triggered. The eggs of flower flies are flat, 1/8″ long, whitish and finely divided. These elongated eggs are laid individually and attached lengthwise on leaf surfaces among groups of aphids.

Reference: Syllabus of the 1997 Advanced Landscape Plant IPM Short Course, Volume III; John Davidson, Dept. of Entomology, Univ. of Maryland. ❑

Weekly Weather Summary

Keith Arnesen, Ph.D., Agricultural Meteorologist

Weather Summary for the Week Ending 8 am Monday 6/ 9/ 3

	RAINFALL			TEMPERATURE				GDD BASE50		MON
WEATHER STATIONS	WEEK	TOTAL	DEP	MX	MN	AVG	DEP	TOT	DEP	%FC
BELVIDERE BRIDGE	3.68	16.47	3.93	82	43	60.	-6	435	-45	97
CANOE BROOK	3.89	18.69	4.97	73	46	60.	-6	457	14	99
CHARLOTTEBURG	2.73	18.13	4.48	76	40	57.	-7	249	-74	99
FLEMINGTON	2.99	16.33	3.31	77	47	60.	-7	427	-37	98
LONG VALLEY	2.41	14.34	.34	78	42	57.	-7	245	-123	98
NEWTON	2.77	13.20	1.00	75	40	59.	-6	366	-9	98
FREEHOLD	3.27	15.06	2.14	76	51	61.	-7	485	-53	98
LONG BRANCH	3.23	17.01	3.81	74	50	61.	-6	380	-103	95
NEW BRUNSWICK	3.52	15.85	3.16	78	48	61.	-8	444	-133	98
TOMS RIVER	3.24	14.53	1.67	77	46	61.	-4	447	-41	95
TRENTON	3.07	14.44	2.73	74	46	60.	-9	436	-178	95
CAPE MAY COURT HOUSE	3.15	13.48	2.13	74	49	61.	-6	402	-145	96
DOWNSTOWN	2.44	13.79	2.17	73	47	60.	-9	493	-145	96
GLASSBORO	2.91	14.95	2.50	73	49	62.	-7	553	-65	96
HAMMONTON	1.42	11.49	-.63	76	48	61.	-8	520	-89	100
POMONA	3.61	13.47	2.33	76	46	61.	-7	430	-103	95
SEABROOK	1.86	13.25	2.40	74	52	62.	-7	582	-61	96
ATLANTIC CITY MARINA	2.71	10.23	-.37	75	52	62.	-5	411	-93	96
SOUTH HARRISON	2.52	14.59	3.03	73	50	61	NA	553	NA	NA

WES KLINE — GDD BASE 40 PINEY HOLLOW Last Week 142 (Ending 6/2/03) This Week 143 (Ending 6/9/03)

Rutgers Cooperative Extension - NJAES
U.S. DEPARTMENT OF AGRICULTURE
Rutgers -The State University of New Jersey
Plant & Pest Advisory
18 College Farm Road
Cook College
New Brunswick, N.J. 08901-8551

PLANT & PEST ADVISORY LANDSCAPE NURSERY & TURF EDITION CONTRIBUTORS

RCE Specialists and Staff
Bruce B. Clarke, Ph.D., Turf Pathology
Ann B. Gould, Ph.D., Ornamentals Plant Pathology
Steven Hart, Ph.D., Weed Science
Joseph R. Heckman, Ph.D., Soil Fertility
Albrecht Koppenhofer, Ph.D., Turfgrass Entomology
James A. Murphy, Ph.D., Turf Management
Gladis Zinati, Ph.D., Nursery Management
Richard J. Buckley, Coordinator, Plant Diagnostic Laboratory
RCE County Agricultural Agents and Program Associates
Bergen, Joel Flagler (201-599-6162)
Burlington, Raymond J. Samulis (609-265-5050)
Camden, James Willmott (856-566-2900)
Steven Rettke, Program Associate IPM
Cape May, Russell Blair (609-465-5115)
Cumberland, James R. Johnson (856-451-2800)
Essex, Jan Zienteck, Program Coordinator (973-353-5958)
Gloucester, Jerome L. Frecon (856-881-4191)
Hunterdon, Winfred P. Cowgill, Jr. (908-788-1338)
Mercer, Annette Capp, Program Associate (609-989-6830)
Middlesex, William T. Hlubik (732-745-3443)
Monmouth, Richard G. Obal (732-431-7261)
Morris, Pedro Perdomo (973-285-8307)
Somerset, Nick Polanin (908-526-6293)
Sussex, Brian Oleksak, Program Associate (973-579-0985)
Union, Madeline Flahive-DiNardo (908-654-9854)
Warren, William H. Tietjen (908-475-6505)
Newsletter Production
Jack Rabin, Associate Director for Farm Services, NJAES
Cindy Rovins, Crop Management Communications Editor

For back issues, visit our web site at: www.rce.rutgers.edu/pubs/plantandpestadvisory