

## BMP Performance Goals



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## **Introduction**

### **The Environmental Institute for Golf**

The Environmental Institute for Golf (EIFG), the philanthropic organization of the Golf Course Superintendents Association of America (GCSAA), is a collaborative effort involving golf industry stakeholders dedicated to strengthening the compatibility of golf with the natural environment. The Institute funds programs and services including education, research and outreach to advance and communicate environmental stewardship of the golf industry. For more on The Institute, visit [www.eifg.org](http://www.eifg.org).

### **Golf's Drive Toward Sustainability**

The EIFG is collaborating with Golf 20/20, scientists, regulators and environmental advocacy groups to advance the sustainability of the golf course industry. The EIFG has positioned sustainability as a never-ending goal and is urging the golf industry to commit to continual improvement.

### **Sustainability Definition**

A sustainability definition has been developed and reviewed by GCSAA's Environmental Programs Committee and the Golf 20/20 Environmental Committee in an effort to clarify what sustainability means for the golf course industry. The definition has been created utilizing the intentions of the U.N. Brundtland Commission's definition of sustainable development. The U.S. EPA definition was also used along with advice from other professionals by the development team. The definition incorporates the three key elements of sustainability; society, economy, and the environment.

*The U.S. golf industry recognizes sustainability, the integration of environmental stewardship, social responsibility and economic viability, as a critical and never ending goal. The golf industry embraces sustainability as "meeting the needs of the present without compromising the ability of future generations to meet their own needs."*

Sustainability is about ensuring profitable businesses while making decisions that are in the long-term interest of the environment and communities. The focus is on continual improvement, professionally managing and conserving resources and inputs, and reducing waste while providing playing conditions that satisfy golfers of today and tomorrow.

Sustainability incorporates three main areas of focus: society, economy and the environment, which are sometimes referred to as the triple bottom line - people, planet and profit. Businesses focusing on sustainability will incorporate these key elements within their decision-making processes to help deliver a positive return on investment. The golf course industry currently provides benefits to society, local communities and the economy, as well as the environment. These values or benefits were presented during the National Golf Day event in 2009 and have been continuously promoted with subsequent messages and communications.

Golf facilities should communicate their value to their communities, including jobs, economic contributions, recreational values and green space benefits in addition to their stewardship practices. The EIFG is focusing on presenting the message about golf's value and the importance of continuous improvement.

### **Golf Course Environmental Profile**

Data have been collected over the last four years to establish a baseline understanding of the property features, inputs and management practices of U.S. golf facilities. The first series of surveys is intended to report results, provide recommendations and assist in setting direction for future improvements. It is being used in a variety of venues to communicate about the industry in a factual manner. Collecting data again in the future will allow us to measure performance in comparison to the baseline information. The profile is Golf's Drive Toward Sustainability's measuring tool.

### **BMP Performance Goals**

A cornerstone of Golf's Drive Toward Sustainability is the examination of existing Best Management Practices (BMPs) and the development of performance goals. The performance goals are designed to be high level action based statements, not technical instructions. The statements are broad-based and encompass the entire golf facility, including management of turfgrass, landscape, environmental resources, buildings, amenities and operations. They provide golf facilities a resource from which to evaluate their current operations and design a plan for continuous improvement. They are being used to prompt the creation of new tools and resources, support existing programs and will be used to recognize and reward performance by the EIFG and other collaborators.

There are various BMPs, resources and voluntary programs already in the marketplace that are known to be useful. These include the Audubon International program, Florida BMPs, Oregon Stewardship Guidelines, US Air Force – Golf Course Environmental Management Program, CMAA's Full Facility Environmental Performance Audit and the Michigan Turfgrass Environmental Stewardship Program, to name a few.

The performance goals will offer guidance to golf facilities not currently involved in these programs or utilizing the tools. These statements will also assist golf facilities to further engage in existing voluntary programs.

