



***Carolina Lakes Golf Course***  
**Environmental Baseline Assessment**  
**Shaw AFB, South Carolina**      **Apr 04**





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# Executive Summary

## U. S. Air Force GEM Program

The U. S. Air Force Golf Course Environmental Management (GEM) program is a proactive Air Force Center for Environmental Excellence (AFCEE) initiative to foster a better understanding of the environmental challenges facing our golf courses worldwide. Armed with the support and approval of the Air Force Services Agency golf program, AFCEE's goal is to facilitate the creation of an environmentally friendly golf course facility while supporting the installation mission.

The primary tenets of the GEM Program are to minimize or eliminate potential negative environmental impacts, attain and maintain daily compliance with all appropriate regulations, and constantly examine all aspects of golf course management to achieve the highest standards of environmental excellence.

## GEM Program process

There are five steps in the GEM program process.

- Analysis
- Documentation
- Implementation
- Evaluation
- Revision

## Environmental challenges

The following environmental challenges were identified during the GCEBA process:

- Bird/Wildlife Aircraft Strike Hazard (BASH)
- Water quality management
- Wetlands
- Environmental Restoration Program site
- Threatened & endangered species
- Invasive exotics

## Where do we go from here?

Once the environmental challenges are identified, it is paramount that the golf course staff should determine their preferred management approach in the context of their ongoing, long-term goal of providing the best golfing experience for their customer's dwindling recreation resources.

Armed with this well-conceived, golf facility-based management approach, the golf staff should then coordinate with the environmental staff to ensure that there is consistency and compatibility with installation-wide natural resource and environmental management goals and objectives.

Finally, the staff should proceed with the next steps in the GEM Program process documented in this study.

## Introduction

The golf course environmental baseline assessment (GCEBA) is the initial step in the process of creating a successful ecosystem-based Golf Course Environmental Management (GEM) Plan.

The intent of the program is to provide an efficient, customer-driven management tool that will free up course managers and superintendents to devote more of their efforts to caring for their customers and the golf course. Properly designed and implemented, the GEM Plan will keep the entire golf facility in compliance with the constantly changing environmental requirements while contributing to the installation's vital recreational opportunities.



*The Carolina Lakes Golf Course clubhouse.*



*Caption*

## Goal of the GEM Program

The goal of the U. S. Air Force GEM program is to facilitate the creation of an environmentally friendly golf course facility for its customers while supporting the installation mission. The Air Force Center for Environmental Excellence (AFCEE) is dedicated to helping to identify ways that more rounds can be played on better-conditioned courses while minimizing or eliminating negative impacts to the environment. In most cases, the U. S. Air Force's golf courses are being managed compatibly with the environment. The GEM program is the vehicle to document our successes while communicating directly with our customers, commanders, and local community.



*The unique 12<sup>th</sup> is one of the best short par 4's in the U.S. Air Force.*

## GEM Program Process

Efficient implementation is the most important aspect of any initiative where practices and procedures are examined and may undergo significant change. This is especially true of the GEM Plan process. The latest requirements for the GEM Plan components are described and outlined on the AFCEE golf course environmental management program website: <http://www.afcee.brooks.af.mil/ec/golf/>. Detailed explanations and directions for completing the GEM Plan will be delineated in AFCEE's proposed handbook ***Golf and the Environment, Guidelines for the 21<sup>st</sup> Century***.

The GEM Program is derived from many diverse environmental regimes such as the National Environmental Policy Act, the Environmental Compliance Assessment and Management Program, and the ISO 14001 environmental management system. There are five basic steps in the implementation of the GEM Program process:

- Analysis
- Documentation
- Implementation
- Evaluation
- Revision



*This area right of the 6<sup>th</sup> is now classified and managed as a wetland.*



*The recent changes to lake bank maintenance improves aesthetics.*

## Analysis

Experienced environmental managers realize the importance of assembling all of the data relevant to a problem prior to determining its best solution. Analysis is the first and most important task of the golf course environmental baseline assessment (GCEBA) and the GCEBA is the initial step in the process of creating an ecosystem-based Golf Course Environmental Management (GEM) Plan. Properly completing the GCEBA is paramount to the long-term compatibility of an installation's golf course management practices with the GEM Program, and more importantly, the U. S. Air Force's natural resource and environmental management goals and objectives.

## GCEBA COMPONENTS

The GCEBA is comprised of the following components:

- Site visit, interviews, and data collection
- Course specific analysis
- Miscellaneous facility review
- Environmental compatibility quotient checklists
- Identification of environmental management challenges
- Summary report

## Documentation

It is not enough just to know how to create a successful golf course environmental management program. There must be a written record documenting existing site data, maintenance practices, pesticide applications, and other historical golf course activities. By documenting what we know, we will be able to determine how to make better decisions in the future. The completed GEM Plan will assist in the daily management of the course while providing a convenient vehicle to communicate to commanders and customers alike the environmental issues that challenge us on our golf course as well as our plans to deal with them. In order to reach the environmental stewardship goals set by the U. S. Air Force, we must consistently employ only those management practices that minimize or eliminate potential negative impacts to the environment.

