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Turf Grass TRENDS

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Effective management of Japanese beetles

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JAPANESE BEETLES are among the most damaging turfgrass pests east of the Mississippi River. Unlike many turfgrass insects that feed at only one life stage or on only one plant part, Japanese beetles feed on the leaves and fruits of many weeds, ornamentals and tree varieties as adults—and on turfgrass and other plant roots as grubs. Because of this, turfgrass managers may consider Japanese beetles as two separate pests, each requiring a different strategy for effective control.

Deciding when, where and how to treat adult Japanese beetles is relatively straightforward, but that is not the case for beetle grubs in the soil. The management of Japanese beetle grubs will never be easy. Knowing where, when, how and if to treat for grubs is difficult to determine. Short residual insecticides require a better understanding of when and where to treat for grubs, and public demands that insecticide use be decreased or eliminated dictate that turfgrass managers become increasingly knowledgeable of the ecology of this pest.

Understanding how Japanese beetles live

MOST JAPANESE BEETLES have a one year life cycle—that is, one cycle of adults, eggs and grubs in the soil each year. Adult beetles begin to emerge from the soil in early to mid-summer, with peak populations in the Northeast occurring during the first week in July. Years with unseasonably cool temperatures (such as 1992) may cause an emergence delay of two weeks or longer.

Female beetles have as many as 20 mature eggs to lay soon after they emerge and mate. In many cases, a high number of eggs are laid by females close to the turf from which they emerged. For this reason, some turf areas seem to have high populations of grubs year after year. After laying her first batch of eggs, a female beetle must feed to mature more eggs. Males beetles are attracted to females by a sex lure compound (pheromone) that is given off by females. Both male and female beetles fly to feeding sites soon after initial mating and egg-laying. Feeding adult beetles are closely associated with such weed species as smartweed, wild blackberry, wild grapes, crabgrass, ragweed and cattails, and common ornamentals such as crab apple, wild cherry, peaches, plums, maples, birch, roses, sassafras, mountain ash and linden.

Female Japanese beetles do not simply lay their eggs on the soil surface. They crawl down into the soil 2 to 6 inches to deposit their eggs. Eggs and young grubs are extremely sensitive to temperature and moisture extremes and the soil environment is more moderate and stable at those depths. Under extreme environmental conditions of dryness and high soil temperatures, the eggs may not hatch and young grubs may not survive. The ideal soil for egg laying is well-drained, non-compacted and loamy. This type of soil generally will not flood in rainy periods or dry completely during drought. As a good rule of thumb, soil conditions that are ideal for growing turf are also ideal for growing Japanese beetles.

Locating and controlling grubs

MOST PROPERTIES HAVE AREAS that have the *potential* for grub problems every year, some areas that *will* have grub problems most years and other areas that seldom, if ever, see grubs. This is mainly

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due to the proximity of turfgrass to feeding sites, soil characteristics of the various egg-laying (oviposition) sites, and the wetness or dryness of the year. For example, well-drained hilltops may have heavy grub populations in relatively wet years while poorly drained low areas will have the best conditions for egg hatch and grub survival in very dry years.

. . . turfgrass that is successfully treated in late summer for Japanese beetle grubs will not have to be retreated the following spring. There can never be more Japanese beetles in an area in April and May than there were the previous fall.

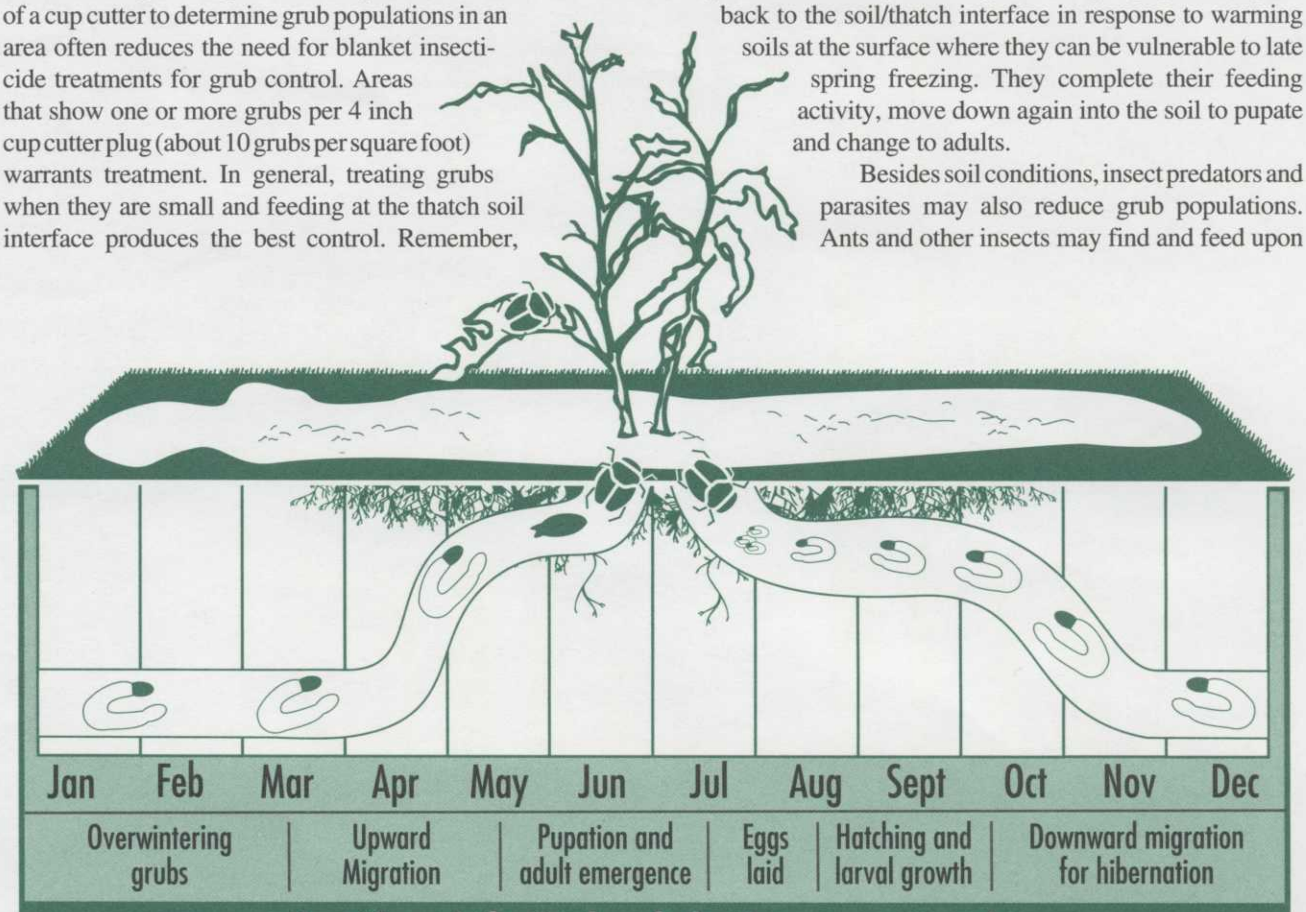
After hatching, the grub or immature feeds on turfgrass roots at the soil/thatch interface. Grubs are often able to escape poor soil conditions by moving down further into the soil. If the soil is hot and dry, grubs may move down several inches to the cooler and more moist depths of the soil. If however, light irrigation is used on a regular basis, the coolest and wettest part of the soil may be the upper root zone, and that is where you should expect to find the grubs.

