Making Your Golf Course Greener

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

A Handbook for Golf Course Managers

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Making Your Golf Course Greener

A Handbook for Golf Course Managers

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Table of Contents

INTRODUCTION..... 2

IN THE CLUBHOUSE: Basic Green Business Practices Checklist
- Solid Waste Reduction & Recycling..... 4
- Energy Conservation & Reduction..... 5
- Water Conservation..... 7
- Building & Grounds Maintenance..... 7
- Fleet & Employee Vehicles..... 8

ON THE COURSE: Guidance for Best Management of Your Playing Surface
- Irrigation..... 9
- Nutrient Management..... 10
- Pest Management..... 14

POLLUTION PREVENTION..... 16

GREEN PURCHASING..... 17

SUMMARY..... 18

APPENDICES
- Applicable Programs..... 19
- Additional Online Resources..... 21
- Sources..... 22

Introduction

Table of Contents | Appendix

There are nearly 120 golf courses throughout the state of New Hampshire, each showcasing their unique game-play challenges and natural beauty to their patrons. It is this natural beauty that often draws people into New Hampshire and keeps them coming back to enjoy all that our state has to offer. Golf courses should be considered valuable assets to the communities in which they reside for the recreation, economic vigor, and green space benefits they can provide. These tremendous benefits may be diminished by the potential environmental impacts of altering large areas of natural space, consuming large quantities of fresh water for irrigation and the use of chemical fertilizers and pesticides to maintain playing surfaces.

The goal of this guide is to offer recommendations to New Hampshire golf courses to become more environmentally sustainable and profitable businesses. This guide focuses on the "Three P's" of sustainable business: *People, Planet,* and *Profit*. In these times of rising costs, shrinking budgets, and intensified public awareness of environmental concerns, an increasing number of golf courses are realizing the benefits of becoming more environmentally sustainable. Golf courses that operate with a genuine focus on environmental responsibility often find themselves better aligned with changing customer demands. Other benefits regulary experienced by businesses that are environmental stewards are: lower operating costs, improved public image, diminished legal or regulatory problems, increased market share, and improved overall heath of their workplace and staff.

The checklists and suggestions included in this guide walk you through a series of considerations. The first section, In the Clubhouse: Basic Green Business Practices Checklist, focuses on green business practices in and around clubhouse facilities. The second section, On the Course: Best Management of Your Playing Surface, provides guidance and strategies for irrigation, nutrient management and pest control on the course grounds. Finally, the Pollution Prevention and Green Procurement sections provide suggestions to further reduce the quantity and toxicity of waste produced at your course.

While most of the information in this guide consists of suggestions, MANDATORY items that pertain specifically to compliance with environmental laws and regulations have been highlighted for your benefit.

How to Use This Guide

Select the checklists and suggestions that best meet the needs of your course's management, employees, patrons, and environment. Ultimately, the most important resource in the implementation of your strategy is the onsite expertise and participation of your staff and management.

Setting specific, measurable environmental goals is a theme throughout this guidebook. Establishing objectives, measuring performance against those objectives, and responding to the results, are basic management skills common to all successful businesses.

The first step in getting started is to write down your goals for "greening" your golf course as precisely as possible. This is your "Environmental Policy Statement." You should use this statement to guide you in making choices as you work through this document. Over time, you may want to revise this statement in response to changing conditions, but you should always be guided by it.

A corporate environmental policy may be a simple one or two-sentence statement such as:

> *(Name of New Hampshire Golf Course) is committed to sustainable business practices which include total compliance with environmental regulations, advancement of environmental awareness, minimization of environmental risks, reduction of emissions and waste, and conservation of land, energy and water.*

On the other hand, a more detailed policy can provide a clearer description of your business's environmental philosophy. This statement can establish more specific environmental, health and safety goals that your course is seeking to attain:

> *(Name of New Hampshire Golf Course) will conduct its business in a manner that protects the environment and the health and safety of employees, customers and public. We will integrate this commitment into our business planning and operations by establishing and maintaining management systems that carry out the following principles:*
>
> ***Health & Safety –***
> *Foster a culture that makes the health, safety and well being of our employees our number one priority – more important than production, profits and serving the customer – and provides every employee the absolute right and obligation to question, stop and correct any unsafe act or condition.*
>
> ***Compliance –***
> *Conduct our business in accordance with all applicable environmental, health and safety laws and regulations, and other relevant standards to which we may voluntarily subscribe. We shall provide the training, management systems, and resources necessary to achieve compliance.*
>
> ***Pollution Prevention –***
> *Factor pollution prevention and resource conservation opportunities into our business planning and operating decisions to help reduce our impact on the environment.*
>
> ***Communications –***
> *Maintain an open and honest dialogue with our employees and stakeholders about the environmental and health and safety performance of our operations and services.*
>
> ***Continuous Improvement –***
> *Establish key measures to track our performance and set objectives and targets to drive continuous performance improvement. We shall conduct audits and assessments and promptly correct conditions that we determine threaten human health, safety or the environment.*

Involve your employees in this effort!
Their ideas and contributions are critical to the success of your environmental policy.

Into The Clubhouse: Basic "Green Business Practices"

Table of Contents | Appendix

It is generally accepted that environmentally responsible companies have addressed a basic set of core environmental issues. These include solid waste reduction and recycling, water conservation, energy efficiency, facility maintenance and vehicle use management. The following checklists provide options and suggestions that can be applied to meet the goal of becoming more environmentally responsible and also help cut operating costs. Most of these suggestions can be implemented with relatively minimal effort. Generally, these activities would be considered part of a more comprehensive environmental improvement process such as a Pollution Prevention Program, described later in this guide in the section titled: Pollution Prevention.

Solid Waste Reduction & Recycling

Conduct a Waste Audit

Use the following table to:

- □ Assess and quantify all solid wastes generated – type, volume, weight, source.
- □ Set a goal for the diversion or reduction of your generated waste stream.
- □ Prioritize waste streams and choose one or more to focus on.
- □ Find markets for waste – make it a *product*, not a *waste*.

