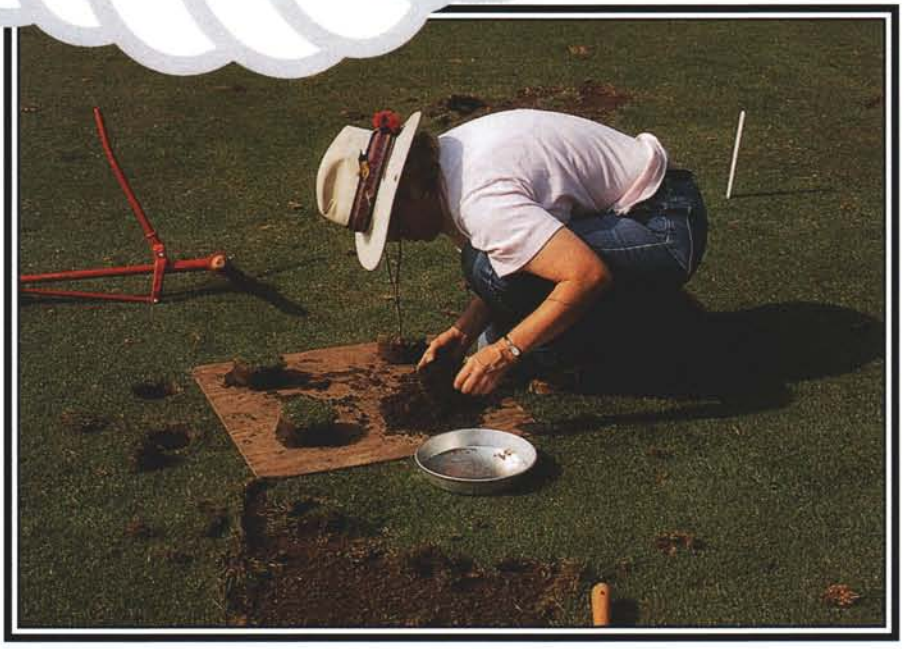
Integrated Pest Management

Case study: managing white grubs



Inspecting cup cutter soil plugs for white grubs. Courtesy: Dr. Patricia Vittum

by Dr. Patricia J. Vittum

Many turf managers have been asked to develop an Integrated Pest Management (IPM) program for their facilities. However, IPM is often left undefined by school administrators, state agencies, and recreation departments.

IPM definitions range from "intelligent plant management" to using no pesticides. But most IPM definitions include such key phrases as: identifying key pests and setting tolerance levels for those pests; providing optimum growing conditions for turfgrass; using several different strategies to keep pests below the tolerance level; using pesticides when other alternatives are not available, or cannot provide adequate levels of control; and evaluating the success of any actions taken.

It can be daunting to attempt to establish an IPM program that addresses all of the various pests and problems in a given athletic field complex. You're asked to deal with such diverse issues as insect activity, disease outbreaks, weed infestations, the need for adequate drainage and irrigation, and of course that old bugaboo, mowing height and patterns.

The techniques and approaches outlined here suggest ways a turf manager can develop an IPM approach for white grubs. These strategies can be used to develop similar approaches for other pests, with the eventual goal of establishing an all-encompassing IPM program.

We always recommend that turf managers start small. Concentrate on a single pest, and learn about various alternatives before incorporating additional pests into your controls. Alternatively, identify a small part of your turf complex, and gradually expand to include other areas as you gain confidence in your monitoring and decision-making skills.

Site assessment

Any IPM program begins with site assessment. You must identify primary agronomic challenges such as heavy soils, drainage problems, traffic patterns that lead to compaction, and practice schedules that limit options such as core aerifying.

Most facilities have certain pests that show up in the same general area year after year. White grubs may appear in the south end zone of the football field, or a patch of crabgrass may develop where heavy equipment passed a couple years ago. Record these kinds of hot spots so you know where to concentrate your efforts when it comes time to monitor pest activity.

Monitor the problem

Monitoring normally means getting out and looking closely at the turf to identify *which* pests are present and active, and *how many* pests are there. You can sample for most turf insect pests that can occur on athletic fields, as long as you use the right sampling technique and do it when the insects are still there!

To sample for white grubs, use a small garden spade (six inches on a side) or a golf cup cutter (4.25-inch diameter) to take a sample of turf

and soil to a depth of three to four inches. Place the soil and turf on a sheet of plywood or a plastic tarp and break it up by hand. Use a hand trowel to further break up the soil, especially near the roots.