By early-August grubs are often sufficiently large that feeding damage may be apparent in areas with high infestation levels. Ideally, it is the best time to look for beetle grubs in the soil. At this stage the grubs are still small but easily seen and identified. Early detection of heavy grub populations at this time will give adequate time for you to treat them. The use of a cup cutter to determine grub populations in an area often reduces the need for blanket insecticide treatments for grub control. Areas that show one or more grubs per 4 inch cup cutter plug (about 10 grubs per square foot) warrants treatment. In general, treating grubs when they are small and feeding at the thatch soil interface produces the best control. Remember, because there is only one generation of Japanese beetles each year, turfgrass that is successfully treated in late summer for Japanese beetle grubs will not have to be retreated the following spring. There can never be more Japanese beetles in an area in April and May than there were the previous fall.

It is important to remember that grubs will be moving down into the soil profile to escape from falling temperatures in autumn. Several nights with temperatures below freezing are enough to drive grubs down below the level where insecticides can be effective. Because most insecticides take from several days to several weeks to show maximal effectiveness, turfgrass managers should take care in choosing control materials for late fall applications and take care not to treat too late in the fall.

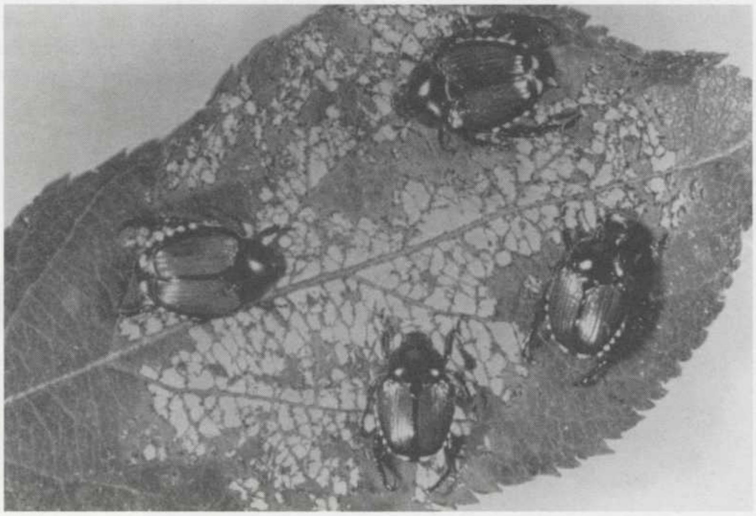
Although Japanese beetle grubs move down into the soil to escape from freezing temperatures, additional mortality often occurs over the winter. This can occur if the grubs are prevented from moving far enough into the soil to escape lethal environmental conditions. Sudden cold spells when there is little snow cover to act as an insulator often causes high over wintering mortality. In the spring, grubs migrate back to the soil/thatch interface in response to warming soils at the surface where they can be vulnerable to late spring freezing. They complete their feeding activity, move down again into the soil to pupate and change to adults.

Besides soil conditions, insect predators and parasites may also reduce grub populations. Ants and other insects may find and feed upon



One Year Life Cycle of the Japanese Beetle

Japanese beetles feeding. Chewing the tissue between the veins in foliage, Japanese beetles can cause severe damage in a relatively short period of time. Pheromone (sex hormone) traps can attract large numbers of adults, but vegetation near the traps may suffer. In addition to attacking ornamental trees and shrubs, adult Japanese beetles also feed on corn silk and can damage a number of crop plants.



grub eggs, while parasitic wasps and ground beetles(carabids) may attack and kill grubs in the soil. Japanese beetle grubs will also attack each other if they are too closely packed in the soil. Although the reason for this predatory activity is not well understood, it may have evolved to allow each grub to have sufficient turf roots to feed on as it grows and develops. One good reason not to use soil insecticides indiscriminately is to preserve the natural predators and parasites found in every soil. Larger vertebrate predators—such as skunks, raccoons and birds—also help to reduce grub populations.

