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PLANT & PEST ADVISORY

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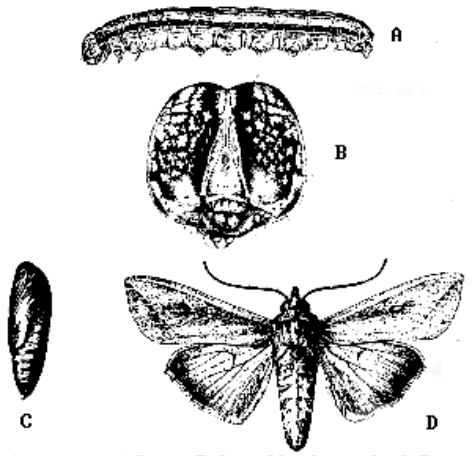

Armyworm. A, Larva. B, Larval head capsule. C, Pupa. D, Adult.

INSIDE

Armyworm Outbreaks in New Jersey Turfgrass

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

The "common" or "true" **armyworm**, *Pseudaletia unipuncta*, only occasionally damages cool-season turfgrasses. However, in the last few days numerous observations of **armyworm** mass occurrence have been reported from Mercer and Monmouth Counties. **Armyworms** feed on a wide range of grasses, especially small grain and other types of "crop" grasses. Turfgrasses are less likely to be attacked, but areas near susceptible field crops are at a higher risk.

Annual **armyworm** infestations in New Jersey result from northward migrations of moths in spring, typically in April. Adult **armyworms** are uniformly pale-brown to grayish-brown moths with a distinct white spot in the center of each forewing (wingspan 1.5") and dirty white to light gray-brown hindwings. The moths become active at dusk, feed on flower nectar, and are attracted to light. Each female moth can lay thousands of greenish-white, round eggs (0.02" diameter) in rows or clusters (25 to several hundred eggs per cluster) on grass foliage. Newly hatched larvae (1/16" long) are pale green and crawl by looping until about half grown. Full-grown larvae (1.5" long) are grayish to greenish-brown, with 2 pale-orange stripes along each body side and a pale-colored, broken stripe down the middle of the back. The head is honeycombed with dark lines.

Young larvae skeletonize the foliage or chew the margins of leaf blades. Serious damage is caused by bigger larvae that chew whole plants down to the crown. Larvae from a given egg mass tend to stay together and feed in the same area until everything has been devoured, usually in roughly circular patterns. Then they migrate en masse in search of fresh food. When disturbed, **armyworms** will often curl into a tight ball. The larvae grow to full size in 3-6 weeks. Pupation occurs in the ground and the moth emerges after 2-3 weeks. There are typically 3 generations per year. The second (June/July) and third (August) generations are most likely to cause damage in turf.

Armyworms are easy to control by spot treating on an as needed basis. To catch potential outbreaks before extensive damage can occur, watch for skeletonized or chewed leaves, piles of frass, or the larvae themselves. Flocks of birds attracted to turf areas or holes pecked in the turf may indicate presence of armyworms or other pests. Almost any

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surface insecticide will provide good control of **armyworms**. To maximize the intake of pesticide residues from the grass by the nocturnally feeding larvae, use liquid applications, apply late in the day, and withhold irrigation and mowing for 24 hours after application.

Effective insecticides for **armyworm** control include organophosphates (e.g., Dursban, Diazinon, Oftanol, Dylox), carbamates (e.g., Sevin), pyrethroids (e.g., Talstar, Tempo, Deltagard, Battle, Scimitar, Astro), the insect growth regulator Mach2, the spinosyn Conserve SC, and entomopathogenic nematodes (products containing *Steinernema carpocapsae* or *Heterorhabditis bacteriophora*). While organophosphates, carbamates, and pyrethroids will also kill natural enemies, Mach2 and nematode products are safe for beneficials. ❑

To catch potential outbreaks of armyworm before extensive damage can occur, watch for skeletonized or chewed leaves, piles of frass, or the larvae themselves.

Preventative Control of White Grubs

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

The arrival of new insecticide chemistry with long residual activity in the soil in the last few years, has added preventative applications as an option in the management of **white grubs**. **White grubs** are the larvae of a complex of scarab beetles including **Oriental beetle**, **Japanese beetle**, **masked chafers**, **European chafer**, **Asiatic garden beetle**, and **Green June beetle**. The two insecticides presently on the market, Merit, a neonicotinoid, and Mach2, an insect growth regulator, can be applied as early as late May and June, respectively, to provide season-long **white grub** control. If applied that early, various other insect pest can also be controlled (Merit and Mach2: **billbugs**, **annual bluegrass weevil**, **greenbugs**; Mach2: **cutworms**, **sod webworms**) or at least suppressed (Merit: **chinch bugs**).