  Example: Composting turns food scrap waste into a highly desirable and nutrient soil amendment product for course or landscaping.

Type	Volume	Weight	Source	% Reduction Goal	Priority Focus #

What are the biggest sources of waste at your course?

_____

_____

How can these waste streams be changed or removed to reduce the amount of waste produced?

_____

_____

What are alternative markets/uses that could turn an identified waste into a product?

_____

_____

Reduction Measures in the Office

- □ Purchase duplex (double-sided) printers/copy machines.
- □ Set computer defaults to double-sided printing.
- □ Set up a "reuse room" or closet for reusable office supplies like folders, binders, etc.
- □ Keep previously used paper near printer; use it for drafts, internal memos, scratch pads, etc.
- □ Use and transmit documents electronically instead of on paper.
- □ Design marketing materials that require no envelope; simply fold, seal, and mail.
- □ Recycle ink cartridges: many retailers and suppliers will buy back or offer a credit for returning empty cartridges.
- □ Eliminate junk mail and magazines:
  - -Return cataloges to source and request to discontinue mailings.
  - -Purge your own mailing lists to eliminate duplication.
  - -Remove your company name from junk mail by registering at:
    http://www.dmaconsumers.org/offmailinglist.html

General Solid Waste Reduction Measures

- □ Make recycling easier and more accessible – recycling bins will be utilized most effectively if they are visible, convenient, clearly labeled and placed next to trash bins.
- □ Purchase products in bulk and/or with minimal packaging.
- □ Develop a comprehensive composting program for food waste.
  - -Composted material can serve as a high quality top dressing for course or landscaping.
- □ Install energy efficient air hand-dryers in bathrooms to eliminate paper towels.
- □ Arrange with suppliers to ship orders in reusable containers and pallets.
- □ Send toner/printer cartridges back to supplier for recycling and potential refund or discounts on new purchases (large office supply stores recycle them as well).
- □ Establish a policy to purchase products with maximum post-consumer recycled content.

Energy Reduction & Conservation

Have an energy audit conducted for the facility

- □ Contact your utility provider for a free energy assessment.
  - -Visit www.nhsaves.com and www.nheconomy.com for NH business energy efficiency resources and grant information.
- □ Set a goal for % reduction in annual energy use.
- □ Purchase renewable energy certificates to reduce greenhouse gas impact of your facility.
  - -See the impact you are making: calculate your greenhouse gas savings at:
    http://www.epa.gov/cleanenergy/energy-resources/calculator.html
- □ Explore alternative/renewable energy installations at your facility; take advantage of free renewable energy sources such as wind, solar and geo-thermal.
  - -Solar charging stations and on-board solar-charging roofs for golf carts are efficient methods of recharging your electric vehicles. Under the right conditions, on-board solar charging systems will extend the daily range of your electric carts, prolonging the lifespan of the cart batteries and significantly reduce energy costs. Investigate this option!

Energy Reduction Measures

- □ Perform regular maintenance on HVAC system.
  - -Clean or change filters every two months.
  - -Check for leaks, clogs, obstructions, etc. every year.
- □ Retrofit all incandescent bulbs with LED or compact fluorescent lamps.*
  - - Installing LED or CFL lighting is an easy way to make significant reductions in your facility's electricity expenses. Calculate your potential savings and Retuern on Investments (ROI) at: http://e3living.com/pages/no-parent-page/cost-calculator.html
- □ Replace T12 fluorescent lamps* with T-8 or T-5 lamps with electronic ballasts or with LED lighting.
- □ Install control switches such as occupancy sensors to control lights, AC, heat, etc.
- □ Consider installing downward-focused parking lot lighting to reduce wattage and light pollution.
- □ Institute a policy that all lighting and electronic devices are turned off in unoccupied rooms.
- □ Replace incandescent and fluorescent EXIT signs with LED EXIT signs – this can provide electric bill savings of $50/yr or more per sign! Calculate your cost savings and return on investment at the ENERGY STAR website: EPA LED Calculator (link opens a download page for Excel spreadsheet).
- □ Check location of thermostats or zone sensors; relocate if they're located in areas of the room ex posed to excessive heat or cold.
- □Manage cooling and heating zones to condition only occupied spaces.
- □ Check the timing for general outside lighting and adjust for business hours and seasonal changes. Installing sensors, dimmers and other controls will significantly increase energy efficiency and save your course money.
- □ Parking lot lighting is an ideal location to install LED fixtures. LED bulbs are ultra-efficient and have the longest lifespan of any current lighting technology.
  - - LED bulbs alone will save 50% or more off your electric bill and maintenance savings over the life of the bulb. Combine LED with motion sensors, photo-sensors, or other lighting controls for additional operating cost savings over conventional lighting!
- □ Always request Energy Star or EPEAT certified when leasing or purchasing new equipment.
- □ Clean light bulbs; dirt can reduce light output by 50%.
- □ Set hot water heaters to a temperature of 125-140 degrees F.
- □ Consider landscaping with seasonal foliage that shade buildings in summer while allowing sunlight to enter windows in winter.
- □ Consider installing low thermal emissivity "low-e" windows, air sealing and improving building insula tion to maximize heating and cooling efficiency of building.

***Fluorescent light bulb recycling**

Converting from incandescent light bulbs or standard T12 fluorescent lamps to high efficiency fluorescent (T-8 or T-5) or compact fluorescent (CFL) bulbs is an easy way to save electricity and money. Energy Star qualified CFLs use up to 75 percent less energy than incandescent light bulbs and last up to 10 times longer. However, Fluorescent bulbs (as well as HID bulbs) have a small amount of mercury inside the glass tube. Because of this mercury, it is against the law to dispose of fluorescent bulbs in landfills, incinerators, or with household waste at a transfer station. These bulbs are a "universal waste" that MUST be properly recycled. The N.H. Department of Environmental Services recommends that burned-out CFLs be recycled. Please refer to the NHDES Universal universal waste fact sheet titled: Waste Mercury-Containing Lamps: Management Requirements for Handlers and Transporters (click link or see appendix for website address) for proper management of this mercury-containing waste. Fluorescent bulb recycling information and broken bulb clean-up procedures can be found on the NHDES Universal Waste fluourescent bulbs webpage.

