

STATE	WHO POSTS							PLACEMENT OF SIGN				INFO GIVEN TO CUSTOMER				WHO NOTIFIED				
	commercial applicator	lawn care	golf course	tree & shrub service	homeowners	structural pest control	others	conspicuous points of access	specific intervals	specific intervals <small>on golf course</small>	not applicable	time of application	prior to application	upon request	not applicable	customer	adjacent neighbors	registry list	upon request	not applicable
Montana																				
Nebraska																				
Nevada																				
New Hampshire	X	X	X				X				X				X	X	X			
New Jersey	X	X	X	X	X		X				X	X							X	
New Mexico																				
New York	X	X		X			X				X								X	
North Carolina																				
North Dakota																				
Ohio	X	X	X			X	X				X				X	X		X		
Oklahoma																				
Oregon																				
Pennsylvania	X	X	X	X	X				X		X	X			X	X	X	X		
Puerto Rico																				
Rhode Island	X	X				X	X				X	X			X	X		X		
South Carolina																				
South Dakota																				
Tennessee																				
Texas											X									
Utah																				
Vermont	X	X	X	X			X				X	X	X		X			X		
Virginia																				
Washington	X		X				X						X					X		
West Virginia	registry list																			
Wisconsin	X	X	X	X			X				X	X	X					X		
Wyoming																				

CALLBACK

THE GAME THAT MEASURES SUCCESS BY THE YARD.

START

**GRUBS!
LOSE YOUR
TURN.**

CALLBACK

**STORMS.
GO BACK
2 YARDS.**

**EMPLOYEE
CALLS IN SICK.
LOSE A TURN.**

**YOU START
A WAITING LIST
DRAW A CARD.**

**CUSTOMER
DRAW A
REFERRAL.
YARD CARD.**

**MOWERS
RUIN
A TREATMENT.
GO BACK 1 YARD.**

CALLBACK

YARD CARD

YARD

**GRUBS!
LOSE YOUR
TURN.**

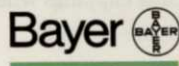




You didn't use Merit.[®]
CALLBACK
 Go back 3 yards.

**THE BEST WAY TO
 MOVE YOUR BUSINESS
 FORWARD IS TO MAKE
 SURE YOU DON'T
 GO BACK.**

The rules are simple. Keep your customers happy and you keep moving forward. Otherwise, you go directly to a callback. And the more you go back, the harder it is to get ahead. But one application of MERIT[®] Insecticide is all it takes to control grubs and callbacks. And fewer callbacks mean more time, money and labor you can use to move your business forward. Which puts you ahead of the game. For more information, contact Bayer Corporation, Garden & Professional Care, Box 4913, Kansas City, MO 64120. (800) 842-8020. <http://usagri.bayer.com>



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NORTHERN WEED CONTROL

combines cultural/chemical tools

Once you understand your most serious weed problems you can develop a multi-pronged program, using your experience, to control them.

by TOM FERMANIAN,
Ph. D./University of
Illinois

Most weeds with similar growth habits can be managed with a single strategy.

Integrated Pest Management (IPM) combines sound cultural practices with occasional application of herbicides to manage weeds. Cultural practices include mowing, irrigation, fertilization, cultivation, mechanical control, and sanitation.

Mowing

Depending on the weed species, mowing can affect the development of its population. A limited number of species are generally found in turfs, particularly well established turfs, because mowing pressures reduce weeds' recuperative potential. Some weeds, such as annual grasses, adapt to low mowing heights and frequent mowing. They can often be managed by raising the cutting when possible. Timely mowing can reduce the production of weed seeds. This can also be accomplished using plant growth regulators or collecting clippings when seedheads are present.

Irrigation

High soil moisture favors nutsedges, annual bluegrass,

crabgrass, goosegrass and many other weeds. Drying out the turf or irrigating less frequently will give the turf a competitive edge over these water-loving weeds. Carpetweed and sand-burr compete well in dry open soils. If these weeds are a problem, increase irrigation.

Fertilization

Accurate, timely fertilizations make turf a good competitor. Excess fertilization can promote weed growth. High levels of nitrogen cause annual bluegrass, crabgrass, and many other species to grow rapidly. Excessive fertilizations, particularly with soluble sources, can potentially injure turf foliage allowing weed invasion.

