BEST MANAGEMENT PRACTICES FOR THE GOLF COURSE: WHAT'S NEW AND WHAT'S NOT

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Introduction

Golf course management for the 21st century must be different than now. Whatever the futuristic plans for the year 2000 might include, add three factors concerning the environment to those other golf course management decisions which will affect how golf courses are managed - credibility, accountability and defensibility. Why? Because the public does influence environmental law. Because the public will insist that drinking water supplies be protected. Because of the link between water resources and watersheds, management of water resources must include the watershed. Incorporation of Best Management Practices (BMPs) to protect water resources should be part of the golf course's overall environmental management program.

Golf course management decisions must be made based on the principles of Sustainable Resource Management. This can be defined as a pattern of human activity that can be supported indefinitely. This means it must be synonymous with progress. It also means becoming less dependent on non-renewable resources and that activities associated with golf course management must not create a negative impact environmentally. In many people's eyes, golf courses have an image as an energy waster and polluter. Those knowledgeable about turfgrasses can offer many positive environmental impacts such as the following: oxygen production; cooling of the atmosphere; absorption of sound and glare; preventing erosion; and effective filtering of natural and synthetic contaminants. Equally, a second list could be offered which touches on the positive impacts dealing with our quality of life including the following: providing areas for popular recreational activities; increasing property values; providing greenspace and wildlife habitats in urban areas; and economics - jobs! Less informed individuals, and those whose agendas are anti-development and anti-golf would list the following as negative impacts: destruction of wildlife habitat; sedimentation of wetlands; fertilizer and pesticide pollution; and wasting of valuable water resources.

Environmental quality has many aspects. Public perception and attitude is often influenced by the popular press. Consider the following article on the Neuse River which flows through Raleigh, North Carolina to the coast:

> "City sewage, industrial wastewater, farm fertilizers, livestock manure and lawn and golf course chemicals are changing the Neuse (River), choking it with nitrogen and phosphorus."
>
> - Julie Powers Rives
> Raleigh News and Observer

Upon inquiring as the types of studies into the problems associated with environmental quality and the Neuse River which focussed specifically on lawn and golf course problems, it was determined that there were none. The reporter admitted that she was just making a "generalization." The danger here is obvious. The public does not know what is a "generalization". Since fertilizers and pesticides are used on lawns and golf courses they must create a pollution problem. What is lacking is good, scientifically valid data which identifies a specific problem which must be corrected.

The response to these problems from the golf course perspective is clear. The industry must be proactive and not only just point out the positive benefits, but must also address situations where golf course management intersects with environmentally sensitive areas and develop management strategies which will protect these areas. To protect natural resources a threefold approach should be taken as follows: 1) Preventative measures; 2) Control measures; and 3) Detection. This proactive approach stresses incorporating Best Management Practices (BMPs) into the design as a preventative strategy; protecting water quality through removal, filtration, detention or rerouting potential contaminants before they enter surface waters; using Integrated Pest Management (IPM) to achieve BMP goals; a Risk Assessment, including developing strategies for protection of environmentally sensitive areas and guidelines for pesticide selection based on this assessment; and detection through an environmental monitoring program that provides feedback to the golf course superintendent as to conditions and movement of materials.

Management Program

A well developed management plan will be well documented and structured. While some of the types of information may at first seem elementary, to someone who is not scientifically astute it will lend credibility to one's intentions to manage the golf course in a responsible way rather than making instantaneous decisions. This plan should include, but not necessarily be limited to, the following:

Site Description and Evaluation - This will include a detailed description of the physical setting, preferably hole-by-hole with the surrounding environment with drawings and/or aerial photographs as available to delineate where concerns must be focussed. The description should also include details of the topography and how it intersects with natural areas and interacts with management practices. The general soils mapping should be included which classifies the native soils and gives an indication of fertility, percolation, depth to bedrock and/or groundwater. Surface water features should be described and located. Data on the climate should summarize conditions which relate to growth of turfgrasses at the course and impact pest management strategies such as temperature, rainfall, potential evapotranspiration, length of growing season, and mean first and last frost dates.