Water Conservation

Conduct a water-use audit for your buildings

- □ Perform a water use and conservation audit at your facility. For tips on this process, read the NHDES Fact Sheet titled: Performing a Business or Industry Water Use and Conservation Audit (click link or see appendix for web address).
- □ Identify all areas of water use within your facility and rank according to volume.
- □ Set a goal for % reduction for facility water use.
- □ Consider separate meters for high-use lines, or for equipment you want to manage closely.

Water Conservation Measures

- □ Recycle or reuse water wherever possible (example: collect rain water in cisterns for use in landscaping).
- □ Drain and flush hot water tanks every 6 months to prevent scale build up.
- □ Install automatic shut-offs on water fixtures wherever possible including public water use areas (i.e., bathrooms).
- □ Install low-flow aerators for all sink faucets (1.0 gallons per minute max.).
- □ Install low-flow toilets (1.28 gallons or less per flush); consider "dual-flush" options for further water savings.
- □ Install waterless or ultra low-flow (1/8 gallon per flush) urinals.
- □ Install high pressure, low volume pre-rinse spray valves in kitchen.
- □ Implement maintenance procedures to quickly detect and repair water leaks.

Building and Grounds Maintenance

- □ Adopt an Integrated Pest Management (IPM) program for pest control. IPM Strategies include:
  - -Proper identification of pests.
  - -Determine if infestation warrants treatment.
  - -Denial of entrance, food, water and habitat.
  - -Use non-toxic pesticides/natural treatments and minimize use of chemical pesticides.
- □ Food waste is a costly waste stream for food service businesses.
  - -Train staff to minimize food waste. Donate excess un-served food leftovers from events to local shelters.
  - -Establish a composting program for food waste from kitchen and dining facilities.
  - -Connect with local animal farmers to pick up food scraps for animal feed (contact the Pollution Prevention Program to connect with local farmers).
- □ Use Xeriscape landscaping or native drought-tolerant plant species to reduce maintenance and water requirements. Learn more about Xeriscape and Water-Wise landscaping from the NHDES Fundamentals of Xeriscaping and Water-Wise Landscaping Fact Sheet.
- □ If your facility must irrigate landscaping:
  - -Utilize storm water collection whenever possible by installing rain barrels or cisterns to collect rain water from building roofs. Learn more about rain barrels on the NHDES Stormwater Management's Rain Barrel Do-It-Yourself Fact Sheet and the EPA green infrastructure website.
  - -Irrigate in the early morning or evening hours to minimize water loss from evaporation.
  - -Inspect for system leaks regularly and repair immediately.
  - -Alter irrigation time and duration in response to precipitation and season.
  - -Spot water landscaping only when needed.
  - -Use a drip irrigation system to reduce water loss to evaporation.
  - -If sprinklers are used: ensure they distribute water properly and do not over-water landscaping.
  - -Use mulch in shrub and flowerbeds to reduce water evaporation loss.

- □ Inspect parking lots, trails, paths and other areas for obvious signs of drainage problems such as the formation of gullies, active erosion or sediment deposits. Correct problems by implementing Stormwater Best Management Practices (BMPs). A variety of helpful Stormwater BMPs are described on the NHDES Stormwater website.
- □ Stormwater runoff from roofs, parking lots and other hard surfaces is expected, but the amount of runoff can be reduced by capturing and directing runoff to areas where it can soak into the ground. Rain gardens, dry wells, retention ponds and other practices can be used to manage stormwater runoff and reduce its impact on your course and the surrounding natural resources. Visit EPA's Soak Up the Rain website for management ideas and resources.
- □ Construct parking lots, paths, patios and other hard surfaces with pervious materials such as pervious pavers, pervious asphalt and pervious concrete. This allows stormwater to soak into the ground instead of running off, helping to reduce erosion and pollution. Learn more about pervious walkways and patios by reading the NHDES Pervious Walkways and Patios Do-It-Yourself Fact Sheet.
- □ Most people are unaware that the water that enters a catch basin flows directly into a nearby lake or stream without any treatment. Identify and label all catch basins to raise awareness and prevent dumping. Clean out catch basins regularly to remove sediment, trash and other debris to make sure they function as designed.
- □ Implement a salt reduction policy for your winter property maintenance. Ensure your facility's winter maintenance staff (or contracted plow service) is certified through the UNH T2 Green SnoPro certification program.
- □ Keep all hazardous chemicals away from catch basins, drains, wells and all surface water. Please refer to Env-Wq 400 Ground Water Protection regulations
- □ Sweep or power blow parking lots, driveways, walks, patios, decks and steps rather than hosing them off.

Fleets and Employee Vehicle Use

- □ Proper upkeep and maintenance of all course equipment (carts included) will save fuel, energy and time as well as extend the useful life of your fleet and uphold resale values.
    - Manage your used oil and oil filters properly: visit the NHDES Used Oil Management Program website or call toll-free 1-888-TAKEOIL for more information.
- □ Implement a universal no-idling vehicle policy; post "No Idling" signs.
- □ Check tire pressure of all facility vehicles frequently and keep tires properly inflated (carts, mowers, utility vehicles, etc).
- □ Consolidate trips – try to accomplish multiple tasks during one trip rather than taking separate trips for each task.
- □ Buy materials and products from local suppliers when possible.
- □ Encourage web-conferencing and tele-conferencing to reduce conference travel.
- □ Support staff carpooling and set up a ride-sharing bulletin board to allow potential carpoolers to make contact.
- □ Provide priority parking to employees who car pool.
- □ Provide readily accessible showers and bike racks to employees who bicycle to work.

Irrigation

Most golf courses consume large volumes of fresh water to irrigate playing surfaces. Many golf courses have made large investments to update their irrigation systems or have modified their irrigation practices to make significant water use reductions. The following are suggestions that may help your golf course reduce its overall water use impact and help minimize the operating costs of irrigation.