## **GEM PLAN COMPONENTS**

The GEM Plan will be comprised of the following components:

- GCEBA report
- Map of the entire golf course facility grounds depicting locations of the significant environmental management challenges and the golf course facilities
- Booklet that describes the environmental management challenges on the GEM Plan map
- Specific practices that will be employed by the golf course staff to deal with each environmental management challenge after coordination with and approval by the installation environmental staff
- Compilation of best management practices employed at the golf course in their implementation of the GEM program recommendations

## **Implementation**

Positive and decisive action is the only true measure of the success of a GEM Program. By implementing new practices, whether to knowingly improve the course's role in the environmental stewardship of the installation or to just try new ideas to determine their value, will the golf staff and golfers benefit. The Carolina Lakes staff should adopt the GEM Program Environmental Policy and immediately begin finding ways to minimize or eliminate any and all negative impacts to the environment.

## **Evaluation**

In order to ensure the highest quality of customer service and environmental stewardship, there must be continual self-evaluation and improvement. There also should be consistent, on-going measurement of the reduction or elimination of environmental impacts the newly implemented practices have on the course. For example, documenting the reduced use of inputs such as fertilizers, pesticides, and irrigation can be used to demonstrate the increased environmental stewardship of the golf course management practices as well as the overall value of the GEM Program. It is important for U. S. Air Force golf courses to show improvement over time. This can be easily accomplished by regularly evaluating golf course maintenance methods, practices, and management approaches to day-to-day issues and changing when appropriate.

## **Revision**

The very nature of a superior GEM program implies that all documents be regularly maintained to represent the most current conditions. U. S. Air Force golf course managers and superintendents should be constantly looking for ways to improve their environmental stewardship. Acting on lessons learned is right behind initial implementation as the most important aspect of a successful GEM Program. The GEM Plan should be kept as current as possible at all times. Ideally, it should be completely updated at least every three years.

## Course Specific Analysis

One of the most pragmatic and enjoyable tasks in the GCEBA process is the course specific analysis. From a general overall description of the course to the details of the course's history and makeup to the various observations on the way the course plays, looks, and is managed, the course specific analysis sets the stage for the rest of the GCEBA report. It is comprised of the following tasks:

- Course description
- Course details
- Miscellaneous facilities examination

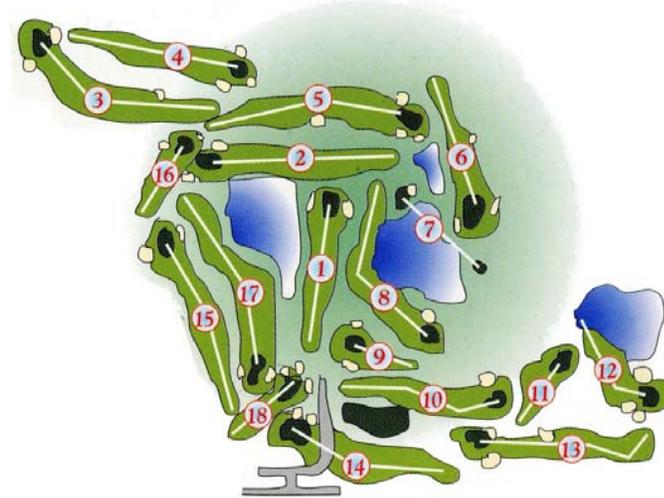


*The 8<sup>th</sup> green is perched on a hill overlooking the irrigation lake.*

## Course description

Carolina Lakes Golf Course is truly one of the highlights of Shaw AFB. The course is situated prominently between Memorial Lake, 9<sup>th</sup> Air Force Headquarters, the senior officer quarters, and the flight line. The course is characterized by gently rolling terrain with native tree populations of loblolly pine, southern live oak, hickory, willow oak, and magnolia. Three strategically located lakes help Carolina Lakes challenge golfers of all abilities.

Hurricane Hugo ravaged the course in 1989 taking dozens of mature trees. Still, Carolina Lakes Golf Course is a beautiful, naturally flowing, and extremely playable collection of golf holes. The course occupies a highly visible and extremely important- area of the installation. The installation's senior officer quarters lies directly north of the course. To the west is a thriving on-base residential area. To the near east is the NCO Club. Just beyond are the 9<sup>th</sup> Air Force Headquarters and the Consolidated Support Group Headquarters. Not too much farther east lies the all-important airfield- the heart of the installation's mission. Carolina Lakes includes four separate and relatively large, multi-functional water features. These lakes not only increase the interest and aesthetic quality of the course, they also gather runoff from the frequent rains that commonly occur throughout the year. Unfortunately, they also are the cause of one of the most profound issues at Shaw AFB due their attractive qualities for large waterfowl – the bane of F-16 pilots and their commanders.