As in human populations, fungal, bacterial and viral diseases (including milky disease) may cause high grub mortality in areas where high grub populations are found. Milky disease of scarab grubs is caused by a bacteria. Every grub species has its own particular bacteria that will cause milky disease in that species. The commercial brand of milky disease is most effective against Japanese beetles and will not infect other grub species very readily.

In soils with high Japanese beetle populations and consistently warm soil temperatures, milky disease builds up in the soil and may reduce grub population below economic damage thresholds after several years. Commercial milky disease in not effective in cooler climates, and where Japanese beetles are not the most common grub species found.

Natural populations of parasitic nematodes may also reduce grub survival. There has been great interest in the possibility of using these nematodes control Japanese beetle grubs in turfgrass. Insect parasitic nematodes may offer a biologic control alternative to conventional insecticides when applied in an inundative release program. Nematodes may be applied through conventional spray equipment, and irrigation requirements are similar to those needed for effective control with chemical insecticides.

Two species of nematodes have shown promise for controlling Japanese beetle grubs in turfgrass, *Steinernema glaseri* and *Heterorhadditis bacteriophora. S. glaseri* was originally described from infected Japanese beetle grubs collected in New Jersey and has the advantage of superior production and storage properties when compared with *H. bacteriophora.* An advantage of *H. bacteriophora* is that their infective stage has a tooth that allows them to enter through the grub's body wall, while *S. glaseri* must enter through an existing body cavity—usually the grub's mouth. *H. bacteriophora* also appears to be superior grub hunters in the soil, allowing them to find and infect grubs more efficiently. Other commercially available nematodes have been shown to be less effective at controlling scarab grubs in turf.

Fungal pathogens also may reduce the number of scarab grubs in turfgrass. In general, warm, moist conditions improve the chance that a fungal disease will reduce grub populations. Indiscriminate use of fungicides to control plant pathogens is not recommended, in part, because such use also reduces populations of beneficial, insect pathogens.

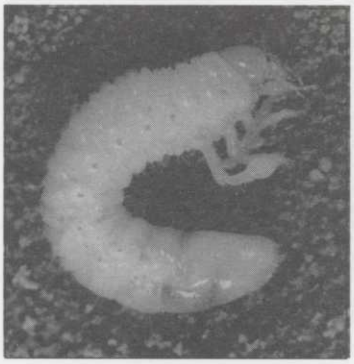
Controlling adult beetles

CONTROLLING ADULT JAPANESE BEETLES may be important for saving valued ornamental plants from feeding damage, but there is no evidence that reducing adult populations will lessen grub damage to turfgrass. Also, the use of Japanese beetle traps will not protect valuable plants or reduce grub damage. These traps, which combine a pheromone to attract adult males and food lure to attract both male and female beetles will draw beetles from long distances. Some will end up in the trap, but many more will end up on surrounding trees and shrubs. The most effective use of a trap to protect your ornamentals is to convince your neighbor to put one in his yard!

The general strategy for controlling adults with insecticides is to treat the foliage in early morning when beetles are actively feeding on the leaves. The beetles will feed on insecticide-covered leaves and also come into direct contact with the insecticide as they rest on the leaves. Because most insecticides work as both a contact and stomach poison, treatment at this time offers the best window of control.

Additives that enhance the adhesion of the insecticide to the leaves and reduce the degrading effect of sunlight (UV) on the insecticide may increase the residual effects of the insecticides on the leaves. Although adults are relatively easy to kill, ornamentals are often repopulated with adults within several days after treatment. For this reason, multiple treatments of insecticide may be needed to protect valued plants. ■

Effects of Milky Spore infection. The grub on the bottom is healthy and the one on top is infected with Milky Spore disease, a bacterial infection that turns the grub's normally clear blood to a milky color before killing them. Sold commercially, the bacteria is one of a number of potential natural controls.



Grub control
Old standbys and new directions

by Christopher Sann

IF THERE IS ONE UNIFYING THEME to the tumult in grub control strategies over the past five to six years, it is that all of the approaches—traditional chemical control, biological (animal, bacterial and fungal based) controls and management strategies—are being closely examined. At this point the main question for turf managers is: how do these approaches mesh with new biologically specific information about grubs and beetles?

New information offers hope of better control

BIOLOGICALLY SPECIFIC INFORMATION about Japanese beetles and other grub forming beetle species has begun to flow from research labs and field tests. In a society that increasingly questions the use of pesticides, turfgrass managers are eager for more accurate information, since it offers a fine-tuned control approach.

New information on the feeding and egg-laying habits of adult beetles, their longevity, and the condition of the reproductive systems of newly emerged female beetles has enhanced the timing factor in traditional chemical control strategies.

There is a considerable amount of new information on the natural occurrence of larval (grub) predators. Surprising levels of natural control have been seen at some test sites. There is new information from initial tests of these naturally occurring predators. The results are hit or miss, but suggest several possible avenues for further study

Management strategies have benefited from the biologically specific information on insect growth, degree day modeling, and information about mortality and endophyte-containing grasses.

Recent past, a confusing era

THE LAST FIVE OR SIX YEARS in the field of traditional chemical grub control have been a mixed bag for turf managers for whom grub control is a significant issue. The introduction early in the 1980's of isofenphos, which is sold under the brand name of Oftanol, offered the chance for season-long grub control for the first time since the removal of chlordane from the turf manager's arsenal of controls.