A collaborative process was established to identify BMPs that golf facilities should be using to make improvements and drive toward sustainability in the areas of water conservation, water quality protection, energy conservation and pollution prevention. The process engaged golf industry stakeholders, environmental advocacy groups, scientists and regulators to review existing BMPs and develop the performance goals. Five working groups, one for each of the aforementioned areas and an oversight committee were involved as part of the process. (See Appendix A: Committee Participation)

The BMP performance goals are centered on the concept of continual improvement incorporating the “plan, do, check and act” model. Facilities are encouraged to adapt a business philosophy of sustainability incorporating continual improvement. Common throughout the BMP performance goals are the establishment of policy, setting goals, developing action plans, tracking / monitoring progress and reporting practices. Facilities are encouraged to adapt the “plan, do, check and act” model incorporating periodic review, reporting, communicating and updating processes. This model in conjunction with industry BMPs are considered the best model for continuous improvement and sustainability. The process should be practical and have a clear business value in order for it to be useful

The BMP performance goals only encompass the aforementioned focus areas and do not specifically address every environmental issue. These areas were selected as priorities through the Profile work and other influences. Other issues such as wildlife and habitat management, air quality, noise and others are integral aspects of golf facilities and should be incorporated within a facility’s overall environmental plan. An environmental plan should be considered a dynamic or living instrument with regular reviews and updates. Likewise, the BMP performance goals are considered dynamic and will be reviewed and updated by the golf course industry to ensure continuous improvement.

Facilities should carefully consider their business environment, including their financial circumstances, when following the BMP performance goals. Businesses need to ensure profitability in order to provide value within their communities.

### **Moving Forward**

The Institute is encouraging golf facilities to begin assessing operations and their facility in light of continuous improvement and sustainability. Facilities are encouraged to use the performance goals as a starting point and to utilize voluntary environmental management programs as a means to assist their efforts.

Facilities should simply start where they are with what they have – and move forward one step at a time. A good environmental program can help you identify, establish, activate and monitor your goals that can be documented and communicated. In today’s business climate, projects that can make an environmental advancement while reducing expenses or increasing profit should be the highest priority. It is recommended that facilities focus on low-hanging fruit in the beginning to make a difference toward the bottom line as well as managing environmental impacts. Facilities should strive for continual improvements through planning and budgeting processes annually. This is important for the golf industry to flourish today and into the future.

**General Golf Facility Environmental Performance Goals**  
**July 16, 2010**

1. Establish a comprehensive environmental policy for the entire facility.
  - a. Support the policy through established goals and written action plans for continuous improvement and enhanced sustainability
  - b. Integrate the policy across all operations
  
2. Establish goals and metrics.
  - a. Establish specific goals and metrics and use them to demonstrate and communicate performance
  - b. Promote the incorporation of national goals (such as recommendations from the Golf Course Environmental Profile) and local goals (from the community, watershed, state, etc.) into the facility's goals
  
3. Promote local coalitions.
  - a. Encourage and support professional memberships for staff and their participation on local and national levels
  - b. Engage and promote local coalitions of allied golf associations, including golf course superintendents, owners, club managers, golf professionals, universities and other pertinent stakeholders, to create an awareness of the golf course industry and address pertinent issues facing the industry
  - c. Seek partnerships with watershed organizations, utilities, environmental advocacy groups, regulatory and natural resource agencies, etc.
  
4. Incorporate technology wherever feasible.
  - a. Use up-to-date technology to improve efficiency, playability, environmental performance and turfgrass performance, as well as to increase operational profits and contribute to the national and regional economies
  
5. Ensure regulatory compliance throughout all operations.
  
6. Incorporate practical performance evaluation and reporting strategies.
  - a. Track and monitor performance across all operations
  - b. Regularly review performance, goals, objectives and policies for continuous improvement
  - c. Report and communicate performance, achievements, objectives and policy
  
