



CHAPTER 3

How to Improve the Environmental Stewardship of Your Course: Developing an Environmental Plan

Developing greater awareness and commitment to environmental stewardship concepts and principles

One of the first and most important steps in improving your golf course is to raise the level of awareness and commitment to the basic concepts and principles that underlie environmental stewardship. It is always easier to implement new practices or change accepted routines when we know the reasons behind the change and receive support and encouragement from colleagues and experts in the field



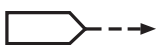
Buffer strip and interpretive sign

Step One



Read the *Environmental Principles for Golf Courses in the United States* and commit to follow these principles in the management of your course.

The environmental principles included in appendix A are a product of the Golf & the Environment Initiative and were developed and endorsed by over 20 golf organizations and national environmental groups as well as the US Environmental Protection Agency. The principles are meant to provide a framework for environmental responsibility in developing site-specific goals for individual golf courses. They are voluntary and assume regulatory compliance with all existing local, state, and federal laws. The principles should be used as a guide to decision making, representing a whole philosophy of environmental stewardship rather than specific dictates each of which must be met in all cases.



Read the *Environmental Principles for Golf Courses in the United States* and commit to follow these principles in the management of your course.

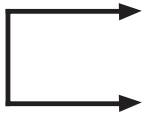
yes

no

comments



Step Two



Identify sources of information and assistance

A number of golf and other organizations have developed a variety of publications, reports and books that can provide technical guidance and information. In addition some organizations can provide direct staff assistance to answer questions and identify other sources of information related to golf courses. Some national organizations include:

Golf Course Superintendents Association of America

David Bishop
1421 Research Park Drive
Lawrence, KS 66049-3859
785-832-4491, fax 785-832-4449
www.gcsaa.org

Center for Resource Management

Paul Parker
1104 East Ashton Avenue, #210
Salt Lake City, UT 84106
801-466-3600, fax 801-466-6800
www.crm.org

United States Golf Association

Kimberly Erusha
PO Box 708
Far Hills, NJ 07931-0708
908-781-5498, fax 908-781-1736
www.usga.org

Audubon International

Ron Dodson
Route 2, Box 131
Selkirk, NY 12158
518-767-9051, fax 518-767-0069
www.audubonintl.org

Wildlife Habitat Council

Mike Hodge
1 Deer Creek Run
Dover, NH 03820
603-740-1453, fax 603-740-1454
www.wildlifehc.org

HQ Air Force Center for Environmental Excellence

Bill Bushman
3207 Sidney Brooks
Brooks AFB, TX 78235-5344
210-536-3719, fax 210-536-3890
www.brooks.af.mil

Army Environmental Center

5179 Hoadley Road
Aberdeen Proving Ground, MD 21010-5401
410-436-2466, fax 410-436-1635
www.aec.army.mil

Step Three



Organize an environmental advisory committee

Creating an advisory committee can be a valuable resource in developing an environmental stewardship plan for the course. Committee members can provide valuable input and information concerning various program strategies and their implementation. Some members may provide valuable links with other resources and departments dealing with environmental and natural resource issues on the base. In some cases committee members may bring needed expertise from a local university, golf organization, or community group off base.

Advisory committees can operate in a number of different ways depending on the needs of the superintendent and his course. Some committees may come together as a group and help the superintendent implement selected projects. In other situations the committee may simply serve as an information resource for the superintendent to call on individually or collectively when he needs advice or specific information. An advisory committee should be organized to meet the needs of the superintendent not as an additional burden, which demands time and effort to maintain. The superintendent with the overall aim of providing resource assistance should define the composition and objectives of the committee.



Advisory Committee on the course

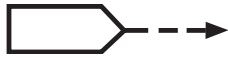
Environmental Planning Process

The environmental planning process provides a systematic approach to collecting relevant information, assessing weaknesses and opportunities, and developing practical strategies for environmental improvement. By following each step in the process you will collect important baseline data describing your course and be able to evaluate your current management practices. As you complete these steps you will be able to identify appropriate changes in your management practices and possible stewardship projects for your course that can better protect environmental resources and improve the environmental performance of your course.



Golf Course at Hill Air Force Base

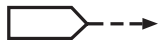
Step One



Collect and review existing military installation plans for wildlife, water quality, forestry, pest management, etc.

Policy and guidance for various environmental and natural resource programs and plans come in the form of Department of Defense directories and instructions, regulations, guidelines, and handbooks prepared by the appropriate agency. Installation plans for various program areas are developed in response to these directories and regulations and may affect the resources or management of the golf course.

The appropriate environmental officer for each installation should be contacted to determine what plans have been developed that are relevant to the management of the golf course. These plans should be collected and reviewed for possible input and coordination to the environmental planning process. Copies of the plans should be maintained in an accessible place for future reference.



Collect and review existing military installation plans for wildlife, water quality, forestry, pest management, integrated natural resource management plan, etc.

yes

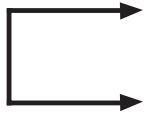
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comments

(list of plans collected and reviewed)



Step Two



Baseline assessment and site analysis

The baseline assessment and site analysis activity is designed to provide a broad base of information about the course, current management practices, and golfer attitudes so that an effective environmental stewardship plan can be developed and implemented. This step includes four different information gathering and assessment activities:

- Activity One – Site Analysis
- Activity Two – Golf Course Map
- Activity Three – Environmental Baseline Assessment Checklist
- Activity Four – Player Attitude Survey



Evaluating erosion problem

Activity One: Site Analysis

Before you can begin to assess environmental problems and opportunities at your course some general information is needed. Complete the following questions for the entire course and then complete the attached "site analysis" form for each hole as you walk the course. Additional site analysis forms for each hole are included in appendix J.

1. Number of holes _____
2. Number of months open per year _____
3. Number of rounds per year _____
4. How many acres or square feet of established turf is there in each of the following six areas?

Greens _____ ft²

Roughs _____ acres

Tees _____ ft²

Practice greens _____ ft²

Fairways _____ acres

Driving range _____ acres

5. How many acres of wildlife habitat are owned or controlled by the golf course? _____ acres
6. Does your course specifically manage for wildlife? Yes No

If yes... Please check all that apply to your wildlife management.