Perform an irrigation audit to assess infrastructure and current practices

- □ Integrate water management as part of the overall environmental policy for the facility and make conserving water a priority.
- □ Complete an irrigation system inventory: identify value of current irrigation controls and hard costs (parts, power).
- □ Complete a water-use profile of landscape and course to analyze spatial distribution of irrigation, irrigation efficiency and water needs.
- □ Inventory and analyze water features of the property such as topography, flow and storage capacity.
- □ Evaluate golf course design for water conservation opportunities.
- □ Determine your soil types throughout the course; soil characteristics help identify effective irrigation application rates, duration and frequencies.
- □ Evaluate irrigation scheduling methods including: evapotranspiration, plant-based, soil-based, budget approach (see EPA water budget finder tool in appendix) and water deficit irrigation.
- □ Re-examine existing water conservation and efficiency efforts to update and improve.
- □ Adjust spray patterns to irrigate only desired areas and avoid overspray onto walkways, pavement and other non-irrigated areas.
- □ Consider local, regional and national irrigation recommendations for audits, protocol, timing, etc.

Develop a written water-use plan, addressing the following areas:

- □ Efficiency goals
- □ Methods of water conservation
- □ Measurement and tracking
- □ Drought contingency plans
- □ Cost analysis

Implement practical tracking and recordkeeping measures

- □ Monitor and record water-use data.
- □ Use an adequate number of meters, gauges, etc. to meter total water use.
- □ Complete reports and water-use analysis.

Set goals for water-use efficiency and conservation

- □ Investigate and identify feasible alternative (non-potable) irrigation water sources: reclaimed water, water-harvesting from runoff, storm water collection, saline sources, etc.
- □ Identify future water use needs; make water reduction a priority in course planning.
- □ Coordinate water efficiency and conservation strategies with organizations governing water rights, water use and water management including planning/zoning groups.
- □ Educate facility staff, officials, club members and the local community about water conservation efforts successfully implemented at your course and your plans for further reductions.
- □ Consider coordination and partnership on water related issues with university researchers, extension programs, area conservation groups, etc.

Manage turf grass for water conservation

- □ Evaluate height of cut on greens for seasonal conditions and stress minimization.
  - -Explore the practice of rolling your greens: rolling 1-2 times weekly allows for a higher mow height which improves the health of turf and maintains a fast roll speed. Do not overdo it, excessive rolling may cause compaction issues.
- □ Practice proper soil cultivation techniques to promote root depth for irrigation efficiency and water conservation. The health of your soil will directly affect the health of your turf.
- □ Select and install drought-resistant landscape plants and turf grasses. Use species and cultivars adapted to local climatic and soil conditions, being mindful of water-use characteristics. Prepare for changing climate and more restrictive water use regulations when establishing new areas of vegetation.
- □ Evaluate the size and layout of turf areas: rethink managed turf grass versus unmanaged “natural” areas to reduce input requirements. A deep rough can be visually dynamic, technically challenging and serves as an important habitat for small animals.
- □ Promote the implementation of natural vegetation buffer areas, especially in and around surface water and drainage areas.
- □ Incorporate fertilization practices that minimize water use.
- □ Implement only environmentally responsible soil amendments to improve soil properties and water holding capacity.
- □ Evaluate the use of plant growth regulators and ensure these methods are environmentally responsible.
- □ Control traffic (cart, player, equipment) on turf to relieve stress and compaction.
- □ During irrigation, do not exceed the lowest infiltration rate of soil at any site on course.
- □ The use of environmentally-safe wetting agents can help retain soil moisture therefore requiring less irrigation input.

Irrigation system components: improvements, upgrades and enhanced technology

- □ Analyze your irrigation system; prioritize system updates by what component improvements will have the biggest impact on advancing water-use efficiency.
- □ The effectiveness of soil, plant and environmental sensors cannot be overstated
  - – install remote moisture sensors and rain shutoff switches in all irrigation systems to avoid over-watering and increase system efficiency. Handheld mobile units are also available.
- □ Install and monitor an on-site weather station as part of your irrigation management.
- □ Consider long- and medium-range weather forecasts to schedule irrigation to reduce the risk of runoff and nutrient leaching during large rainfall events.
- □ Consider subsurface irrigation drip systems.
- □ Install a pressure maintenance pump ("jockey pump") to supplement large irrigation pumps during times of low demand (hand watering, select heads, upholding system pressure, etc).
- □ Pumps that incorporate Variable Frequency Drive technology (VFD) are able to regulate electrical draw based on demand and are 30% or more efficient than traditional electric pump motors.
- □ Update sprinkler heads:
  - -Low volume where feasible.
  - -Replace full-circle sprinkler heads with part-circle heads to avoid spraying out-of-play and excessive overlap.
  - -Install adjustable trajectory nozzles.

Performance of the irrigation system

- □ Optimize irrigation scheduling and operation for efficient water use.
- □ Ensure regular maintenance of the irrigation system for optimum performance.
  - -Routinely inspect, repair or replace nozzles that are worn, partially clogged or do not rotate freely.
  - -Routinely test entire system for water leaks.
- □ Use the irrigation audit process and review the results.

Actively monitor, review and modify your conservation strategies and goals for *continuous improvement*.

Nutrient Management

Nutrients are essential for life, however, excess nutrients can contaminate drinking water supplies. They can also speed up plant growth in lakes and ponds and lead to algae blooms which make the water unhealthy for fish and other animals. The over-use and improper application of fertilizers is a major contributing factor to water quality problems throughout the United States. Everyone that uses fertilizer is a potential contributor to this problem, However, highly visible nutrient users such as the agricultural industry and golf courses often receive much of the blame for the serious problems that nutrient runoff causes. The truth is that the majority of golf courses manage fertilizer usage in a responsible and effective manner. These courses understand that strict and proper nutrient management is essential to achieving desired playing conditions, saving money, and protecting the environment. The following are suggestions to help you better manage nutrients on your course.