7. Ensure practical communications and education for the staff, members, golfers, and community.

**BMP Performance Goals**  
**Water Conservation**  
**July 23, 2010**

1. Integrate water conservation management as part of the overall environmental policy for the facility.
2. Assess facility infrastructure and current practices.
  - a. Complete a building fixture inventory (sinks, faucets, toilets, etc.)
  - b. Complete an irrigation system inventory/identify value of current irrigation controls and hard costs (parts, power)
  - c. Complete a water-use profile – buildings/operations/landscape/golf
  - d. Inventory and analyze water features of property – topography, flow, storage capacity
  - e. Evaluate buildings, amenities, structures, landscape and golf course design for water conservation opportunities, including new and existing facilities
  - f. Identify existing water conservation and efficiency efforts
3. Conduct a water-use audit.
  - a. Audit building and operations water use
  - b. Perform irrigation audit(s) and/or other techniques to analyze spatial distribution, irrigation efficiency or water need
  - c. Consider local, regional and national recommendations for audits, protocol, timing, etc.
4. Develop a written water-use plan, addressing the following areas:
  - a. Efficiency
  - b. Conservation
  - c. Drought contingency in geographical areas where applicable
5. Implement practical tracking and recordkeeping measures.
  - a. Use an adequate number of meters, gauges, etc.
  - b. Monitor and record use data
  - c. Complete reports and use analysis
  - d. Complete cost analysis
6. Set goals for water-use efficiency/conservation.
  - a. Identify feasible building efficiency upgrades (fixtures, use patterns, etc.)
  - b. Investigate and identify feasible alternative (non-potable) irrigation water sources; reclaimed, water-harvesting from runoff, stormwater, saline sources, etc.
  - c. Identify future water use needs
  - d. Coordinate water efficiency/conservation strategies with organizations governing water rights, water use and management, including any planning/zoning groups

7. Manage golf playing surfaces for optimal performance and desired conditions through the maintenance of healthy and functional turfgrass while minimizing environmental impacts.
  - a. Select optimal turfgrass species
  - b. Maximize plant health
  - c. Optimize performance and desired conditions
  - d. Minimize potential for negative environmental impacts
  
8. Manage turfgrass for water conservation.
  - a. Evaluate height of cut
  - b. Practice proper soil cultivation techniques to promote root depth for efficiency and conservation
  - c. Evaluate irrigation scheduling methods, including evapotranspiration, plant-based, soil-based, budget approach, deficit, atmosphere-based
  - d. Use an on-site weather station where feasible
  - e. Select and install drought-resistant landscape plants, including turfgrass. Use species and cultivars adapted to climatic/soil conditions, being mindful of water-use characteristics
  - f. Evaluate turfgrass areas for appropriate acreage, functional/playable turfgrass versus non-playable areas, and consider the water consumption characteristics of the facility's turfgrass versus other vegetation, such as trees, etc.
  - g. Promote the implementation of natural vegetation areas
  - h. Incorporate fertilization practices that minimize water use
  - i. Utilize pest management and develop Integrated Pest Management protocols
  - j. Evaluate soil moisture and wetting characteristics and the use of wetting agents
  - k. Evaluate the use of plant growth regulators
  - l. Control traffic (cart, player, equipment) to relieve stress
  - m. Perform a cultural practice analysis; hand-watering, managing disease pressure-times, evaluate time of day, etc.
  - n. Evaluate the business value of dormant / winter overseeding
  - o. Monitor irrigation for proper water application
  - p. Evaluate soil amendments to improve soil properties and water holding capacity
  
9. Manage buildings, amenities, golf course practices and other operations for water conservation and to eliminate waste.
  
10. Evaluate new technology for application to:
  - a. Buildings
  - b. Amenities
  - c. Operations
  - d. Landscape
  - e. Irrigation
  - f. Turfgrass

11. Evaluate infrastructure improvements and install upgrades/technology where feasible, including:
  - a. Irrigation system design and devices that will advance water-use efficiency
  - b. Irrigation design, equipment and control improvements
  - c. Soil, plant and environmental sensors (weather stations, remote sensing and similar technologies)
  - d. Subsurface irrigation and surface drip systems
  - e. Building and operations for technological improvements
  
12. Ensure overall performance of the irrigation system.
  - a. Optimize irrigation scheduling/operation for efficient water-use
  - b. Ensure maintenance of the irrigation system for optimum performance
  - c. Use the irrigation audit process and results
  
13. Educate facility staff, officials, members and community related to water conservation.
  - a. Consider linkages with the region's universities, research and Extension programs, etc.
  