If **white grubs** are the primary targets, the optimal application time for Merit and Mach2 is July when the female beetles are laying eggs. At this time, control efficacy against most **white grub** species is typically in excess of 90%. As the larvae hatch and go through their three larval stages, they become less susceptible to these insecticides (and other insecticides). Applications against the 3rd larval stage in September are not recommended.

Oriental and **Japanese beetle** are very susceptible to Merit and Mach2, and even mid-September applications can still provide around 70% control. **Masked chafers** are less susceptible to Merit, and where this species prevails (typically not in New Jersey), applications should be done during egg-laying (June-July) and at the highest label rate. The **European chafer,** the major pest of low maintenance lawns North and West of New Jersey, appears to be less susceptible to Mach2 and Merit, and applications should be done during the egg-laying period (June) and at the highest label rate. The **Asiatic garden beetle** appears to be immune to Mach2 and even July applications of Merit may only provide around 60% control.

The obvious disadvantage of preventative applications is that they have to be done before **white grub** populations can be estimated through soil sampling. Because **white grub** infestations tend to be localized and sporadic, preventative applications are applied over larger areas than required for grub control. This increases the cost of grub management and may in the long-term dramatically reduce populations of natural enemies by depriving them of prey or hosts. Smart turfgrass managers will restrict preventative applications to high-risk areas, i.e., 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. ❑

Plant Diagnostic Laboratory Highlights

Richard Buckley, Plant Diagnostic Laboratory Coordinator

Turfgrass

Worms, worms, and more worms - **Armyworms** that is! The laboratory received numerous phone reports over the last few days of huge armyworm populations in turfgrass. We finally got a jar-full late yesterday afternoon, and the critters appear to be the **true armyworm**, *Pseudoletia unipuncta*. This is the species identified in Ohio and Pennsylvania, and it is assumed to be the one in New York and Massachusetts. In New Jersey, the reports came from Mercer, Middlesex, Monmouth, Somerset, and Hunterdon Counties. This armyworm generally is not a regular problem in New Jersey turf, but when it is, the damage is quite spectacular. Most reports indicate populations around 100 per square foot. In New York counts as high as 150 caterpillars have been seen. From the size of them, it looks as if the larvae are in the mid- to late-instars. The penultimate instar should be about 1.5 inches long. According to Dr. Paul Heller (Penn State) the outbreak in turf is related to the dry weather in April and May. Corn planted during that time did not germinate on schedule. When the rains finally got here in late-May the storms brought adult moths to the region from the south. With no corn, which had yet to germinate, the next best thing for an armyworm lunch is turfgrass, so here we are. Anecdotal reports suggest that carbaryl is the most effective control material for a quick knockdown. Most other materials will work, but might be slower. Refer to Dr. Koppenhofer's full-length feature (on page 1) in this issue for other insecticide choices. The larvae may be too large for a biorational, like spinosad at this point, but keep Conserve or Dipel in mind for the next generation. Monitor areas around local outbreaks with a soap flush to keep track of the population. Dr. Pat Vittum (UMass) suggests that they are already seeing natural mortality in the field due to parasitism and disease and that the population will do itself in because of its huge size. We think that the next generation will be smaller, but be vigilant in your monitoring. We are looking for a bunch to use in our winter turf classes, so if you have them we would appreciate a jar-full. Please send them to the Plant Diagnostic Laboratory, PO Box 550 Milltown, NJ 08850. Place the specimens in alcohol and use a sturdy box.

Anthracnose is coming into it's own as the disease of the week. Samples with confirmed **anthracnose** were sent to the laboratory from Virginia, Tennessee and Pennsylvania, as well as, from Camden, Essex, Morris, Warren, Salem, Somerset, and Burlington Counties in New Jersey. Field reports of anthracnose control issues with the use of Heritage have been increasingly common, so be sure to rotate and mix your materials in your anthracnose management programs. The other summer diseases are in full swing. **Brown patch**, **Pythium blight**, and **dollar spot** samples were frequent submissions this week. Finally, we are also seeing some ratty looking turf that is simply the result of excess moisture. Locally heavy downpours and tough site conditions are too blame.

