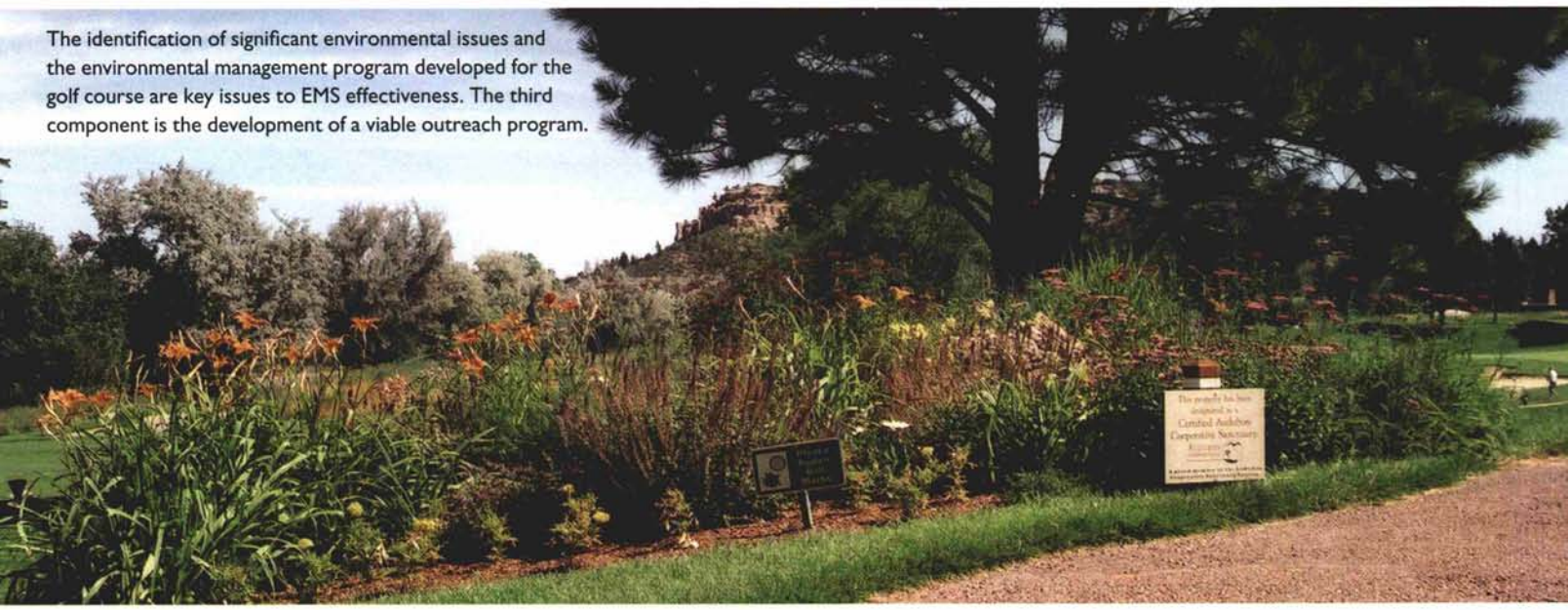
The Devil is in the Details

Environmental Management Systems (EMS) and golf courses.

BY ROBERT N. CARROW AND KEVIN A. FLETCHER



The identification of significant environmental issues and the environmental management program developed for the golf course are key issues to EMS effectiveness. The third component is the development of a viable outreach program.

Environmental Management Systems (EMS) are an increasingly prevalent approach to managing all environmental issues on a site — whether a golf course, manufacturing plant, agricultural production or processing facility, or any other entity. It is a voluntary, standardized, systematic approach to manage environmental issues that is adapated across all industries and on an international scale. In a companion paper (*Green Section Record*, July/August 2007), the EMS concept was defined along with its history (Carrow and Fletcher, 2007). In this article, focus is on the EMS concept and golf courses — implementation, challenges, opportunities, and implications.