### Course details

Architect	E. R. Riccoboni
Year constructed	1954
Climate	Humid
Average annual rainfall	43 inches
Elevation	250 feet above sea level
Winds/Prevailing Direction	NE/SW
Total Facility Acreage	130 acres
Par	36-35-71
Yardage/Rating/Slope	Blue- 6495/70.1/123 White- 6123/68.5/118 Yellow- 5234/68.9/111 Red- 4852/68.1/106
Golf course manager	Bruce Miller
Superintendent	Rory Cox
Turfgrass	
Tees-	- 419 Hybrid Bermuda
Fairways-	- Common Bermuda
Greens	- 328 Hybrid Bermuda
Roughs-	- Bermuda/Bahia



*Looking across the 12<sup>th</sup> tee toward Memorial Lake it is easy to see how intimate the course is with the rest of the installation.*



**Carolina Lakes Golf Course Aerial Photo**

## Miscellaneous Facility Review

Although the course is primary to the enjoyment and eventual return of most of Carolina Lakes' customers, the support facilities play a huge role in the overall success of the operation. This section of the GCEBA will examine the following facilities for their aesthetic, functional, and environmental values:

- Clubhouse/pro shop/snack bar
- Maintenance complex
- Practice areas
- Pesticide mixing and storage
- Cart barn
- Infrastructure



*The clubhouse has been recently upgraded inside and out.*



*Manager Bruce Miller has the pro shop in great shape.*

## Clubhouse

The clubhouse has recently received a much-needed upgrade. The interior was the primary area of improvement as the snack bar and the pro shop received enhancement. The exterior received new paint, changes to the landscape, and a new tournament scoreboard area that enlarged the deck.

## Maintenance complex

The maintenance complex was recently replaced to the current, attractive and well-built configuration. Superintendent Rory Cox satisfied most of his needs and wants with the new project. Storage space is somewhat lacking and much of his equipment is still being parked outside under a carport cover.



*Superintendent Rory Cox is proud of his new maintenance facility.*



*New state of the art lift and ample working space fills the bill.*



*Most of the key equipment can now be stored out of the weather.*



*Practice putting and chipping green is nearby the 1st tee.*

## Practice areas

Carolina Lakes Golf Course is outfitted with a small, yet serviceable driving range. The range is a little short when the wind is blowing favorably for the golfer and is much too narrow for most of us. The practice green receives double use as it used for both putting and the short game.

## Pesticide mixing and storage

The pesticide storage facility was one of the few items that were not replaced during the maintenance complex upgrade at Carolina Lakes. Superintendent Rory Cox and his staff continue to have a safe and adequate location to care for the course's pest needs.



*Although it is beginning to show its age, the Mixing facility is fully compliant with all requirements.*

## Cart storage facility

The existing cart storage facility is relatively new and one that more than satisfies the needs of Carolina Lakes Golf Course. The facility features space for ample electric carts, storage, mechanic's area, and a large locker room. The facility has been nicely landscaped around its perimeter. The golf course side is so heavily planted that it nearly disappears from view for customers.



*Cart storage facility looks as if it was designed more for jai alai.*



*Irrigation pump house is well-constructed masonry and steel facility.*

## Infrastructure

This section examines important elements of a quality golf course that are difficult to group into another category. Cart paths are in fair condition. The parking lot is in good condition and is almost large enough to satisfy the regular demands of Carolina Lakes' customers during peak hours. Landscape development attempts have been relatively successful and should be continued where appropriate. There is a site amenity group near most teeing areas. The course signage could be improved. The irrigation system is working well and the water supply is secure for the near to long term.

## Determining the Baseline (ECQ)

The following is a brief compilation of some of the responses in each of the ten Environmental Compatibility Quotient (ECQ) categories obtained in an interview with the superintendent and the manager conducted during the site visit.

### ECQ Categories

- Overall Management Philosophy & Documentation
- Safety, Training, And Awareness
- Compliance
- Pesticide Use, Storage, & Handling
- Pollution Prevention
- Conservation Practices
- Water Resources
- Maintenance Practices
- Customer Relations & Education
- Miscellaneous Special Projects & Activities

### Key to checklist responses

- **Yes** = Practice is complete or ongoing and can be verified.
- **Partial** = Practice has been initiated but needs further attention and improvement.
- **No** = Practice is not in place.

## ECQ Checklists

The Environmental Compatibility Quotient (ECQ) checklists are a convenient method of assessing the overall performance, implementation, and completeness of an installation's Golf Course Environmental Management Plan. The checklists can be used in many ways including:

- As an analytical tool while compiling a Golf Course Environmental Baseline Assessment like this one.
- As a self-assessment tool for the golf course manager or superintendent.
- As an award nomination evaluation by a Golf Course Assessment Team (GCAT).



*This small creek crosses in front of the 12<sup>th</sup> tee and drains the wetland behind the photographer.*

## Interpreting the ECQ

The ECQ compiled for an installation's course is a snapshot of the overall performance and compliance with the GEM Plan. There are two measures obtained as a result of using the ECQ checklists to determine the status or quality of the environmental management program: 1) determining the actual and; 2) potential environmental compatibility quotients.

- **Actual ECQ-** the total percentage of "Yes" responses for all ten checklists. This number represents the current level of the golf course management practice compatibility with the environment
- **Potential ECQ-** the total percentage of "Yes" responses plus the total percentage of "Partial" responses for all ten checklists. Maybe the most significant measure; the potential ECQ represents a level of compatibility that could be reached by finalizing or fully implementing a particular practice or procedure.