Nursery

Cylindrocladium wilt and blight was diagnosed on Leucothoe from a Burlington County container grower. The disease was quite active during the rain and humidity in mid-June. **Phytophthora crown and root rot** was the problem for field grown lilac from a Hunterdon County grower. ❑

Diseases of Turfgrass

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

Bentgrass Dead Spot

This disease will soon develop on sand-based greens and tees in the Mid-Atlantic Region. The causal agent, *Ophiosphaerella agrostis,* induces small reddish-brown spots 0.5 to 1 inch in diameter. Spots usually do not coalesce and only enlarge to 4 inches in diameter. Affected areas eventually fade to a light tan color. Initially, symptoms may be confused with **dollar spot, copper spot, black cutworm** and golf ball injury. However, upon close inspection, black flask-shaped fruiting bodies (*pseudothecia*) can be found embedded in necrotic leaf and stem tissue. Active patches often have a half inch bronzed outer margin. Roots are unaffected and foliar mycelium is not apparent in the field.

Over the past few years, bentgrass dead spot has been identified on numerous bentgrass cultivars and has been most serious on high sand content greens and tees. To date, all reports have come from recently established sites (one to six years old). Outbreaks have not been observed on fairways. Environmental conditions that appear to enhance disease development include hot, dry weather. The disease also appears to be more common in sunny locations than in shaded areas. Although little is known about chemical control, Daconil (chlorothalonil), Cleary 3336 (thiophanate-methyl), Fore (mancozeb), Medallion (fludioxonil), and Aliette (fosetyl-Al) have suppressed symptom development in University tests. However, only Medallion is currently labeled for the control of bentgrass dead spot.

Brown Patch

This disease, caused by the fungus *Rhizoctonia solani*, continues to be reported on tees, greens, and home lawns due to the warm, humid weather. To reduce the incidence and severity of **brown patch**, avoid nitrogen applications during hot weather, irrigate between midnight and 8 a.m. to reduce the period

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of leaf wetness, and spray turf with Banner, Chipco 26GT, Cleary 3336, Compass, ConSyst, Curalan, Daconil, Eagle, Fungo, Heritage, mancozeb, Manicure, Medallion, Prostar, Sentinel, Thalonil, or Touche per manufacturer's recommendations.

Pythium Blight

With the return to hot, humid weather, **pythium blight** has recently been reported on golf greens and tees. Pythium thrives in low or poorly drained areas, especially when the night temperatures are above 68 to 70^{0}F. For best results, improve drainage, water in the early morning hours (midnight to 8 am), avoid over-fertilization, and apply Aliette, Banol, Heritage, Koban, mancozeb, Prodigy, Quell, Subdue MAXX, or Terraneb SP, Terrazole, according to the manufacturer's recommendations.

Turf Field Day

Mark your calendars now for this year's Rutgers Turfgrass Research Field Days. The Landscape Turf Research Field Day has been set for August 1, 2001 at the Plant Science Research Farm in Adelphia, NJ. 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 Golf Turf Research Field Day will be held on August 2, 2001 at the Turf Research Farm (Ryders Lane) in North Brunswick, NJ. This event starts at 9:30 AM (registration); field tours will run from 10 AM to 3:00 PM. The cost of registration is $20 ($30 with lunch) for the August 1 field day and $25 (no formal lunch, but a food vendor will be on site) for the August 2 event. Recertification credits will be available at the conclusion of each program. Call Marlene at (732) 932-9400 Ext. 339 for further information or directions. ❑

Vascular Wilt Diseases of Shade Trees, Part II: Verticillium Wilt

Ann Brooks Gould, Ph.D., Plant Pathology

Vascular wilt diseases in shade trees are caused by organisms that disrupt the uptake and flow of water and minerals in xylem tissues. In Part II of this four part series on vascular wilt diseases, Verticillium wilt, an important disease of trees, shrubs, annuals, herbaceous perennials, and vegetables, is discussed.

Introduction

The fungus *Verticillium dahliae*, which is found in cultivated soils all over the world, causes Verticillium wilt in woody species. *V. dahliae* forms small survival structures known as *microsclerotia* that resist degradation and can persist in soil for many years. Microsclerotia germinate when exposed to plant exudates from nearby developing roots. The fungus penetrates the epidermis of these roots, moves into xylem tissues, and is carried up to the canopy. Vascular tissue becomes clogged, and affected branches wilt and die.