- provide food crops
- provide dedicated out-of-play wildlife sanctuary
- provide bird/bat boxes
- other, please describe _____

7. Please check the general habitat types that occur, in-play or out-of-play, on property that is under the same ownership and/or management as your golf course.

_____deciduous woodland

_____riparian areas

_____tree plantation

_____freshwater pond/lake

_____prairie/grassland

_____brush land or scrub

_____streams/rivers

_____saltwater marsh/estuary

_____cultivated farm land

_____freshwater marsh

_____desert

_____ranch land/pasture

_____coniferous forest

_____ocean shore

_____botanical garden

_____other, please describe _____

_____sand dunes

_____wetland

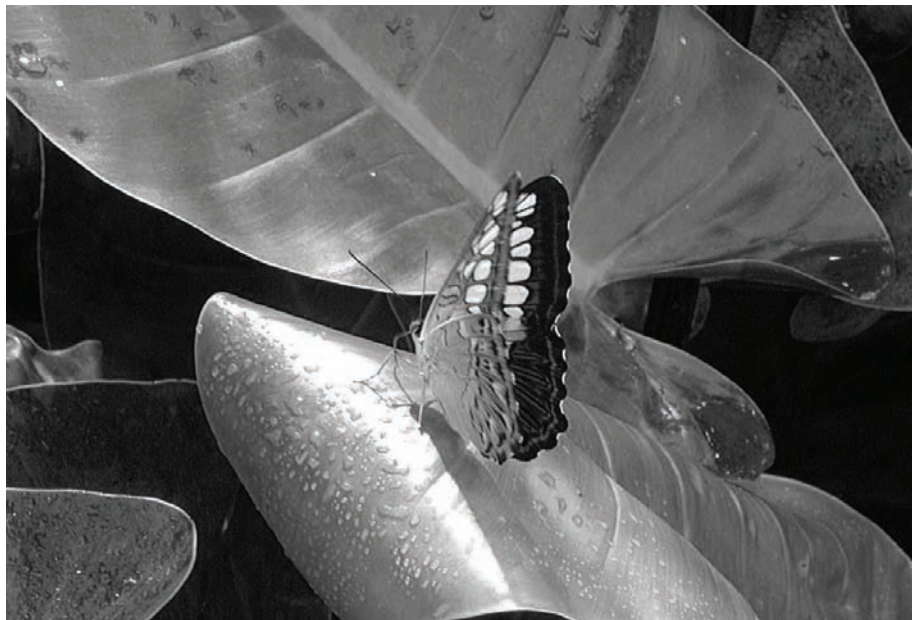


Site analysis has been completed

yes

no

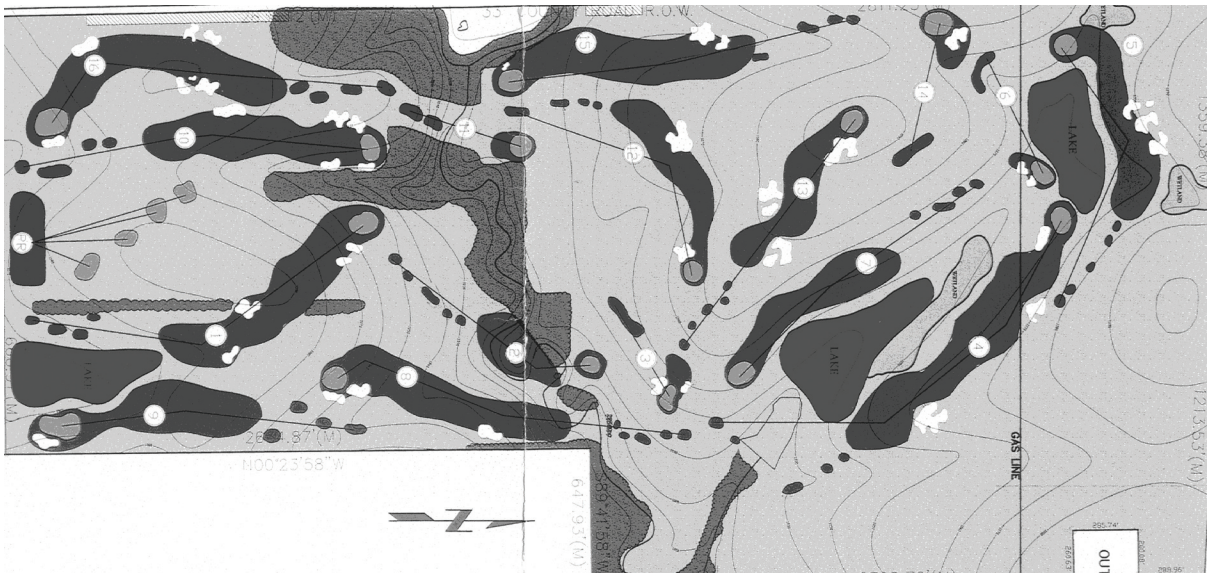
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Activity Two: Golf course map

Developing and using a map of the golf course can be an important tool for future planning and decision making. A map is a graphic representation of the land and environmental resources for which the superintendent has direct responsibility. Some of the most important aspects and uses of the golf course map include:

1. Site analysis process – special site features, problem areas or important observations from the site analysis should be included on the map. The map helps define spatial relationships and can help the superintendent visualize more clearly the “big picture.”
2. On-going process/use of overlays – by combining the base map with the use of transparent overlays, the superintendent has a dynamic yet simple tool to analyze problem areas and record changes.
3. Tool for communication – the map and overlays can be used by the superintendent to communicate his management plans to other professionals, employees, and the general public. In the 8 ½ x 11 format, the map information can be copied for use in reports or as transparent overlays. They can also be presented to groups as projections on an overhead projector.