14. Actively monitor, review and modify conservation strategies and goals for continuous improvement.

**BMP Performance Goals**  
**Water Quality Protection**  
**July 23, 2010**

1. Integrate water quality protection as part of the overall environmental policy for the facility.
2. Conduct a watershed and groundwater assessment of the property.
  - a. Identify position of property in relation to its watershed
  - b. Identify overall goals and qualify concerns of the local watershed
  - c. Indicate surface water and flow patterns
  - d. Indicate stormwater flow as well as existing and potential holding capacity
  - e. Indicate impervious surfaces, such as buildings, parking lots, or pathways
  - f. Indicate major drainages and catch basins that connect to local surface water bodies
  - g. Identify and understand depth to water tables and soil types
  - h. Locate well heads
3. Manage golf playing surfaces for optimal performance and desired conditions through the maintenance of healthy and functional turfgrass while minimizing environmental impacts.
  - a. Select optimal turfgrass species and cultivars
  - b. Optimize performance based upon the facility's business objectives
4. Develop and implement a written nutrient management plan.
  - a. Use regional guidelines for nutrient applications that are based upon peer reviewed scientific research and experts recognized by the turfgrass industry, such as university turfgrass scientists, Extension specialists, etc.
  - b. Use soils/tissue tests from all application areas (landscape, rough, greens, tees, putting greens, etc.)
  - c. Utilize/recycle nutrients that occur from the use of recycled/effluent water, grass clipping deposition or soil organic matter
5. Manage landscape features to promote water quality.
  - a. Ensure proper water management, incorporating plant needs, landscape characteristics, soil types and amendments, water flow, etc., for healthy turfgrass, reduced runoff and minimal environmental risks
  - b. Maintain structural best management practices (detention basins, swales, wetlands, buffer strips, etc.) for stormwater runoff, drainage, etc.
  - c. Prevent soil and streambank erosion, etc.
6. Manage and apply fertilizer appropriately.
  - a. Select and appropriately apply fertilizer products that will meet the needs of the soil and plants as well as achieve water-quality protection goals
  - b. Understand terminology and follow label directions
  - c. Consider all potential influential environmental factors, such as weather, to reduce environmental risk when making fertilizer application decisions

- d. Time applications to optimize plant health and water-quality protection
  - e. Calibrate application equipment
  - f. Handle and store fertilizer properly to avoid spills
  - g. Implement buffer zone management practices to protect water bodies and well heads
  - h. Avoid impervious areas and other landscape features susceptible to runoff
7. Develop and implement a written IPM plan.
  8. Manage and apply pest control products appropriately.
    - a. Ensure adequate personnel training, certification, licensing etc.
    - b. Store products in facilities designed for pesticide storage
    - c. Select pesticide products to maximize efficacy and environmental protection while managing costs
    - d. Mix and apply pesticides according to label directions
    - e. Load and rinse application equipment in a manner to protect the environment and the applicator (use personal protection equipment)
    - f. Use appropriate pesticide application equipment
    - g. Calibrate and maintain equipment regularly
    - h. Implement pesticide-free buffer strips where needed to protect water bodies
    - i. Minimize disturbance of areas designated for native species/use native species
    - j. Maintain emergency spill and response plans, kits, training, inventory, hazardous communications program, etc.
    - k. Follow all local, state and federal requirements
  9. Use landscape planning, management strategies and techniques that minimize impacts to surface water and groundwater resources.
    - a. Evaluate landscape scenarios incorporating turfgrass, native species and other stands of healthy vegetative cover to protect water resources where feasible
    - b. Evaluate reduced maintenance zones within landscapes to protect water resources where feasible
    - c. Evaluate slopes and topography for acceptable management and surface water flow
  10. Manage existing aquatic resources appropriately.
    - a. Develop a pond/lake management plan (impounded waters)
    - b. Manage streams, drainages, wetlands and other surface waters appropriately
    - c. Ensure proper well head protection
  11. Evaluate water-quality monitoring practices and implement where feasible.
  12. Educate facility staff, officials, members and community on water-quality protection issues.
  13. Properly manage facility and amenities operations and wastes.

