CHEMICAL LOG

Insect Damage and Monitoring Techniques

Turf insects can be among the most troublesome problems faced by sports turf managers. These pests feed on turf roots and can destroy an entire field in a relatively short period of time. Recognizing insect problems is the key to avoiding the serious turf damage they can cause. Early detection along with cultural, biological and chemical controls can help prevent turf loss and keep the field in top playing condition.

White Grubs: Use a shovel or spade to cut three sides of a square in the turf anywhere from six to 12 inches on a side and three to four inches deep. Flip the sod back on the uncut (fourth) side and use a hand trowel to dislodge soil in the soil/thatch interface. The cream-colored grubs will be very visible against the dark soil background.

Place grubs in a container and count them after removing all of them from the sample area. Convert the area to square feet (e.g., six-inch sides = 0.25 square feet). Note that a standard cup cutter is equivalent to 0.1 square feet. Take a number of samples and then average the number of grubs found. For ease in averaging, make all sampling cuts the same size.

Damage from white grubs resembles drought stress initially, with general thinning of turf, yellowing or both. In some circumstances, skunks or raccoons may tear apart turf in infested areas to feed on grubs near the surface.

Approximate threshold (or "acceptance") levels have been devised to treat insects per square foot. For white grubs (Japanese beetles and similar species) the threshold level is six to ten insects per square foot. Insecticides used to control the bugs include bendiocarb (Turcam), carbaryl (Sevin, Sevimol), chlorpyrifos (Dursban), diazinon, ethoprop (Mocap), isazofos (Triumph), isofenphos (Oftanol) and trichlorfon (Proxol, Dylox).

Comments: Check the interface of the root and thatch for the presence of grubs in mid-July to early August. Treat between mid-August and mid-September in moist soil if grub populations average at least five to ten bugs per square foot. Water (at least 1/2-inch) immediately after applying an insecticide but avoid puddling. If the population was not controlled in late summer, apply spring control as soon as grubs are near the surface (normally in April).

Chinch Bugs: Insert an open cylinder (such as an empty coffee can with both ends removed) into the turf so that the can goes at least four inches into the soil. Fill the can with water under moderate pressure (or "slosh" the water around by hand) and wait about five minutes. Chinch bugs (and big-eyed bugs) will float to the surface of the water. As an alternative, use a cup cutter or similar device to remove cores of turf about four to six inches in diameter, place the cores in a bucket and fill the bucket with water.

Damage is often confused with drought stress and normally occurs during July and early August. Damage (wilted or browned-out areas) is most severe in sandy soils and in sunny areas. Small patches gradually coalesce into large areas of wilted or dead turf.

The approximate threshold for chinch bugs is 30 to 50 per square foot. Insecticides used for treating chinch bugs include acephate (Orthene), bendiocarb (Turcam), carbaryl (Sevin), chlorpyrifos (Dursban), cyfluthrin (Tempo), diazinon, fluvalinate (Mavrik), isazofos (Triumph), isofenphos (Oftanol) and propyl thiopyrophosphate (Aspon).

Comments: Populations are highest in fine fescues and thick thatch. Use an endophyte-containing cultivar when it is available and avoid drought conditions. Spray in June, and water lightly (1/10 inch) after applying the insecticide. In some cases a second application two to three weeks later may be needed.

Sod Webworms and Cutworms: Prepare an irritating drench by mixing one fluid ounce of lemon-scented dish detergent in one or two gallons of water. Use

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a sprinkling can to spread this solution over an area about two by two feet. Wait three to five minutes. Webworms and cutworms (and earthworms) will be irritated by the soapy solution and crawl to the surface of the turf area. Note: On sunny days and on bentgrass turf, rinse the soapy solution into the turf with clear water after you have completed the insect count.

Damage usually begins as small, discrete brown patches that can coalesce into large areas of damage. A finger inspection of the infested area sometimes will reveal burrows lined with green frass (insect excrement). Cutworms are often active around aerification holes.

No good estimate is available on the approximate threshold levels for these insect pests. However, insecticides such as carbaryl (Sevin), chlorpyrifos (Dursban), cyfluthrin (Tempo), isazofos (Triumph) and trichlorfon (Proxol, Dylox) are used to treat both sod webworms and cutworms. Bendiocarb (Turcam) and fluvalinate (Mavrik) also are used for controlling sod webworms.

Comments: Check for sod webworm activity by looking for small green pellets in the upper thatch or flushing an area with soapy water. Watch for webworm moths flying at twilight. Apply controls ten to 14 days after the number of moths declines sharply. Repeat applications might be needed. Treat as late in the day as possible and water lightly (1/10 inch); do not mow for one to three days after an application.

Most cutworms are nocturnal, so treatments are most effective later in the day. Inspect aerification holes throughout the summer: The adult moths often lay eggs in holes. Apply two to four weeks after moth flight reaches its peak.