Golf Course Cultural Practices- Mowing affects playability, turf performance, stress tolerance, pest problems and evapotranspiration. Mowing factors to consider include species, cultivars, and golfer's expectations. Mowing objectives during optimum and stress situations should be described. Irrigation factors such as slope, type of grass, height of cut, rooting depth, weather factors, soil types and irrigation system performance should also be documented. Fertilization factors to be addressed should include soil and plant tissue testing, objectives for growth, choice of materials, and environmental consequences. Supplemental practices such as aerification (which could affect pesticide/nutrient loss due to runoff), topdressing/vertical mowing (which affects thatch control and pesticide/nutrient response) and others are also important.

Safety - Details on storage, handling, disposal and record keeping of pesticides related to worker protection, employee right-to-know, OSHA, should be provided.

Best Management Practices - Developing the plan should rely heavily on use of (BMPs). There are several goals of BMPs which are as follows:

Reduce the off-site transport of sediment, nutrients and pesticides;
Control the rate, method and type of chemicals being applied;
Reduce the total chemical loads by use of IPM, economic thresholds, alternative pest control and fertility testing

Examples of BMPs which can be put into place include:

use of vegetative buffers for filtering runoff or sub-surface drainage
planting more pest resistant or stress tolerant cultivars
culturally or biologically controlling pests
using soil testing and plant tissue analysis to help determine nutritional requirements

There are many more examples which are intent on meeting the goals of BMPs as stated above (Balogh and Walker, 1992; USEPA, 1993).

Integrated Pest Management - IPM is a BMP whose strategies have been applied in agriculture for over 30 years. Recently, the US Department of Agriculture has launched an initiative which has a goal to implement IPM methods on 75% of the total crop acreage by the year 2000. The EPA supports this effort and the Office of Pesticide Programs has been instrumental in helping golf course superintendents find ways to incorporate IPM strategies into their programs. The definition of IPM as put forward by the Responsible Industry for a Sound Environment (RISE) is as follows:

"A system of controlling pests in which pests are identified, action thresholds are considered, all possible control options are evaluated and selected controls are implemented. Control options - which include biological, chemical, cultural, manual and mechanical methods - are used to prevent or remedy unacceptable pest activity or damage."

The choice of control options then is based on:

effectiveness
environmental impact
site characteristics
worker/public health and safety

economics

The basic components of IPM are 1) monitoring - of potential pest populations and their environment; 2) determining - pest injury levels; 3) decision making - developing and integrating all biological, cultural and chemical control strategies; 4) educating - personnel on all biological and chemical control strategies; 5) timing and spot treatment - utilizing either the chemical, biological or cultural methods; 6) evaluating the results - an on-going process. This necessitates that the turf manager and people involved in the IPM program have a thorough knowledge of turf and its pest problems, that there be a structured monitoring or scouting program the intensity of which is determined by the value of the area and a knowledge of pest life cycles and that detailed records are kept to measure the effectiveness of the program and record information on which to make future decisions.

There are six basic approaches for turf protection using IPM as follows: 1) regulatory - using certified seed, sod, and sprigs; 2) genetic - selecting the best adapted species/cultivars for the location; 3) cultural - a healthy grass means fewer problems; 4) physical - isolating areas where pests are a problem; 5) biological - favoring natural competition; and 6) chemical - which is selective, but may be necessary. One of the critical strategies to an IPM approach is to set thresholds for pest problems and try to only use chemical treatments when they are exceeded. This requires vigilant daily scouting for pests by qualified personnel who are trained to recognize the pest problem even at an early stage.