Are there already EMS programs in the golf industry? The answer is yes. In agriculture, horticulture, and golf courses, the EMS concept is most advanced in Australia. The February 2007 issue of the *Australian Journal of Experimental Agriculture* was devoted to EMS in agriculture and horticulture (http://www.publish.csiro.au/nid/72.htm), while *Environmental Business Solutions* (EBS 2007) recently developed an EMS program entitled e-PAR™ for golf courses. The e-PAR™ program was developed by Terry Muir of EBS Australia in conjunction with the AU EPA and the Australian Golf Course Superintendents Association and is the most advanced program in the world applying the EMS concept to golf courses. Within the U.S., some individual clubs have used e-PAR™ or information on EMS in general and developed their own EMS.

Audubon International has three programs based on the EMS model and encompassing many of the EMS elements (Audubon International, 2007) — Audubon Cooperative Sanctuary, Audubon Classic, and Audubon Signature Programs. Their programs illustrate the necessity for flexibility within an approach and for adapting any environmental approach, including the EMS concept, to encompass new developments or additions (planning, construction, long-term management), as well as existing facilities. Recently, Ron Dodson, president and CEO of Audubon International, elaborated in the book *Sustainable Golf Courses — A Guide to Environmental Stewardship* on many of the key environmental issues encompassed in the EMS concept when applied to golf facilities (Dodson, 2005). Additionally, the University of Georgia and Audubon International cooperatively developed a web-based educational guideline for golf courses that describes the EMS concept, history, elements, assessment of environmental issues, development of Best Management Practices (BMPs) for each environmental issue, and lists resources for those interested in this concept (Carrow and Fletcher, 2007a).

The U.S. Air Force's Golf Club Environmental Management (GEM) program is based on EMS (GEM 2007). The Air Force mandated that all installations "develop and implement an environmental management system (EMS) to sustain, restore, and

modernize natural infrastructure to support mission capability." GEM is an EMS designed for golf facilities situated within the military structure and method of operation.

Other groups have developed programs or information sources that relate to certain components of EMS but are not EMS programs, such as:

- The Michigan Turfgrass Environmental Stewardship Program (MTESP) (http://mtesp.org/). This is an Environmental Management Program (EMP) developed through collaborative efforts of Michigan State University, government agencies, the turfgrass industry, and advocacy groups. The MTESP has elements that an EMS would incorporate, but it isn't an EMS. Note: An EMP is similar to a BMP to manage a specific environmental issue.
- Club Managers Association of America's Environmental Performance Audit (http://www.cmaa.org/onlinesurveys/environmentalaudits/EAdetail.asp?1ngEAID=1). The CMAA's Full Facility Environmental Audit (FFEA), developed by Audubon International, states that it "is an internal, self-assessment or evaluation that uses standard, widely accepted environmental management practices to measure overall environmental performance." This is not an EMS or EMP, but could potentially be used to develop an audit for an EMS, provided it addresses all the audit criteria listed in the EMS.
- Environmental management on golf facilities is a topic of concern around the globe. Mackay (2006) recently surveyed a number of organization Web sites around the world containing information on some aspects of environmental stewardship on golf courses.
- The USGA's *Green Section Record* and its Turfgrass Environmental Research Online (TERO) (http://usgatero.msu.edu/currentpastissues.htm) site has considerable environmental information related to golf courses.
- Environmental Institute for Golf (EIFG) (http://www.eifg.org/). The EIG is a component of the Golf Course Superintendents Association of America, and their Web site is a portal for environmental information from various sources related to golf clubs.

Use of alternative irrigation water sources is just one example of infrastructure improvements that may already be implemented on the golf course prior to an EMS assessment.

One point that is clear from the above listing is that acronyms abound in the environmental area. It is important to understand the difference between EMS (a holistic program that includes EMPs/BMPs and Environmental Assessment [EA]) and individual components of an EMS — EMPs/BMPs, EA, and other components or elements. In the USA, as the EMS concept becomes more defined and developed, various entities will create tools, programs, literature, and other resources to assist golf clubs in efficiently developing their site-specific EMS or in auditing of EMS.