Host Range

Many woody plant species are susceptible to Verticillium wilt. These species include: ash, azalea, barberry, boxwood, brambles, buckeye, camphor tree, carob, carrotwood, catalpa, cherry and other stone fruit trees, Kentucky coffee tree, cork tree, creosote bush, currant and gooseberry, daphne, elder, elm, weeping fig, flannelbush, golden-rain tree, grapevine, guayule, heath, hebe, hibiscus, honeysuckle, hop seed bush, horse-chestnut, India-hawthorn, jasmine, lilac, black locust, magnolia, maple, nandina, olive, Russian olive, osage orange, osmanthus, Japanese pagoda tree, peony, pepper tree, persimmon, photinia, pistache, privet, rabbit-brush, redbud, rock-rose, rose, sage brush, salt bush, sassafras, serviceberry, smoke tree, spirea, sumac, tree-of-heaven, tulip tree, tupelo, viburnum, wiegela, winter fat, and yellowwood (Sinclair et al., 1987). In New Jersey, we see Verticillium wilt most often on maple and tulip trees.

Plants that are immune or somewhat resistant to Verticillium wilt are those that limit the spread of the pathogen in the plant. These species include: all gymnosperms, all monocots, apple and crabapple, mountain ash, beech, birch, boxwood, butternut, citrus, dogwood, eucalyptus, firethorn, sweet gum, hackberry, hawthorn, certain species of hebe, hickory, holly, Katsura tree, linden, honey locust, mulberry, oak, oleander, pawpaw, pear, pecan, plane tree and sycamore, poplar, quince and flowering quince, rhododendron, certain species of rock rose, sugarberry, walnut, willow, and Japanese zelkova (Sinclair et al., 1987).

Symptoms

In woody hosts, Verticillium wilt is first noticed as a sudden wilting, scorching, or premature leaf drop on a single branch or on several branches within a portion of the canopy. Leaves may appear light green, yellow, or red, and are small in size. Through the growing season, affected branches progressively wilt throughout the canopy and die, and branches infected late the previous growing season may fail to leaf out the following spring. In nursery stock, seedlings, grafted liners, and 2- to 3-inch caliper trees are often affected by Verticillium wilt. Severely affected trees die.

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In some trees, infected plants may not exhibit symptoms each year, or the disease may progress very slowly over a period of years. In these chronically infected hosts, branch growth is reduced, leaves are sparse, and buds fail to develop. Since the disease reduces the vigor of the host, plants become more susceptible to other diseases, insects, and drought stress. Symptom expression among different species is highly variable and is affected by environmental and soils conditions. In general, Verticillium wilt is more troublesome in sandy loam, loam, and clay soils high in organic matter.

A diagnostic feature of Verticillium wilt common to many hosts is a brown, green, or gray streaking in the wood just beneath the bark of infected branches. In green ash, however, streaking is often absent, making diagnosis difficult. Note that other disease agents can cause streaking in wood, so affected branches must be sent to a laboratory for positive diagnosis.

Disease Management

In nurseries, Verticillium wilt can be a serious problem, so steps should be taken to avoid its introduction to field sites or to reduce inoculum levels in already infested fields. These include:

- rotate all fields regularly
- do not plant susceptible species in nursery sites where *V. dahliae* is known to exist
- eliminate weeds that serve as hosts to *V. dahliae* and increase inoculum levels in soil
- avoid stock from wholesalers with a history of this disease

In both the nursery and the landscape, Verticillium wilt is best managed by planting disease resistant species and cultivars in sites where the disease has been diagnosed. In addition, high levels of nitrogen fertilization may exacerbate disease development. Fungicides are not effective for management of this disease and are, therefore, not recommended.

Sources:

Ash, C. 2001. Verticillium Wilt. Pages 67-68 in: Diseases of Woody Ornamentals and Trees in Nurseries. APS Press, St. Paul, MN.