These are also largely determined by the value of the area and the recuperative capacity of the turf (Watschke et al., 1994). Information on the biology of insect problems common to the area should also be included in an IPM plan. For example, there is a degree day model on billbug larvae and adults that uses climatic information on which to base the scouting program and plan the most effective treatment schedule.

Thresholds for fungal and bacterial diseases are less well defined and depend to a great extent on the turfgrass species, prevailing environmental conditions, economic or aesthetic value of the site, and the cost of chemical treatment versus renovation of damaged turf sites. Thresholds may also be based on previous history of infection at the site, particularly for problems such as Spring Dead Spot, Take-All Patch and Summer Patch. Similarly, weed problems can be handled with the same objective in mind.

Monitoring programs focus on two objectives as follows: the IPM objective, to determine if pest populations are building to a point they will need some form of control to be implemented; and the environmental objective to determine if any environmental impact is occurring. Monitoring for golf agronomic purposes can be grouped by frequency. There are those items which need to be monitored on a daily basis such as quality of cut, soil moisture, disease incidence, weed infestation and leaf insects; on a *weekly* basis such as soil temperatures, tissue nitrogen concentrations, algae and moss infestation and the presence of hydrophobic soil problems; on a *monthly* basis the soil profile should be examined for presence of fungi, compaction, infiltration rate, soil pH should be analyzed, and the irrigation system should be checked for calibration; at least *annually* a complete soil analysis should be performed, drainage should be evaluated, wind movement and shade should be checked. The determination of timing on these and other factors may vary due to location and the type of soil and turfgrasses in the area. But, some form of structured program should be in place to collect information to help in making management decisions.

IPM is an evolutionary process! Changes will continually be made to the program as information is collected about the golf course, new information on strategies for control and as the options for control change. When starting an IPM program it is important that it be a structured program. The monitoring should be set up to use designated scouts (which should include the superintendent), keep detailed records and continually evaluate the results.

Risk Assessment

Risk Assessment is the process of assigning magnitudes and probabilities of effects to ecosystems resulting from human activities or natural phenomena. The risk assessment protocols include procedures that characterize the source of the risk, the ecological resources at potential risk, the magnitude of the hazard, the exposure potential, and the assessment of risk. A list of pesticides appropriate for use in watershed locations should be developed from this type of analysis. Based on the receptors on the property, restrictions for use of certain

materials should be made where appropriate. Evaluation of materials should start with chemical properties and site conditions. Further evaluation will be based on exposure potential and toxicity and screening models such as GUS, SCS ad PLP can be used. At this point, materials may be accepted for use or require further evaluation. Computer simulations and maximum exposure limitations can further refine the list of those acceptable for use, perhaps with restrictions on locations based on site conditions such as slope, soil texture, proximity to surface water features, etc. This risk assessment procedure will allow development of a list of pesticides which under well managed conditions present the least possible potential for environmental problems.

Cooperative Sanctuary Program

An additional option as part of the overall IPM and monitoring strategy is to consider becoming a part of the Audubon Cooperative Sanctuary Program of Audubon International. The whole approach to the Audubon program is to promote sound land management and conservation of natural resources, incorporating every aspect of the use of BMPs and IPM. Additionally, it encourages the superintendent to take a leadership role in conservation projects and the recognize those golf courses for their efforts. Under this program, everyone should work towards gaining certification in the areas of environmental planning, public involvement, integrated pest management, wildlife food enhancement, wildlife cover enhancement, water conservation and water enhancement. These are not just critical issues from the public relations perspective, but promote and document good stewardship on the golf course.

Summary

The benefits of incorporating BMPs and IPM into golf course management programs are threefold:

assures more judicious use of pesticides/fertilizers
an economic savings
public relations over environmental concerns and less environmental impact

IPM strategies have been successfully employed at thousands of golf courses around the world. By adopting the strategies of prevention, control and detection and using recognized conservation principles, good stewardship and environmental awareness can make golf course management in watershed areas environmentally responsible.

Literature Cited

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