ELEMENTS OR FRAMEWORK OF GOLF COURSE EMS

The authors have adapted the basic elements of the generic USEPA EMS, but with some changes to better fit the golf industry. Key EMS components appropriate for golf clubs are suggested as: **Plan, Implement, Monitor, and Review**. These components are the framework for **18 practical steps** or elements suggested for developing a golf course EMS plan and are illustrated in Figure 1. Although the EMS framework may evolve within the golf course industry, these suffice to adequately illustrate the EMS concept. Each of the steps or elements of an EMS is briefly defined in the first article (Carrow and Fletcher, 2007) and in more detail in their Web-based document on EMS (Carrow and Fletcher, 2007a).

In this article, the focus is on elements that are especially important for the golf course industry but that are not dealt with in detail in more generic EMS documents, namely: identification of significant environmental issues or impacts; environmental management programs or BMPs for each environmental issue; and outreach. The first two are central to EMS effectiveness,

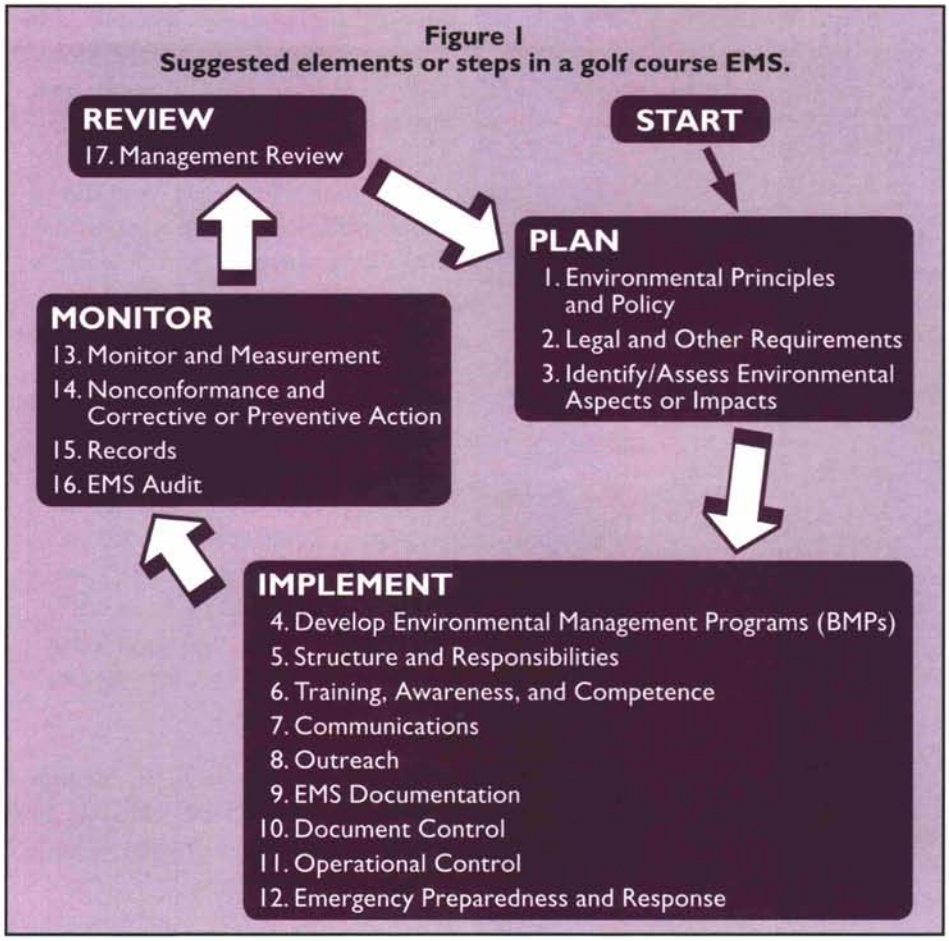


Figure 1
Suggested elements or steps in a golf course EMS.

and the third is a key opportunity for golf courses.