Cultivation/sanitation

Core aeration, vertical mowing, spiking, or slicing—is generally beneficial for turf growth. But the practices can also move buried weed seeds to the surface allowing them to germinate. Topdressing might bring in foreign seed.

Herbicides

Herbicides, particularly postemergent herbicides, is one tool any turf manager needs. Most postemergent herbicides have been developed to target either of these two large groups.

Broadleaf weeds

Most broadleaf weeds can be controlled with one of a large group of broad spectrum postemergent herbicides. Some narrowly focused or single species postemergent herbicides are available for difficult to control or unusual weed species. Spot control is available with a non-selective herbicide. Check the turf tolerance of any selective herbicide. Some of the postemergent herbicides have a narrow range of tolerant turf species.

2-4, D, similar compounds

One of the original selective postemergent herbicides was 2-4, D. This and other similar compounds such as mecoprop, dichlorprop, and dicamba all control a wide spectrum of broadleaf weeds. Each material has particular strengths in controlling a select group of species. Often times they are used in combination allowing



White clover can be controlled by most broadleaf herbicides



Wood sorrel with yellow flowers

TABLE 1 HERBICIDES FOR BROADLEAF WEED CONTROL IN TURF

COMMON NAME	TRADE NAMES (PRODUCERS)	USES
2,4-D	AM-40, 2,4-D Granules, 2,4-D L. V. Ester, Solution ; (Riverdale) 2,4-D Amine 4, 2,4-D LV4, SEE 2, 4-D LV4 (Riverside/Terra International) Weedone LV4 (Rhone Poulenc)	Selective, post-emergence control of broadleaf weeds. See label for tolerant turfgrasses and species controlled.
2,4-D + dicamba	81 Selective Weedkiller (Riverdale) Four Power Plus (Turfgo/United Horticultural Supply) Lawn Weed Killer (Bonide) Triple D Lawn Weed Killer (Rockland)	Selective, post-emergence control of broadleaf weeds. See label for tolerant turfgrasses and species controlled.
2,4-D + dichlorprop	2D + 2DP Amine, Turf D + DP (Riverdale) Fluid Broadleaf Weed Control (The Scotts Co.) Weedone DPC Ester, Weedone Amine (Rhone Poulenc)	Selective, post-emergence control of broadleaf weeds. See label for tolerant turfgrasses and species controlled.
2,4-D + dichlorprop +dicamba	Strike 3 (Riverside/Terra International) Super Trimec (PBI/Gordon)	Selective, post-emergence control of broadleaf weeds. See label for tolerant turfgrasses and species controlled.
2,4-D + mecoprop	2D Amine + 2 MCPP (Riverdale) 2 Plus 2 (ISK Biosciences) MCPP-2-4D (Cleary)	Selective, post-emergence control of broadleaf weeds. See label for tolerant turfgrasses and species controlled.
2,4-D + MCPP + dicamba	Bentgrass Selective Weed Killer (LESCO) Brushfire, Brush-out, Brush-Whacker, HS-130, SNS-2000 (NCH) Granular Broadleaf Weed Killer (Lebanon) Mec-Amine-D (Turfgo/United Horticultural Supply) Three-Way Lawn Weed Killer (Rockland) Three-Way Selective, Three-Way DG (LESCO) Trimec Bentgrass Formula, Trimec Classic, Trimec Southern (PBI/Gordon) Triplet Selective, Triplet Water Soluble (Riverdale)	Selective, post-emergence control of broadleaf weeds. See label for tolerant turfgrasses and species controlled.
2,4-D + MCPP + dichlorprop	Dissolve, Triamine, Triamine Granular, Triamine Jet-Spray, Tri-Ester (Riverdale) Jet-Spray 3-Way Weed Control (The ScottsCo.) Three-Way Ester (LESCO)	Selective, post-emergence control of broadleaf weeds. See label for tolerant turfgrasses and species controlled.
2,4-D + MCPP + MSMA + dicamba	Trimec Plus (PBI/Gordon)	Selective, post-emergence control of broadleaf weeds. See label for tolerant turfgrasses and species controlled.
2,4-D + triclopyr	Chaser (Turfgo/United Horticultural Supply) Turflon II, Turflon II Amine (LESCO)	Selective, post-emergence control of broadleaf weeds. See label for tolerant turfgrasses and species controlled.
DCPA	Dacthal (ISK Biosciences) Garden, Turf & Ornamental Herbicide 5G, Turf & Ornamental Herbicide (Bonide) HS-110 (NCH) Super Dacthal 686 (Rockland)	Selective, post-emergence control of creeping speedwell and preemergence control of selected broadleaf species.
Dicamba	Vanquish (Sandoz) K-O-G Weed Control (The Scotts Co.)	Selective, post-emergence control of broadleaf weeds. See label for tolerant turfgrasses and species controlled.
Isoxaben	Gallery (DowElanco)	Selective, preemergence control of broadleaf weeds. See label for tolerant turfgrasses and species controlled.
Triclopyr	Turflon Ester (DowElanco, Monterey)	Selective, post-emergence control of broadleaf weeds. See label for tolerant turfgrasses and species controlled.
Triclopyr + clopyralid	Confront (DowElanco)	Selective, post-emergence control of broadleaf weeds. See label for tolerant turfgrasses and species controlled.