## ECQ Scoring Scale

Percent Responses Yes or Partial per Category	Level
93-100%	Advanced
83-92%	Getting there
73-82%	Showing progress
63-72%	Early stages
Less than 62%	Just started




# Carolina Lakes Golf Course

## Environmental Policy

In concert with the Shaw AFB mission, the staff at **Carolina Lakes Golf Course** pledge to employ only those management practices that minimize or eliminate the potential for negative impacts to the environment and the surrounding community, ensure compliance with all appropriate regulations, and to constantly reevaluate our processes to achieve the highest standards of environmental excellence.

<b>Overall Management Philosophy &amp; Documentation</b>				
<b>#</b>	<b>Environmental Compatibility Indicator</b>	<b>Yes</b>	<b>Partial</b>	<b>No</b>
1	Has management demonstrated that the environment is an important part of their responsibilities by initiating the GEM Planning process?	✓		
2	Has the golf course adopted and posted an Environmental Policy?	✓		
3	Is the GEM Plan underway or completed, available, and updated regularly?		✓	
4	Is a map of the property highlighting environmental opportunities or constraints such as wildlife habitat, water resources, sensitive landscapes, special management zones, etc. used in the environmental management decision-making process and is it posted for customers?		✓	
5	Environmental goals, objectives, issues, projects, and progress are evaluated at least annually and are regularly communicated to employees, customers, management, and the local community?		✓	
6	Are written records of water quality monitoring activities, results, and control measures readily available?	✓		
7	Is there an inventory of bird and mammal species documented, maintained, and readily available?	✓		
8	Is there a general understanding of how course management practices may positively enhance or adversely impact the environment?	✓		
9	Are the environmental impacts of pest control measures such as leaching and runoff potential, toxicity to non-target organisms, soil absorption capacity, pesticide persistence, water solubility, and effects on soil microorganisms and non-target species considered as part of the course management planning process?	✓		
10	Are records of pest treatments employed and their effectiveness maintained and used to guide future pest control decisions?	✓		
	<b>Point totals for each column</b>	<b>7</b>	<b>3</b>	<b>0</b>

<b>Safety, Training, &amp; Awareness</b>				
<b>#</b>	<b>Environmental Compatibility Indicator</b>	<b>Yes</b>	<b>Partial</b>	<b>No</b>
1	All employees are familiar with the overall GEM Plan and are trained on the importance of environmental compliance with the goals and objectives of the program?		✓	
2	All appropriate employees are trained to be familiar with U. S. Air Force, federal, South Carolina, and OSHA regulations that apply to storage, handling, and disposal of chemicals used on the property?	✓		
3	All employees are aware that chemical use, storage, and disposal and their potential risks to human health and the environment?		✓	
4	All employees are trained to understand that poor management practices may adversely impact worker health, on- and off-site water quality, local soil health, and wildlife species and their habitats?		✓	
5	A current copy of all Material Safety Data Sheets (MSDS) for all chemicals used anywhere on the golf course property is maintained and readily available for use by employees?	✓		
6	All employees receive regular, documented training on all potential OSHA issues?	✓		
7	Are all golf course pesticide applicators active participants in a local respiratory and pulmonary testing program?	✓		
8	Pesticides, fertilizers, and other chemicals are stored on appropriate shelving in an approved storage facility?	✓		
9	Are golfers notified in the pro shop and on the first and tenth tees about the day's planned or recently completed spraying of any chemical or fertilizer that may be hazardous to human health and safety?	✓		
10	Are key staff members trained regarding water quality and conservation issues?		✓	
	<b>Point totals for each column - Response percentage</b>	<b>6</b>	<b>4</b>	<b>0</b>

<b>Compliance</b>				
<b>#</b>	<b>Environmental Compatibility Indicator</b>	<b>Yes</b>	<b>Partial</b>	<b>No</b>
1	Is fuel storage/delivery managed in accordance with federal, South Carolina and local regulations?	✓		
2	Are installation environmental staff members included in on-going course management discussions and plans at regularly scheduled meetings?			✓
3	Are there regularly scheduled golf course staff meetings to discuss environmental management issues?			✓
4	Does the director of golf and the superintendent attend ESOHCAMP in-briefings and out-briefings?			✓
5	Does the director of golf and/or the superintendent coordinate with installation environmental staff on the various management plans that affect or include the golf course?		✓	
6	Have all necessary permits been secured and/or updated and their requirements satisfied in a timely manner?	✓		
7	Has appropriate impact analysis (NEPA) been performed on all proposed actions on or affecting the golf course property?	✓		
8	Are containers used to store used oil in good condition, not leaking, and clearly labeled?	✓		
9	Has the golf course staff submitted their proposed management approach to the identified environmental challenges to the installation environmental staff for coordination and review?			✓
10	Were there less than two major golf course facility-related findings during the last official ESOHCAMP visit?	✓		
	<b>Point totals for each column - Response percentage</b>	<b>5</b>	<b>1</b>	<b>4</b>