IDENTIFICATION

Identification of Significant Environmental Impacts/Issues (Element 3 of Figure 1): In this step, how the golf course interacts with the environment is assessed by identifying the club's environmental aspects and impacts and determining which are significant. Some of the environmental aspects may be regulated, while others may not be. A comprehensive assessment of environmental impacts may require outside assistance and involve considerable effort. However, a comprehensive assessment is normally a one-time process. It would involve the whole golf facility — course, other grounds, clubhouse, maintenance, etc. When reviewing the general information on EMS concepts by the USEPA or other sources, the documents will not contain specific information on this element since the particular environmental impacts are specific to an industry. However, this step is "the key element" in ultimately developing a successful EMS.

During the environmental impact assessment process, courses should identify specific products, operations, and activities from which any environmental aspects/impacts arise. Likewise, any monitoring that is performed on these operations or activities for environmental purposes can be noted. For example, if generation of waste products is noted as a significant environmental aspect, it would help to know which operation(s) generate the wastes. It might also help to know whether these are monitored or otherwise measured in some manner. Thus, during the environmental impact assessment, the following information may arise that will assist in later EMS steps:

- Current management practices to mediate or manage the particular environmental impact.
- Infrastructure improvements that are being or have been made to mediate or manage the particular environmental impact.
- New or altered practices or infrastructure changes to improve BMPs for the issue may be identified or become apparent.
- Monitoring practices already in process.
- Monitoring practices that will be necessary in the future.

We encourage golf courses to carefully define what current practices and current/past infrastructure improvements have been made to assist in alleviating or preventing a particular environmental issue. In Table 1, examples are provided of practices and infrastructure improvements related to the environmental issue of "Water-Use Efficiency/Conservation" that many courses have instituted but that may not be readily recognized by regulatory agencies, environmental activities, or the general public. A general estimate of costs associated with current practices and infrastructure improvements would be useful in demonstrating the commitment of the course to more sustainable environmental management.

The primary environmental issues in a golf course environmental assessment are summarized below. If after the assessment a particular issue does not reveal an environmental problem or concern, it still should be included in the EMS along with any BMPs and monitoring that is related to the issue. While some of these issues are routinely included in current environmental assessment schemes, others are not. Carrow and Fletcher (2007a) provide the reasoning for inclusion of issues not normally considered, such as items 3, 5, 9, and 10, where each of these is an emerging environmental concern.

1. Environmental planning and design of golf courses, additions, and renovations.

2. Sustainable maintenance facility design and operation.
3. Turfgrass and landscape plant selection.
4. Water-use efficiency/conservation.
5. Irrigation water quality management.
6. Pesticides: water quality management.
7. Nutrients: water quality management.
8. Erosion and sediment control: water quality management.
9. Soil sustainability and quality.
10. Stormwater management.
11. Wildlife habitat management.
12. Wetland and stream mitigation and management.
13. Aquatic biology and management of lakes and ponds.
14. Waste management.
15. Energy management.
16. Clubhouse and building EMS concepts.
17. Climatic and energy management.

Conducting a site assessment related to the above environmental issues may require considerable time and effort when, for instance, water-use efficiency/conservation and use of alternative irrigation water sources are critical issues for a golf course — a situation that is becoming more common. In most cases, development of a comprehensive BMP water-use efficiency/conservation plan for a golf course is a process that is best done over a 1- or 2-year period, especially if alternative irrigation water sources or poor water quality sources are part of the plan. In other cases, where the water supply is known and adequate in quantity and quality, site assessment is somewhat easier. In other instances, the "site assessment" or information gathering process requires contracting companies to do detailed water audits of the existing irrigation system and water source options, along with water quality assessment and other rather complex information gathering tasks. Carrow et al. (2007) presented a detailed discussion of these factors and a template to follow, including irrigation system design.

Assessment of water-use efficiency/conservation should be done with attention to the future, since it may involve costly and time-consuming challenges related to the various strategies, especially irrigation system design, irrigation system capability for scheduling, landscape design alterations, and changes necessary for use of one or more alternative irrigation water sources. Ultimately, the BMP plan for water conservation within an overall EMS can be no better than the information that goes into the decision-making process. Thus, site assessment in this area is especially important.