Early studies, such as tests done at Ohio State University in the mid-1980's, showed that, although isofenphos did not provide the season-long control as was originally claimed, it did provide excellent control over a shorter period of time. Those test results showed exceptional 92% control of overwintering Japanese beetle larva from April applications; however, the control from these April applications, did not extend into the newly hatched generation in August.

As more turf managers used the isofenphos, reports of control failures began to filter in. Tests of soil from four Ohio golf courses that had previously reported control failures after applications of isofenphos confirmed significant degradation of the compound.

Samples of thatch and soil were dissolved in water and introduced into a microbe supporting nutrient solution that contained 10% isofenphos. The degradation was very high after only three days, ranging from 91% to 99%. Subsequent field tests of as many as five formulations of isophenphos—in different soil types and for three different grub species—showed variable levels of control effectiveness.

The use of the formulations was generally successful in upstate New York and throughout Pennsylvania, while applications on Long Island, New York, showed reduced effectiveness for all formulations. These field results were confirmed with laboratory tests. Isofenphos was proving to be a material that could provide excellent control, but under variable circumstances.

Meanwhile, the old stand-by grub control, diazinon, was having its share of problems. After an unfortunate poisoning of geese at a Long Island golf course, the EPA—in a compromise decision made under pressure from environmental groups—canceled the registration of diazinon for applications on golf courses and sod farms. The EPA also reduced the amount of active ingredient that could be legally applied per

Triumph produces effective control levels—in the 90% range, but so far it is only available in liquid formulations that have a high LD50, causing it to be designated as a Restricted Use Pesticide.

thousand square feet. A follow-up series of control efficiency test results put diazinon's percent of control—at the reduced level of active ingredient—only in the 60% range. This series of events put the use of diazinon for grub control under a cloud.

During this same period two new materials, Triumph and Dylox, became available: Triumph produces effective control levels—in the 90% range, but so far it is only available in liquid formulations that have a high LD50, causing it to be designated as a Restricted Use Pesticide. This designation has caused some problems for both applicators and potential formulation manufacturers. The applicators have stricter safe handling requirements to meet, in addition to questions about the use of the material on home lawns or in populated areas. Because of concerns about the high toxicity of the product, a major formulator shelved the introduction of a granular formulation of Triumph, although it was showing highly effective control levels.

Dylox shows excellent high knock down of even large, mature grubs, but, because it penetrates rapidly into the soil, it remains in the grub-containing zone for a relatively short time. These characteristics make the precise timing of Dylox applications very important.

Uncertainty leads to look at alternatives

WITH ALL THE UNCERTAINTY INVOLVED in the use of traditional chemical controls, there has been an increasing look at alternative, "natural" materials. These alternative materials include the well-known Milky Spore disease, as well as pathogenic protozoas, fungi, and nematodes.

A Connecticut survey studied the occurrences of natural predators on seven larval stages of various beetle species with some surprising results. Grubs were harvested from 49 locations and checked for the occurrence of natural predators. The parasitic

Common insecticides used for grub control

Trade name	Active ingredient
Oftanol	Isofenphos
Dursban	Chlorphryfos
(name varies)	Diazinon
Sevin	Carbaryl
Dylox	Trichlorfon
Proxol	Trichlorfon
RESTRICTED USE PESTICIDES	
Turfcam	Bendiocarb
Triumph	Isazophos
Mocap	Ethoprop

This table does not include application rates or prices due to the variability of the available formulated products. Follow labeled instructions when making applications.

infection levels varied widely, according to the species of the larva recovered and the type of parasitic organism involved. The infection levels were as low as 1%–2% for some species of larva and parasites, but were in the teens for others. One microsordium had an overall average infection rate of about 25%, even though it was only present at 70% of the recovery sites. Some sites had infection levels that were as high as 80–90%. The fact that the vast majority of the larva that were harvested were actually introduced to the sites showed that the levels of naturally occurring parasites was quite varied and higher than anticipated.

Promising parasites have produced inconsistent results

ADDITIONAL TESTS HAVE BEEN RUN to try to find out which of these naturally occurring predators showed the highest levels of control in the field, as well as the most

Nematode. Nematodes are parasitic worms. Several varieties are being tested for potential use as natural controls on Japanese beetle grubs.

effective methods of application.

One test studied the relationship between two promising pathogenic nematodes and application water levels. The results showed that these two species showed maximum control levels when applied with .25 inches of water, and reached control levels of 53% and 73%—a level that is comparable to some traditional chemical controls.

> **Isofenphos is still a viable control material, when some precautions are taken. It still can be used for longer-term grub control, 6–8 weeks, on sites where grubs are an ongoing problem and where there has been no history of control failures.**

Unfortunately, as further tests were conducted on promising species of parasites, the results have been variable —as illustrated by the test of a parasitic nematode as control for mole crickets. The promising nematode was tested under varying conditions of soil moisture, exposure time, application density and temperature. The researchers even looked at the age of the nematodes to see if that variable had an effect. The low infection efficiency did not change significantly under any of these laboratory conditions. The nematode had showed promise in the field, but it failed to produce confirming results in laboratory testing.

A recent study, which summarized the results of 380 applications of parasitic nematodes to 82 test sites, found that most of the test failures might be explained by the use of unsuitable strains of nematode or poor environmental conditions. More research may yet identify the right combination of biological ingredients and environmental conditions that produce a "natural control" with a broad potential for usage, but tests even of highly promising parasites have shown maximum control rates only under very narrow environmental conditions.

One strain of bacteria was shown to be highly effective at infecting Japanese beetle grubs:

- IF APPLIED IN THE FALL,
- WITH SOIL TEMPERATURES greater than 68°F (20°C),
- ON SILTY CLAY SOIL,
- WITH 1-4 DAY IRRIGATION FREQUENCY
- AND WITH LESS THAN 3/8 INCH OF THATCH.