<b>Pesticide Use, Storage, &amp; Handling</b>				
<b>#</b>	<b>Environmental Compatibility Indicator</b>	<b>Yes</b>	<b>Partial</b>	<b>No</b>
1	Are there trained scouts on staff other than the superintendent to monitor turf and plant health and pest populations using scouting forms to record the type, severity, location, and treatment of pest problems and organized into a report or guide so that they can be used for future pest control solutions?		✓	
2	Are there written pest profiles of common pest species with a variety of potential control measures pre-evaluated including alterations in cultural management, biological, physical, and mechanical controls prior to treating the problem on the course?	✓		
3	Are there established and documented aesthetic and functional thresholds for all managed areas to effectively manage pest populations and reduce chemical use?		✓	
4	Is there a specially designed pesticide mixing area where all mixing is performed by appropriately trained personnel?	✓		
5	Has a list of pesticides and other chemicals stored or used at the golf facility been provided to the appropriate Fire Department(s)?			✓
6	Is there a written, up-to-date, and readily available Integrated Pest Management Plan in use at the facility?	✓		
7	Are scouting forms collected, processed, and mapped to aid decisions for control?			✓
8	Are written and readily available records maintained of all applications of pesticides made by certified applicators, including the following? <ul style="list-style-type: none"> <li>- the quantity of each pesticide used</li> <li>- the chemical or common name of the active pesticidal ingredient(s) (not the product name)</li> <li>- the pest or purpose for which the pesticide was applied</li> <li>--the date and place of application.</li> </ul>	✓		
9	Is the chemical storage structure/area locked, well ventilated, fire proof, and access is limited to select personnel?	✓		
10	Are food storage and prep areas properly cleaned to reduce the likelihood of pest infestations and required pesticide applications?	✓		
	<b>Point totals for each column - Response percentage</b>	<b>6</b>	<b>2</b>	<b>2</b>

<b>Pollution Prevention</b>				
<b>#</b>	<b>Environmental Compatibility Indicator</b>	<b>Yes</b>	<b>Partial</b>	<b>No</b>
1	Are there designated "no-mow" areas (other than ponds) and "no spray zones" and buffer areas around pond, river, stream, or lake edges and have they been communicated to mower operators and pesticide applicators?	✓		
2	Has the Installation Spill Plan been amended to include the golf course facility and is there a spill containment kit at each required location and are spill containment procedures in place?	✓		
3	Does the chemical storage area have a sealed metal or concrete floor and are all pesticides handled over an impermeable surface?	✓		
4	Does the chemical storage area have a lip along the edges to contain spills?	✓		
5	Are liquid products stored below dry products and are dry materials stored on pallets or shelves to keep them off the floor?	✓		
6	Have all the golf facility employees regularly received documented and approved HAZCOM and safety and health training?	✓		
7	Are grass clippings blown off equipment with compressed air instead of or prior to washing?	✓		
8	Are gasoline, motor oil, brake and transmission fluid, solvents, and other chemicals used to operate or maintain equipment and vehicles prevented from directly or indirectly entering water bodies?	✓		
9	Has the watershed in which the course resides and contributes runoff to been identified and mapped to aid the golf course staff in the management of their facility?		✓	
10	Are appropriate quantities of fertilizers applied during weather conducive to reducing the potential for leaching and runoff?	✓		
	<b>Point totals for each column - Response percentage</b>	<b>9</b>	<b>1</b>	<b>0</b>

<b>Conservation Practices</b>				
<b>#</b>	<b>Environmental Compatibility Indicator</b>	<b>Yes</b>	<b>Partial</b>	<b>No</b>
1	Are recycling containers conveniently provided for customer and employee use throughout the golf course facility?		✓	
2	Are there officially and appropriately designated minimally maintained areas on the golf course facility grounds?	✓		
3	Has the irrigation system or its components recently been upgraded to reduce inefficiency, malfunction, and overall water use?	✓		
4	Has all “non-target” irrigation (ponds, natural, or out of play areas, etc.) been eliminated or minimized?	✓		
5	Have flow meters been installed to monitor water use and detect potential waste?	✓		
6	Has the entire golf course facility property been examined for critical habitats, threatened or endangered species, wetlands, floodplains, and historical/cultural resources?	✓		
7	Are employees encouraged to minimize their trips around the course to conserve on the use of fossil fuels?			✓
8	Does the snack bar utilize reusable plates and silverware for use by customers throughout the facility’s operating hours?	✓		
9	Have all potential wildlife habitat maintenance practices been coordinated with the installation BASH officer and environmental management personnel?	✓		
10	Are all motorized golf course equipment checked regularly for excessive air polluting emissions?			✓
<b>Point totals for each column - Response percentage</b>		<b>7</b>	<b>1</b>	<b>2</b>

<b>Water Resources</b>				
<b>#</b>	<b>Environmental Compatibility Indicator</b>	<b>Yes</b>	<b>Partial</b>	<b>No</b>
1	Are water features regularly monitored for algae, erosion, excessive aquatic plant growth, fish kills, and sedimentation?	✓		
2	Are wash and wastewater kept from making direct contact with surface water and are they recycled or allowed to filter through a vegetative area when cleaning and maintaining equipment?	✓		
3	Outdoor irrigation of non-golf course landscape areas are regularly monitored and maintained for leaks and efficient performance?	✓		
4	Has the golf course staff been provided with stormwater management planning requirements from the installation's environmental staff?			✓
5	Have part circle irrigation heads been installed where possible to preserve water resources and reduce maintenance while minimizing potential negative impacts to surrounding minimally maintained areas?	✓		
6	Are all water feature maintenance tasks coordinated with the installation natural resource manager and bird/wildlife aircraft strike hazard officer?	✓		
7	Has the irrigation system been completely checked for proper water distribution in all irrigated areas and are water leaks fixed in a timely manner?	✓		
8	Are moving water bodies such as streams or creeks that pass through the golf course regularly monitored for water quality both upstream and downstream of the course?			✓
9	Does the facility have a Drought Management Plan written, ready, and available if, or when, irrigation restrictions may be instituted and required by the community or the installation?			✓
10	Are water quality problems immediately reported to supervisors or regulatory agencies (if required) for appropriate action?	✓		
	<b>Point totals for each column</b>	<b>7</b>	<b>0</b>	<b>3</b>