Sinclair, W. A., Lyon, H. H., and Johnson, W. T. 1987. Diseases of Trees and Shrubs. Comstock Publishing Associates, Cornell University, Ithaca, NY. ❑

Ornamentals Pest Notes

Deborah Smith-Fiola, Ocean County Agricultural Agent, and Steven Rettke, Program Associate in IPM

✔ **PRIVET RUST MITES (GDD = 300 - 800)(PPI = Ruby Horse chestnut)—1st generation:** This eriophyid mite attacks Amur privet and California privet. They are white to yellow in color and spindle-shaped with four legs (not eight). Even with a 10x lens they are difficult to see since the adults are less than ½ mm in length (at least a 30x microscope is recommended). These mites suck leaf juices resulting in a silvery stipple damage, and also inject toxins that cause leaves to cup downward and turn olive green. Premature leaf drop may result with serious infestations. Most damaging activity occurs during the spring and early summer months. Predaceous mites are the most effective natural enemy, but the use of a dormant oil spray to reduce the overwintering adults on privet twigs may be necessary to prevent a spring outbreak. Use a summer oil (1%) or insecticidal soap(1%) in the spring if required to suppress adults and immatures. There are several generations of these mites each year. Curiously, the material carbaryl (Sevin) will work against eriophyid mites as will Cygon (an FQPA restricted material for residential landscapes). Additionally, some of the pyrethroids can provide effective rust mite control.

✔ **BOXWOOD MITE (GDD = 450 - 700) (PPI = Kousa Dogwood ; Cranberry Bush):** This spider mite is neither a true cool or warm season mite since it is usually most active with intermediate temperatures during mid-spring and early summer. Preferred hosts include most boxwood types, but Japanese boxwood is seldom damaged. This adult mite is yellow-tan in color and has long legs. The relatively large eggs are light yellow and overwinter on leaves and twigs. There are several generations a year. Their feeding damage results in foliage with yellow to bronze stippling that may resemble injury caused from thrips. With severe populations, entire leaves may turn yellowish white and premature defoliation can occur. When monitoring for this pest during the winter, look for the eggs underneath stippled leaves caused from previous season infestations. When the boxwood mites are active, they can be found on both the top and bottom of new growth.

Detected overwintering eggs can be destroyed with dormant oils (2-3%). Summer oils (1-2%) or insecticidal soaps can be sprayed to control mild mite populations. With high infestations, the use of a residual miticide may be necessary such as Conserve(with a spreader/sticker), Hexygon (eggs and immatures only), Florimite or some of the pyrethroids (Smimitar/Battle, Talstar, Mavrik, DeltaGard, etc.).

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✔ **COTTONY CAMELLIA SCALE (GDD = 700+ - crawlers) (PPI = Kousa dogwood - end bloom)**: In the more northern climates, this soft scale is most commonly found on holly, yew, euonymus, and maple. This scale gets it name from the conspicuous oval (1/4 inch), white, cottony wax ovisacs(eggs) extending from the female. There can be several hundred eggs contained within each of these ovisacs, which are placed on the underside of leaves before the female dies in late spring. Eggs hatch and the crawlers emerge in early summer. The movement of the immatures remains restricted to the undersides of the leaves. There is only one generation a year and immatures overwinter. Honeydew and sooty mold are the major problems caused by this species.

Even with severe infestations, dieback of twigs or branches is not likely. Symptoms may only include leaves turning a light green color. Beneficials (parasitoids) can provide significant suppression of this scale if pesticides do not destroy them. If heavy honeydew and sooty mold become a problem, then horticultural oil or soap should be applied in order to conserve the beneficials. A dormant oil can also be sprayed against the immatures overwintering on the bark or leaves.

✔ **JUNIPER SCALE (GDD = 707-1260—crawlers) (PPI = Mock-orange):** This imported armored-scale insect is found on the foliage and twigs of primarily Juniper and occasionally Arborvitae. The female covers are circular and white (1/16 inch in diameter). The male covers are white and elongated and are even smaller in size. Yellowish cast skins are attached to the surface of the waxy covering of both sexes. Adult females overwinter on the foliage and there is only one generation each year. With light infestation there are often no apparent symptoms. Significant populations of 10 or more scales per ½ inch of twig can result in yellowed foliage and needle drop. Populations that remain unabated will result in dieback and an unattractive plant. Scales usually build up first on the south side of shrubs or on the side against buildings. Crawlers start hatching by mid-June and can continue well into July. Controls may *not* be required if many beneficials are present (monitor especially for parasitoid emergence holes in covers). Dormant oil sprays can be used and summer oils or insecticidal soaps can be targeted against the crawlers. A late summer systemic insecticide such as acephate (Orthene) can be applied if the crawler stage is missed.

