Monitoring for Improved Golf Course Pest Management

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Pest management has become a major public policy issue today, affecting both large and small golf facilities throughout all regions of the country. This issue is debated passionately in certain states, but no golf course superintendent anywhere is free from public and golfer scrutiny when pesticide use and pest management practices are discussed.

Attitudes among superintendents concerning pesticide use and pest management issues have changed in recent years. It is not unusual to find superintendents scheduling pesticide applications in the pre-dawn hours to avoid conflicts with concerned golfers and neighbors. Notification laws have been instituted in several states, and it is likely that states will continue to enact more restrictions regarding pesticide availability and application. Course officials are even insisting that pesticide applications be made on specified days when the golf course is closed.

Are these policies the result of an irrational wave of public hysteria and extreme environmental activism, or is it long overdue, genuine concern based upon greater knowledge of pesticide issues? The answer, as it usually does, probably lies somewhere between these extremes. However, the intent of this article is not to examine this debate. Instead, it is to provide information about a sound program that will improve pest management results and possibly reduce pesticide applications.

It should be emphasized that an effective pest management program must begin with the turf's agronomic quality. A weakened or stressed turf is more vulnerable to disease, insect pests, and weed encroachment. The basic requirements for turfgrass have not changed. Adequate light, moisture, and effective drainage are three basic requirements for healthy turf.

Quickly consider which greens on your golf course require the greatest attention regarding pest management. More than likely they are perennially weak greens located among mature trees, or they suffer from poor surface or internal drainage. Simply removing or pruning trees or modifying drainage can dramatically improve the growing environment on these greens and reduce or eliminate many pest problems. The majority of Turf Advisory Service reports from USGA agronomists include recommendations concerning tree pruning and removal, yet these recommendations are often the most difficult to sell to course officials.

Improper water management, insufficient fertility, and excessively low mowing heights further stress the turf, leaving it more vulnerable to various pests and diseases. Several recent articles in the GREEN SECTION RECORD have discussed the importance of balancing the turf's fertility requirements and mowing limitations against practices aimed at providing championship playing conditions. This concept is especially important as play increases on many courses.

Water management also has been addressed in countless articles. Nevertheless, excessive irrigation continues as one of the greatest errors observed in the field.

Turf species selection is another factor that dictates pest management strategies. Introducing a species in an area outside its adapted range often results in stress that makes the turf more susceptible to pests. The use of creeping bentgrass in Florida is a good example of a grass species poorly adapted to the state's intense summer heat and humidity. From a pest control standpoint, architects and managers are advised to use grass species that are best adapted to specific regional conditions.

What other options exist to improve pest management results on the golf course? Trade and scientific journals discuss progress with biological and alternative control techniques. Plant breeders continue to work on improved turf cultivars, and new application equipment has been developed to improve our capabilities with a reduced environmental impact. Even with these advances, though, many feel it is too difficult to develop a field program that incorporates new technologies. Results from research and breeding programs hold promise but have yet to provide consistent field results that can be easily worked into existing programs. These new technologies are considered by some to be too costly or labor intensive for practical implementation. Finally, we have to ask ourselves to what extent we are willing to try new technologies and adopt new programs. It is difficult for many to change established practices that have been ingrained from formal education, practical training, and field experience.

The truth is, there are indeed low-risk programs and technologies that the superintendent can use for more effective pest management. The majority of these techniques are straightforward, common-sense practices that can be initiated even with a limited budget and staff. Let's take a closer look at one specific program that can be implemented to improve the results of your pest management program. In fact, it is currently in use at quite a few golf courses in the Rochester, New York, area.

The program is based on monitoring. Monitoring itself is not a new concept, of course, but let's look at a more structured monitoring program specifically designed for golf courses. The formalized programs are still in their developmental stages, but they already have improved pest management results and have reduced or eliminated some pest-

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icide applications at many participating golf courses.

What Does a Structured Monitoring Program Consist of?

Essentially, a structured monitoring program uses designated scouts to collect a wide range of field data on the golf course. The information is documented and provided to the golf course superintendent in a formalized report that can be used as a basis for objective pest management decisions. The data include infectious and non-infectious symptoms observed on the golf course. Regular monitoring provides an excellent record of pest populations and their resulting damage, which can be used for future planning and program development. Regular monitoring also provides follow-up information on the success of a particular control measure against a pest.

The monitoring can be completed by a course employee who has formalized training in field diagnosis of weeds, diseases, and insects. He or she may have other duties to perform as an employee of the club, but the primary responsibility should be the monitoring program. The superintendent must avoid the temptation of assigning other work tasks that might disrupt regular monitoring practices.

