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Circle 131

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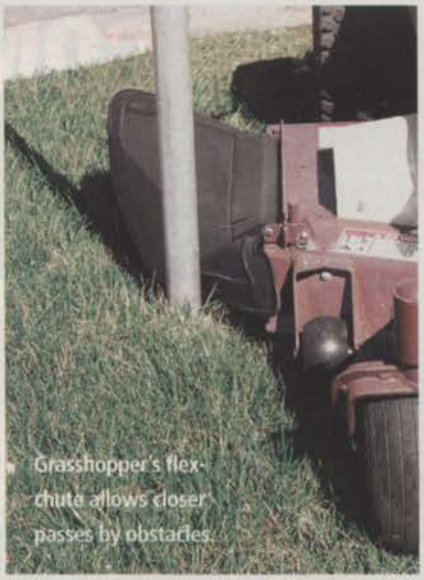
next to fences and other barriers. This translates to less scalping on rough terrain, and cleaner cutting in tight spaces.

"For quality cutting, there is a noticeable improvement in the appearance of the cut you can get with a front-mount mower, and this is because of the way the deck is suspended," Walker says.

Also, 4-wheel drive provides greater traction, and therefore more safety, on slopes. "The longer [mower] length distributes weight more evenly and helps absorb vibration caused by rugged terrain," Stucky says, which means a smoother ride and a lighter footprint on turf.



Grasshopper's flex-chute allows closer passes by obstacles.

Multi-task machine

If a job calls for more than just mowing, a front-cut configuration can serve as a single-machine solution, Stucky adds. "Managers who are responsible for complete grounds care can optimize their budgets by employing front-cut power units for leaf pickup, sweeping, backfilling, snow removal, edging, aeration and spraying," he says.

Walker Mowers are famous for their grass collection systems. Because the attachment is designed for the front-cut machine, it does not upset the balance of the mower, Walker says. Imagine a banker's scale: one side loaded with the cutting deck, the other side with the attachment. On a mid-mount mower, iron isn't evenly distributed when you add attachments. These machines require counterweights.

"If you have an easy-on, easy-off mower deck, then you can take the deck off in the fall and attach a leaf blower," Pena notes. "Once fall has passed, you take off the blower and attach a snow blower or blade. You can also opt for a rotary broom to sweep parking lots." LM

— The author is a Cleveland-based freelance writer.

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Circle 134

De-bugging your turfgrass

Build cool-season turf insect pest control on good culture practices, knowing pests and their habits and making the right application choices at the right times.

Images this page: A long winged hairy chinch bug sits on a blade of grass (top of page); an adult bluegrass billbug (above); and sod webworm larva and frass nestled in the lawn thatch zone (right).

BY RAYMOND A. CLOYD

Insects and other arthropods that feed on turfgrass fall into three categories — pests that do their dirty work below ground, those that reside in thatch and damage plant crowns, and the leaf and stem insect pests. Belowground insects, such as grubs, feed on turfgrass roots. Crown and thatch feeders include chinch bug (*Blissus* spp.), sod webworm (many different species), armyworm (*Pseudaletia unipuncta*), cutworm and billbug (*Sphenophorus* spp.). Insects and mites that inhabit leaves and stems include greenbug (*Schizaphis graminum*), clover mite (*Bryobia praetiosa*) and billbug (*Sphenophorus* spp.)

To manage these pests you must be able to identify them and the damage they cause. How else can you make the proper recommendations to lessen their impact or take appropriate action to control them?

Watch for thatch

Thatch provides an ideal habitat for chinch bugs, billbugs and caterpillars including sod webworm and cutworm. A thatch layer greater than a 1/2-in. can restrict the movement of insecticides and reduce their efficacy. The great majority of insecticide residue can remain in the thatch and prevent the insecticide from reaching the target zone, particularly when the pests are grubs, the larval stage of northern and southern masked chafers, Japanese beetle and black turfgrass ataenius. A heavy thatch layer can increase the breakdown of an insecticide due to chemical or microbial factors. Verticutting and/or core aerification alleviate thatch problems.