So, this initial plan can be made, but it may change over time as additional information is gained — for example, an anticipated irrigation water source may be deemed unacceptable due to quality or quantity constraints after a more detailed assessment is conducted. An initial EMS plan may be developed with a central component of the plan consisting of laying out how and when the full site assessment information

Table 1
Examples of water-use efficiency/conservation practices and infrastructure improvements that may already be implemented by a golf course prior to an EMS assessment.

Management, Personnel, and Education Aspects

1. Scouting — costs
2. Hand watering — hours and costs
3. Night watering capability
4. Staffing in irrigation control and irrigation maintenance — irrigation assistant
5. Traffic controls and costs
6. Management for water conservation
   a. Height of cut
   b. Soil cultivation to promote root depth
   c. Evapotranspiration utilization for irrigation scheduling
   d. Selection and installation of drought-resistant landscape plants
   e. Natural vegetation areas
   f. Fertilization practices to minimize water use
   g. Pest management — early morning or late evening applications to reduce water loss; use of Integrated Pest Management protocols.
   h. Wetting agent usage
7. Record keeping and costs
8. Goal setting regarding water-use efficiency/conservation
9. Education efforts — education taken by superintendent or any club official related to water conservation; list benefits of golf courses and turf areas; publish water conservation plans; engage stakeholders (members, patrons, neighbors, general public) with the benefits of water conservation.

Infrastructure Improvements

10. Grass selection and establishment — adapted species and cultivars or climatic/soil conditions; use of drought-resistant grasses, such as bermudagrasses
11. Rain, leak, etc. loss controls and costs
12. Current irrigation controls and hard costs (parts, power)
13. Irrigation design and control improvements — zoning of heads into similar water use areas; irrigation system design to take into account factors that influence water-use efficiency (slope, soil type, wind, etc.)
14. Possible irrigation methods (plant-based, soil-based, budget approach, deficit, atmosphere based); on-site weather station
15. Use of alternative (non-potable) irrigation water sources — reclaimed, water-harvesting from runoff, stormwater, saline sources, etc.
16. Metering — installation and ongoing calibration and replacement
17. Infrastructure improvements made due to using alternative irrigation water — water treatment, soil treatments, extra cultivation, drainage, etc.

Development of new low-water-use grasses for golf courses is an important continuing effort. The USGA Turfgrass Environmental Research Program is funding research at Colorado State University in the development of saltgrass (*Distichlis spicata*), a turfgrass species with exceptional salinity tolerance and growth potential in hot environmental conditions.

may be obtained and then integrated into a future plan. That is the nature of EMS and BMP — not all the answers to questions need to be obtained before an initial plan is developed. EMS is cyclic in nature and is intended to continue the processes of planning/implementation/monitoring/review and continue the cycle again.

EMP ACTION PLAN

Develop Environmental Management Programs (Element 5 of Figure 1). An important part of the planning effort is defining what your organization intends to achieve in the environmental area. To achieve your objectives and targets, you need an **action plan** — also known as an environmental management program (EMP) or BMP (Carrow et al., 2005). Essentially, for each environmental issue identified in Element 3 "Identify/Assess Environmental Aspects or Impacts," BMPs should be developed that are specific to the issue. The various BMP programs should be linked directly to your objectives and targets — that is, the program should describe how the organization will translate its goals and policy commitments into concrete actions so that environmental objectives and targets are achieved (Audubon International, 2002). The BMPs can be combined into the overall EMS. For each environmental issue, the BMP should entail the following:

- Include all current practices and past infrastructure improvements in the BMP.
- Add additional practices as required.
- Include comments on any infrastructure improvements that are planned that will enhance management of the issue. An EMS is an ongoing, cyclic process that allows and encourages improvements over time.