A professional scout, who often is employed by several courses in a locale, also may be used to complete the monitoring program. Because they see several courses each week, professional scouts can spot trends in an area, and can use the information from one course's problems to assist the others. A scout is typically a graduate with a degree in agronomy or horticulture with emphasis in pest management. Students often serve summer internships as scouts, and then return following graduation as full-time scouts. The degree of education, field experience, and formal diagnostic training of a scout will influence the effectiveness and cost of the monitoring program. It was determined in the Rochester program that scouting greens, tees, and fairways weekly would cost each participating course approximately $3,000 per year.

How is a Monitoring Program Conducted?

An intensive program includes monitoring the greens, tees, fairways, roughs, and ornamental plantings and trees. Monitoring frequency varies for each portion of the golf course depending on the available time and operating budget. The greens and tees usually require the greatest attention and are initially monitored daily or every other day. Fairways and rough areas may be monitored less frequently if labor or time is a concern. Monitoring time can be reduced significantly once the indicator areas, or hot spots, for particular pest problems are found on the golf course. The superintendent can help provide guidance as to where such locations are for particular pests, and monitoring efforts can be concentrated in these areas when conditions

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favor those pests. Monitoring in the early morning hours is preferred, as disease symptoms and signs are most conspicuous prior to mowing. Scouting early each day also minimizes interference with play.

Monitoring greens and tees is completed simply by walking a circular pattern around each green to observe insect activity, weeds, disease, and non-infectious symptoms. The overall quality of the greens, tees, and fairways can be rated, and symptoms should be documented on a formalized scouting sheet. Pest activity may be quantified by counting actual insects, disease lesions, or weeds, or by estimating a percentage of affected or damaged turf.

Fairways often are scouted from a golf cart or utility vehicle. Closer examinations are completed if symptoms are observed. Scouting programs for certain pests can require a more in-depth procedure. For instance, evaluating late summer white grub populations requires a more specialized procedure which is completed separately from daily monitoring activities.

How Much Time Does a Structured Monitoring Program Require?

The time required to scout the entire golf course will vary depending on the time of season, pest activity, and degree of scouting. Initial scouting of greens, tees, and fairways has required approximately 3 to 31/2 hours for formalized programs in Rochester, New York. The time requirement often can be reduced as the program becomes more refined. Obviously, the more time allotted to monitoring, the more successful the program. However, managers and superintendents in the Rochester area feel that monitoring frequency could be limited to two or three visits per week without sacrificing the program's success. Several golf courses involved in the program are monitored even less frequently.

Nationally, monitoring frequency would be directly dependent on the weather conditions. Regions of the country with greater disease or pest pressure would probably require greater monitoring frequencies during periods of peak disease or insect activity.

What Tools Are Required for a Monitoring Program?

The scout's tools are basically simple. A good set of eyes and an open mind are definite requirements. The scout also should be armed with a standard 10X hand lens, soil probe, cup cutter, pocket knife, tweezers, scalpel, collection vials, and field identification books. A 1-2 gallon diluted detergent solution also might be required for sampling thatch inhabiting and various weevil insects. Other permanent monitoring tools that would be helpful include a weather station, pheromone traps, and pitfall traps. These are permanent monitoring tools that might be stationed at each golf course.

How is the Field Information Packaged?

The field data are carefully tabulated on prepared field sheets that are provided immediately to the superintendent following the monitoring session. The information then can be logged into a computer to develop a permanent data base. Data sheets should contain as much pertinent information as possible. The monitoring date, weather conditions, soil temperatures, and general comments on the turf's overall condition can be listed along with the precise location and description of specific pests or symptoms encountered. Mapping pest activity, symptoms, or weed populations can be a valuable reference for the future. The data sheets can contain preformed diagrams of each hole, or the scout can sketch a rough drawing indicating the specific problem areas.

What Are Some of the Actual Monitoring Techniques?

Specific monitoring practices vary depending on particular pests. Generally, disease symptoms and weeds are monitored visually. Insect monitoring may require excavation with a knife, cup cutter, or sod shovel, probing, trapping, or drenching. The scout should be fully knowledgeable with all monitoring techniques available for those pests that may be encountered. An excellent source of information for insect monitoring is Turfgrass Insects of the United States and Canada by Dr. Haruo Tashiro. It is available through Cornell University Press. Universities and extension agencies are excellent sources for information concern

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ing diagnosis, biologies, and monitoring techniques for the specific, pests in your region.