The obvious limitations of these optimum conditions means that widespread use of this biological control is also not likely anytime soon.

Biologically specific information has helped

A CONSIDERABLE AMOUNT OF INFORMATION on the biology of a number of turf-damaging beetles has become available in the past few years. This information can be used to fine tune management practices.

A test of June beetle eating and egg-laying habits found that when the adults had a chance to feed their longevity increased by 54% (23 vs. 15 days) and they laid 89% more eggs (51 vs. 27 eggs). A test of the reproductive systems of newly emerged female Japanese beetle adults found that the systems were not fully developed and, though they developed rapidly, most of the beetles did not reach maturity until late in the adult emergence cycle.

Other turf-damaging insects have been studied to see if their life cycles lend themselves to Degree Day modeling *(see page 7 "Terms to Know").* The life cycles of other turf-damaging insects, such as fruit flies, were found to be predictable using Degree Day modeling, and some of the sixteen different species of sod web worms were also found to be subject to degree day modeling. Although Degree Day models for the many species of turf-damaging beetles have yet to be developed, the fact that other species of turf-damaging insect life cycles lend themselves to this modeling technique gives hope that specific models will also become available.

A study in New Jersey of the feeding habits of billbugs on both high-endophyte tall fescue varieties and on endophyte-free tall fescue varieties found that there was little difference in the feeding between the varieties. There was however significantly higher mortality rates on billbugs feeding on high-endophyte varieties. The results of this test show that the effects of high-endophyte turfgrass varieties on the feeding of turf-damaging insects is after the turf damage has been done.

What affect does this information have on field practices?

NOW THAT THE EVENTS IN THE FIELD of chemical control have quieted, turfgrass managers are left with a reduced set of control options. The use of the currently available chemical control materials has been tightened and the when and where of their use has come into clearer focus.

Isofenphos is still a viable control material, when some precautions are taken. It still can be used for longer-term grub control, 6–8 weeks, on sites where grubs are an ongoing problem and where there has been no history of control failures. As a precaution, researchers who have studied isophenphos degradation are recommending that it not be applied at a site for more than 2–3 consecutive years. Alternating isophenphos with other materials may well forestall the development of high populations of degrading parasites and allow its use into the foreseeable future. So far this degradation has not been confirmed for other materials, although the possibility does exist.

The other available chemical control materials—such as diazinon, Triumph, and Dylox—continue to have their places in grub control strategies. Diazinon, though not a material for sites with heavy infestations, can be effectively used at low to moderate infection level sites. It is particularly useful at sites that need a second, late season control application for surface active insects. Triumph seems to be a material better suited to larger sites with available irrigation, although it probably would find wider use by the lawn care industry if it were available in a granular formulation. The use of Dylox should be restricted to curative applications, for it is very effective at high density infestations and the control of mature grubs.

The "natural" alternatives research is in a consolidation phase

THE INITIAL FLUSH OF EXCITEMENT about natural alternative control measures has subsided as the slow research process gets into high gear. There is more than enough survey information on the prevalence of naturally occurring predators to move the examination of these materials into the nuts and bolts phase.

Which materials can be confirmed as promising controls, under what circumstances are these materials effective, do these circumstances translate into materials that can be effective in the field, are these materials mass producible or applicable and can it all be done in a cost effective manner? These questions must be answered before these materials can be marketed as effective alternatives. The recent failure of the "Milky Spore Disease" produced by the Ringer Corporation illustrates how problematic the production of known alternative materials can be—let alone the finding, production and marketing of new materials. Industry sources estimate that the mass introduction of alternative materials at 10 to 15 years—if at all.

Managing sites and strategies has come into tighter focus

BIOLOGICALLY SPECIFIC INFORMATION helps turf managers to make more accurate decisions about whether to apply control materials preventively or whether to wait and apply materials only when needed.

Information about high-endophyte grass varieties has shown they will help reduce populations of feeding insects, but their use will not alleviate the need to monitor the amount of damage done—particularly to highly maintained sites. Information on feeding, egg-laying and longevity of adult beetles helps managers of marginally infected sites to fine tune the applications to the end of the adult emergence cycle. Monitoring adult populations and beetle species in marginally infected sites can eliminate the need for chemical applications.

The potential Degree Day modeling of turf-damaging beetles offers the greatest hope to turf managers for fine tuning control applications, be they alternative or chemical. As this management practice is explored for grubs and other turf-damaging insects, precision applications, or the promotion of alternative environments, may become the norm.

Turfgrass managers will have to bide their time

FOR NOW GRUB CONTROL means chemical control. Whether the future holds viable natural alternatives is still very much in question. Turfgrass managers must bide their time until that point and continue to refine their strategies for control of the complete spectrum of sub-surface and surface active turf-damaging insects. ■

TERMS TO KNOW

chlordane .... A banned insecticide formerly used to control soil grubs and termites in and around structures.

Degree Day modeling ... A way of calculating emergence times, using the total number of degree days, which is expressed as a range. A degree day is the difference between the average daily temperature and a base starting temperature, which is usually chosen because it represents a theshold of activity above minimal levels.

endophyte .... A bacteria that is present in plant in a symbiotic, or mutually beneficial, relationship. The waste products of this bacteria have proven to be powerful naturally occuring insecticide. In some cases, they have demonstrated some degree of disease control. They are present in some varieties of grass and not present in others.

isofenphos .... The active ingredient in the insecticide Oftanol.