Any grubs will be very noticeable against the dark soil. Put them in a small bowl or cake pan and count them. Then translate those numbers into a number of grubs per square foot estimate. If you use a cup cutter, multiply by 10. If you used a six-inch spade, multiply by four.

Take several samples from each of your fields to get a representative sample. Sometimes there will be areas without any grubs, and other areas that are heavily infested.

In some parts of the country, it's possible to find several different species of grubs in one athletic field. Each of these species has a slightly different life cycle and responds to chemicals differently. It's important to determine which species is/are present. You may have to send some specimens to a local turf specialist (try your extension service!) to help identify the species.

Be sure to monitor the insects when they are most likely to be present and active. White grubs actively feed in the root zone at two times during the year. In spring they feed between mid-March and mid-May, depending on the species and the local climate. They feed again in autumn, between late August and early December.

An initial sample collected in spring can often predict where grubs are most likely to be active the following autumn. You may have few management options in the spring, but it helps tremendously to know where the problem is most severe. You'll be able to concentrate your management efforts in those areas in late summer and early autumn.

There are occasional instances when a grub population is very heavy in spring, but not evident later that summer. For example, unusually dry summers will force beetles to seek lower, poorer-draining areas, where there may be residual soil moisture.

Set tolerance levels

Tolerance levels, or action thresholds, for white grubs vary. Asiatic garden beetle grubs can number as many as 20 to 25 per square foot in locations with adequate irrigation and few agronomic stresses. European chafer grubs can number as few as two or three per square foot in locations with limited water and other stresses.

In general, moderately maintained athletic fields — ones that are fertilized according to local needs, can be irrigated when unusually dry conditions persist, and have at least occasional periods when sports teams are not practicing or playing — can tolerate between eight and 15 Japanese beetle grubs per square foot, at least in most of New England. That number must be lowered if the field is a primary game field, if there are other agronomic stresses present, or if there are skunks or raccoons in the vicinity that like to root around looking for grubs. Skunks and raccoons looking for grubs can cause much more damage than the grubs themselves.

Remember that tolerance levels may not be the same for all fields in your complex or in your city.

Identify management alternatives

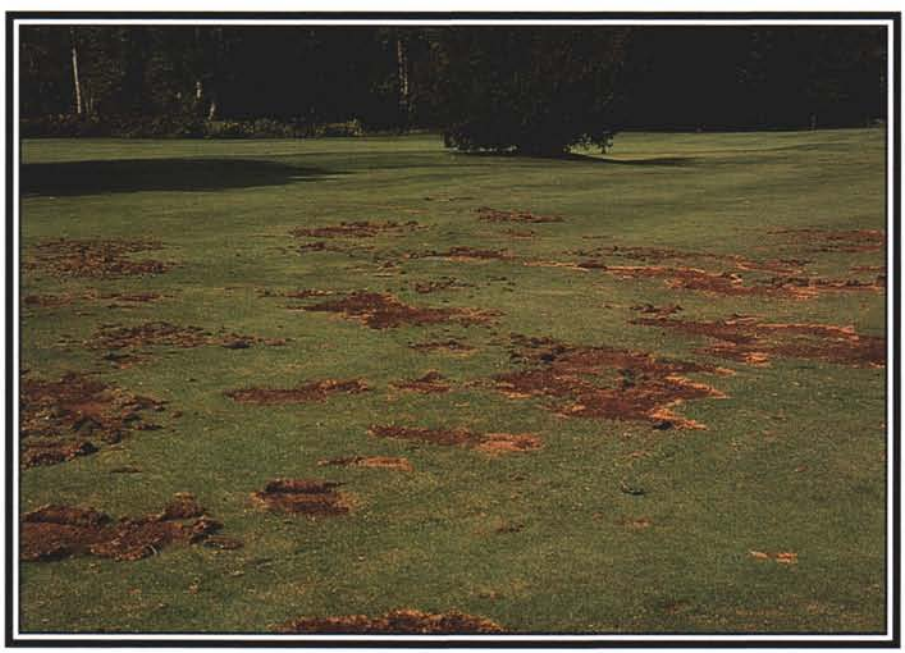
Once you have identified white grubs on your sports fields and you have determined that the population exceeds your tolerance level, you must consider your available management alternatives. In an IPM program, you normally first look for cultural strategies that will provide optimum growing conditions for the turf (thereby raising your tolerance level) or put the white grubs at a disadvantage.

Very few specific agronomic techniques will directly affect grub survival, but proper irrigation will encourage healthy roots and enable grass to outgrow some grub feeding. Manipulating mowing height is another cultural strategy that can help in some instances.