for the reduction of their individual single use rates through a synergistic action. Double and triple combinations of these materials provide effective control for almost any broadleaf species in turf. They are formulated as ester- or amine-based compounds to provide greater control or more turf safety, respectively.

Non-phenoxy broad spectrum herbicides

Triclopyr and Clopyralid, are broad spectrum postemergent herbicides that can be targeted towards a wide range of weeds in many turfs. Triclopyr is often found in formulations by itself or in combinations with 2,4, D to broaden its effectiveness across a wider group of weeds. Confront is a combination of both Triclopyr and Clopyralid which is effective with many tough broadleaf weeds such as wild violets and creeping charlie.

Other postemergent broadleaf herbicides

Several materials are available for a smaller group of weeds or for special uses. Bromoxynil will not injure seedling turfgrasses and is often used as the initial material for cleaning up newly seeded turfs. Several materials such as Basagran, Vantage, and DCPA are targeted towards a small group of species. Manage and Basagran can be used for controlling yellow and purple nutsedge. **LM**

—Tom Fermanian is Associate Professor of Turfgrass Science, Dept. of Natural Resources and Environmental Sciences, University of Illinois.

IN THE SOUTH, only strongest weeds survive

Proper selection and management practices give warm-season turfgrasses the 'competitive' edge in the turfgrass manager's battle against weeds.

by FRED YELVERTON, Ph.D./University of North Carolina

Warm-season turf species are ideally adapted to the lower-tier states in the US. Cold tolerance usually determines how far north a particular warm-season turf species is used.

Proper turfgrass selection is critically important for many reasons, not the least of which is weed management. Most weed problems originate because the turfgrass is not growing vigorously and is therefore unable to successfully compete with many weed species. Good turfgrass weed management begins with proper selection of a turfgrass species.

Other common management problems that lead to weed problems include attempting to grow a particular turfgrass species where; 1) there is too much shade, 2) drainage is poor resulting in water-logged soils, 3) improper fertility and liming schedules are utilized, 4) consistent use of improper mowing heights, and

5) where soil compaction exists.

While many weed problems are brought on as a result of the above-mentioned problems, weeds can also be a present where the turfgrass is competitive and being managed properly. A good example in warm-season turf is crabgrass and goosegrass. Both of these weeds can germinate prior to breaking dormancy of the warm-season turf species. In this case, it is impossible for the turf to have a competitive edge early in the spring because it is still dormant.

Large and smooth crabgrass can germinate when soil temperatures near the

Herbicides kill weeds as they germinate and grow through the herbicide-treated zone. They do not prevent weed seed germination.

soil surface average about 52 to 55 degrees F. over several consecutive days. In many areas of the South, this can be as early as February through April.

Goosegrass germinates when soil temperatures are approximately 60 degrees F., which is usually a minimum of two to three weeks later. Depending on the area, many warm-season turf species may not reach the maximum growth potential until late April until mid-June. Where crabgrass and goosegrass problems exist, the use of appropriate preemergence or postemergence herbicides are generally required.