LD50 .... The amount, in parts per million, of a material required to kill 50% of a representative population. LD literally stands for lethal dose. It is the numerical representation of a material's potential toxicity.

microspordium .... A small asexually produced, parasidic spore.

Milky Spore disease ...... A disease of grubs caused by a specific bacteria.

mole crickets .... A species of cricket that lives by burrowing in turf.

nematodes .... Small worms, some of which are parasitic, that are being studied as potential grub controls.

oviposition .... Egglaying.

protozoas .... Single cell animals.

BACK-AT-THE-OFFICE

Recording hazardous waste water

IF YOU HAVE NOT ALREADY REVIEWED your operation for compliance, get started on the process with the following general checklist. Also, individual states and localities may have even more stringent standards, so check with your state and local authorities to make sure that you are in compliance with their rules *(see page 9 under "Regulatory Watch")*. ■

If you check any of the following items, you probably have a compliance problem.

HAZARDOUS WASTE WATER CHECKLIST

PROBLEM MATERIALS

- ❑ Canceled pesticides
- ❑ Unused, left-over tank mixes that will not be recycled
- ❑ Materials considered to be carcinogenic
- ❑ Spill clean-up residues in quantities exceeding 220 lbs. or 1/2 of a 55 gal. drum
- ❑ Unusable mixture spills in containment areas from mixing or loading operations
- ❑ Left-over mixes from pesticides designated as hazardous
- ❑ Pesticides or pesticide mixtures placed in unmarked containers

PROBLEM CONTAINERS

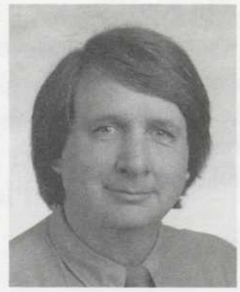
- ❑ Unrinsed pesticide containers
- ❑ Pesticide containers that have been rinsed less than three times
- ❑ Triple rinsed containers that have not been drained for 30 seconds
- ❑ Empty paper pesticide containers that have plastic liners and have not been triple rinsed

PROBLEM PRACTICES

- ❑ Dumping tank rinse water onto ground or into drains
- ❑ Storing left-over tank rinse water that is not to be recycled
- ❑ Storing left-over mixes of materials designated as hazardous and non-hazardous
- ❑ Burning rinsed pesticide containers contrary to labeled instructions
- ❑ Storing old or out of date pesticides
- ❑ Having any leaking pesticide containers
- ❑ Washing the outside of pesticide application equipment on the application site within 300 yards of a well, creek, pond, lake, drainage ditch, or storm drain.

INTERACTIONS

COMMENTS & OBSERVATIONS



Posting: It's a matter of courtesy

by Christopher Sann

POSTING INVOLVES PLACING two or three small warning signs around a site after applying a pesticide. Sounds fairly simple, but some people's perceptions of it are clouded by the complexities of the environmental awakening and the whole series of related controversies that have occurred over the last 10 to 20 years.

Posting is a required procedure around agricultural fields, orchards and nursery growing areas, where it is primarily aimed at protecting workers. Posting tells the workers what material has been applied and how long they should wait before re-entering a treated site.

Is posting a big imposition on our industry? Not in terms of costs. From a labor stand point it might take one worker an average of three minutes per location to get the signs from the truck and place them around a site. The cost of the labor to place the signs should be about 49¢, assuming a wage rate of $7.50 per hour with a benefit package that costs 30%. The signs, if bought in quantity, should cost about 5¢ apiece—with a cost of 10¢ per site, if an average of two signs are used per site. Thus, the cost of the labor and the signs amounts to about 59¢ per site.

Does posting somehow represent a singling out of our industry? Not at all. The standards for notifying workers and the general public about potential hazards are going up for every industry and every line of business. Despite the inevitable discomforts and disagreements involved in any major change, we are all better off for it in terms of costs, safety, good labor relations, and good public relations.

Getting to where we are today has not been easy, but we have come a long way. Companies that used to tell everyone outside of senior management to mind their own business now have extensive safety and community outreach programs. They tout their safety records and their environmental "due diligence" in their advertising. These issues have gone from skeletons in the closet to selling points. There is still a fair amount of foot-dragging, but many people have realized that there are advantages to getting ahead of the power curve on this issue.

An idea whose time has come

In fact, quite a few people support the idea of posting:

• ENVIRONMENTALISTS

From the proverbial 'wet paint' signs of painters and the 'wet floor' signs used by janitors to the 'please excuse our progress' signs used by highway departments, this kind of courtesy is just plain good business.

- FEDERAL, STATE AND LOCAL government regulators
- MANY TURFGRASS MANAGERS
- MANY HOME OWNERS
- AVERAGE CITIZENS, ALL SIZES, SHAPES

PLCAA (the Professional Lawn Care Association of America) supports the idea. At a recent congressional subcommittee hearing to re-authorize FIFRA, PLCAA recommended requiring all lawncare operators to post sites on which they apply pesticides.

Posting will help notify people to take care when entering the area where a pesticide application has been made. It will notify post office workers, service personnel, delivery people, people walking their dogs, home owners coming home from work, housewives coming home from running errands, latch key kids coming home after school—anyone who might walk onto a treated area. These are all excellent reasons for requiring the posting of pesticide treated turf areas. Taken in toto they provide a overwhelming reason for the adoption of posting requirements on the federal level.

All that having been said—there is one more reason that outweighs all of the above. Put the issue on a personal level. If I am going to apply a pesticide to a turf site, posting the site is a matter of courtesy. From the proverbial "wet paint" signs of painters and the "wet floor" signs used by janitors to the "please excuse our progress" signs used by highway departments, this kind of courtesy is just plain good business.

