

**Wrenwoods Golf Course**  
**Environmental Management Plan**  
Charleston AFB, SC Mar 07



## Charleston AFB Wrenwoods Golf Course Environmental Policy.

**In concert with the Charleston AFB mission,  
we 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.**



# 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. AFI 32-7064 requires a GEM Plan as part of the Integrated Natural Resources Management Plan (INRMP).

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 Compatibility Quotient

<b>Actual ECQ</b>	<b>64</b>
<b>Potential ECQ</b>	<b>92</b>

## Final environmental challenges

The following environmental challenges were identified during the GEM Plan process:

- Reforestation
- Solid Waste Management Units (SWMUs)
- Site drainage & runoff
- Wetlands
- Native area establishment

## Where do we go from here?

The true measure of a successful GEM program is how well is it executed in the field each and every day. The installation golf and environmental staffs should continue to analyze, document, monitor, evaluate, revise, and implement changes based on lessons learned. The GEM Plan should be updated annually and revised during the next INRMP iteration update. The entire GEM process can be found on the regularly improved AFCEE GEM program website (<http://www.afcee.brooks.af.mil/ec/golf/>).

# Analysis

## Course details

Architect	E. R. Riccoboni
Year constructed	1954
Climate	Humid
Average annual rainfall	51.4 inches
Average growing season	294 days
Elevation	15-45' MSL
Par	36-35-71
Yardage / Rating / Slope	Blue- 6634 / 72.1 / 134 White- 6263 / 70.1 / 131 Gold- 5805 / 67.2 / 121 Red- 5095 / 69.3 / 112
Turfgrass	Bermudagrass
Tees-	Common Bermuda/mix
Fairways-	Tifdwarf Bermudagrass
Greens	
Roughs-	Bahiagrass/mix

## Course Description

Charleston AFB’s Wrenwoods Golf Course is a relatively flat golf course that once was a tight, tree-lined track. After a few hurricanes in the ‘80s the trees were removed and the course maintained in a manner that hindered vegetative re-growth. The course is on track with a new, natural and sensitive management and aggressive tree replanting programs to restore the golf course to its original design. The putting surfaces, while new, are rather small and circular creating the need for an accurate approach shot.

With the increasing aesthetics and playability expectations, Wrenwoods Golf Course is in definite need of partial reconstruction. Fairways consist of a less than desirable playing surface. The current fairways are in desperate need of contouring and regrassing with a new and improved hybrid Bermudagrass. Several original tee complexes are also in need of further attention to level the playing surface and replace existing turf with a new hybrid variety of Bermudagrass. Funds were committed to reconstruct nine holes of bunkers providing the eighteen hole facility inconsistent conditions.

In the end, with the renewed passion and professionalism Wrenwoods Golf Course is making great progress in our efforts to be a recognized and desired destination within the Air Force Community.

Image removed due to perceived potential security risk.

## **Wrenwoods Golf Course Aerial Photo**

## 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)



*Golf Course Superintendent Andrew Burrow educates staff on the new natural areas.*

## 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
90-100%	Advanced (Green)
70-89%	Showing progress (Yellow)
69% or less	Getting started (Red)



*Tree protection using Round-up and mulch prevents mower damage.*



*Ornamental grass plantings need minimal irrigation and improve course aesthetics.*