Annual Bluegrass (Hyperodes) Weevils: Use a cup cutter or similar device to collect cores of four to six inches in diameter. Loosely break up the soil in the cores and place the loosened soil and all plant matter in a dishpan or similar plastic container. Fill the container with lukewarm water and wait about five minutes. All stages except eggs will float to the surface of the water, where they can be counted.

The most severe damage normally occurs in early June and again in late July, with moderate damage at other times of the summer as well. Damage begins as small yellow patches, often along the edges of fairways or on collars, and spreads into large areas. Severely damaged areas take on a water-soaked appearance. Damage is restricted to short cuts (fairways and shorter) of annual bluegrass.

The approximate threshold level for the weevils is 30 to 50 per square foot. These insects are combatted with chlorpyrifos (Dursban), isazofos (Triumph) and isofenphos (Oftanol).

Comments: Treat between forsythia and flowering dogwood "full bloom" (usually late April to mid-May). Treat for the second generation of the bugs if necessary during the first two weeks in July. Water lightly (1/10 to 1/5 inches).

Bluegrass Billbugs: Look for evidence of damage along the edges of paved areas in mid- to late July. Larvae can be found by digging into the root/thatch interface with a hand trowel and inspect-

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Integrated Systems for Controlling Aquatic Weeds

By Paul R. Beaty, Ph.D.

Sports turf managers handle a wide range of duties beyond maintenance of athletic fields. In many cases the manager of an athletic facility or complex also maintains the surrounding grounds, which may include a lake, pond or irrigation reservior. Those who have worked in the golf industry are well aware that when spring arrives, those once pristine lakes begin to brew with animal and plant life that, if left unchecked, can become a significant problem. How can managers who are responsible for the care of these lakes, ponds and reserviors deal with the potential problems of aquatic weeds?

Plants require three things for growth — light, nutrients and heat. In the fall, reduced light and cooler temperatures result in slower plant growth and less of nutrients. However, nutrients continue to accumulate, especially in bodies of water that receive runoff from lush landscape areas.

As day length increases and temperatures rise, managers should keep a close eye on all bodies of water. When water temperatures reach the high 60s, explosive algal growth can occur.

Don't Bomb It

What's the solution to this explosive growth? A common response is to purchase some algicide or herbicide and treat heavily, applying the "a little is good, a lot must be better" theory. However, "bombing" may be exactly the wrong thing to do. Killing the bloom only produces decaying algal cells that release stored nitrogen and phosphorus. Another species of algae is most likely waiting to use these nutrients, and the process may become a vicious cycle. Of course, if the situation gets too ugly, chemical treatment may be necessary, but a light treatment will suffice; don't bomb it!

The goal is to allow non-offensive plants to grow and utilize nutrients that enter the system. One management technique involves planting several kinds of algae and some emergent vegetation, so the aquascape can absorb the incoming nutrients.

Plants and fish remove nitrogen and phosphorus from the system. Unless chlorine or bromine is used to maintain a sterile environment, something is going to grow. The more herbicides and algicides are used, the more resistant certain plants will become.

Harvesting can be mechanical or biological. Mechanical control can mean using a floating aquatic weed harvester, which may cost more than $100,000, or it can be as simple as raking excess plant and algal growth out of the pond for use as compost.

Nutrients are going to enter the system no matter what you do. Removing them is better than killing plants or algae, which release these nutrients to promote the growth of something else.

Biological control is an environmentally popular concept. Some areas of the country allow use of a species of fish called the grass carp or white amur (*Ctenopharyngodon cidella*); however, in some areas, use of this fish is illegal. Sterile varieties of the grass carp are available to prevent reproduction and overpopulation, which could create other environmental problems.

These herbivores are an incredible tool for lake and pond harvesting. Rooted plants are a favorite meal, and even grass clippings will be cleaned from the surface.

Other fish filter plankton from green water or gobble up midge larvae before they become a nuisance. Microscopic zooplankton are beneficial in keeping the pond from getting green by eating smaller plant cells. Snails graze bottom surfaces and eat organic material. Basically, anything that lives and grows in the system without itself becoming a problem is beneficial. An aquascape that contains plants and fish requires surprisingly little control.

I strongly believe that chemicals should only be used when absolutely necessary. Chemical control is usually very expensive compared to biological methods. In addition, it's not easy to load the spray rig, boat, etc., and do a treatment. Why not let animals do the work for you?

No Ultimate Answers

Aeration is another technique of aquatic weed control that is widely promoted. Oxygenation occurs at the air-water interface. If the water is moving, aeration occurs. Even shallow ponds usually are adequately aerated by wind action.

Do floating fountains oxygenate the pond? Those that draw water from the bottom of the pond are the best, as they move more water to the surface.

Systems that inject compressed air to the bottom of the pond can be useful. The rising bubbles move a great deal of water to the surface, where it can be naturally aerified. The amount of oxygen absorbed from the bubbles is negligible in shallow features.