For maximum control with preemergence crabgrass/goosegrass herbicides, application must occur prior to any weed seed germination. They must also be watered in to set up a chemical barrier. For

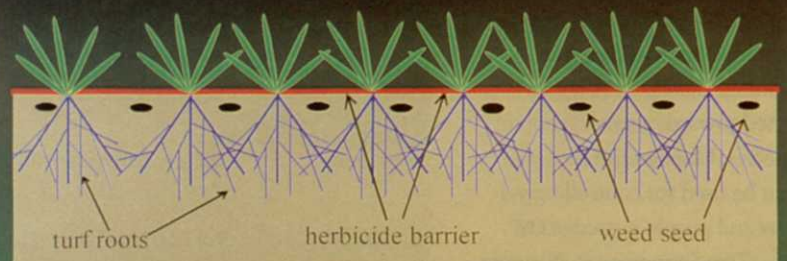
proper application and maximum control, it is helpful to understand how these herbicides work.

It is a fairly common misconception that these preemergence herbicides prevent weed seed germination. They do not prevent weed seed germination!

The germinating weed seedlings die as they grow through the herbicide treated zone. With the case of dinitroaniline herbicides such as Barricade, pendimethalin, Team, Balan, Surflan, and XL the herbicide is absorbed into young roots and shoots of emerging weeds. Cell division is inhibited and the weed seedling dies.

A common question regarding preemergence control of crabgrass and goosegrass is "Can I enhance control by splitting the herbicide application?"

Weed Control with Preemergence Herbicides



Herbicides do not prevent weeds from germinating, they kill weeds as they grow through the herbicide treated zone.

The answer to this question depends on where you are at geographically. As a general rule, the longer frost-free season, the more advantage there will be to splitting the herbicide application. For instance, in North Carolina, we often see enhanced crabgrass control by splitting the application in the eastern part of the state but seldom see an advantage in the western part of the state.

Again, this is due to the difference in the length of the season. In the far eastern part of the state, crabgrass can germinate as early as early March and the first frost is usually in November, whereas in the western part of the state, crabgrass may not germinate until early April and first frost is in October. (This excludes the mountain regions where climate prevents the use of warm-season grasses).

Compare these dates to crabgrass germination and first frost for your geographical area to get an indication on whether you should consider split applications. For goosegrass control, we almost always see an advantage to splitting the application with dinitroaniline herbicides, regardless of where we are in the state. The reason for this is goosegrass is not as easily controlled by these herbicides as is crabgrass.

By splitting the application of a dinitroaniline herbicide, generally half of the full herbicide rate is applied at the recommended time prior to any crabgrass germination. The re-

maining half is then applied about eight weeks later. One exception is with Barricade. For this product, it is generally recommended that two-thirds of the rate be applied at the initial application date and the remaining one-third be applied about eight weeks later.

When considering the use of dinitroaniline herbicides for weed control, it is generally not recommended that they be used where additional grow-in is needed. This is because these herbicides also affect root growth of the turfgrass plants. Therefore, if there are bare areas from excessive wear, or if for whatever reason the warm-season turf species is not well established (recently established, etc.), these herbicides can slow down the spread of the turf into these thin areas. The photograph on page 61 illustrates root injury from a dinitroaniline herbicide on 'Tifway' bermudagrass that is not well established. In these situations, it is generally recommended that weeds be controlled with the appropriate postemergence herbicide registered for use on the particular turfgrass species.

Control during establishment

During establishment, good weed control during establishment is often the most difficult to obtain. This is because sunlight is directly contacting the soil surface because the turf is not yet competitive. In addition, most turfgrass species are more sensitive to herbicides



and can easily be injured during the establishment phase. Good weed control is extremely important during establishment because weeds slow down establishment and poor control during this time can lead to weed seed buildup in the soil which leads to weed problems in the future.

Any new planting of turf should include a carefully planned weed management program during the establishment phase. As previously mentioned, sound turf management practices will assist in the establishment phase. Proper soil preparation, optimum soil pH, and proper soil fertility are all critical because they will allow more rapid growth of the turfgrass which shifts the competitive edge to the turf and away from weeds. If the warm-season turf species is vegetatively planted, care should be taken to keep sprigs moist after proper planting procedures.

Good weed control during establishment can result in more rapid turfgrass establishment. Note more rapid establishment of 'Tifway' bermudagrass on left side of picture as opposed to right side, where control is poor.

Good weed management in warm-season turf begins at establishment. Weed control during establishment should be planned prior to planting. Failure to plan for weeds during the establishment phase can result in failure. Remember, the best way to prevent weed problems is to properly manage the turfgrass. If herbicides are needed, make sure you check for turfgrass and weed sensitivity to the particular herbicide in question. **LM**

The author is Assistant Professor & Extension Specialist Turfgrass Weed Management at North Carolina State University.