<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 installation environmental and golf 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 identified environmental challenges available, used in the environmental management decision-making process, and is it posted for customers?	✓		
5	Are environmental challenges and their management method, target, and objective, and overall golf course GEM program goals evaluated at least annually and are they regularly communicated to employees, customers, management, and the local community?	✓		
6	Are written records of water quality monitoring activities, results, and control measures collected and readily available?	✓		
7	Is there an inventory of bird and mammal species 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 considered prior to their use as part of the course environmental management planning process?	✓		
10	Are records of pest treatments 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	Are all golf course employees familiar with the GEM program and are they trained on the importance of environmental compliance with the goals and objectives of the program as it applies to their specific duties?		✓	
2	Are all appropriate employees trained to be familiar with U. S. Air Force, federal, state, and OSHA regulations that apply to the storage, handling, and disposal of all chemicals potentially used on the property?	✓		
3	Are all employees aware of the potential risks to human health and the environment of chemical use, storage, and disposal?	✓		
4	All appropriate employees receive documented training on practices that may adversely impact worker health, on- and off-site water quality, and wildlife species and their habitats?	✓		
5	Is a current copy of Material Safety Data Sheets (MSDS) for all chemicals used anywhere on the golf course property maintained and readily available for use by regularly trained employees?	✓		
6	All employees receive regular, documented training on all potential OSHA issues associated with their specific duties?	✓		
7	Are all golf course pesticide applicators active participants in a respiratory and pulmonary testing program?	✓		
8	Are all pesticides, fertilizers, and other chemicals 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 planned or recently completed spraying of any chemical or fertilizer that may potentially be hazardous to human health or general public safety?		✓	
10	Are key staff members trained regarding water quality and conservation issues pertinent to the course and their particular duties?	✓		
	<b>Point totals for each column</b>	<b>8</b>	<b>2</b>	<b>0</b>