Environmental Baseline Assessment Checklist

Golf Course: _____

Prepared by: _____

I. Environmental Planning

Environmental Management Practices	Yes	Partial	No	Planned/comments
1. We have completed an environmental assessment, audit, or site analysis.				
2. We have read the “ <i>Environmental Principles for Golf Courses in the United States</i> ” and have committed to adopt them as guiding principles for environmental management of the course.				
3. We have defined a set of environmental goals based on the “principles” and best management practices.				
4. We have formulated an environmental plan and evaluate progress annually to adjust goals and strategies.				
5. We maintain a record system to measure and document environmental improvement.				
6. We have submitted our environmental goals and plans to the appropriate environmental officers and base commanders and have received their support and endorsement.				
7. We have identified sources of information and assistance from various military, local, regional, state, or national organizations.				
8. We have collected and reviewed existing military installation plans for wildlife, water quality, and other natural resource areas.				
9. We have completed a golf course map showing routing of greens, tees, fairways, water features, roughs, and trees.				
10. We have received GCSAA/Golf Digest Environmental Leaders in Golf Award or certification in the Audubon Cooperative Sanctuary Program.				

Date completed: _____



Environmental Baseline Assessment Checklist

Golf Course: _____

Prepared by: _____

II. Safety, Training, and Awareness

Environmental Management Practices	Yes	Partial	No	Planned/comments
1. All Material Safety Data Sheets (MSDS) for all chemical use are kept up-to-date and available to all employees.				
2. Appropriate military or state programs have certified all pesticide applicators.				
3. All employees are trained in safety regulations and proper procedures according to military, OSHA, federal, and state guidelines.				
4. Golfers are notified in the pro shop and on the first and tenth tees prior to and immediately following pesticide applications.				
5. All employees receive continuing education opportunities through military, GCSAA, and/or other educational organizations.				
6. The golf course superintendent is GCSAA certified.				
7. The chemical storage structure/area is locked, well ventilated, fireproof, and access is limited to select personnel.*				
8. All maintenance employees have been made aware of environmental plans and procedures and understand that non-compliance can negatively effect the environment and human health.				
9. Liquid chemicals are stored below dry products.				
10. All maintenance employees are trained in the proper use of equipment and safety precautions regarding eye protection, noise protection, ventilation, etc.				

*Pesticide storage and mixing facilities meet the standards and best management practice guidance contained in MIL-HDBK-1028/8A (Military Handbook, Design of Pest Management Facilities, dated November 1991)

Date completed: _____

Environmental Baseline Assessment Checklist

Golf Course: _____

Prepared by: _____

III. Pollution Prevention

Environmental Management Practices	Yes	Partial	No	Planned/comments
1. Water resources such as streams, ponds, lakes, and wetlands are protected by an unmowed buffer strip of natural vegetation at the water's edge.				
2. Spill containment kits and procedures are in place at approximate locations. (AFPMB Tech. Info. Memo No. 15)				
3. Fuel storage facilities include an impervious floor surface and necessary spill containment wall or curb.				
4. Wash-down and cleaning of maintenance equipment is done on an impervious surface with proper containment, recycling, and/or disposal of rinsate.				
5. No-spray zones have been identified and designated around surface water areas.				
6. Mixing and loading of pesticides is done on an impervious surface with proper containment to prevent possible contamination of soil or water resources.*				
7. Pesticides are applied only during appropriate weather conditions to prevent drift from wind or surface runoff from rainstorms.				
8. Pesticides are applied according to label directions.				
9. Water quality tests are conducted annually to measure indicators such as PH, dissolved oxygen, nutrients, and pesticide residues.				
10. Soil erosion is prevented and controlled by stabilizing and proper planting of stream banks, steep slopes, and other areas.				

*Pesticide storage and mixing facilities meet the standards and best management practice guidance contained in MIL-HDBK-1028/8A (Military Handbook, Design of Pest Management Facilities, dated November 1991)

Date completed: _____



Environmental Baseline Assessment Checklist

Golf Course: _____

Prepared by: _____

IV. Plant Protection and Nutrition

Environmental Management Practices	Yes	Partial	No	Planned/comments
1. We have developed a written IPM plan with pest profiles, thresholds and scouting forms that emphasize non-chemical tactics to deal with pest problems.*				
2. We record and map all pesticide applications and results for future reference. (<i>DD Form 1532-1 Pest Management Maintenance Report</i>)				
3. We maintain a map of "hot spots" requiring special care.				
4. Soil tests have been conducted to determine turf nutritional requirements.				
5. We procure and use only those pesticides that have been recommended by the Armed Forces Pest Management Board and approved by the Pest Management consultant.				
6. All pesticide applicators are either DoD (spray technician) and/or state certified.				
7. Only the quantity of pesticides needed for one season are ordered and stored at any one time. (<i>DODI 4150.7</i>)				
8. We apply only the amount of pesticide necessary to control the pest after scouting indicates pest thresholds have been exceeded and non-chemical tactics are not adequate to solve the problem.				
9. We use nutrient products and practices that reduce potential for water contamination and do not exceed the needs of the turfgrass such as slow-release fertilizers, fertigation, selected organic products, and spoon-feeding.				
10. We work to prevent pest problems by changing conditions such as using pest resistant turf varieties, modifying microclimate or changing cultural practice management programs.				

*Department of Defense Instruction 4150.7 identifies seven steps that form the basis of IPM and should be followed on military installations

Date completed: _____

Environmental Baseline Assessment Checklist

Golf Course: _____

Prepared by: _____

V. Wildlife Management

Environmental Management Practices	Yes	Partial	No	Planned/comments
1. A wildlife habitat map has been completed with identification of special or sensitive areas such as threatened and endangered species habitat.				
2. Bird houses and feeders have been placed in appropriate places and are regularly maintained.				
3. Forest floors are left natural and cavity trees and brush piles are left as habitat.				
4. A written inventory of major wildlife species including birds, mammals, and other species has been completed.				
5. We manage damaging wildlife through non-harmful means when possible.				
6. We have improved or expanded wildlife habitats through creation of no-mow zones, new wetland areas, wildflower plantings, or other special projects.				
7. We have introduced native trees, shrubs, and other indigenous vegetation wherever possible.				
8. We have consulted with wildlife specialists to insure that wildlife management plans minimize bird strike hazards to military air craft.				
9. We have designated and maintain at least 30 acres (or 20% of the total area) per 18 holes as wildlife habitat.				
10. Sensitive habitat such as nesting areas or threatened and endangered species habitat are protected from disturbance by golfers, construction/maintenance activities.				