What about ozone or activated oxygen? A lot of money is being invested into these systems, but the systems I have seen require a lot of maintenance. In addition, ozone is toxic to anything alive. Although ozone has applications in spas and sewage treatment, I do not think it is compatible with living systems.

Some say bacteria are the answer. They have the unique ability to consume organic detritus and eliminate it. However, the scientific community believes if conditions are right, bacteria are readily available and are capable of incredibly rapid reproduction. Why spend a lot of money to add them?

Basically, an aquascape can be treated in two ways. The first and most expensive is to treat it like a swimming pool and keep it sterile. However, if you do not like or cannot afford the sterile look, use plants and animals to absorb the nutrients that enter the system through irrigation runoff, direct fertilization or from the atmosphere. Help them so they can help you.❑

Editors Note: Dr. Paul Beaty is the owner of Southwest Aquatics, a lake-management service headquartered in Palm Desert, CA.

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ing the area. Accumulations of sawdust-like material will be found in the thatch.

Bluegrass billbug-infested areas begin to wilt but do not respond to watering. As larvae feed in the stems and on the roots, damaged turf can be tugged loose with very little force. Infested areas will brown out entirely in a matter of several days. Damage is usually most severe in late July and early August.

The approximate threshold level is five to ten billbugs per square foot. The insect can be controlled with insecticides such as carbaryl (Sevin), chlorpyrifos (Dursban), isazofos (Triumph) and isofenphos (Oftanol).

Comments: One application to a newly mowed turfgrass in June when adult billbugs are active in an area. Check the adjacent pavement. Water lightly (1/10 to 1/5 inches).

Threshold Levels

The key to any integrated pest management program is identifying threshold levels. No single magic number will be appropriate for all turf managers.

Several agronomic factors will have a direct effect on the number of insects a turf area can tolerate. Some of these factors include the species of turfgrass, the height of cut, availability of irrigation (and resulting soil-moisture distribution), use patterns (including traffic and other sources of compaction) and general fertility programs. The thresholds presented in the table are for nonirrigated turf. In most cases, irrigated turf can sustain higher populations without showing stress. Threshold levels will depend on the overall vigor of the turf being managed.

Biological Controls

Milky Spore: Milky spore is a disease caused by a bacterium (*Bacillus popilliae*) that affects the digestive system of Japanese beetle grubs. It is ineffective against other species of grubs and is relatively nontoxic to people and other "nontarget" organisms. It is available commercially (Doom, Grub Attack and Japidemic, among others) and can be applied to Japanese beetle grub-infested turf.

Milky spore is somewhat inconsistent in the Northeast, primarily because soil temperatures do not remain warm long enough in the summer. More turf managers have reported success in the sandy soils of Massachusetts than in other areas. In any case, the milky spore organism takes several months to become effective but in some cases will remain so for three to five years.

Endophytic Grasses: Some grasses contain endophytes, fungi that grow inside the plants. These endophytes seems to provide some level of resistance to chinch bugs, bluegrass billbugs, sod webworms and cutworms. Currently, endophytes have only been incorporated into some cultivars of fescues and perennial ryegrasses. Individuals who are capable of renovating turf areas should consider using endophytic cultivars to reduce stress from surface-feeding insects.❑

The above article was excerpted from the Professional Turfgrass Management Guide published by the University of Massachusetts Cooperative Extension System.

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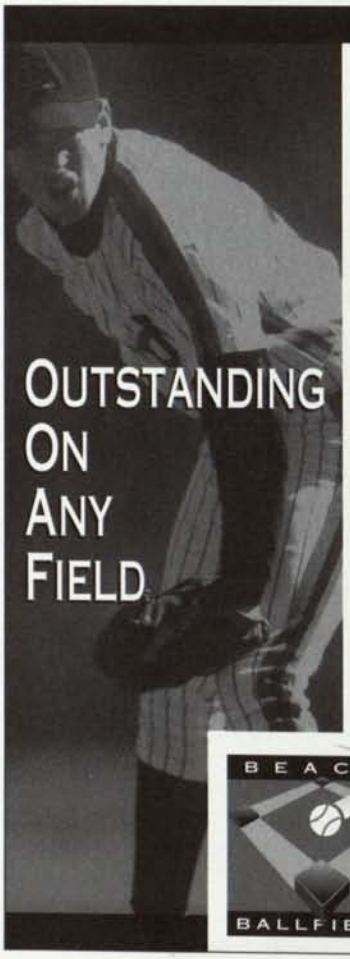

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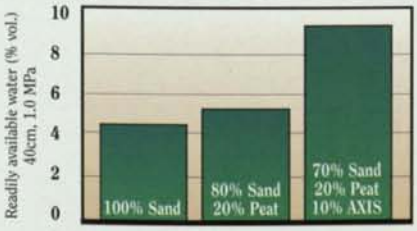

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