<b>Compliance</b>				
<b>#</b>	<b>Environmental Compatibility Indicator</b>	<b>Yes</b>	<b>Partial</b>	<b>No</b>
1	Are the fuel storage/delivery area and associated equipment managed in accordance with federal, state, and local regulations?	✓		
2	Are installation environmental staff members regularly consulted on pertinent course management discussions and plans?	✓		
3	Are there golf course staff meetings where environmental management issues are regularly discussed with all employees?		✓	
4	Do the director of golf and the superintendent attend all internal and external ESOHCAMP in-briefings and out-briefings?	✓		
5	Do the director of golf and/or the superintendent coordinate their input on the various management plans that affect or include the golf course with installation environmental staff?		✓	
6	Have all environmental challenges been physically identified and mapped to aid the golf staff's daily management efforts?		✓	
7	Has appropriate impact analysis (NEPA) been performed on all proposed actions on or affecting the golf course property?		✓	
8	Are oil containers used to collect old oil in good condition and correctly labeled?	✓		
9	Has the golf course staff assisted the installation environmental staff with the required Golf course Environmental Management Plan requirements?	✓		
10	Were there less than two major golf course facility-related findings during the last official ESOHCAMP visit?	✓		
<b>Point totals for each column</b>		<b>6</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 pest populations that notify management include findings into a report or guide for future use?	✓		
2	Are there written pest profiles of common pest species with a variety of potential control measures including cultural, biological, physical, and mechanical controls prior to treating the problem on the course?	✓		
3	Are there established, documented, and utilized aesthetic and functional thresholds for effective management of pests that may also reduce chemical use?		✓	
4	Is there a specially designed pesticide mixing area where all mixing is performed by appropriately trained personnel?	✓		
5	Has a current list of all pesticides and other chemicals stored or used at the golf facility recently been provided to the appropriate Fire Department(s)?	✓		
6	Is there a written, readily available, and regularly updated Integrated Pest Management Plan for the entire golf course facility?		✓	
7	If personal protective equipment is required for pesticide use, storage, or handling, is it available for use by trained individuals?	✓		
8	Are written and readily available records maintained of all applications of pesticides made by certified applicators, including the following? - the quantity of each pesticide used; - the chemical or common name of the active pesticidal ingredient(s); - the pest or purpose for which the pesticide was applied; and the date and place of application.	✓		
9	Is the chemical storage structure/area well ventilated, fire resistant, and locked with access limited to select personnel?	✓		
10	Are there designated and documented "no spray" areas around pond, river, stream, or lake edges and have they been communicated to pesticide applicators?	✓		
	<b>Point totals for each column</b>	<b>8</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 and documented "minimally-maintained" or natural vegetative buffer areas around pond, river, stream, or lake edges and have they been communicated to mower operators and pesticide applicators?	✓		
2	Is there a readily available copy of the Installation Spill Plan that includes the golf course facility and is there a spill containment kit at each required location with spill containment procedures in place?	✓		
3	Does the chemical storage area have a sealed metal or concrete floor and are all liquid 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 appropriate pallets or shelves to keep them off the floor?	✓		
6	Do all golf facility employees regularly receive documented and approved HAZCOM and safety and health training?	✓		
7	Are grass clippings removed from 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?	✓		
10	Are appropriate quantities of fertilizers applied during weather conducive to reducing the potential for leaching and runoff?	✓		
<b>Point totals for each column</b>		<b>8</b>	<b>1</b>	<b>1</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 appropriately designated and mapped 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 irrigation system flow meters been installed to monitor water use and detect potential waste?			✓
6	Has the entire golf course facility property been examined for landfills, critical habitats, threatened or endangered species, wetlands, floodplains, and historical/cultural resources or other environmentally sensitive features?	✓		
7	Are employees encouraged to minimize their trips around the course to conserve on the use of fossil fuels and minimize potentially harmful exhaust emissions?	✓		
8	Do the restaurant and/or snack bar utilize reusable plates and silverware for use by customers throughout the facility’s operating hours?		✓	
9	Have the annual maintenance practices for the officially designated “minimally-maintained” or natural areas been coordinated with the installation Bird/Wildlife Aircraft Strike Hazard (BASH) officer and installation environmental management personnel?			✓
10	Are all motorized golf course equipment regularly checked for excessive air polluting emissions?		✓	
<b>Point totals for each column</b>		<b>3</b>	<b>4</b>	<b>3</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 equipment wash or wastewater kept from directly entering surface water and are they recycled or allowed to filter through a vegetative area?		✓	
3	Are outdoor irrigation of non-golf course landscape areas regularly monitored and maintained for leaks and efficient performance?	✓		
4	Has the golf course staff coordinated with the installation's environmental staff on potential storm water management planning requirements?	✓		
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, natural, or water feature areas?			✓
6	Are all water feature maintenance tasks coordinated with the installation Bird/Wildlife Aircraft Strike Hazard (BASH) officer and installation environmental management personnel?		✓	
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 that pass through the golf course such as streams or creeks regularly monitored both upstream and downstream of the course for overall water quality?	✓		
9	Does the facility have an approved written and readily available Drought Management Plan if, or when irrigation restrictions may be required by the community or the installation?		✓	
10	Is there a comprehensive, up to date, and readily available written Water Feature Management Plan for the entire golf course facility?		✓	
	<b>Point totals for each column</b>	<b>4</b>	<b>5</b>	<b>1</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 such as Integrated Pest Management, Tree Management, and Hazard Communication?		✓	
3	Are green, tee, and fairway mowing heights maintained at reasonable levels that do not unduly stressing turf or requiring additional chemical inputs?	✓		
4	Are there regular and documented procedures in place to continually improve overall course soil health such as topdressing, organic amendments, aeration, and drainage improvements?	✓		
5	Is there an up to date and readily available map of the course's "hot spots", or those areas requiring special care or regular attention?	✓		
6	Is all maintenance equipment maintained and cleaned in a manner that minimizes or eliminates the potential for spreading of pest or disease contamination?	✓		
7	Has there been a complete examination of all aspects of the golf course facility operation (including the snack bar and grill, clubhouse, pro shop, cart storage facility, and maintenance complex) for potential negative environmental impacts?	✓		
8	Is contour mowing used to conserve fuel and increase playability and aesthetics?	✓		
9	Have all playing surfaces been inventoried and mapped for potentially agronomically challenging soil types?	✓		
10	Are soil tests and plant tissue analysis used to determine nutritional requirements?	✓		
<b>Point totals for each column</b>		<b>9</b>	<b>1</b>	<b>0</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 an on-going and documented customer environmental management educational program?	✓		
2	Is there a highly visible location at the course or clubhouse where golf course environmental management notices and informational messages are regularly posted for the education and enjoyment of customers?		✓	
3	Do the course manager and superintendent actively communicate with customers to determine their points of view?	✓		
4	Is there documented, regular communication by course management with installation civil engineering, environmental, and leadership on GEM program issues or concerns?		✓	
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 around or near recycled or otherwise non-potable water?	✓		
8	If applicable, have areas of the course been designated "Environmentally Sensitive Zones" per USGA rules?	✓		
9	Are course staff members regularly trained on how to improve their dealings with customers?	✓		
10	Are there clinics provided to teach beginning golfers the basics of the game to include the rules as well as the environmental challenges faced by the golf staff at their facility?	✓		
	<b>Point totals for each column</b>	<b>7</b>	<b>3</b>	<b>0</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 execution in the near future that would demonstrate the compatibility of the course's management methods with GEM program initiatives?		✓	
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?	✓		
4	Are there regular field trips hosted at the course for local students or other community groups?			✓
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>4</b>	<b>3</b>	<b>3</b>