Develop and implement a written nutrient management plan

- □ Use regional guidelines for nutrient applications that are based upon peer-reviewed scientific research and experts recognized by the turf grass industry, such as university turf grass scientists, extension specialists, etc.
- □ Perform regular soils/tissue tests from all application areas (landscape, rough, greens, tees, putting greens, etc.) and modify practices accordingly to meet (but not exceed) the nutritional needs of the plants and soil. For more information, visit the UNH Cooperative Extension Soil Testing program website.

Use landscape planning, management strategies and techniques that minimize impacts to surface water and groundwater resources

- □ Use native plants in landscaped areas. Once established, native plants require less water, less fertilizer and less maintenance.
- □ Designate reduced-maintenance zones or areas where natural vegetation is allowed to grow. This reduces maintenance costs and protects water quality by serving as a natural buffer to stormwater and pollutants.
- □ Evaluate landscape scenarios incorporating turf grass, native species and other stands of healthy vegetative cover to protect water resources.
- □ Evaluate steep course sections. Look for signs of active erosion such as gully formation, bare ground or exposed rocks or roots. Correct erosion problems using BMPs to reduce stormwater flowing directly down the slope. See NHDES Storm Water Management BMPs and resources HERE and in the appendix.
- □ Monitor weather forecasts: do not apply rapid-release fertilizers before a rain event; this not only adversely affects surface waters, but it is also a tremendous waste of time and money for your course.
- □ Maintain chemical spreaders and calibrate before every application.
- □ Utilize proper aeration practices to help manage thatch, minimize compaction, and improve water absorption.
- □ Advanced slow-release fertilizers (such as Polyon® controlled release fertilizer) will reduce the number of applications per season, require less fertilizer per application and minimize loss of product into surface water.

Manage existing aquatic resources responsibly

- □ Develop a impounded waters (pond/lake) management plan
- □ Establish natural vegetative buffers for streams, drainages, wetlands and other surface waters.
- □ Ensure proper well head protection: fertilizers and pesticides shall not be applied within the protective radius of all wells used for potable water. See Env-Ws 373.12 in the DESIGN STANDARDS FOR NON-COMMUNITY WATER SYSTEMS regulations.
- □ Do not discharge contaminated equipment wash water to surface water directly or indirectly through ditches and storm drains.

Consider all nutrient sources

- □ Let grass clippings lay: Redistribute greens clippings throughout course, clippings will return moisture and nitrogen back into the soil and natural fertilizer!
- □ Apply naturally-derived nutrients: compost top dressing, compost tea, worm castings.
- □ Organic fertilizers tend to have slower-released nutrients and are not derived from chemically processing natural gas like synthetic fertilizers.

Properly manage your equipment wash water

Equipment wash water can contain organic material such as grass clippings and soil as well as soaps, oil and fuel residue, fertilizer and pesticide residue. These materials can severely degrade water quality and should ***never*** be allowed to enter surface waters. To manage equipment wash water responsibly, consider the following:

- □ Equipment wash water (rinsate) recycling stations are commercially available and specifically designed for golf courses. These units assist in the appropriate management of equipment rinsate by filtering out debris. Some systems are able to neutralize or degrade chemicals and nutrients from the wash water from course equipment. These units also conserve large amounts of water by enabling the reuse of wash water. Investigate these units for your course.
- □ Wash water from equipment that carries or spreads chemicals such as fertilizers, pesticides, herbicides, fungicides, etc. should be rinsed in a location where the rinsate is collected to a holding tank. This rinsate can be administered to turf if it does not contain any regulated substances (i.e., oils, fuels or solvents). In cases where the rinsate from equipment *does* contain regulated substances, the rinsate must be captured in a holding tank and this holding tank must be registered with the Underground Injection Control (UIC) program. For more information, please contact Mitch Locker in the Groundwater Discharge program: (603) 271-2858, mitchell.locker@des.nh.gov
- □ Most pesticides, herbicides and fungicide wastes are considered hazardous wastes and are regulated under Federal and State laws. Discharge of hazardous waste (which includes rinse water that contains these chemicals) into the environment is strictly prohibited by Federal and State law.
- □ Vehicles such as golf carts, mowers, rollers, cultivators, utility vehicles etc. that are NOT used for the transport or dispersion of chemicals should be rinsed in a method that:
    - a. Captures all wash water and prevents erosion and runoff into surface water, wetlands and/or stormwater drainage ways.
    - b. Collects all organic material such as grass clippings to prevent them from entering surface water.
    - c. Infiltrates water back into the ground by use of a highly pervious wash-station such as a thick layer of crushed stone over a deep bed of pervious gravel.
    - d. Maximizes separation of wash station to all water sources (dug or drilled wells, irrigation ponds, streams, storm drainage, culverts, etc.)

Please refer to The New Hampshire Code of Administrative Rules chapters:
ENV-WQ 402 GROUNDWATER DISCHARGE PERMIT AND REGISTRATION, and
ENV-WQ 401 BEST MANAGEMENT PRACTICES FOR GROUNDWATER PROTECTION
Additional links and contact info are provided in appendix.

Pest Management

Chemical pesticides are another contributor to water pollution and may pose serious health risks to humans and non-target plants and animals. The unintended consequences to the environment from improper use, storage or disposal of pesticides can be significantly harmful to an ecosystem. Improper pesticide management can also result in steep fines, clean-up costs and severe damage to public relations. The importance of responsible pesticide management cannot be overstated; begin by adopting a comprehensive pest management program at your course.

Adopt an Integrated Pest Management (IPM) program for pest control

Integrated pest management (IPM) is a strategy that focuses on long-term prevention and/or suppression of pest problems with minimum impact on human health, the environment, and non-target organisms. Preferred pest management techniques include promoting naturally occurring biological controls, using alternate plant species or varieties that resist pests, selecting pesticides with lowest toxicity to humans and non-target organisms; adoption of cultivating, pruning, fertilizing, or irrigation practices that reduce pest problems; or changing the habitat to make it incompatible with pest development. Use targeted applications of chemical pesticides as a last resort when careful monitoring indicates they are needed and all feasible non-chemical alternatives have been exhausted.