A modest proposal

IN FACT, I THINK TURF MANAGERS should take this concept of "just plain good business" one step further. I propose that all turfgrass managers voluntarily agree to make a major effort to see that all non-target applications of any material applied to turf sites be removed from any surface where it might become a source of non-point pollution. Put more simply, we should remove any applied materials that have landed on roads, sidewalks, driveways and any location where water may move the materials into ponds, creeks, rivers, bays or any body of water.

From a practical standpoint, granular applications should be swept or blown from these surfaces. Liquid applications require that the applicator be careful to avoid spraying non-target areas.

As practicing turfgrass ecologists—or at least as professionals who read the handwriting on the wall, we should make sure that our activities are not the source of any potential pollution. It is not only the correct thing to do, but any pollution that might develop from the failure to remove these non-target applications could prove to be disastrous to an industry that is struggling to prove to society in general that we are competent professionals and deserving of society's trust. ■

REGULATORY WATCH

Fed issued "final" rules on training for workers who transport hazardous materials

THE U.S. DEPT OF TRANSPORTATION has issued final rules governing the minimum training requirements for workers who transport hazardous materials. Every two years employees, who handle or transport such materials must receiving training aimed at increasing their general awareness as well as specific job and safety training.

Industry group issues new standardized MSDS format

THE CHEMICAL MANUFACTURERS ASSOCIATION reports that it has established new voluntary standards for the format for Material Safety Data Sheets (MSDS). The new format simplifies the reporting of MSDS information and makes it more consistent.

Product labels are no substitute for MSDS's in California

AS OF THIS PAST JANUARY, California began requiring that manufacturers, distributors, and dealers provide MSDS's directly to pesticide purchasers. Unlike many other states, California had exempted this requirement and allowed the pesticide label as a substitute for MSDS's.

Ohio puts labeling of possible carcinogens on the ballot

THE OHIO SUPREME COURT has let stand a carcinogen labeling proposition set to appear on the ballot in November. If approved by Ohio voters, the proposition will require extensive labeling of products that are possible carcinogens or that pose reproductive threats. In addition, chemical companies, farmers and others will have to issue warnings to area residents of possible risks.

Hazardous waste water generator

MANY COMPANIES ARE STILL IN THE PROCESS of determining how the hazardous waste regulations of the Resource Conservation and Recovery Act (RCRA) apply to their operation. Here are two sources of additional information:

- "Understanding the Small Quantity Generator Hazardous Waste Rules: A Handbook for Small Business". Call the EPA's RCRA/Superfund Hotline at **1-800-424-9346**.
- Information packets are also available from several companies that specialize in helping small companies with regulatory compliance, including

  Compliance Corp. of America Inc.
  The Woodland Bldg.
  4243 Dunwoody Club Drive, Suite 103
  Dunwoody, GA 30350-5611. ■

THE LATEST WORD ON . . .

Laser guided fertilizers?

WELL, NOT QUITE—but two universities are testing a new laser-based sensing system for measuring nitrous oxide emissions from agricultural fields. The initial results of the laser testing found higher than anticipated levels, which indicates that the fertilizers applied to the fields are not being used as efficiently as had been expected. As this technique is refined, it may help the turf management industry to improve both the efficiency of turf fertilizers and the techniques and management strategies that are used to apply fertilizers.

Earthworms

A STUDY OF THE EFFECTS of 17 commonly used turf pesticides on earthworm populations has shown that several materials produce high death rates and have residual effects that can last up to five months. Single applications of benomyl, ethoprop, carbaryl, or bendiocarb produced high earthworm death rates of 60–99%. Other insecticides, including diazinon, isofenphos, trichlorafon, chlorpyrifos, and isazophos caused less severe mortality rates in other tests.

Another recent study of earthworms showed that, over a 23-month period, net loss of organic matter is greater and microbial activity is higher in thatch layer samples that contained earthworms than in samples from which earthworms were excluded or eliminated by insecticide use. The earthworms deposited large amounts of mineral soil into the thatch layer samples.

Billbug biology and susceptible varieties

A TWO-YEAR STUDY IN EASTERN NEBRASKA found that adult billbugs emerge from their over-wintering homes in the topsoil in April. Found in the thick thatch layers above the soil, they mated and laid eggs and died as new adults emerged in August. The highest number of billbug eggs were found in the lushest stands of bluegrass at the sites. During the early summer of both years, the naturally occurring larval stage of an unidentified parasite was found inside varying numbers of adult billbugs.

A recent survey of pure stands of various varieties of bluegrass, tall fescue, perennial ryegrass, and creeping fescues found that they were all hosts for the four species of billbugs found in New Jersey. In an associated laboratory test, billbug survival rates in Kentucky bluegrass, ryegrass, tall fescue and bermudagrass were tested. With the exception of the bermudagrass—a less desired host—there was no difference in the three remaining species.

High maintenance impact on fine fescues

FINE FESCUES ARE AN EXCELLENT SPECIES for low to no management situations. They are particularly well-suited to no maintenance situations that tend to the dry side. In a long-term test of the survivability of different turf species, mixtures of different varieties of bluegrass, ryegrass, and fine fescue were seeded, tended until established, and then left with no maintenance other than periodic mowing. After two to three years, the ryegrasses faded, and after five to seven years the bluegrasses faded, leaving the fine fescues as the dominate variety in the test stands. Under these low maintenance conditions, the predominately fine fescue turf stands remained stable for years.