<b>Maintenance Practices</b>				
<b>#</b>	<b>Environmental Compatibility Indicator</b>	<b>Yes</b>	<b>Partial</b>	<b>No</b>
1	Is there a written, regularly updated, and readily available Golf Course Maintenance Plan?	✓		
2	Does the Maintenance Plan include individual plans to include Integrated Pest Management, Tree Management, Hazard Communication, Drought Management, Water Feature Management, and a Site-Specific Spill Prevention Response Plan?		✓	
3	Are green, tee, and fairway mowing heights maintained at reasonable levels without continually stressing turf or maximizing chemical inputs?	✓		
4	Are there regular procedures in place to continually improve soil health such as topdressing, organic amendments, aeration, and drainage?	✓		
5	Is there a map of the course's "hot spots" requiring special care or regular attention?			✓
6	Is all maintenance equipment maintained and cleaned in a manner that eliminates the potential for spreading of pest or disease contamination?		✓	
7	Has there been a complete examination for potential negative environmental impacts of all aspects of the golf course facility operation including the snack bar and grill, clubhouse, pro shop, and maintenance complex?	✓		
8	Is contour mowing used to conserve fuel and increase playability and aesthetics?	✓		
9	Have all playing surfaces been inventoried and mapped for soil types including soil structure, nutrient levels, organic content, compaction, and water infiltration?			✓
10	Are soil tests and plant tissue analysis used to determine nutritional requirements?	✓		
<b>Point totals for each column - Response percentage</b>		<b>6</b>	<b>2</b>	<b>2</b>

<b>Customer Relations &amp; Education</b>				
<b>#</b>	<b>Environmental Compatibility Indicator</b>	<b>Yes</b>	<b>Partial</b>	<b>No</b>
1	Are the course manager and superintendent involved in a regularly updated, documented, and on-going customer educational program?			✓
2	Is there a conveniently located and highly visible place at the course or clubhouse where golf course environmental management notices and informational messages are regularly posted for customers?			✓
3	Do the course manager and superintendent actively communicate with customers to determine and document their points of view?		✓	
4	Is there active and regular communication with the golf management staff, civil engineering, environmental management, the Services manager, and commanders by course management?	✓		
5	Does the golf staff regularly survey their customers on how they rate the various elements of the golf course facility?	✓		
6	Is there consistent and attractive signage around the course and grounds that would increase the awareness of the average golfer to the environmental management practices employed?	✓		
7	Are there signs appropriately located to warn golfers of hazards when drinking reclaimed or otherwise non-potable water?			✓
8	Are there interpretive signs posted to highlight key habitats or have appropriate areas been designated "Environmentally Sensitive Zones" per USGA rules?	✓		
9	Are course staff members trained regularly on how to improve their dealings with customers?	✓		
10	Are there clinics provided to teach beginning golfers the basics of the game and to teach all levels of golfers the rules of the game?	✓		
	<b>Point totals for each column</b>	<b>6</b>	<b>1</b>	<b>3</b>

<b>Miscellaneous Special Projects &amp; Activities</b>				
<b>#</b>	<b>Environmental Compatibility Indicator</b>	<b>Yes</b>	<b>Partial</b>	<b>No</b>
1	Are there projects planned and funded for the next year that would communicate the compatibility of the course's management methods with protection of the environment?			✓
2	Are there projects planned and funded to reduce the course's potential negative environmental impacts?			✓
3	Are there tournaments or other events planned that may educate customers on the environmental challenges faced by the golf staff at this installation?			✓
4	Are there regular field trips for local students or other local community groups hosted at the course?			✓
5	Are there projects planned to eliminate or minimize a potential erosion problem?	✓		
6	Does the course have a native tree installation program complete with planting plan and maintenance schedule?			✓
7	Are any of the local schools or universities involved in educational or research activities at your course?			✓
8	Are there special facility-wide recycling programs underway?	✓		
9	Is your course an active participant in the USAF Golf Environmental Management Program?	✓		
10	Has your facility been nominated by your MAJCOM for the golf course environmental management award in the last 3 years?			✓
	<b>Point totals for each column</b>	<b>3</b>	<b>0</b>	<b>7</b>