Date completed: _____



Environmental Baseline Assessment Checklist

Golf Course: _____

Prepared by: _____

VI. Water Usage

Environmental Management Practices	Yes	Partial	No	Planned/comments
1. A flow meter has been installed and is operating correctly.				
2. We monitor water use and inspect and repair irrigation leaks daily.				
3. We irrigate only greens, tees, fairways, and maintained landscape areas.				
4. We use soil moisture sensors and/or evapotranspiration and weather data in daily irrigation plans.				
5. We use native or drought tolerant plant materials whenever possible.				
6. We have made our irrigation system more efficient through improved valves, sprinkler heads, or computerized controls.				
7. We have determined the appropriate irrigation application rate through a catch cup analysis or irrigation audit.				
8. We monitor and adjust the irrigation system daily to maintain peak efficiency.				
9. We avoid use of irrigation system during windy conditions or when evaporation rates are highest at midday.				
10. We use mulch, ground covers, and drip irrigation or other water saving measures for trees, shrubs, and landscaped areas.				

Date completed: _____

Environmental Baseline Assessment Checklist

Golf Course: _____

Prepared by: _____

VII. Conservation and Waste Management

Environmental Management Practices	Yes	Partial	No	Planned/comments
1. We leave grass clippings in place or if possible compost and recycle.				
2. We dispose of chemical packaging according to directions.				
3. We recycle or dispose of motor oil, electric batteries, unused solvents, etc., according to law and best community disposal techniques.				
4. We purchase products in bulk or through other means that minimize unnecessary packaging.				
5. We operate a composting program for grass clippings and other organic materials.				
6. We have a multi-product recycling program in place for the clubhouse and golf course.				
7. We have an energy conservation program that includes high efficiency lighting, and heating and cooling systems for buildings.				
8. We use high efficiency pumps for water pumping and irrigation.				
9. We use renewable energy systems when feasible or off-peak power for golf cart recharging.				
10. We have employed shade trees and other landscaping to reduce cooling costs for clubhouse and maintenance building.				

Date completed: _____



Golf Course: _____

Prepared by: _____

VIII. Outreach and Education

Environmental Management Practices	Yes	Partial	No	Planned/comments
1. A resource map and other materials describing wildlife habitat and other environmental resource areas on the course are posted in the clubhouse.				
2. A copy of the "Environmental Principles" and a poster of "What Golfers Can Do to Help" are on display in the clubhouse along with our environmental goals and policies.				
3. We have organized an environmental advisory committee to assist and advise with environmental plans.				
4. We communicate regularly with the base environmental officer and other base personnel responsible for wildlife or other natural resources within the military.				
5. We have placed "environmental resource" signs on the course to educate golfers about sensitive resources and stewardship practices.				
6. We conduct school tours, seminars, or other outreach programs to educate golfers, base personnel, other others about environmental issues and our stewardship practices.				
7. We communicate with our golfers through bulletins, newsletters, opinion surveys, etc. to advise and educate them about stewardship practices and to obtain their input.				
8. We provide nature trails, jogging trails, or other non-golf use of the course when appropriate for educational and recreational purposes.				
9. We involve community/school groups in special stewardship projects such as erecting/maintaining bird houses, planting wildflowers, etc.				
10. We share information about environmental problem solving and stewardship practices with other golf course superintendents in the local community and other military organizations.				

Date completed: _____

Activity Four: Player Attitude Survey

Conducting a player attitude survey is not a difficult task and can be very helpful to a superintendent. A survey can provide a broad view of the opinions and attitudes of a majority of players, not just the few who are outspoken or who have a tendency to complain. A player survey can provide a superintendent with a variety of current information related to course conditions and player expectations. For example a survey can address current opinions about questions or issues such as:

- the condition of tees, fairways, and greens
- specific locations on the course that need more attention or a change of maintenance tactics
- recent projects or changes that may have affected play or the appearance of the course

A survey can also be used to gauge attitudes and general support for future policies or practices that may be implemented. In the demonstration project conducted at Ft. Benning players were asked in a mailed survey if they would be willing to support a variety of environmental projects as part of an overall environmental stewardship plan. The players responded much more favorably than expected with 94% in favor of creating buffer strips to protect water resources and other sensitive areas; 83% in support of creating no-mow natural zones; and 88% in support of setting up bird houses and feeders. Because the survey had a 47% response rate, the course superintendent could move forward with these and other measures knowing that players had been provided an opportunity for input and strongly supported his actions. This survey is a tool to obtain information, but also to educate players and gain their support for proposed actions and policies.



Players at the Admiral Baker Golf Course



Step Three



Develop specific program strategies

Having completed the baseline assessment and site analysis of the course, the superintendent should have a good overview of both the opportunities and problems that need to be addressed. The program strategies are the “heart” of the course environmental plan and the place where the superintendent should define his specific environmental goals and strategies. Using the same program areas as the baseline assessment checklist, the superintendent can refer to his notes and areas of concern on the checklist and the site analysis forms to complete the program strategies. The program or stewardship categories include:

1. Environmental planning and management
2. Safety training and awareness
3. Pollution prevention
4. Plant protection and nutrition (example included)
5. Wildlife management
6. Water usage (example included)
7. Conservation and waste management
8. Outreach and education



Superintendent Ray Meredith explaining benefits of no-mow zone



ENVIRONMENTAL PLANNING AND MANAGEMENT PHILOSOPHY

Goal:

To operate the golf club in a way as to compliment its surrounding ecosystem and make every effort, through its daily management practices, to respect and preserve the courses natural resources.

Overview:

As a first step to developing a management philosophy, the superintendent should site the course within its growing environment.

Growing regions determine grass selection, fertilizer and pesticide selection, number of rounds played, and length of growing season.