**BMP Performance Goals**  
**Pollution Prevention**  
**July 23, 2010**

1. Integrate pollution prevention management as part of the overall environmental policy for the facility.
2. Assess golf facility operations and infrastructure for potential pollution impacts (air, waste, water and soils) and identify reduction opportunities and effective control measures.
  - a. Consider local noise and light pollution issues
3. Minimize potential pollution impacts in the selection, storage and maintenance of facility equipment, including agronomic, food service, building HVAC and other systems/devices.
4. Implement tracking and recordkeeping measures.
  - a. Monitor key devices and operations, record and track data
  - b. Complete summary reports with analysis and recommendations
  - c. Complete cost analysis and highlight return on investment for improvements
5. Minimize waste from all operations.
  - a. Ensure all solid waste is evaluated for reduction, reuse, and/or recycling practices and that all processes are in compliance
  - b. Evaluate hazardous waste and similar materials for procedures that will lead to reduction, reuse or as a last choice, recycling and that all processes are in compliance with local, state and federal requirements
  - c. Focus on product selection and use for all operations from chemicals, fuels, food products, office products, laundry products, furniture, packaging, to promote items with zero waste generation. Bulk purchasing and minimal packaging should become standard purchasing language
6. Ensure that materials storage, mixing and loading areas have minimal environmental impact.
  - a. All chemicals (pesticides, pool products, fertilizers, cleaners, paints, fuels, etc.) are stored in areas designed for that purpose and are in compliance with local, state and federal requirements
  - b. Ensure spill kits and personal protective equipment are available and employees are trained in their use
  - c. Mix, load and apply landscape and turfgrass management products according to label instructions and follow local, state and federal requirements
  - d. Mix and load pesticides and fertilizers in an environmentally protective manner (using impervious surfaces, spill containment, anti-siphoning, emergency shut-off capability, etc.)
  - e. Ensure that fuels are adequately stored and dispensed and that spills are contained

- f. Maintain emergency spill and response plans, kits, training, etc.
7. Ensure that the cleaning, washing, containment and maintenance of all equipment, parts and materials are conducted in a manner that minimizes environmental impacts and are in compliance with local, state and federal requirements.
    - a. Clean/wash turfgrass maintenance equipment, golf cars and service vehicles in a manner that adequately protects environmental resources
    - b. Conduct parts washing/cleaning for equipment maintenance in a manner that adequately protects environmental resources
  8. Implement proper battery-management programs.
    - a. Evaluate new technology and upgrade where feasible
    - b. Recharge and recycle all batteries
    - c. Optimize battery charging equipment for efficiency
    - d. Store, charge and dispose of batteries properly
    - e. Utilize off-peak times for charging where feasible
  9. Evaluate building and other infrastructure design, construction and maintenance practices to minimize pollution.
    - a. Use recycled or recyclable materials whenever feasible
    - b. Evaluate maintenance practices and alternatives to minimize pollution and protect environmental resources
    - c. Prevent and fix leaks in all building systems through regular inspections and maintenance
    - d. Ensure proper septic system function
  10. Review supply chain, customer activities and other activities in the facility's sphere of influence to minimize environmental impacts.
    - a. Evaluate overall environmental impacts from business partners, suppliers and customers to implement/promote pollution prevention through education and action plans when feasible
  11. Educate facility staff, officials, members, customers and the general public about the facility's pollution prevention activities.