Basic IPM Strategies include:

- □ **Identify** pest(s) – understand characteristics of pests such as lifecycle, food and environmental requirements, etc. The Northeastern IPM resource center can assist with identification of pests through their online resource database.
- □ **Monitor** to determine if infestation warrants treatment and establish a threshold for action.
- □ **Prevent** by denial of entrance, food, water and habitat to target pest.
- □ **Control** by natural treatments or use of non/low-toxic pesticides:
  - -biological controls (nematodes, bacteria, yeast, promoting beneficial predatory insects)
  - -pheromones
  - -pest lures/traps
  - -promotion of natural predators (i.e., maintain birdhouses, bat-houses)
- □ *Minimal* and *targeted* use of chemical pesticides as last resort: select lowest toxicity option and apply strictly per manufacturer's guidelines.

Manage and apply pest control products appropriately

- □ Ensure all personnel that have access to pesticides are trained, certified, licensed etc.
  - -Is your facility OSHA compliant? WorkWISE NH is a free and confidential on-site occupational safety and health consultation service available to assist NH businesses in meeting OSHA regulations. Contact WorkWISE NH for more information. http://www.keene.edu/conted/workwisenh/
- □ Store pesticide products in facilities designed for pesticide storage with spill prevention and spill containment features.
  - -Pesticide storage methods must meet requirements as stated in the Department of Agriculture regulations: Pes 800; DISPOSAL AND STORAGE OF PESTICIDES AND PESTICIDE CONTAINERS.
- □ Select pesticide products that maximize effectiveness, safety and environmental protection.
- □ Mix and apply pesticides strictly according to label directions.
- □ Load and rinse application equipment in a method that protects the environment and the applicator (use personal protection equipment).
- □ Only use appropriate pesticide application equipment.
- □ Calibrate and maintain spreading equipment regularly.
- □ Implement pesticide-free buffer zones to protect all water bodies.
- □ Minimize disturbance of areas designated for native species.
- □ Maintain emergency spill and response plans, kits, training, inventory, hazardous communications program, etc.
- □ Keep up-to-date and follow all local, state and federal pesticide requirements.
- □Protect pollinating insects; never apply toxic pesticides on or near plants that are in bloom.
- □Install birdhouses and bat-houses throughout your course; Birds and bats will help control nuisance insect populations on your course.

All commercial and private pesticide applicators, as well as pesticide dealers, are required to be licensed or permitted through N.H. Department of Agriculture's Division of Pesticide Control. Please contact the Division of Pesticide Control at (603) 271-3550 for detailed requirements.

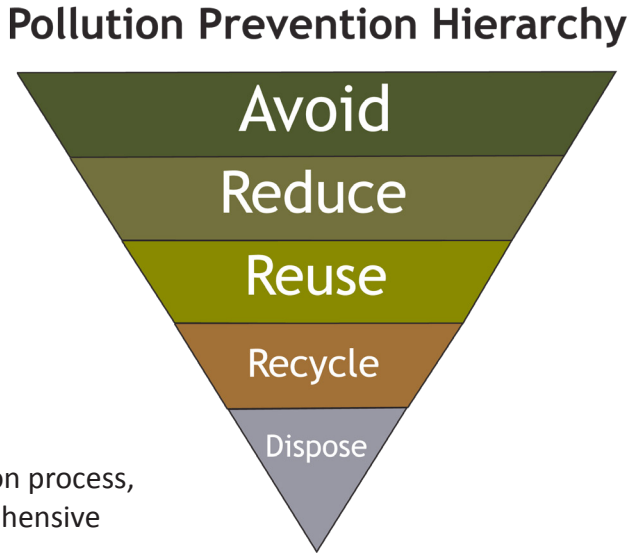
Pollution Provention

Table of Contents | Appendix

Pollution Prevention (P2) describes activities that reduce the amount and/or toxicity of wastes generated by a process. In contrast to pollution control strategies which seek to manage a pollutant and reduce its environmental impact after it has been created, the P2 approach seeks to increase the efficiency of the process, thereby reducing the amount of pollution generated or even eliminate its creation in the first place. Think of it as "preventive medicine" for all types of waste. Although there is wide agreement that source reduction is the central idea of pollution prevention, some professionals use the term pollution prevention to also include recycling and reuse. Visit the NH Pollution Prevention website.

Pollution Prevention is the first of the "systematic review and improvement" processes that include Total Quality Management and ISO 14,000 series Environmental Management Systems. These all have the same basic implementation steps:

1. organize a team
2. analyze the process
3. identify alternatives
4. evaluate alternatives
5. implement projects
6. measure the results
7. repeat steps 2 - 7



Once you have completed the Pollution Prevention process, you are in a better position to implement comprehensive environmental programs at your course.

Upper Management Support

- □ Develop a written corporate policy making pollution prevention a priority.
- □ Establish clearly defined waste reduction goals with measurable objectives.
- □ Create a pollution prevention review team or task force (a "green team").
  - Appoint green team leaders that are champions for the environment.

Planning and Assessment

- □ Train employees in pollution prevention practices and encourage their participation throughout the entire process.
- □ Conduct regular assessments to identify pollution prevention opportunities.
- □ Identify the types, volumes and toxicity of wastes generated at each step in the process. Look for the root cause of a waste's generation.
- □ Examine the standard and "hidden" costs of managing both hazardous materials and hazardous wastes (examples of hidden costs: special safety equipment needed only because of a specific hazardous material, disposal costs involved with hazardous material, increased safety/environmental risks, increased liabilities, increased regulatory costs, etc.).

Green Purchasing

Table of Contents | Appendix

Green purchasing is the practice of adding environmental and social considerations to the price and performance criteria that businesses use when making purchasing decisions. Green purchasing is also commonly referred to as environmentally preferred purchasing (EPP), green procurement, and environmentally responsible purchasing. Green purchasing attempts to identify and minimize environmental and social impacts through the use of environmentally friendly products, and by maximizing resource efficiencies. An informed purchaser understands that the true cost of any product is not found on the invoice, it is the total lifecycle costs of that product from production, purchase, use and finally, disposal. Green purchasing is a way of looking at your purchases from a broader persepctive to take all impacts of that product into consideration.