General criteria for site selection are as follows:

- General growing region (North, South, Transition).
- Locate the course within that region. For example there is a difference in the timing of overseeding between the northern edge of the South region and its southern edge.
- Locate the course relative to mountains (elevation), rivers, valleys, and coastline.
- Locate in proximity to urban/rural areas.
- Locate with the military installation.

Principles and Practices: Once the superintendent has “sited” the course, he/she can set parameters for environmental goals. These goals can then be further specified after reviewing the site analysis and any baseline maps.

Once the goals are established, the superintendent should formulate a system of evaluation and record keeping that will organize and chart all progress toward the achievement of these goals.

In the process of developing these goals and formulating the supporting charts and records, military superintendents should take the time to research all available documents and records that already exist on the property. More often than not military installations have a wealth of site information already in place. For example:

- Forestry Division- Tree mapping and wildlife habitat records.
- Civil Engineering- Topographical maps, infrastructure layouts.
- Recreation Division- Definition of golf course role as recreation for its soldiers and/or any public play policies.
- Archives- Old aerial maps, pictures, or text of the golf course.



ENVIRONMENTAL PLANNING AND MANAGEMENT PHILOSOPHY

Golf Course: _____ Date completed: _____

Military installation: _____ Prepared by: _____

1. Problems/concerns identified through baseline assessment and site analysis

2. Environmental stewardship goals and objectives

3.

Stewardship actions and improvement strategies	Location/Hole	Date



SAFETY, TRAINING, AND AWARENESS

Goal:

To make the course compliant with all pesticide regulations, employee training procedures, and golfer notification regulations.

Overview:

Military golf courses in general have developed safety programs with some more comprehensive than others. But much less attention has been given to follow-up training programs for employees and especially notification procedures for golfers.

Principles and Practices:

It is important to make every effort to standardize safety programs for all military installations. Baseline examples follow:

- Material Safety Data Sheets (MSDS)- Collect in a loose-leaf binder and store for easy access during inspections. Keep backup records in hard copy or database for superintendent reference.
- Upon delivery of new pesticides, MSDS sheets should be cataloged *prior* to its use on the property. Vendors should be made aware of this procedure prior to the sale.
- Install pesticide fill and containment area to EPA regulations.
- Install pesticide storage area to EPA regulations.
- Only licensed applicators can handle restricted use pesticides.
- Develop training program for applicators.
- Develop awareness program for all other employees.
- Develop system of notification regulations for golfers such as signs on the first and tenth tees, in the locker rooms, or part of an installation newsletter.



SAFETY, TRAINING, AND AWARENESS

Golf Course: _____ Date completed: _____

Military installation: _____ Prepared by: _____

1. Problems/concerns identified through baseline assessment and site analysis

2. Environmental stewardship goals and objectives

3.

Stewardship actions and improvement strategies	Location/hole	Date



POLLUTION PREVENTION

Goal:

Take the necessary steps to prevent pollution to surface and groundwater sources.

Overview:

Superintendents on military installations should pay particular attention to this category because a spill or contamination of a large magnitude has the potential to draw the attention of local, regional, and federal regulating agencies. Military superintendents surveyed complained about the effectiveness and workability of their wash-down facilities or areas. Those that did not have them wish they did and those that did have them wished they worked better.

Principles and Practices:

Golf courses on military bases should have adequate fuel storage facilities. Many of the guidelines and principles outlined within the Safety Training and Awareness section will assist in implementing a pollution prevention program. General guidelines for a prevention program follow:

- Have spill containment kits on site and train all employees in their use.
- Fuel storage facilities constructed to local fire code regulations.
- Discourage any fuel loading from gas cans on the course even for small hand tools.
- Procedures in place for mixing and disposal of pesticides.
- Development of or adherence to an existing erosion control plan.
- Water quality tests done periodically on both surface and groundwater sources.
- Wash-down area installation. All wash-down systems require frequent and diligent maintenance programs. Weekly cleaning of filters is generally the rule. It is also a good idea to pre-clean much of the bulk (grass clippings) off prior to cleaning in the wash down area.



POLLUTION PREVENTION

Golf Course: _____ Date completed: _____

Military installation: _____ Prepared by: _____

1. Problems/concerns identified through baseline assessment and site analysis

2. Environmental stewardship goals and objectives

3.

Stewardship actions and improvement strategies	Location/hole	Date

PLANT PROTECTION AND NUTRITION

Goal:

To select the appropriate plant material and develop nutrient and pesticide programs that will insure the highest quality playing surface along with a minimum impact to the site's natural resources.

Overview:

This program would, in all likelihood, become the backbone of any Environmental Plan for the golf course. Each golf course superintendent would transfer scouting records and general course evaluations already in hand to a series of overlay plans that would then give a picture of the plant protection scheme as it relates to actual disease pressure. From this the superintendent would be able to quickly assess potential areas where fertilizer and pesticide applications may be reduced.

Principles and Practices:

This plan also provides a presentation tool to review boards and base commanders for yearly operational review and capital project proposals. It also provides a military standard for golf course assessment and review.

The steps toward production of this document are as follows:

- Provide a baseline map of the course that delineates:
 - the course routing showing tees, greens, fairways, rough
 - buffer vegetation such as woods, stream, fields and lakes
 - support structures- clubhouse, cart storage, turf management building, pump station
- Provide an overlay of the course with observed location of pests based on scouting reports and historical information.
- Develop a list of pesticides currently utilized on the course including target pests and estimates of actual quantities.
- Provide an overlay that shows the area of these pesticide applications
- Develop a list of fertilizers and other miscellaneous products (growth regulators, wetting agents, and biopesticides) that are currently used on the course.
- Provide an overlay that shows the areas of application.

The superintendent will now be able to evaluate and demonstrate all pesticide and fertilizer applications on his course. Any duplicate or redundant applications will become evident on the overlays. As an example if brown patch disease is detected only in greens and approaches but fungicide applications to treat brown patch are applied to all greens and fairways, there may be an opportunity to decrease certain fairway applications by eliminating a portion or all of the areas not currently showing disease infection.