**BMP Performance Goals**  
**Energy Conservation**  
**July 23, 2010**

Energy conservation performance goals are organized into the following categories:

- General energy conservation goals
- Buildings and amenities – the buildings, infrastructure and amenities of the facility such as the clubhouse, swimming pool, restaurant, maintenance building(s), tennis courts, etc.
- Golf course – the golf course and surrounding landscapes, pump station, irrigation system and related agronomic operations (playing surfaces, equipment, turfgrass maintenance etc.)

**General energy conservation goals:**

1. Integrate energy conservation as part of the overall environmental policy at the facility.
  - a. Coordinate and integrate the policy to the entire facility, including the services the facility provides to its customers and community
  - b. Communicate policy to all stakeholders - members, customers, constituents, etc.
2. Establish an energy management plan for the facility (incorporate quality management elements for continual improvement (expressed as plan, do, act, check).
  - a. Investigate tax benefits and other incentive programs (government and non-government programs)
  - b. Evaluate voluntary energy conservation programs, tools and certification
    - 1) Identify assistance, incentives and programs from energy providers
    - 2) Identify state/local programs and certification
  - c. Consider U.S. Green Building Council's LEED program
  - d. Consider EPA's EnergyStar, Portfolio Manager, etc.
  - e. Consider energy management software and /or services
3. Track and measure the facility's energy use.
  - a. Energy sources include electricity, natural gas, liquid fuels and renewable/alternative energy
  - b. Monitor all energy use; track data, evaluate billing meters
  - c. Install adequate meters, gauges, etc.
  - d. Develop an equipment inventory incorporating individual equipment's energy use, traffic patterns, maintenance records, hours of operation, etc.
  - e. Establish a baseline (use a minimum of one year of data)
  - f. Consider benchmarking performance using prior use records or against similar facilities

4. Evaluate energy-use-reduction opportunities.
  - a. Evaluate all potential and existing energy sources and research providers (electricity, natural gas, liquid fuels and renewable/alternative energy providers) for costs, efficiency/assistance programs and incentives
  - b. Identify and categorize operations for energy efficiency opportunity and conservation analysis, then prioritize those that are most important, have the greatest impact or greatest use
  - c. Perform assessments of all the facility's infrastructure and operations
  - d. Perform appropriate audits throughout the facility depending upon operation and infrastructure
  - e. Identify efficiency and conservation elements of infrastructure/ hard items and behavioral/process-oriented items
  - f. Evaluate new construction, redesign and renovation projects for energy conservation opportunities
  
5. Set goals for buildings/amenities and the golf course operation and develop implementation plan.
  - a. Incorporate first-cost consideration (initial investment and long-term gain)
  - b. Implement the plan, measure appropriate systems/processes, analyze results, report findings, establish new goals and update the plan on a regularly scheduled basis as part of the plan, do, check and act cycle

**Buildings and amenities:**

1. Set goals for energy-use efficiency/conservation.
  - a. Consider building, infrastructure and equipment efficiency
  - b. Evaluate upgrades
  - c. Identify future energy needs
  
2. Ensure proper equipment selection (type, size, etc.), operation and maintenance.
  - a. Prioritize energy consumption as part of the selection
  - b. Incorporate a cost analysis with a suggested five-year or less return on investment
  
3. Ensure that HVAC systems are properly selected, designed, sized, installed, operated and maintained for intended service.
  
4. Ensure energy efficient buildings, amenities and related infrastructure.
  - a. Optimize use of space
  - b. Ensure routine maintenance and repair leaks
  - c. Consider natural lighting, heating, cooling etc. (includes plant selection, use of colors, etc.)
  - d. Optimize temperature/environmental settings – heat loss, etc.
  - e. Evaluate building automation systems, monitoring systems, etc.