Planning

- □ When contemplating purchases of new products, check to ensure that no currently owned product could be used to fill your need – is the new product purchase really necessary?
- □ Investigate the feasibility of short-term rental, leasing or sharing of the product as alternative to buying.
- □ Ensure the entire quantity requested will be used completely. If not, create a reallocation plan for reuse or recycling.

Acquisition

- □ Choose the most energy- and water-efficient products available.
- □ Give preference to products with reusable content and recycled materials over virgin materials.
- □ Purchase products free of hazardous components that would require special labeling, handling and/or waste disposal practices.
- □ Chose products whose maintenance and upkeep are free of hazardous materials.
- □ Choose cleaning products that are non-toxic, biodegradable and environmentally compatible. Look for cleaning products with labels such as: ecologo, Design for the Environment (DfE), GreenSeal, Bio prefered.
- □ Choose products whose manufacturer assures that the health of humans, animals and plant life is not endangered throughout the life cycle of the product (manufacturing, use and disposal).
- □ Avoid using products with materials from environmentally compromised areas (e.g. paper from rain forest trees).
- □ Select products certified under a recognized eco-labeling program (e.g., ENERGY STAR, WaterSense, EPEAT, DfE).
- □ Select products designed to minimize waste.
- □ Choose products constructed from the greatest percentage of post-consumer recycled materials possible (particularly important for paper products such as paper towels, napkins and toilet paper).
- □ Purchase products from local suppliers whenever possible.

Packaging

- □ Choose products from a supplier/manufacturer that has reduced the amount of packaging needed to properly ship, store and use the product.
- □ Purchase frequently used products in bulk.
- □ Select products packaged in material(s) that can be reused/recycled by the end user or the supplier.
- □ Choose products packaged in post-consumer recycled material(s).
- □ Choose products that are free of hazardous components.

Operation, utilization and maintenance

- □ Consider products that are easy to maintain and economical to repair.
- □ Choose products that can be enhanced or upgraded to allow for possible future needs.
- □ Choose replacement parts that have been recycled or reconditioned.

Disposal

- □ Determine if the product or its parts can be reused, reallocated, sold or donated to others for use.
- □ Return product or its parts to the supplier for reuse, recycling or recovery.
- □ Brainstorm ideas of how the product can be repurposed before disposal, i.e., utilized for a use other than its original intention.

Summary

Table of Contents | Appendix

There are many reasons why New Hampshire is consistently voted as one of the best states to live in the U.S. Our clean waters, fresh air, protected forests and mountains are but a few of the things that make the Granite State such a desirable place to reside and visit. It is this natural beauty that draws visitors from all over to enjoy the great variety of recreation New Hampshire has to offer. Golfing is among the favorite recreational options here in New Hampshire and therefore our courses contribute greatly to the state and local economies.

Golf courses provide many benefits to the communities they are in, however there is no denying that they can consume a large amount of resources such as water, energy, fertilizers and pesticides to maintain the grounds for play. Most golf course management understand that protecting New Hampshire's land, air and water is not only important from an environmental and health standpoint but is crucial from a business perspective as well. The majority of course superintendents go to great lengths to minimize water, pesticide and fertilizer inputs into their courses as these are expensive commodities that must be closely managed. Most course superintendents also understand that there is a growing demand by their patrons for courses to be operated in an environmentally sensitive manner; they have found that reducing the golf courses' environmental "footprint" will not only improve their public image, but will also significantly reduce operating costs and liabilities.

The objective of this handbook is to assist golf course management in their efforts of pursuing "greener" and more efficient business operations at their course. The suggestions and resources contained in this document focus on efficient use of water, energy, fertilizers and pesticides on the course as well as in the clubhouse. Some of the recommendations are easy low-cost/no-cost suggestions while others may be more involved. Either way, the key is to pick a few at a time, follow through to completion, then choose a few more. The process of becoming a "green" business is a continuous endeavor. "Green" businesses are in constant process of increasing efficiencies and reducing their generation of waste – this document can assist you with these pursuits.

Appendix

Table of Contents

Applicable Programs

NHDES Pollution Prevention Program
29 Hazen Drive; PO Box 95
Concord, NH 03302-0095
In State: (800) 273-9469
(603) 271-6460
(603) 271-2667 (fax)
email: nhppp@des.nh.gov
Website: http://des.nh.gov/organization/commissioner/p2au/pps/ppp/

NHDES Groundwater Discharge Program
Mitchell Locker
29 Hazen Drive; PO Box 95
Concord NH 03302-0095
(603) 271-2858
(603) 271-0656 (fax)
email: mitchell.locker@des.nh.gov
website: http://des.nh.gov/organization/divisions/water/dwgb/dwspp/gw_discharge/index.htm
Administrative Rules:

- GROUNDWATER DISCHARGE PERMIT AND REGISTRATION (Env-Wq 402):
  http://des.nh.gov/organization/commissioner/legal/rules/documents/env-wq402.pdf
- BEST MANAGEMENT PRACTICES FOR GROUNDWATER PROTECTION (Env-Wq 401):
  http://des.nh.gov/organization/commissioner/legal/rules/documents/env-wq401.pdf

NHDES Large Groundwater Withdrawal Permitting Program
Christine Bowman
NHDES Drinking Water & Groundwater Bureau
29 Hazen Drive; PO Box 95
Concord, NH 03302-0095
(603) 271-8866
(603) 271-0656 (fax)
email: christine.bowman@des.nh.gov
website: http://des.nh.gov/organization/divisions/water/dwgb/dwspp/lg_withdrawals/index.htm

NHDES Drinking Water & Groundwater Bureau
Stephen Roy
29 Hazen Drive; PO Box 95
Concord, NH 03302-0095
(603) 271-3918
(603) 271-0656 (fax)
email: stephen.roy@des.nh.gov
Env-Wq 400 Groundwater Protection regulations:
http://des.nh.gov/organization/commissioner/legal/rules/documents/env-wq401.pdf
website: http://des.nh.gov/organization/divisions/water/dwgb/dwspp/lg_withdrawals/index.htm