PLANT PROTECTION AND NUTRITION

Golf Course: _____ Date completed: _____

Military installation: _____ Prepared by: _____

EXAMPLE

1. Problems/concerns identified through baseline assessment and site analysis
 Some of the greens, tees and walk-off areas showed excessive wear during times of peak play. The greens and tees in question were:

- Smaller than the rest of the greens
- Located in areas of full shade
- Located in sheltered areas.
- Had limited teeing/cupping area.

The walk off areas were:

- In areas that play was constricted by bunker placement.
- In areas where a designated path did not exist or was misplaced.
- In areas of shade or poor air circulation
- In an area where there is inadequate or confusing signage to the next tee.

2. Environmental stewardship goals and objectives

To improve the turfgrass on these areas by examining all the contributing factors, giving a rough estimate of cost and time involved in each approach and prioritizing a plan of action to address the problem. Outlined below is an example for addressing a tee that rarely has an adequate grass cover.

3.

Stewardship actions and improvement strategies	Location/hole	Date
Orientation to the sun (faces north)	#8 tee	1/16/03
Tree canopy – overhanging limbs	#8 tee	1/16/03
Size (100 sq. ft./1000 rounds)	#8 tee	1/16/03
Grass selection – high traffic turf	#8 tee	1/16/03
Nutrient program high Phosphorus program	#8 tee	1/16/03
Pesticide program – determined by superintendent	#8 tee	1/16/03

PLANT PROTECTION AND NUTRITION

Golf Course: _____ Date completed: _____

Military installation: _____ Prepared by: _____

1. Problems/concerns identified through baseline assessment and site analysis

2. Environmental stewardship goals and objectives

3.

Stewardship actions and improvement strategies	Location/hole	Date

WILDLIFE MANAGEMENT

Goal:

Protect and improve natural habitat to support healthy, diverse wildlife species.

Overview:

Many military installations contain large areas of natural habitat that often are in close proximity to the golf course. This may provide opportunities to enhance or expand habitat on the course that connects to these larger areas and provide golfers with new opportunities to view wildlife. Most installations also have wildlife specialists on base who can provide the golf course superintendent with valuable advice and expertise on how to manage and improve wildlife habitat on the course. For courses that are located near airfields, special considerations must be exercised to minimize bird hazards to aircraft. The base wildlife specialist should be consulted on this issue as part of developing the wildlife management program strategy.

Principles and Practices:

When developing the program strategy take into account the basic needs of wildlife for space, cover, food, and water. The specific requirements of each species will vary and not all needs must be met on the course but many simple low-cost projects can be implemented that can enhance or expand these basic habitat needs. Some suggestions on how to proceed and some actions that should be considered are listed below:

- On the base map of the course, prepare an overlay of important habitat areas – note any endangered, threatened species habitat or particularly sensitive areas for nesting, breeding, etc.
- With assistance of wildlife specialist on base or other resource people, develop a written inventory of wildlife species including mammals, birds, and aquatic wildlife.
- Erect bird boxes/feeders or bat boxes and inspect and maintain on regular basis.
- Expand existing habitat through planting of native vegetation, wildflowers, or creating new wetland areas.
- Create no-mow natural areas in out-of-play zones and deep rough.
- Protect sensitive areas and threatened or endangered species habitat from disturbance from construction, maintenance, or golfer activities.
- Leave cavity trees and brush piles for wildlife habitat.
- Leave natural vegetation, leaves, and branch litter on forest floors.
- Use indigenous plants/native plant species whenever possible in landscaping and tree replacement plans.



WILDLIFE MANAGEMENT

Golf Course: _____ Date completed: _____

Military installation: _____ Prepared by: _____

1. Problems/concerns identified through baseline assessment and site analysis

2. Environmental stewardship goals and objectives

3.

Stewardship actions and improvement strategies	Location/hole	Date

WATER USAGE

Goal:

To reduce total water consumption and simultaneously create uniform playing conditions.

Overview:

The golf course superintendent has an opportunity to evaluate total water consumption on the golf course through utilization of the irrigation as-built and the routing plan for the golf course. In addition the superintendent will have notes or logs that indicate dry (and wet) areas on his course.

Principles and Practices:

After determining these locations, he can program his system accordingly and/or add (eliminate) irrigation heads, upgrade nozzles or install part circle heads according to the updated irrigation plan.

The steps to evaluate this plan are as follows:

- Provide a base line map of the golf course with topography if possible.
 - Delineate the routing plan showing all greens, tees, fairways and roughs
 - Delineate the buffer areas showing woods, streams, and lakes
 - Delineate all support structures such as the clubhouse, turf management building, cart storage building and pump station, sewage treatment facility.
- Provide an irrigation as-built as an overlay
- Develop an irrigation materials list as support to the as-built that includes
 - Number and type of heads
 - Type of control system (satellite, decoder)
 - Piping system (block, valve-in-head) and size
 - Pump station (vertical turbine/suction) and capacity
 - Irrigation storage pond (capacity)
 - Weather station (type, location)
- Include the results of an on site spray distribution test.
- Show documented results of water withdrawal either through flow meter readings or through calculations based on number of sprinklers and estimated run times.
- Daily, seasonally or yearly rainfall totals available from a weather station or from a local weather forecaster, airport or on base.
- Provide an overlay showing locations of dry areas on the course.

The superintendent can place the overlay of the dry areas on the as-built of the irrigation system and evaluate and adjust coverage and demonstrate to his superiors areas of the course that may need irrigation upgrades. In addition the superintendent will be able to identify quickly the areas where the course may be over-irrigated and can shut off or decrease the water. Quite often these areas may also be areas of disease pressure and this overlay could be a valuable tool to use in the plant and nutrition section as well.

For this reason all these overlays would be standardized off the base line routing plan for the course.

For the wet and the dry areas the superintendent would go through a similar process of identifying the source of the problem once the locations of the areas are determined from maps and baseline studies. The head nearest the problem area would be located in the field. The superintendent would then determine if that head is operating correctly on the satellite or central control system. Finally a spray distribution test would be done to determine if the correct amount of water at the correct pressure is coming out of the head.