5. Ensure that equipment (lights, motors, pumps, etc.) for tennis courts, swimming pools and other areas are properly selected, designed, sized, installed, operated and maintained for intended service.
6. Ensure efficient lighting, including both interior and exterior areas.
  - a. Incorporate technology and up-to-date equipment – lights, controls, switches, etc.
  - b. Implement schedules/controlled use
  - c. Evaluate off-grid pole lighting and similar technology
7. Evaluate golf car equipment/operations and ensure proper selection, operation, charging and maintenance as well as fleet size and management.
  - a. Consider alternative equipment, products and practices
8. Implement energy management, efficiency and conservation practices.
  - a. Work with energy providers on existing energy management practices
  - b. Consider cost analysis
9. Implement water efficiency/conservation practices.
  - a. Consider national and local programs like the EPA's WaterSense program as it relates to buildings (see water conservation BMPs)
10. Consider alternative products, operations and practices for efficiency/conservation.
  - a. Evaluate alternative transportation
  - b. Evaluate cleaning practices (dry vs. wet)
  - c. Consider local versus distant purchases, product selection, etc.
  - d. Evaluate energy coming into the facility
11. Educate and motivate employees, guests, etc. about energy conservation.
  - a. Consider the use of incentives
  - b. Streamline roles across staff and departments to meet business objectives
12. Evaluate, report and communicate energy use plan, conservation activities and results.

**Golf Course:**

1. Set goals for energy-use efficiency/conservation including infrastructure, equipment, behavior and agronomic practices.
  - a. Evaluate upgrades
  - b. Consider future energy costs and regulations
  - c. Evaluate use of alternative energy fuels
  - d. Identify future energy needs
2. Ensure proper selection (type, size, etc.), operation and maintenance of equipment.
  - a. Prioritize energy consumption as part of the selection process

- b. Optimize equipment-use data, including hours operated, use patterns, mowing speed, etc.
  - c. Incorporate new technology and upgrades when feasible
  - d. Consider alternative equipment, products and practices
3. Ensure efficient design, selection, operation, and maintenance of irrigation pumps, irrigation controls and other irrigation components.
  - a. Assess irrigation pump efficiency
  - b. Audit irrigation system (see water conservation BMPs)
  - c. Schedule and operate the pumps and irrigation events with a goal to minimize energy consumption
  - d. Identify and implement infrastructure and behavioral changes that will further reduce energy consumption
  - e. Evaluate technology and upgrades, implement when feasible
  - f. Consider alternative practices (using non-peak hours, hand watering, etc.)
4. Evaluate agronomic cultural practices for turfgrass and other landscapes.
  - a. Ensure appropriate turfgrass/species selection for the facility's circumstances (climate, soils, expectations for play, business plan, etc.)
  - b. Consider turfgrass, plant materials, and landscape options that require fewer inputs and energy use
  - c. Implement water conservation practices (reference water conservation BMPs)
  - d. Evaluate alternative agronomic practices (product selection, labor vs. equipment or chemical, hand pulling, hand watering, etc.)
5. Evaluate equipment/operations and ensure proper selection, operation, charging and maintenance.
  - a. Consider alternative equipment, products and practices
6. Implement energy management, efficiency and conservation practices.
7. Educate, train and motivate employees on energy efficiency practices pertaining to golf course operations.
8. Evaluate, report and communicate energy-use plan, conservation activities and results.

## Appendix A

## **Committee Participation**

### **Oversight Committee**

- David Burger, Stewardship Partners
- Robert Carrow, Ph.D., University of Georgia
- Scott Cole, Syngenta
- Dan Dinelli, CGCS, North Shore Country Club
- Jay Eccleton, CGCS, The Emerald at Maple Creek
- Kelly Elbin, The PGA of America
- Kimberly Erusha, Ph.D., United States Golf Association
- Pat Finlen, CGCS, The Olympic Club
- Paul Foley, Golf Course Builders Association of America
- Britton Harold, Jacobsen, A Textron Company
- Brett Hetland, CGCS, Brooks National Golf Club
- Dana Lonn, P.E., The Toro Company
- Bill Maynard, CGCS, Milburn Golf & Country Club
- Ruben McCullers, Solid Waste & Pollution Prevention Branch EPA Region 7
- David McLaughlin, World Wildlife Fund
- Chad Ritterbusch, American Society of Golf Course Architects
- Ron Rosenbaum, Club Managers Association of America
- Bill Stinson, Rain Bird Corporation - Golf Div.
- Mike Tinkey, National Golf Course Owners Association
- Anthony Williams, CGCS, Stone Mountain Golf Course