The trend toward higher levels of maintenance can upset that stability, according to another study. As long as fine fescue is maintained under low to moderate management conditions, it has performed well. However, many fine fescue areas are increasingly managed at higher levels, and these stands showed increasing deterioration due to increasing insect and disease damage. Fine fescues are vulnerable to chinchbugs, sod webworms, billbugs, leaf spot, and Pythium diseases.

Dethatching and chinchbug

DETHATCHING CAN HELP reduce chinchbug problems, according to a Michigan study. When chinchbug populations were compared 24 hours after being released, the populations were an average of 329% higher on the thatchy plots than on the dethatched plots.

Also, in a random survey of over 100 home lawns, thatch thickness was greater on infested lawns by an average of 53%. The study looked at other variables, including clipping weight, chlorophyll content and grass species. The data indicated that thatch levels and fine fescue content were the only variables that showed a definite correlation. The higher the fine fescue content and the lower the bluegrass content, the higher the incidence of chinchbug infestation. ■

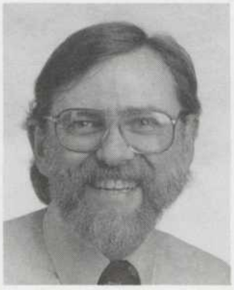
LETTERS TO THE EDITOR

Readers who wish to comment on any aspect of the articles, news items, or commentaries published in *Turf Grass Trends,* or on any issues or concerns raised by them, should do so by writing to:

TURF GRASS TRENDS
2070 Naaman's Rd., Suite 110, Wilmington, DE 19810

Please include a return address. Where appropriate, and as space allows, we will respond to the letters we publish. We reserve the right to edit all letters. All published letters become the property of *Turf Grass Trends.*

Hysteria



by Russ McKinney

THE WORD ITSELF goes back to ancient male notions about women. Behavior that men saw as excessive anxiety and emotional excitability were attributed to disturbances in the uterus.

Hysteria still means over-reaction, but it is, of course, not a feminine exclusive—nor is it confined to the public sector. Industries are just as capable of reacting hysterically—and so are news media and professional environmentalists. In fact, the whole development of environmental awareness over the past 20 years and the resulting, and still ongoing, regulatory changes have been dogged from the beginning by hysteria on all sides. No doubt the hysteria has made everyone's job more difficult.

In an age of unprecedented information, when we all have more facts about everything, why is hysteria still a problem? The short answer is because people's lives, their livelihoods, and their futures are at stake. That clouds and compromises everyone's judgment. It also means that most of us tend to approach the unknown, not with scientific curiosity or journalistic impartiality, both of which require extensive training and experience to develop, but with hardened hypotheses . . . guns at the ready.

The recent comments by Dale Miller, chief executive officer of Sandoz Agro, are based on a similar point. Speaking at a meeting of the National Association of County Agricultural Agents, Miller said, in effect, that pesticide producers should put their guns down and put their energy into cleaning up their act. Over-glowing reports about benefits and inadequate responses to the real problems created by the industry have destroyed its credibility with the public, according to Miller. The question is how to get it back.

I recommend facing "the facts." As a business reporter, I repeatedly found that the facts were a better guide through the forest than strongly held pre-conceptions—my own or anyone else's. In getting to know the field of turfgrass management, I have been impressed by the array of complexities involved and the multitude of fronts on which real progress is being made. Stick with the facts: if they aren't on your side, then you are going the wrong way.

Part of the promise of new knowledge, which represents liberation from hysteria and ignorance, is lost, because we abuse it—by using it to help rationalize our existing ideas, values, and work habits, instead of using it to improve them. This is true for environmentalists as well as industries, and journalists and academic researchers also have to maintain constant vigilance against this tendency.

Of course wonderful as our new knowledge is—many questions always will remain unanswered. There always will be plenty of room for prejudices, conjectures, and honest differences of opinion. So, we all need to respect our shared limitations and our fundamental right to have different opinions.

Ultimately, given the cloud of self-interest and the limitations of our objective knowledge, I think we always will need checks and balances—like the Constitution and the marketplace. Arguments for depending on self-imposed restraints sound much better than the reality of what they produce, which is frequently no real restraint, no real protection for the other sectors involved, and no real progress.

In his controversial remarks, Miller pointed out that "every time we do not speak out or act against the few bad actors in agriculture, we are responsible for the creation of more restrictive laws and regulations." His point is well-taken. If you feel your industry is hurt by over-regulation, you first need to look at what you yourselves are doing to help create a climate of public distrust.

How can the industry regain its lost credibility? First, stop trying to blur the distinction between impartial editorial content in the media and paid advertising. The media shouldn't be for or against anyone. They should be looking for the facts, and that is what you should give them. If you want to advertise your products or your views, pay for the space—and don't try to disguise it as something that it isn't.

Most importantly, if you create bad news, stick to the facts and deal with the consequences. I have dealt with people and companies involved in major industrial accidents, charges of conflict of interest, and a host of other tacky situations. From my experience, the most effective crisis managers weren't the ones who pretended there was no crisis.

On the other side of the coin, if you want to create good news, earn it the old fashioned way: do something newsworthy. ■

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Automata improves soil moisture sensor

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The next issue of *Turf Grass Trends* will feature in-depth articles on:

- **Wetting Agents: tools to enhance water movement** by Drew Effron
- **Lesser known summer foliar blights** by Dr. Eric Nelson
- **Improving turfgrass drought survivability** by Christopher Sann
- **PLUS** our regular updates on the latest research findings, new products, regulatory actions, and timely tips on improving your turf management practices.

Subsequent issues will include articles on:

• SEEDS, SEEDING AND SOD • SOIL TESTING • DORMANT FERTILIZERS & SOIL AMENDMENTS • TRAINING AND SEMINARS • AND WINTERKILL.

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