Before making any determination of supply pond capacity it is important to check the flow meter at the source and install one if needed or have the current one tested for accuracy. If the pond is supplied by runoff and/or surface water check the inlets for erosion and flow. If the pond is supplied by groundwater have a well installer do a flow test. Finally if all supply sources are functioning adequately then determine the pond depth and dredge to increase capacity. This step is costly and time consuming and as such is generally considered a capital project.



WATER USAGE

Golf Course: _____ Date completed: _____

Military installation: _____ Prepared by: _____

EXAMPLE

1. **Problems/concerns identified through baseline assessment and site analysis**
 The following observations were made after conducting a baseline study with maps and overlays:
 - The golf course has chronically wet areas in the front side fairways and dry areas in the roughs on the backside.
 - Some of the dry areas on back nine have functional sprinkler heads in the middle of a dry area.
 - During dry periods many of the sprinkler heads “clog” and fail to operate.

2. **Environmental stewardship goals and objectives**
 - Use less water over the course of a full golf season.
 - Increase the capacity of the irrigation supply pond to store water during the rainy season.
 - Improve water quality.
 - Improve the playability of the course by eliminating “plugged” balls on the front side and lost balls or unplayable lies on the back side that do not get caught up in the rough. This will also improve the quality of the turfgrass and result in decreased nutrient and pesticide use.

3.

Stewardship actions and improvement strategies	Location/hole	Date
Saturated landing area – locate the nearest head	Hole #5	1/17/03
Saturated landing area – determine irrigation cycle	Hole #5	1/17/03
Saturated landing area – spray distribution test	Hole #5	1/17/03
Dry area – locate nearest head	Hole #16	1/17/03
Dry area – determine irrigation cycle	Hole #16	1/17/03
Dry area – spray distribution test	Hole #16	1/17/03
Irrigation pond capacity – install flow meter	Pond	1/5/03
Irrigation pond capacity – check inlets for erosion	Pond	1/5/03
Irrigation pond capacity – dredge	Pond	TBD

WATER USAGE

Golf Course: _____ Date completed: _____

Military installation: _____ Prepared by: _____

1. Problems/concerns identified through baseline assessment and site analysis

2. Environmental stewardship goals and objectives

-
-
-
-
-
-
-

3.

Stewardship actions and improvement strategies	Location/hole	Date

CONSERVATION AND WASTE MANAGEMENT

Goal:

Reduce, reuse, and conserve available resources to minimize operational costs and environmental impacts.

Overview:

During the course of developing and implementing a turfgrass management program for golf courses at military installations, opportunities arise for recycling everything from soda cans to grass clippings. Alternative substitutes for traditional energy sources are sometimes simpler and less costly than traditional methods. Due to budget restrictions on most military installations, the superintendent must carefully evaluate these options and enact them in such a way as to minimize initial expense and any ongoing labor.

Principles and Practices:

Listed below are some of the conservation strategies presented on the checklist followed by an assessment of the impact to a typical golf operation.

1. Grass clippings as compost.	Cost of sand	\$\$
2. Dispose of chemical packaging	Disposal fees	\$
3. Recycle batteries, motor oil	Disposal fees	\$\$
4. Purchase products in bulk	Storage/Distribution	\$\$\$
5. Leave grass clippings in place	Clipping dispersion-wet	\$
6. Can/paper recycling	Volunteers	NC
7. High efficiency lighting/cooling	Capital expense	\$\$\$\$\$
8. VFD irrigation pumps	Capital expense	\$\$\$\$\$
9. Off peak cart chargers	Capital expense	\$\$
10. Shade trees as landscaping	Capital expense	\$\$

The dollar signs (\$) represent estimated relative costs and could vary greatly between regions. For example one golf course may have unused storage buildings making option four a “NC” expense.

Some of the capital expense items like item #7, *High efficiency lighting/cooling*, may have long-term savings that more than offset initial costs. Item #8, *VFD(Variable Frequency Drive) irrigation pumps*, may not have any additional costs if the club has to replace the pumps anyway.

All these strategies will result in cost savings over a period of time. If a course develops a prioritized list of conservation strategies to be implemented over a period of years, the net result will be that the club will see operating expenses fall and remain lower over the long term.



CONSERVATION AND WASTE MANAGEMENT

Golf Course: _____ Date completed: _____

Military installation: _____ Prepared by: _____

1. Problems/concerns identified through baseline assessment and site analysis

2. Environmental stewardship goals and objectives

3.

Stewardship actions and improvement strategies	Location/hole	Date

OUTREACH AND EDUCATION

Goal:

To utilize the golf course maintenance operation as an environmental learning tool for communities within and possibly outside the military installation.

Overview:

Many golfers and members of the community don't understand the environmental benefits for golf courses or the stewardship practices of a good superintendent. By educating golfers and reaching out to the community you can help them understand what you do. You may be surprised at the support you receive for environmental projects.

Principles and Practices:

Examples of outreach and education

- Clubhouse posters/brochures describing wildlife habitat and course conservation projects.
- Local tournament to raise money for local conservation project.
- Environmental/Resource Advisory Committees.
- Science/field day program with local schools.
- Environmental resource signs located on the course.
- Monthly newsletters.
- Player attitude survey.
- Community tour/open house to showcase projects.
- Volunteer program for installing and maintaining bird boxes.
- Sponsor "water watch" program for volunteer monitoring of streams and ponds with citizen groups, i.e., Izaak Walton League or State Agency of Water Resources.
- Use your advisory committee to help identify and organize projects.
- Many outreach and education projects are low cost and can provide big benefits in golfer and community support.
- Contact other courses to see what they have done for outreach and education.
- When explaining your course's resources and projects use photos, maps, charts, and other graphic tools to communicate. Remember not everyone is interested in the details of "turf management" but people do relate to issues of wildlife, water quality, and healthy vegetation.
- Involve the golf pro, course management and maintenance staff in your outreach and education efforts.



OUTREACH AND EDUCATION

Golf Course: _____ Date completed: _____

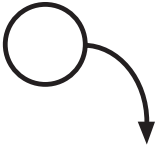
Military installation: _____ Prepared by: _____

1. Problems/concerns identified through baseline assessment and site analysis

2. Environmental stewardship goals and objectives

3.