Higher mowing heights normally result in deeper and healthier roots, which help turf outgrow or tolerate some grub activity. However, practice or game schedules and the type of sport played will dictate a turf manager's flexibility. A field hockey field maintained at 1.0 to 1.25 inches will be less able to withstand grub pressure than a soccer field maintained at 2.0 inches.

In some cases, biological control options may be available. Very little field testing has pitted biological agents against turf insects on athletic fields. However, tests have been conducted on other turf conditions.

For white grubs, non-chemical options include milky disease



Skunks rummaging for grubs can cause more damage to turf than grubs themselves.
Courtesy: Dr. Patricia Vittum

(caused by Bacillus papillae) and insect-attacking nematodes. Milky disease is available commercially, but it only affects Japanese beetle grubs.

There are several entomopathogenic nematodes on the market, but only one seems to reduce grub populations consistently. That one, Heterorhabditis bacteriophora, is available in several commercial formulations.

Another nematode, Steinernema carpocapsae, is even more readily available commercially, but it really doesn't work on white grubs most of the time. It's important to read the small print on those nematode containers, and be sure you get the right one!

Biological control options are usually more expensive than traditional insecticides. Handle the organisms carefully so they remain healthy. Do not store nematodes or bacteria in very hot or very cold conditions, and be sure to water-in the nematodes very thoroughly.

Many turf managers still turn to traditional insecticides to manage white grub problems, in part because the non-chemical options have sometimes been less reliable. An IPM program recognizes that pesticides are one of many control options, but they are normally used only after all other avenues have been investigated. An IPM program emphasizes using insecticides in a way that maximizes their effectiveness, so application timing and material selection are critical. IPM also encourages the use of insecticides that will minimize disruption to the environment.

There are several turf insecticides currently on the market that do very different things. Materials like imidacloprid remain active for several weeks after application. They can be applied as beetles begin laying eggs, or as eggs just begin to hatch.

Some people feel such products do not fit in an IPM program, because they must be applied before scouting (or monitoring) has documented the presence of a high grub population. However, imidacloprid has several chemical characteristics that make it generally less problematic in the environment than some other insecticides. Most turf managers consider it a valuable tool in an IPM program.

Many insecticides are intermediate in their activity. They take three to seven days to become active against grubs, and remain active for about five or six weeks.

Materials such as bendiocarb and diazinon can be applied in August in most locations, and they reduce grub populations significantly. Note that diazinon is extremely toxic to wild fowl, like geese. If geese or other birds are present, resist the temptation and use another insecticide, or look for other, non-chemical alternatives. Remember that an IPM program has a commitment to working

with local wildlife!

A turf manager subscribing to an IPM program often needs a quick "clean up" spray to reduce grub populations after they become active. Trichlorfon is such a material. It kills grubs within one or two days of application, and it breaks down about a week after application. It's an ideal product to use after scouting has shown a damaging population is present.

Whatever insecticide you use to control white grubs, you *must water it in* with at least 1/4 inch of water.

Evaluation

Much of turf IPM is truly common sense, but one important aspect that is often overlooked is program evaluation. If your sampling shows that you had an average population of 25 grubs per square foot and you decide to use an insecticide, it's really important to go back and sample again after the insecticide has had a chance to work.

If you find five grubs per square foot after the treatment, it's tempting to say that your strategy did not work. But in fact, you managed to kill 20 of the 25 grubs. This translates to at least 80-percent control. That's pretty good in the real world.

If you failed to sample ahead of time, you have no way of documenting that you had a grub problem in the first place. You'll never be sure whether your strategy actually worked.

You can't claim to be operating in an IPM program unless you monitor pest activity *before* you take action, and then monitor again after you have taken action to compare the results. At the same time, you should make a few notes about things that went very well and things that could have gone better.

Final thoughts

Much of IPM truly is "intelligent plant management:" providing the best growing conditions, reducing stresses, working with sports teams to schedule aerification and other agronomic techniques, etc. To implement an IPM program at your facility, start with a small and manageable aspect of your management plan. You can start by developing the IPM steps outlined here for a particular pest. You can also start by developing an all-encompassing monitoring program for various insect pests you encounter in your area.

Once you're comfortable with monitoring, you can start developing tolerance levels for each pest. Do some background reading to determine which control options will be your best bet, and what conditions will give those options the best chance to be effective.

With a little practice and perseverance, you will be on your way to developing an IPM program that will satisfy any legislator or parent!

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