Irrigation and pest control

Proper irrigation is generally needed to maintain high-quality turfgrass. It can also improve turf insect control. For grub control, for example, 1/2- to 3/4-in. of water to a treated area after an insecticide application helps move the insecticide into the target zone. Because grubs move deeper into the soil as the soil dries, irrigating

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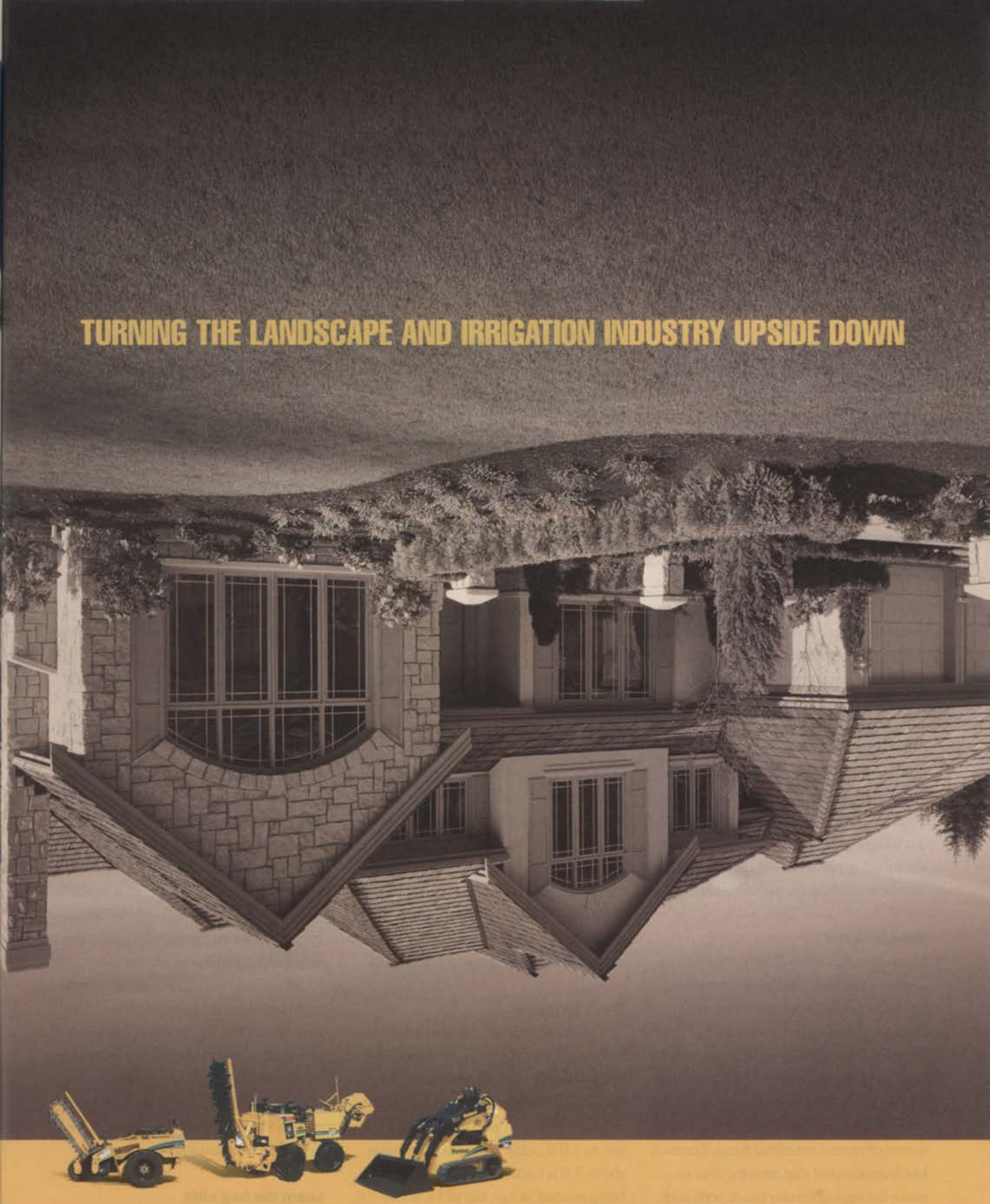
PHOTOS BY: DAVID J. SHETLAR