Stewardship actions and improvement strategies	Location/hole	Date

<p style="text-align: center;">Step Four</p> 	<p style="text-align: center;">Prioritize actions and improvement strategies and complete a phasing schedule</p>
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Stewardship Actions and Improvement Strategies

Each program strategy prepared in step three will probably list goals and actions that will require more than one season or one annual budget to complete. Therefore it will be necessary to select those that can be implemented in the current year and those that can be undertaken in years 2 or 3. This will require prioritizing according to the urgency and importance of the action and the available resources of time and budget.

List the top priority actions under each category and check the year of planned completion on the chart on the following page.

	<p style="text-align: center;">Actions and improvement strategies have been prioritized and a phasing schedule has been completed.</p>
<p><input type="checkbox"/> yes _____</p> <p>_____</p> <p><input type="checkbox"/> no _____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>	<p>comments</p>

ACTION PRIORITIES

Phasing Schedule:

	Year 1	Year 2	Year 3
1. Environmental Planning & Management			
2. Safety, Training, and Awareness			
3. Pollution Prevention			
3. Plant Protection & Nutrition			
5. Wildlife Management			
6. Water Usage			
7. Conservation & Waste Management			
8. Outreach & Education			

Step Five



Plan implementation: monitor and record results

Implementing the environmental plan is the key to making changes on the ground. Planning by itself can be interesting and informative, but if it isn't implemented it is simply an academic exercise. Having defined specific goals and action priorities, the next step is to change existing practices or initiate new projects that will fulfill the objectives listed earlier in the document.

Monitoring and recording the results of this activity is a way to keep track of what is being accomplished and is the means to measure progress. In some cases this is a very simple process in other situations it requires observation and judgment to determine progress. For example, if one of the action priorities includes notifying golfers of pesticide applications it is very simple to record when and how the notification took place. If one of the goals is to improve wildlife habitat and species diversity by creating no-mow zones and erecting bird houses you can document the initial action but must observe the response from wildlife to see what the end result will be. The environmental condition of the course may be best measured by observing and recording changes in key environmental indicators such as the numbers of wildlife species, changes in tested water quality, or improved health of turf on greens and tees.



Monitoring no-mow/habitat area





Erecting a bluebird box

On the following chart, summarize the actions taken and observed results corresponding to each action priority listed. Monitoring of course conditions is a daily/weekly activity as part of a typical course management so documenting accomplished actions and results in 3, 6, and 12 month intervals should not be difficult.

	Plans have been implemented and results have been monitored and recorded	
<input type="checkbox"/>	yes	<hr/> <hr/> <hr/>
<input type="checkbox"/>	no	<hr/> <hr/> <hr/>
comments		

Action Priorities

Documented Results

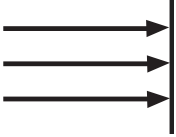
Program Action Priorities	3 months Date:	6 months Date:	12 months Date:
1. Environmental planning & management			
2. Safety, training & awareness			
3. Pollution prevention			
4. Plant protection & nutrition			



Action Priorities

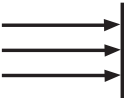
Documented Results

Program Action Priorities	3 months Date:	6 months Date:	12 months Date:
5. Wildlife management			
6. Water usage			
7. Conservation & waste management			
8. Outreach & education			

<h2>Step Six</h2> 	<h2>Evaluate and adjust goals, plans and strategies</h2>
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Once a regular monitoring and recording process is in place the superintendent can effectively measure progress over time. Besides knowing how things are progressing the superintendent can then determine if the strategies are effective in meeting the defined goal or if the goal is appropriate and realistic. The information gained from this monitoring and evaluation feedback will prompt the superintendent to adjust any elements of the environmental plan accordingly. If adjustments are necessary the superintendent should return to the written program strategies and edit or rewrite the listed “goals” and/or “stewardship actions and improvement strategies.” For example, if a stated action was to create 30 acres of no-mow zones in order to increase wildlife habitat and reduce water and chemical inputs and the response from golfers to the new natural zones was negative, the superintendent might explore several possible responses such as:

- reduce the amount of no-mow zones
- adjust the boundaries of the zones to prevent lost balls
- educate the players more effectively about the purpose and environmental benefits for the natural zones
- put more emphasis on other measures such as IPM techniques, existing habitat enhancement, etc., and reduce priorities for no-mow zones

	<p>Goals, plans, and strategies have been evaluated and adjusted</p>
<input type="checkbox"/> yes	<hr/> <hr/> <hr/> <hr/>
<input type="checkbox"/> no	<hr/> <hr/> <hr/> <hr/>
<p>comments</p>	

Summary Report

Improving the Environmental Stewardship of Your Course

Yes No Partial

1. Awareness and Commitment to Environmental Stewardship Concepts and Principles

- | | | | | |
|-----|---|--------------------------|--------------------------|--------------------------|
| 1.1 | Read environmental principles and commit to follow these principles in the management of your course..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 1.2 | Identify sources of information and assistance..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 1.3 | Organize an environmental advisory committee..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

2. Environmental Planning Process

- | | | | | |
|-----|--|--------------------------|--------------------------|--------------------------|
| 2.1 | Collect and review existing military installation plans for wildlife, water quality, forestry, pest management, etc. | | | |
| 2.2 | Baseline assessment and site analysis | | | |
| | 2.2.1 site analysis | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| | 2.2.2 golf course map | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| | 2.2.3 baseline assessment checklist | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| | 2.2.4 player survey | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2.3 | Develop specific program strategies | | | |
| | 2.3.1 environmental planning and management | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| | 2.3.2 safety training and awareness | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| | 2.3.3 pollution prevention | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| | 2.3.4 plant protection and nutrition | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| | 2.3.5 wildlife management | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| | 2.3.6 water usage | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| | 2.3.7 conservation and waste management | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| | 2.3.8 outreach and education | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2.4 | Plan implementation: monitor and record results | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2.5 | Evaluate and adjust goals, plans | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