## ECQ Summary

#	Environmental Compatibility Quotient Category	Yes	Partial	No
1	Overall Management Philosophy & Documentation	7	3	0
2	Safety, Training, & Awareness	8	2	0
3	Compliance	6	4	0
4	Pesticide Use, Storage, & Handling	8	2	0
5	Pollution Prevention	8	1	1
6	Conservation Practices*	3	4	3
7	Water Resources*	4	5	1
8	Maintenance Practices	9	1	0
9	Customer Relations & Education	7	3	0
10	Miscellaneous Special Projects & Activities*	4	3	3
	<b>Composite point total/response percentage</b>	<b>64</b>	<b>28</b>	<b>8</b>

### Mar 07 Results:

#### Wrenwoods Golf Course, Charleston AFB, SC

- Actual ECQ (# of “Yes”) = 64 (**Red, Getting started**)
- Potential ECQ (Actual ECQ plus “Partial”) = 92 (**Green, Advanced**)

\* = Category requires improvement or attention

## Environmental challenges

One of the important results of the GEM process is the identification of potential environmental challenges to be addressed in the long-term GEM Planning process. After determining the relative significance and validation of each potential environmental challenge, the installation golf and environmental staffs should determine the set of final challenges that will be actively managed in the GEM Plan. Armed with the list of final environmental challenges, the golf staff should determine the best management approach that satisfies the goals of the golf facility from the course playability and customer satisfaction perspectives. Then the golf staff's preferred management approach should be coordinated with the installation's environmental staff for refinement, coordination, and approval.

The entire GEM process can be viewed at the GEM website (<http://www.afcee.brooks.af.mil/ec/golf/>). The following potential environmental challenges were identified during the GCEBA process:

- Solid Waste Management Units (SWMUs)
- Wetlands
- Bird/Wildlife Aircraft Strike Hazard (BASH)
- New clubhouse site plan
- Floodplains

## FINAL ENVIRONMENTAL CHALLENGES

The following final environmental challenges were identified during the GEM Plan process:

- Reforestation
- Solid Waste Management Units (SWMUs)
- Site drainage & runoff
- Wetlands
- Native area establishment

Image removed due to perceived potential security risk.

## **Wrenwoods Golf Course Environmental Challenges**



*Juvenile pines placed in thin areas to increase forest density.*

## REFORESTATION

Historically, the golf course has been excessively mowed for the past several years. This practice proved labor intensive and was not economical in regards to fuel consumption or damage done to mowing equipment from tree roots and holes. Additionally, many trees/habitat areas were lost due to hurricanes.

### Management Practice

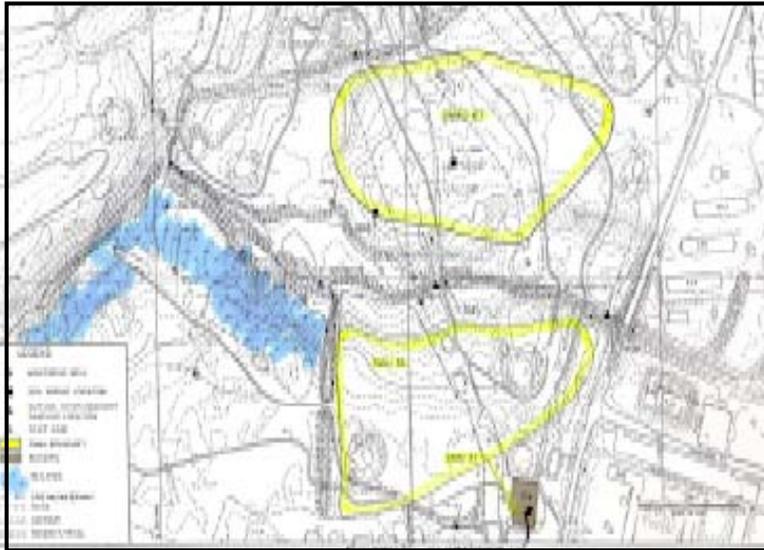
Using the new Bobcat skid loader with tree spade, the golf maintenance staff has been able to go into densely populated stands of native pines and place juvenile trees in less dense areas, thereby, contributing to the reforestation of these areas.