TURNING THE LANDSCAPE AND IRRIGATION INDUSTRY UPSIDE DOWN



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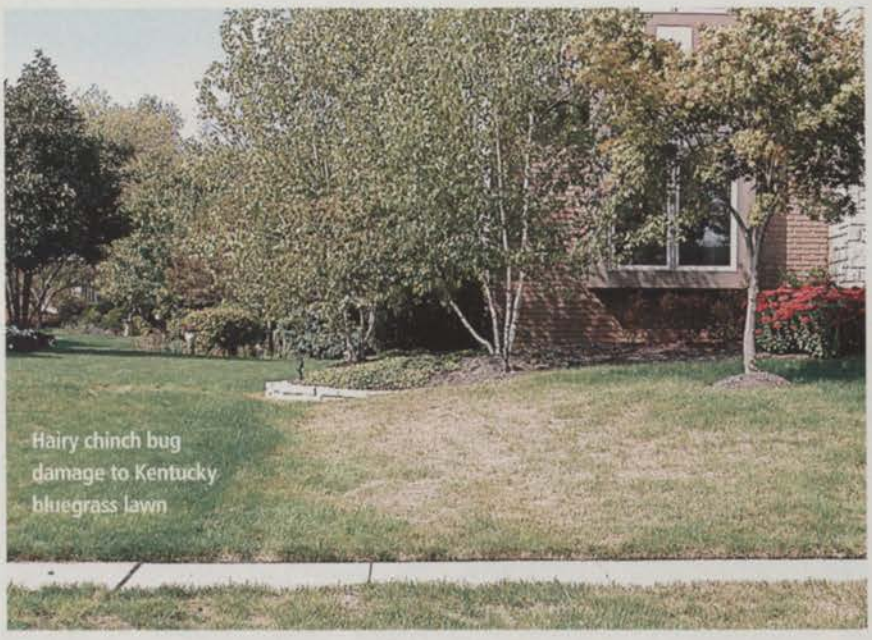
prior to applying an insecticide improves control, as well. Soil moisture also influences the growth, distribution and abundance of grubs, and can result in higher localized grub densities.

Soil moisture is critical during the warmer months (August and September) when grubs are feeding on roots and cool-season turfgrass, such as Kentucky bluegrass, is stressed. Cool-season turfgrass isn't able to increase root mass during summer's dog days to compensate for grub feeding. Proper irrigation reduces stress, allows the turfgrass to tolerate higher densities of grubs before damage is evident, and encourages recuperation of root loss. In addition, watering turfgrass, as needed, encourages the growth and spread of natural fungal populations such as *Beauveria spp.*, which may provide some control of chinch bugs and other insect pests.

It is not advisable to water in chemical products to control crown, thatch, stem and leaf-inhabiting pests such as chinch bugs, green bugs and most caterpillars, however. The insecticide must remain on the foliage so those insects not killed from the initial application will die when they consume residues on treated leaves.

Mow it higher

Mowing turfgrass too closely decreases its ability of produce a sufficient root mass and increases susceptibility to feeding damage caused by grubs, even at low grub densities. Mowing higher can reduce problems with chinch bugs and billbugs, in addition to increasing the humidity at the soil level, which promotes the growth and spread of natural beneficial fungi. Research has demonstrated that mowing may remove the eggs of certain insect pests such as black cutworm (*Agrotis ipsilon*), which is the major caterpillar pest on golf courses, and influence the distribution of black turfgrass ataenius (*Ataenius spretulus*).



Hairy chinch bug damage to Kentucky bluegrass lawn

PHOTO BY: DAVID J. SHETLAR

Why fertility matters

Excessive nitrogen fertility levels promote rapid succulent growth, which is attractive to insects, thus increasing susceptibility and the likelihood of the turfgrass suffering feeding damage. Applications of excessive nitrogen tend to stimulate insects via higher reproductive rates and shorter developmental times due to the enhanced levels of amino acids (precursors of nitrogen) in the plant tissue. In addition, excess applications of nitrogen result in an increase in thatch creating an ideal habitat for certain insects such as chinch bugs, billbugs and sod webworms. The use of slow-release nitrogen fertilizers may reduce the attractiveness of turfgrass to insect pests.

Don't forget pH

The measurement of the concentration of hydrogen ions [H+] in a solution is its pH, a logarithmic scale indicating the acidic and basic properties of water. The pH scale ranges from 0 to 14. A pH value below 7.0 is acidic whereas a pH value above 7.0 is basic or alkaline, 7.0 itself being neutral. When the pH is above 7.0, then alkaline hydrolysis may occur, a degradation process that fragments insecticide molecules. Certain insecticides are susceptible to alkaline hydrolysis, particularly those in the organophosphate chemical class. For example, trichlorfon (Dylox) is sensitive to alkaline hydrolysis, which shortens its activity period. If high pH water is a problem, add a buffering agent prior to adding the insecticide in order to reduce the pH to the preferred range (5.0 to 6.0).