## ECQ Summary

#	Environmental Compatibility Quotient Category	Yes	Partial	No
1	Overall Management Philosophy & Documentation	7	3	0
2	Safety, Training, & Awareness	6	4	0
3	Compliance	5	1	4
4	Pesticide Use, Storage, & Handling	6	2	2
5	Pollution Prevention	9	1	0
6	Conservation Practices	7	1	2
7	Water Resources	7	0	3
8	Maintenance Practices	6	2	2
9	Customer Relations and Education	6	1	3
10	Miscellaneous Special Projects & Activities	3	0	7
	<b>Composite point total/response percentage</b>	<b>62</b>	<b>15</b>	<b>23</b>

## GCEBA Results

Σ Carolina Lakes Golf Course, Shaw AFB, SC

- Actual ECQ (# of “Yes”) = 62 “Just Started”

- Potential ECQ (Actual ECQ plus “Partial”) = 77 “Showing progress”



## Conclusion

Overall, the Shaw AFB Carolina Lakes course facility and staff has the potential to be among the best the Air Force has to offer. The course design is fun, yet challenging for the better player while not being overly tough for the beginner. The course conditioning is usually top notch and the clubhouse and pro shop are amply sized to accommodate the normal traffic at the course. The course staff regularly practices many of the basic tenets of an ecosystem-based golf course management program.

Like the majority of golf course operations, both military and civilian, the largest problems facing the Carolina Lakes staff is taking proper credit for their sound practices and then communicating them to the customer. And, like most Air Force golf facilities that produce a large percentage of the income to support other recreational opportunities on the installation, little funding is available. In this light, Carolina Lakes is well on its way to being one of the stellar examples of the Air Force's GEM program.

## Areas needing improvement

The ECQ Summary on the previous page highlights the following areas and suggestions and observations to assist the managers at Shaw AFB to improve their environmental stewardship include:

### COMPLIANCE

- Inconsistent interpretations of compliance actions among installation, MAJCOM, and ECAMP evaluators confuse
- Ensure ECAMP results are outstanding
- Insist on having the staff represented at all policy meetings that affect the golf facility
- Seek out opportunities to input into all planning documents that affect the golf facility

### MISCELLANEOUS SPECIAL PROJECTS & ACTIVITIES

- Continue to involve installation youth through rules and instruction clinics
- Consider involving local school children using field trips or activity days
- Enlist the assistance of local city and county officials on golf course environmental planning initiatives
- Initiate Earth Day environmental awareness golf tournament
- Educate customers about the benefits of an environmentally friendly golf course
- Need to demonstrate dedication to "growing" the great game of golf to young airmen, other installation non-golfers, and youth



## The gallery

This section of the report will be where some of the more revealing photographs (of the literally hundreds taken during the site visit) of pests, maintenance practices, and other areas where improvements may be made to create the best possible golf facility.



*The 18th green and the 19th hole are not far apart.*



*Stellar fuel tank and pesticide area typify Shaw's stewardship efforts.*



*One of the wetland areas on Carolina Lakes GC starts here.*



*The 13th at Carolina Lakes is a great medium-length par five.*



*Several cart paths terminate into worn turfgrass areas like this one.*



*Water treatment equipment should either be utilized or removed.*



*This honeysuckle plant is one of the invasive exotics on the Shaw list.*



*The 13th green is a small, yet appropriately-sized target.*



*The flowering dogwood is an attractive understory tree.*



*The constructed lake wall allows mowing right to the edge on the 7<sup>th</sup>.*



*Some trees need to be removed and replaced with proper varieties.*

## Environmental challenges

One of the important results of the GCEBA process is the identification of significant environmental challenges to be addressed in the long-term GEM Planning process. Ideally, the golf staff will address each issue from the best way to satisfy the goals of the golf facility and acceptable levels of course playability and customer satisfaction. The golf staff's preferred management approach for these issues should then be coordinated with the installation's environmental staff for refinement, coordination, and approval.

The GEM Plan would then consist of the environmental challenges, the approach to their management, a map showing where these challenges occur on the golf course, a booklet that describes the mapped challenges, goals and objectives for future years, and a set of best management practices.

The following environmental challenges were identified during the GCEBA process at Carolina Lakes Golf Course, Shaw AFB, SC:

- Bird/Wildlife Aircraft Strike Hazard (BASH)
- Water quality management
- Wetlands
- Environmental Restoration Program site
- Invasive exotics

## BIRD/WILDLIFE AIRCRAFT STRIKE HAZARD (BASH)

A BASH exists at Shaw AFB due to both area and migratory bird species. The lakes on the golf course are a strong attraction. In years past, waterfowl were actually raised on site by well-meaning U.S. Air Force personnel. In addition, swans were encouraged to "hang out". The problem is when these beautiful creatures interact with swiftly moving and delicate machines like an F-16. According to the 20<sup>th</sup> Fighter Wing BASH Plan, Air Traffic Control (20 OSS/OSAT) coordinates with golf course management and CEV prior to golf course hazing of waterfowl. It prescribes that the golf course management must request approval from the control tower prior to hazing, and will also advise when hazing operations are complete.