## Target

The goal of this work is to re-establish the challenging tight, tree-lined golf course that is less maintenance intensive in the non-play areas. Conserving fuel and focusing valuable man-hours for the playable areas of the golf course instead of the roughs are both key considerations. These areas will be enhanced both through natural regeneration of indigenous species as well as some planting. Golf course personnel will coordinate with CEV to restore these forested areas using indigenous or native species where practical.



*New Bobcat and tree spade make moving trees easier and safer.*



*SWMUs near 15<sup>th</sup> green and existing wetlands*

### **SOLID WASTE MANAGEMENT UNITS (SWMUs)**

According to installation environmental staffers, there are several SWMUs located on or near the golf course. Three are inactive landfills, SWMU 66, 67, & 68. These landfills were used to dispose of general refuse and possibly small amounts of industrial wastes.

SWMU 66 is located near the 15th green and extends through to the old practice putting green where refuse was disposed of from 1953-55 totaling approximately 40,000 CY. SWMU 67 is located north of SWMU 66 and is separated by the Golf Course Creek. Between 1956-58, nearly 70,000 CY total refuse.

SWMU 68 is located on the north end of the course near the 1st hole. Between 1959-68, approximately

120,000 CY was dumped in this landfill. This area is used as part of the driving range landing area.

SWMU 118 was an equipment wash rack and is located on the west side of the Wrenwoods maintenance complex facility.

### **Management Practice**

These areas are to be avoided with digging machines and soil work deeper than 12 to 18 inches. Site specific land use controls can be found in Appendix B of the Corrective Measures Implementation Plan for SWMU 68 (LF-06). Golf course personnel will coordinate with CEV prior to work in these areas.

### **Target**

Avoid unnecessary work that could breach these areas.

### **Objectives**

Maintain and monitor these areas. Several groundwater monitoring wells are routinely sampled in the driving range to ensure little to no groundwater contamination.



*Drainage from flight line on holes 5 and 6.*

### **SITE DRAINAGE & RUNOFF**

The golf course receives massive amounts of water during each rain event as it is one of the lowest points on base. The flight line drains through the site at two points which intersect at the lowest point in the golf course before exiting the base. The drainage that comes from the club house does not seem to have sufficient fall as the ditches around the club house are always full of water, thus the holes below the club house do not drain excessive rain.

### **Management Practice**

Consult and coordinate with CEV prior to any work in or around wetland areas in an effort to minimize potential impacts.

### **Target**

Flight line, club house and course drainage. In conjunction with the wetlands, these areas need to be free flowing to minimize ponding and stagnant areas, thereby, allowing storm water to drain from the site quickly.

### **Objectives**

Work with CE to ensure that flight line and golf course drainage is routinely cleaned and maintained. Ensure that all drainage areas do not hold or impede the flow of storm water and drain efficiently. This will help to reduce stagnant areas and will help to reduce mosquito populations as well.



*Flight line and clubhouse drainage crosses holes 1, 5, 8, 7, 16 and 17.*



*Delineated wetland area behind 17 green and 18 tee.*

## WETLANDS

According to the INRMP, there are a total of 30 identified and delineated wetlands at Charleston AFB totaling 354 acres. The wetland surveys were completed in 1997, 2003 and 2005. All but two of the 30 wetlands located on Charleston AFB properties are forested. The majority of the wetlands have been at least moderately disturbed by logging, minor fill at the wetland/upland boundary, or ditching.

Additionally, several wetlands have historically been disturbed by phosphate strip mining. Ideally, the golf course waterways should be freed of excess vegetation and debris so that storm water flows are maintained and new wetlands are not slowly being inadvertently created.