Other factors that can affect the effectiveness of an insect control include photodecomposition, heat, water hydrolysis, volatilization and microbes.

Minimize volatilization, the loss of the insecticide from the plant tissues or soil surface through evaporation into the atmosphere, by making insecticide applications in either early morning or late afternoon.

Microbial degradation occurs when microbes such as bacteria in the soil use insecticides as a food source. Certain insecticides appear to be more susceptible to microbial degradation, especially some organophosphates. The use of different insecticides will avoid the potential for microbial degradation.

Learn the bug's life

In general, the larvae and adults of most arthropod pests are most susceptible whereas the egg and pupa stages are more

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tolerant to most insecticides. For example, grubs are easier to control just after egg hatch, whereas billbugs and black turfgrass ataenius are easily controlled in the adult stage.

Insecticide use is not only dependent on the presence of the susceptible life stage and location of the target insects but also on insecticide formulation, which is generally either granular or liquid. The formulation used depends on the target insect pests.

For control of belowground insect pests, irrigate in both formulations after application. Irrigate liquid formulations of highly soluble insecticides within 24 hours to reduce UV light degradation, which can lessen their effectiveness. When applying granular insecticides make sure the grass blades are dry so that the granules will migrate to the soil surface.

To control grubs, insecticides must reach and reside in the target zone, which is generally located one to two inches below the soil surface. The movement of grubs through the soil profile depends on soil moisture and temperature. The deeper grubs are in the soil profile, due to either

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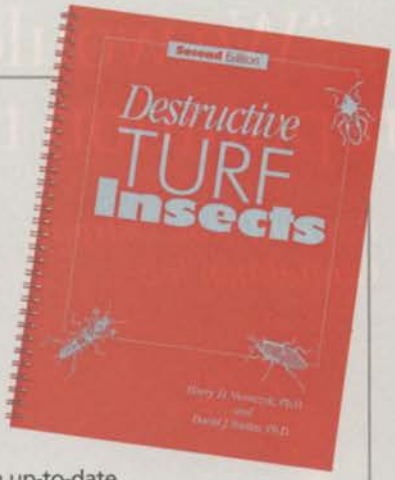
Curative or preventative control?



Insect pests are damaging your clients' lawns, but you're not sure if it's caused by grubs, billibugs, armyworms, chinch bugs or another pest. The Ohio State University entomology professors Harry D. Niemczyk and David J. Shetlar can tell you what it is and what to do about it.

Their book, "*Destructive Turf Insects*," is an up-to-date, practical guide to the insects that destroy turf. There are plenty of photos and illustrations to help turfgrass owners, sport field managers, lawn service operators and golf course superintendents identify and treat insects.

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Cultural practices

Healthy turfgrass can tolerate more insect feeding than stressed turfgrass. For example, a "healthy" turfgrass, due to the amount of root mass, may be able to tolerate 6-8 grubs sq. ft. without noticeable feeding damage. This same density of grubs may severely damage stressed turfgrass. Poor cultural practices are often the cause of stressed turfgrass. Factors such as thatch, irrigation, mowing and fertility impact the susceptibility of a turfgrass to insects or, in the case of pH, affect insecticide efficacy.

— *RC*

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lower moisture levels or warmer temperatures, the more difficult they are to control. This is why pre-treatment irrigation is critical because moist soil attracts grubs closer to the soil surface. The length of time that a lethal concentration of an insecticide remains in the target zone may vary from several days to several months, depending on the insecticide. The time of year insecticides are applied may influence efficacy, as well. Insecticides applied in the fall, or too early in the spring may not be effective if grubs move deeper in the soil. The two insecticides that have been used to control grubs for almost a decade now are imidacloprid (Merit) and halofenozide (Mach 2), but several newer insecticides have been introduced to the market and are providing good control, as well.

Imidacloprid is a systemic insecticide effective against most belowground and crown-inhabiting insects such as grubs (many species), black turfgrass ataenius, billbugs and weevils. It is not effective against caterpillars including sod webworm, black cutworm and armyworm. Apply imidacloprid four to six weeks prior to egg-hatch for maximum effectiveness. The insecticide kills either by contact or ingestion. Smaller grubs, especially those that have just hatched from eggs, are easier to control than larger grubs. Studies have also demonstrated that applications of imidacloprid affect the defensive behavior of grubs, which increases their susceptibility to natural enemies such as entomopathogenic nematodes.

Halofenozide (Mach 2) is a systemic

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