Cool-season insect control: know the symptoms

by J. KEVIN MATHIAS, Ph.D.

Prior to a turfgrass field day, a number of entries in a Kentucky bluegrass study were turning brown. The facility manager suspected herbicide drift and the turfgrass pathologist leaned toward summer patch. An entomologist found the real culprit: billbugs. It's important to properly diagnosis the cause of turfgrass damage.

When monitoring:

- ▶ you need to know key pests and key plants,
- ▶ use effective sampling techniques and
- ▶ become familiar with insect damage symptoms.

Key plants are plants most likely to be damaged by insects. For the cool-season turfgrasses, the non-endophytic grasses such as the Kentucky bluegrasses, creeping bentgrasses and some of the fine fescues are more likely to be damaged by surface-feeding insects such as chinch bugs, sod webworms and cutworms. Shallow or poorly rooted turfgrasses are also considered key plants since root-feeding insects will easily damage these plants.

Key insects are the insects which occur most often within a geographic region. In Maryland, the Japanese beetle and masked chafer grubs are the predominant white grub

species. In New York, the European chafer is one of the most damaging grubs in home lawns. Learn the key pest insects within your area. Sampling techniques such as irritant soap flushes, black light trapping, flotation, pit-fall traps, and soil sampling alert you to the presence of insects, but they can also help determine if action thresholds have been reached. Action thresholds are the number of insects per unit area, in which damage will

occur if some type of control action is not taken.

Action thresholds for turfgrass insects can vary due to differences in the host plants or the level of plant stress from environmental conditions or management practices. (See page 30 for monitoring, diagnosis and control strategies.) □

The author is associate professor of entomology at the University of Maryland.



Scouting for white grubs can be as easy as pulling back a piece of turf.

Some new control products

Talstar (bifenthrin) is a synthetic pyrethroid recently labeled for the turfgrasses. It joins other pyrethroids such as Tempo (cyfluthrin); Scimitar and Battle (lambda-cyhalothrin); Mavrik (fluvalinate) and Astro (permethrin). Talstar comes in different formulation and labeling (restricted and general use) for golf course and home lawn uses. Talstar will control surface-feeding insects such as chinch bugs, sod webworms, adult billbugs, adult annual bluegrass weevils, armyworms, cutworms and atae-nius adults. Nuisance pests such as ticks, fleas and ants are also covered in Talstar labeling.

MACH 2 (halofenozide) is available for the 1998 season. This product mimics the insects' molting hormone—ecdysone—and will cause premature molting. In field tests it has provided consistent and excellent control for a number of white grub species.

Like Merit, this product can be applied early (May-July) and provide season-long control. The level of control is greater on first instar grubs than on later instar grubs. It also has activity against lepidopteran pests, such as sod webworms and cutworms. RohMid will be marketing this product and it will be initially available as a 2SC formulation.

Conserve SC is a new product developed by DowElanco and is in a chemical family known as spinosyn. The active ingredient of this product consists of fermentation products or metabolites of a specific bacterium found to have insecticidal properties. Current labeling is for Conserve to be formulated as a soluble concentrate to control sod webworms, black cutworms and armyworms.

Conserve SC will be active against all larval instars with rates ranging from .08 lb. to 4 lb. of active ingredient per acre

Cruiser is a new nematode product from Ecogen labeled for white grub control.

Cruiser contains the nematode *Heterorhabditis bacteriophora* and has good to excellent activity against white grubs. Current recommendations are at the 1.0 to 1.5 billion nematodes per acre rate, and the product is effective on all larval instars. Supply was limited for Cruiser in 1997 with increased production planned for 1998. □

MONITORING, FIELD DIAGNOSIS AND CONTROL PROGRAMS, COOL-SEASON INSECTS

INSECT PEST

Billbugs

Field diagnosis/monitoring

Adults begin to move from overwintering sites into turf in April/May. Use pitfall traps to determine spring activity. Billbug larvae will bore into crown and stem tissue and then exit into the soil. Look for sawdust-like material in stems. Also, plants, when pulled will sever at the crown. Damage visible by June on key plants, such as Kentucky bluegrass, zoysiagrass.