## Management Practice

As stated before, reviewing drainage issues and working with CE to increase efficiency of flight line drainage areas will avoid incidental creation of unwanted wetlands. Wetland areas have been clearly marked and care is taken to avoid current wetlands with machinery. Additionally, Wrenwoods patrons are asked to help preserve sensitive areas.

## Objectives

Work with CE to formulate a plan for drainage that can be enacted contingent upon adequate funding to improve flight line drainage areas running through the golf course.



*Forested wetlands abound on the Wrenwoods Golf Course.*



*Natural, minimally-maintained areas being established where appropriate around Wrenwoods Golf Course.*

## **NATIVE AREA ESTABLISHMENT**

Along with reforestation and tree plantings, native areas are being reintroduced to Wrenwoods Golf Course. Allowing these areas to return to their natural state encourages growth of native grasses and trees. Many of these areas had been previously maintained as rough areas. This consumed countless man-hours, fuel, fertilizer and additional resources to maintain these otherwise out of play areas on the golf course.

## **Management Practice**

Areas that have already been selected have seen re-growth of native pines and grasses. Not maintaining these areas allowed the golf maintenance staff to focus on other, more important issues on the golf course (i.e.: putting surfaces, tees).

## **Target**

Delineate areas of minimal maintenance. Explain to customers the process and reasoning why these areas are no longer going to be maintained at a 2 inch cutting height.

## **Objectives**

Coupled with the tree planting program, encouraging growth of native grasses and plants will lead Wrenwoods GC back to the aesthetically pleasing, forest-lined golf course from past years that proved to be both challenging and enjoyable.



*Natural area between 1<sup>st</sup> and 8<sup>th</sup> holes with desirable grasses and trees re-inhabiting the areas.*

## GEM Plan Goals & Objectives

### GOALS

- Reforestation of previously forested areas where habitat was lost due to Hurricane Hugo and various other storms
- Increase efficiency of storm drainage system, thereby allowing stormwater runoff from flightline and other areas to flow through the base rather than pooling in golf course areas
- Protection of existing wetland areas
- Establishment of native trees and grasses into areas that were previously mowed

### OBJECTIVES

Objectives are defined as actions or results that are desired to be accomplished prior to the next INRMP update.

- Areas where trees were lost will be allowed to regenerate naturally and also may be planted to return areas to their previous state. This will make the course more challenging and aesthetically pleasing
- Storm water system will be reviewed by golf course and CEV personnel. Ideally plans should be developed to routinely clean these drainage areas and to improve/maintain efficiency
- Golf course personnel and patrons should be made aware of sensitive wetland areas in an effort to protect and maintain these areas in their natural state
- Areas that have been identified as natural regrowth areas should be monitored for progress in regards to re-introduction of indigenous species

## GEM Plan Best Practices

Best practices are defined as any action, method, practice, or result that has proven its value and worth over time. The GEM program has been designed to create a body of scientific data to share with all U.S. Air Force installation golf and environmental staff members.

- Wrenwoods personnel have identified areas that should be allowed to return to a forested state, thereby, reducing maintenance costs and manpower demands. This allows valuable resources to be focused on playable areas of the course
- Wetland areas have been clearly marked in the field so that golf course personnel as well as patrons are aware of these areas. This helps to prevent intrusion and damage to these sensitive areas
- Restoration of natural areas will allow the base to realize a cost savings in regards to both equipment and manpower. This will also reduce costs for irrigation



## Conclusion

Wrenwoods Golf Course personnel will work diligently with CE Squadron to implement goals and objectives of the GEM plan while ensuring compliance with all applicable environmental policies and regulations.

The CE Squadron's Unit Environmental Coordinator (UEC) program should provide the key oversight to assist in improving the ability of the golf and environmental staffs to work together to better support the Charleston AFB mission. In addition, conserving precious water supplies through the application of science, engineering, and demonstrated environmental stewardship may be the only other major issue facing the Charleston environmental and golf staff members.

## The gallery



*Drainage backed up on number 1 fairway.*



*Front view of new golf clubhouse.*



*Picnic area near putting green provides welcome respite from the sun.*



*Newly expanded tee box on #2, doubling size of teeing area.*



*Reforestation on the right side of the second hole.*



*Bunkers in need of renovation.*



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