✔ **COTTONY MAPLE SCALE (802-1265):** This soft scale is common on many different shade trees, such as maple, elm, sycamore, linden, but primarily a problem on red and silver maples. The large white egg sacs may be obvious now, but crawlers are hatching. Once hatched out, the crawlers move to the backs of the leaves to feed for the summer. In the fall they move back to the branches to overwinter. As with all soft scales, honeydew is produced and is a problem in heavy infestations, as is leaf yellowing and dieback of branches. A summer oil (follow label precautions) or insecticidal soap to the leaves can give good control. Acephate (Orthene) gives good control when crawlers are feeding on leaves. If the population is light, no action is recommended. It may take 1-2 summers for natural enemies to control the problem. A dormant oil application in late winter will control most scales.

✔ **FALL WEBWORM (1266-1795 GDD)(1st generation larvae):** These caterpillars produce a web similar to the eastern tent caterpillars, except the web is at the *tips* of branches, and the fall webworm never leaves the protective webbing. When they need more food, the boundaries of the web are extended to include more foliage. By the 2nd generation in August/September, some trees are completely engulfed in webbing from this pest. There are many hosts, but some are preferred (mulberry, walnut, elm, ash, apple, hickory, sweetgum). Unsightly webs can be pruned out, or ripped open with a stick or stream of water, usually destroying the caterpillars. These are true caterpillars, so *Bt.* will control them if the application is applied early in their development. The new biorational product called Conserve (a microbial extract), will do an excellent job of suppressing even the large, late instar larvae (for your future consideration, reports from the field this past spring have indicated that Conserve very effectively controlled both Eastern tent caterpillars and gypsy moths during various stages of their development). Numerous other labeled products include Scimitar, Dursban, Tempo, Sevin, as well as others. ❑

Purple Loosestrife-Eating Beetles Help Native Plants Reclaim Wetlands

Robert Chianese, Chief, NJDA, Div. of Plant Industry, Phillip Alampi Beneficial Insect Rearing Laboratory

Purple loosestrife, *Lythrum salicaria*, is a European plant that is now found in all lower 48 states except Florida and has infested thousands of acres of New Jersey freshwater wetlands. It has been declared a noxious weed in a number of states but is not regulated in New Jersey. Purple loosestrife propagates vegetatively and by seed, out competes natural vegetation, prefers full sun but can tolerate 50% shade and a mature plant can produce over two million seeds. To date, it has caused few problems for growers in New Jersey, but loosestrife will thrive in wet meadows, displaces native vegetation used by waterfowl and other native animals for food, shelter and nesting, infests irrigation ponds and can clog drainage ditches reducing water flow. In addition, it will grow in soil with a pH as low as four, which makes it a threat to the cranberry growing area.

There is no satisfactory means, chemical or mechanical, that can be used for controlling purple loosestrife once it has become well established. Although some native species of insects can be found feeding on purple loosestrife, they have little impact on the plant. Two species of purple loosestrife eating beetles, *Galerucella pusilla* and *G. calmariensis*, collected from their native European country and approved for release in the United States by the United States Department of Agriculture, are being raised by the New Jersey Department of Agriculture, Division of Plant Industry's Phillip Alampi Beneficial Insect Rearing Laboratory. At the request of the Department of Environmental Protection (DEP), release of the beetles are being made on a number of state parks and wildlife management areas (WMA). The goal of the program is to raise thousands of beetles in the laboratory and release them in loosestrife infested sites, in an effort to slow the spread and eventually reduce the population of this aggressive plant. The program is receiving some funding from the DEP's, Nongame and Endangered Species Program for release of the beetles on privately owned bog turtle, *Clemmys muhlenbergii*, sites. Bog turtle is on the New Jersey endangered species list and its habitat is being threatened by the spread of purple loosestrife.

Since the initiation of the program in 1997, more than 830,000 beetles have been released and the species are now established in ten counties. Loosestrife is demonstrating moderate to high mortality rates at some of the first release sites, and native vegetation has been observed reclaiming infested wetlands in at least one of these sites. This is an encouraging sign, since the first releases were only initiated four years ago and impacts to the plant were not expected so soon. The Department continues to work with DEP, releasing the beetles in a number of bog turtle sites. In addition the beetles will be released in a wetland mitigation site and state wildlife management sites.

In an effort to help support the program, a fee of $100/1000 beetles is charged for all beetles released on other than state-owned land. To establish the beetle, the laboratory recommends a minimum release of 3,000 beetles/acre on sites with a moderate to heavy purple loosestrife infestation.

Requests for beetles should be addressed to Mr. Daniel Palmer (609) 530-4192, fax- (609) 530-4195, e-mail- Daniel.Palmer@ag.state.nj.us. ❑

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