### **Energy Conservation Working Group**

- Ben Cunningham, Club Car Inc.
- Allen Evans, E-Z-GO & CUSHMAN, A Textron Company
- Shelia Finney, Gaylord Springs Golf Links
- Dave Freitag, The Club at Pronghorn
- Corey Gerhart, Barton Hills Country Club
- Britton Harold, Jacobsen, A Textron Company
- Tim Hiers, CGCS, The Old Collier Club
- Adam Ikamas, Crystal Mountain Resort
- Dana Lonn, P.E., The Toro Company
- David McCallum, The Island Country Club

- Ruben McCullers, Solid Waste & Pollution Prevention Branch EPA Region 7
- Jonathan Moulton, Old Greenwood Golf Course
- Jeff Newell, Sunridge Hills Country Club
- Kevin Osgood, Sterling Golf Management
- Frank Rossi, Ph.D., Cornell University
- Andrew Staples, Golf Resource Group Inc.

#### **Pollution Prevention Working Group**

- Charlie Birney, Atlantic Golf
- Brett Hetland, CGCS, Brooks National Golf Club
- Joel Jackson, CGCS, Florida Golf Course Superintendents Association
- Barbara Johnson, P.E., Kansas State University
- John Johnson, Retired Golf Course Superintendent
- Peter McDonough, The Keswick Club
- Richard Rees, Ph.D., Bayer CropScience LP
- Jeff Spencer, Michigan Department of Energy, Labor & Economic Growth
- Rich Spurlin, CCM, CCE, Eugene Country Club
- Terry Stratton, Little River Inn Golf & Tennis Resort

#### **Water Conservation Working Group**

- David Coote, Wood Ranch Golf Course
- John Crean, Broken Sound Club
- John Crowder, Valley Crest Golf Course Maintenance
- Dale Devitt, Ph.D., University of Nevada – Las Vegas
- Jay Eccleton, CGCS, The Emerald at Maple Creek
- Mark Esoda, CGCS, Atlanta Country Club
- Dana Lonn, P.E., The Toro Company
- Justin Ruiz, CGCS, The Rim Golf Club
- Mark Schmidt, Ph.D., John Deere
- Andy Smith, Irrigation Association
- Bill Stinson, Rain Bird Corporation - Golf Div.
- Jason Taylor, PGA of America
- Patrick Watson, CGCS, Southern Nevada Water Authority
- Craig Weyandt, The Moorings Club
- Mandy Whitsitt, EPA Region 7 Watershed Planning

## **Water Quality Protection Working Group**

- John Crean, Broken Sound Club
- Darren Davis, Olde Florida Golf Club
- Dan Dinelli, CGCS, North Shore Country Club
- Brian Horgan, Ph.D., University of Minnesota
- Kevin Hutchins, Mission Viejo Country Club
- JR James, Syngenta
- Gene Mulak, Vineyards Golf Club
- Robert Nielsen, Jr., CGCS, Bedford Golf & Tennis Club
- David Phipps, Stone Creek Golf Course
- Richard Rees, Ph.D., Bayer CropScience LP
- Cutler Robinson, CGCS, Bayville Golf Club
- Nancy Sadlon, New Jersey Green Industry Council
- Maria Sanyshyn, Richter Park Golf Course
- Charles Scott, Gull Lake View Golf Resort
- Brian Steinwand, EPA Office of Pesticide Programs
- Tim Theodorakis, DuPont Crop Protection
- Bryan Unruh, Ph.D., University of Florida
- George Walker, Sustainability Engineering and Research Inc.