Control action

Preventive applications if pitfall traps indicate high adult counts (2-5/day). Use Dursban, Tempo, Battle, Talstar and Scimitar for adult control in April/mid-May. Control difficult when larvae are in the stem. Vector or Merit can be used at this time. Soil insecticides such as Sevin, Turcam, Oftanol, Diazinon, Crusade, Mocap, Mainstay and Triumph are labeled. Cool, wet summers favor a fungal disease outbreak of *Beauveria* sp., which will reduce billbug populations. Plant endophyte enhanced grasses.

INSECT PEST

Black turfgrass ataenius

Field diagnosis/monitoring

Adults begin to move from overwintering sites into turf in late March/April. Adults are attracted to lights. Damage by first generation grubs will be seen by late June. Second generation grub damage will be seen by late July/early August. A serious problem on golf course turf where annual bluegrass and creeping bentgrass

are grown.

Control action

Preventive applications may be done if past history dictates it with Dursban and Talstar in April or Merit in May. Soil insecticides such as Proxol/Dylox, Turcam, Crusade, Triumph, Mocap, Oftanol and Mainstay are recommended in June to September period.

INSECT PEST

Chinch bugs

Field diagnosis/monitoring

Prefer warm, dry, sunny locations. Emerge from overwintering sites as temperatures reach 70 degrees F. Flotation sampling is effective. Damage symptoms are irregular brown areas, often seen from July through September. Fine fescues are very susceptible. Other key plants are the creeping bentgrasses and Kentucky bluegrasses.

Control action

Preventive application in April/mid-May for habitual problem sites. Dursban, Diazinon, Sevin, Triumph, Tempo, Oftanol, Mainstay, Battle, Talstar, Astro and Turcam are labeled for control. Cool, wet weather during summer favors fungal pathogens which control chinch bugs. Plant endophyte-enhanced grasses. Big-eyed bug is a beneficial predator.

INSECT PEST

Cutworms/armyworms

Field diagnosis/monitoring

Consists of five main species and may be seen (caterpillars and adults) from May to September. Turfgrass thins. Irritant sampling techniques

will flush insects to surface.

Common problem on bentgrass putting greens. Adults are attracted to lights.

Control action

The following are labeled for control: Sevin, Dursban, Battle, Diazinon, Proxol/Dylox, Scimitar, Tempo, Talstar, Crusade, Triumph, Mainstay. Biorational insecticides include: Steward, Dipel, Vector, Cruiser, and Turplex Bioinsecticide. Light irrigation to work material into thatch may be required for some of these. Plant endophyte-enhanced grasses.

INSECT PEST

Sod webworms

Field diagnosis/monitoring

More than 20 species of sod webworms in the U.S. Defoliation damage visible from May to September. Webbing and frass noticeable from larval feeding. High risk period is July to late Sept. Irritant sampling techniques flush larvae to surface.

Control action

Refer to insecticide list for cutworms and armyworms. Oftanol, Astro, Turcam and Orthene are labeled for sod webworm control. Plant endophyte-enhanced grasses.

INSECT PEST

Grubs: Japanese beetle, masked chafers, European chafer, Asiatic garden beetle, oriental beetle

Field diagnosis/monitoring

These white grub species cause root damage. Damage symptoms are brown turf which can be easily pulled up. Begin to monitor in late July to early August for the presence of

grubs at or near soil surface.

Light trap or pheromone trapping can indicate potential high risk site area for some of these grub species.

Control action

Soil insecticides will give good to excellent control if watered in with half-inch of water. Product labeled are: Dylox/Proxol, Turcam, Mocap, Mainstay, Crusade, Oftanol, Sevin, Diazinon and Triumph. Can be applied mid August/September or in the spring, April-mid May period. Merit applications perform better if applied preventively or during egg laying period. The new nematode product Cruiser is labeled for white grub control.

INSECT PEST

Greenbug aphid

Field diagnosis/monitoring

Kentucky bluegrass is the major host for this insect. Worst outbreaks appear after mild winters followed by cool, wet springs. Feeding damage causes leaves to turn yellow-orange in color.

Control action

Orthene, Dursban and Diazinon for control in June-September period. Treat if yellowing occurs to turfgrass stand. □

SOURCE: DR. MATHIAS. OMISSION OF ANY PRODUCTS IS UNINTENTIONAL. PRODUCTS LISTED FOR INFORMATION ONLY, AND ARE NOT CONSIDERED TO BE ENDORSEMENTS.



*We never said you wouldn't see unattractive spots
on your course. They just won't be dollar spots.*