- DESIGN STANDARDS FOR NON-COMMUNITY WATER SYSTEMS (Env-Ws 373):
  http://des.nh.gov/organization/commissioner/legal/rules/documents/env-ws373.pdf

NHDES Hazardous Waste and Compliance Bureau
29 Hazen Drive; PO Box 95
Concord, NH 03301
(603) 271-2942
(603) 271-0869 (fax)
Toll Free In-State Hotline #: (866) HAZWAST
email: hwcomp@des.nh.gov
website: http://des.nh.gov/organization/divisions/waste/hwcb/index.htm

- Waste Mercury-Containing Lamps: Management Requirements for Handlers and Transporters: http://des.nh.gov/organization/commissioner/pip/factsheets/hw/documents/hw-7.pdf
- Fluorescent bulb recycling vendors, clean-up, general information: http://des.nh.gov/organization/commissioner/p2au/pps/ppuwmp/lamps.html
- Household Hazardous waste collections schedule: http://des.nh.gov/organization/commissioner/p2au/pps/hhwp/documents/hhw_collections.pdf

NHDES Used Oil Grant Program
Dean Robinson, Program Coordinator
29 Hazen Drive, PO Box 95
Concord, NH 03302-0095
(603) 271-6424
email: usedoil@des.nh.gov
website: http://des.nh.gov/organization/divisions/waste/orcb/fms/uomp/index.htm

- Used Oil-Filter Fact Sheet: http://des.nh.gov/organization/commissioner/pip/factsheets/oil/documents/oil-1.pdf

NHDES Stormwater Management
Jillian McCarthy
Watershed Management Bureau
29 Hazen Drive; PO Box 95
Concord, NH 03302-0095
(603) 271-8475
(603) 271-7894 (fax)
email: jillian.mccarthy@des.nh.gov
website: http://des.nh.gov/organization/divisions/water/stormwater/index.htm

- Pervious Walkways and Patios fact sheet: http://des.nh.gov/organization/divisions/water/stormwater/documents/perv-walkw-patios-fs.pdf
- Rain Barrel Fact Sheet: http://des.nh.gov/organization/divisions/water/stormwater/documents/rain-barrel-fs.pdf

N.H. Department of Agriculture, Markets and Food – Division of Pesticide Control
25 Capitol Street, 2nd Floor
Concord, NH 03302
Telephone: (603) 271-3550
website: http://agriculture.nh.gov/divisions/pesticide_control/index.htm

- Administrative Rules: http://agriculture.nh.gov/rules/index.htm
- Pesticide Licensing: http://agriculture.nh.gov/divisions/pesticide_control/pesticide_licensing.htm

Additional Online Resources

Water Management

- EPA Water Budget Data Finder: http://www.epa.gov/watersense/new_homes/wb_data_finder.html
- EPA Soak Up the Rain: http://www.epa.gov/region1/soakuptherain/index.html
- WaterSense: http://www.epa.gov/watersense/
- EPA – Green Infrastructure: http://water.epa.gov/infrastructure/greeninfrastructure/gi_what.cfm#rainwaterharvesting
- NHDES Xeriscape and Water-Wise Landscaping Fact Sheet: http://128.121.25.104:8080/awweb/awarchive?type=file&item=1326
- NHDES Performing a Business or Industry Water Use and Conservation Audit Fact Sheet: http://des.nh.gov/organization/commissioner/pip/factsheets/dwgb/documents/dwgb-26-16.pdf

Pesticide Management

- Northeastern IPM center – Searchable online resources for IPM http://www.northeastipm.org/ipm-in-action/ipmresources/resources-database/search_resources.cfm

Energy Resources (assistance, grants, rebates, incentives)

- nheconomy.com – Energy efficiency and assistance programs for NH Businesses: http://www.nheconomy.com/business-services/energy-efficiency-programs.aspx
- nhsaves.com – Energy efficiency and assistance programs for NH Businesses http://www.nhsaves.com/business/efficiency.html
- Database of State Incentives for Renewable energy & Energy efficiency (DSIRE): http://www.dsireusa.org/

Cost Savings Calculators and Tools

- U.S DOE: Energy and water Cost savings calculators: http://www1.eere.energy.gov/femp/technologies/eep_eccalculators.html
- Energy and water savings calculators: http://greenzu.com/calcs/
- LED and CFL bulb energy savings calculator with return on investment calculator(s) http://e3living.com/cfl-savings-calculator
- ENGERGY STAR LED EXIT – sign cost savings calculator (excel spreadsheet calculator tool download): http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&ved=0CGAQFjAB&url=http%3A%2F%2Fwww.energystar.gov%2Fia%2Fbusiness%2Fbulk_purchasing%2Fbpsavings_calc%2FCalc_Exit_SignsBulk.xls&ei=Bmy_UPWFNOfG0QGO1oCoCQ&usg=AFQjCNF83xCKCffgtvox1lzNmQ2DstEgmg

Green Purchasing links

- Bioprefered: http://www.biopreferred.gov/
- DfE: http://www.epa.gov/dfe/
- Ecologo: http://www.ecologo.org/en/
- ENERGY STAR: http://www.energystar.gov/
- EPEAT: http://www.epeat.net/
- GreenSeal: http://www.greenseal.org/

External certifications and Information sources

- UNH Cooperative Extension: http://extension.unh.edu/
  -Soil Testing: http://extension.unh.edu/Agric/AGPDTS/SoilTest.htm
- N.H. T2 Center Green SnoPro Certification – environmentally responsible winter maintenance practices (click for program info and winter maintenance manuals/BMPs): http://www.t2.unh.edu/green-snowpro-certification
- WorkWISE NH: free on-site occupational safety and health consultation services, OSHA compliance assistance. http://www.keene.edu/conted/workwisenh/

Disclaimer: All references to specific products in this handbook are for example only. References to specific brands or companies in this handbook shall NOT be interpreted as an endorsement by The New Hampshire Department of Environmental Services Pollution Prevention program.

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