How Are Disease Symptoms Accurately Diagnosed?

The scout should be completely familiar with most disease symptoms in the field. There are many excellent books that provide in-depth descriptions of disease symptoms and epidemiology as well as descriptive color plates. The Compendium of Turfgrass Diseases, written by Richard Smiley and published by the American Phytopathological Society, is an excellent source of descriptive information and color plates (this publication currently is being completely revised). Slide sets of various diseases are available from universities and the American Phytopathological Society. Agri-Diagnostics Reveal Kits also are good tools for field diagnosis of specific diseases.

What About Diseases that Cannot Be Identified in the Field?

Many diseases cannot be diagnosed in the field. Microscopic examination is usually required for accurate preliminary diagnosis. Scouts should receive training in microscopic identification of disease pathogens, and they should be provided with a microscope or have access to a microscope and the laboratory supplies required for preliminary examinations. Additional laboratory diagnosis also will be required for some diseases.

Successful disease management depends on rapid, accurate field and laboratory analysis. It is imperative that a strong communication link be established between golf course personnel, scout, and diagnostic lab to assure timely diagnosis for effective control decisions. The success of a monitoring program often hinges on the superintendent's confidence in the scout and the laboratory's diagnostic capabilities.

What Benefits Result from Structured Monitoring?

Instituting a monitoring program improves pest management on the golf course. A monitoring program may not always reduce chemical applications in all situations, but it will assure more judicious use of pesticides. Trained personnel or professional scouts with access to a diagnostic lab are more apt to diagnose pest symptoms correctly, thereby reducing or eliminating improper or unnecessary pesticide applications. This system could result in a substantial monetary savings and possibly reduce the quantity of pesticides applied to the golf course.

A significant economic savings in labor and materials also has been realized during the initial years of monitoring programs completed on golf courses in New York State. The savings are calculated on pesticide applications based on structured monitoring versus applications completed on a preventative schedule. The initial savings have helped defray labor and diagnostic costs involved with the monitoring program. James Willmott, a principal investigator in the Rochester monitoring program, feels that scouting could be economically justifiable to clubs if pesticide applications were reduced by 40-50%. The reductions were a reality in the first years of the program, though this may not always be the case. Monitoring could, in fact, increase pesticide applications in some instances as more pests or pest symptoms are discovered from the greater monitoring intensity.

A structured monitoring program serves as the foundation for an Integrated Pest Management (IPM) program. Various IPM tactics can be used in control strategies should monitoring data indicate a need for action. Several years of compiled data will suggest pest threshold numbers specific to your conditions, which will further improve future control decisions.

Often, a monitoring program focuses attention on the areas of the golf course that perennially suffer specific pest problems. Management efforts or controls often can be concentrated in the indicator areas, thus avoiding broad preventative pesticide applications. Monitoring data can be used to limit pesticide applications only to those areas where pests are currently active. Detailed records and mapping also illustrate problem areas which may require cultural management changes or design modifications. Justification for such projects can be made easier with actual data that highlight the problem.

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Obviously, structured monitoring is not the final answer to our pest management needs. Research is required to develop better forecasting models that can be used along with monitoring for more effective pest management. Research to obtain greater knowledge of pest biologies and life cycles, and pest response to various cultural practices also is required. Looking ahead, structured monitoring programs will begin to provide scientists with some helpful data concerning these needs.

Developing greater pest resistance in turf cultivars is another approach that needs more work. Plant breeders are currently working with naturally occurring endophytes in grasses and are attempting to expand this beneficial fungus into bentgrass, Kentucky bluegrass, and other turf species. Breeding work also continues to search for cultivars with greater disease resistance. For example, the USGA currently sponsors breeding work at Texas A&M University that is searching for Rhizoctonia brown patch and pythium disease resistance in bentgrass and zoysiagrass.

Finally, developments in alternative pest management techniques and biological controls promise to improve our capabilities. The production of host-specific pesticides and improved application equipment also offer promise for pest management programs in the future.

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Combining these technologies with a structured monitoring program will form the basis for strong IPM programs. Pest management results will improve with no loss in turf quality or reasonable playing conditions. Try initiating a monitoring program on your golf course and attempt to incorporate IPM control strategies with it. Perhaps you will surprise yourself or your course officials with a major reduction in the pesticide budget. You also might be surprised at the turf's ability to tolerate disease and insect pests. Finally, instituting a monitoring and IPM program will improve your image as a professional and demonstrate your genuine concern for the environment. After all, how many golf course superintendents don't consider themselves environmentalists?