*Canada geese are the biggest installation BASH concern.*

## WATER QUALITY MANAGEMENT

The protection of the quality of the water features may be the primary environmental concern for Shaw AFB environmental managers. Along the 12<sup>th</sup> hole is the 5.5-acre Memorial Lake. It is used extensively for fishing, resting, picnics and walking. According to the INRMP, a wide flashboard riser is located about 50 feet from shore and may be used to manipulate the water level. Much of the pond's banks have slow drop offs. The small degree of sloping allows ample sunlight to reach the pond's floor and provides excellent habitat for a variety of aquatic vegetation and domestic dabbling for ducks and geese, which present a bird/aircraft strike hazard. The pond has chronic weed and algae problems due to pond design, golf course runoff and the waterfowl population.

The pond left of the 1<sup>st</sup> fairway is about 5.5 acres in size. It has a relatively new flashboard riser as the water control device. This pond suffered a complete fish kill in 1996 due to low dissolved oxygen levels. Alligator weed occupies approximately half the shoreline out to the depth of about 3 feet. Blue-green algae were also present in heavy amounts. All water quality factors were within acceptable ranges although a significant fish die-off occurred during May 1996 killing 80 to 90 percent of the fish population. This was attributed to extremely low dissolved oxygen concentrations. The INRMP contains several recommendations for maintaining this water feature.

The pond along the 8<sup>th</sup> hole is approximately 7.3 acres in size. This pond is used for golf course irrigation purposes. According to the INRMP, it receives fertilizer run off from the golf course. This pond provides irrigation for the golf course by a well and pump. A portion of this pond is accessible for fishing. The pond is approximately 7.3 acres in size. It receives fertilizer run off from the golf course. Alligator weed is present along most of the shoreline and it extends about 10 feet into the water. Blue-green algae are present in heavy amounts across the entire pond. Visibility in the water is only 3 or 4 inches. Alligator weed is the primary problem plant. Some scattered cattail and rushes were also noticed. All water quality factors were within acceptable ranges.



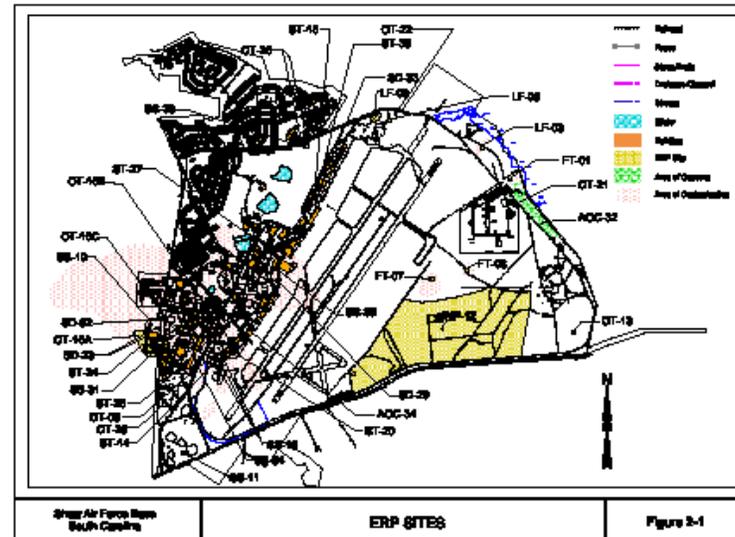
*Excessive algae growth and discoloration of the water near a pipe that drains runoff from the housing area to the north of the 17<sup>th</sup> hole.*

## WETLANDS

There are over 5400 acres of wetlands on Shaw AFB. The golf course contains three artificial ponds developed on the golf course that potentially offer habitat for a fairly large number of wetland species. Inconsistently prescribed maintenance practices have contributed to supporting nama, water-spider orchid, meadow beauty, bugle-weed, ludwigia, downey lobelia, smartweed, and other native wetland plants. Pond bank maintenance concerns directly concern BASH managers. All actions should be coordinated with the environmental staff and the installation flight safety BASH officer.



*The only traditional wetlands begins where a drainpipe from outside the golf course daylights and flows through a large “natural” thicket on its way to Memorial Lake.*



*This map, extracted from the Shaw Management Action Plan, shows the shallow groundwater plume that touches the golf facility property.*

## ENVIRONMENTAL RESTORATION PROGRAM (ERP) SITES

The Shaw AFB restoration program is one of the U.S. Air Force’s best. There are no known ERP sites actually on Carolina Lakes Golf Course facility property. The Management Action Plan documenting the closest known site, SD-29, is available on compact disc. The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) site is currently a Remedial Action Operation (RA-O). There is a newly installed shallow groundwater monitoring well just south of the 12<sup>th</sup> green in association with the remediation of SD-29. There is no action required of the golf course staff on this issue except awareness of the relative proximity of a potential environmental challenge site.



*Japanese honeysuckle is one of the listed Shaw AFB invasive exotics.*

## **INVASIVE EXOTICS**

The INRMP lists several invasive exotic plant species that have a chance to occur on the golf course at Shaw AFB. They include Chinaberry, common bamboo, Japanese honeysuckle, common reed, common privet, and white poplar. None of these species should ever be planted on the golf course grounds. Any that may be existing need to be controlled or eliminated. The INRMP has several control methods listed to deal with these non-native species that become part of an ecosystem and may act as “predators, pathogens, or disrupters”. The INRMP also lists Chinese tallow, kudzu, and hydrilla as potential invasive species of the installation.



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**<http://www.afcee.brooks.af.mil/ec/golf/>**