Identification/assessment of environmental issues coupled with the various BMPs to manage these issues is the heart of an overall EMS. As noted, specific information on these two aspects will not be found in general EMS documents. It is beyond the scope of this article to present detailed BMP templates for each environmental issue, but several of the environmental issues have well-developed BMPs through Audubon International (2007, 2002), Carrow et al. (2007), and other sources. In some cases for the emerging environmental issues, BMPs will need to be better defined within the industry.

OUTREACH

Outreach (Element 9 of Figure 1). The USEPA EMS consists of 17 elements, but we have broken out "communications and outreach" into two elements (USEPA 2007). In addition to internal communication directed toward EMS improvement, golf courses should strongly consider becoming an aggressive **outreach and education resource for the community**. The community is interested in the environment and may not be very well informed on the environmental sustainability and stewardship activities of a golf course. An EMS provides an excellent vehicle to use in community outreach and education. Audubon International (2007, 2002) has several fact sheets and other information related to this topic. Outreach and education activities will require a plan and commitment, such as:

Golf course maintenance facilities should be sustainable both in their design and operation.

- Identify the key education person at the facility.
- Develop educational tools — displays, newsletters, brochures, press releases.
- Continuing education plans and activities — turf managers, community, crew, site managers/owners.
- Formal training of turf managers — environmental turfgrass management or sustainable turfgrass management.
- Site use for educational activities. Develop educational programs for the community (such as schoolchildren, scouts).

IMPLICATIONS OF EMS FOR THE GOLF INDUSTRY

In Part One of this series on EMSs, some key implications of the application of the EMS concept for golf course management were noted (Carrow and Fletcher, 2007). Additional EMS key implications directly related to either a club or components of the turfgrass industry are:

- An EMS allows combining together into one system the various BMPs for each particular environmental issue. It becomes an overall grid to understand the diverse environmental issues and how to manage them.
- As the EMS evolves, there will be a substantial need for: educational materials, site-assessment protocols and tools related to each environmental issue, development of concise BMP protocols and tools for each environmental issue, auditing and certification protocols and tools, and services to conduct on-site environmental assessments and audits. Organizations, consultants, and associations that can provide these services will arise. Due to the comprehensive nature of EMS, it may be attractive to golf courses to seek service providers that can provide holistic service packages.
- Related to the previous statement, educational or information "packaging" must become more focused, targeted, and integrated. General information or even specific information in diverse places will not be nearly as useful when so many environmental issues must be addressed in one EMS. The systematic packaging of environmental information may be at various levels of detail, depending on the target audience, but for the turf manager, specific detail is necessary.
- As detailed BMPs are developed for each environmental issue, application to specific sites is essential since the very nature of BMPs and environmental issues is site-specific — one size does not fit all. A comprehensive BMP template must be refined for each site based on site knowledge and science.
- As "environmental management" evolves into the normal day-by-day operations of a facility in addition to the current daily agronomic, personnel, and economic considerations that managers must consider, environmental staff positions may arise, such as an assistant superintendent/environmental specialist.
- For complex issues, such as water-use efficiency/conservation, irrigation water quality (when water quality is challenging), and salt-affected turfgrass sites, consultants with in-depth understanding of these complexities will be in demand.
- Education of future turf managers must evolve as the EMS concept becomes integrated into all facets of the turf industry (not just golf courses). Students will require: course content to understand the complex issues in much more detail than is the current status; introduction to the terminology, concepts, and management related to each of the environmental issues (depending on the issue, the detail or intensity will vary); and ability to think and manage based on a "systems" approach.

In the end, whether individual golf courses adopt an EMS structure ad hoc or the industry at-large develops a common, accepted template for EMS delivery and verification of practices, one thing remains true: the devil is in the details. Systematically recognizing environmental issues for the facility to manage is important, but how they are managed is where substance parts with intent. It is our contention that any sustained effort at improving the environmental practices of golf course operations industry-wide must include some type of voluntary, verifiable EMS-like program and must be intentional, measurable, and real.

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DR. ROBERT N. CARROW *is professor, Turfgrass Stresses/Soils, The University of Georgia, Griffin Campus;* DR. KEVIN A. FLETCHER *is director of programs and administration, Audubon International, Selkirk, N.Y.*