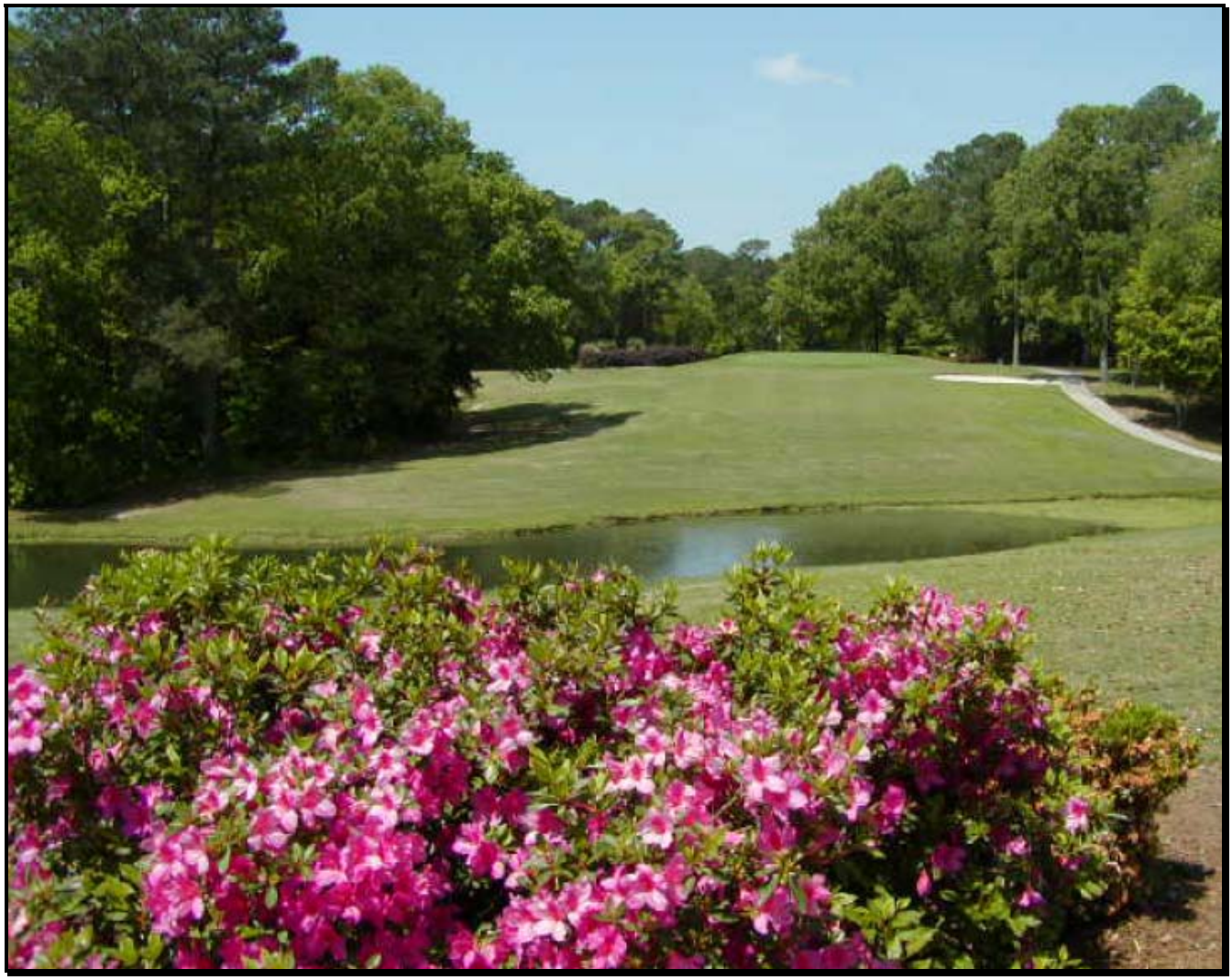
Air Force Center for Engineering & the Environment



Pine Oaks Golf Course
Environmental Management (GEM) Plan
Robins AFB, Georgia

March 2011

San Antonio, Texas

Pine Oaks Golf Course
Environmental Management Policy

In concert with the
Robins 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 regularly reevaluate our processes
to achieve the highest standards
of environmental excellence.

Table of Contents

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 Engineering & the Environment (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. Chapter 11.4 of AFI 32-7064 requires a GEM Plan as part of the Integrated Natural Resources Management Plan (INRMP).

GEM Program process

There are five steps in the GEM program process:

- Analysis
- Documentation
- Implementation
- Evaluation
- Revision

Environmental Compatibility Quotient (ECQ) scores

The following is the summary of the environmental compatibility quotient (ECQ) scores for the site visit conducted in Month Year:

- **Actual ECQ = 67, Just started (Red)**
- **Potential ECQ = 86, Showing progress (Yellow)**

Environmental challenges

The following potential environmental challenges were identified in compiling this document:

- Cultural resources
- Erosion control
- Water use
- Water quality
- Protected species
- Invasive species
- Potential hole relocation
- Audubon Certified Sanctuary Program

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/).

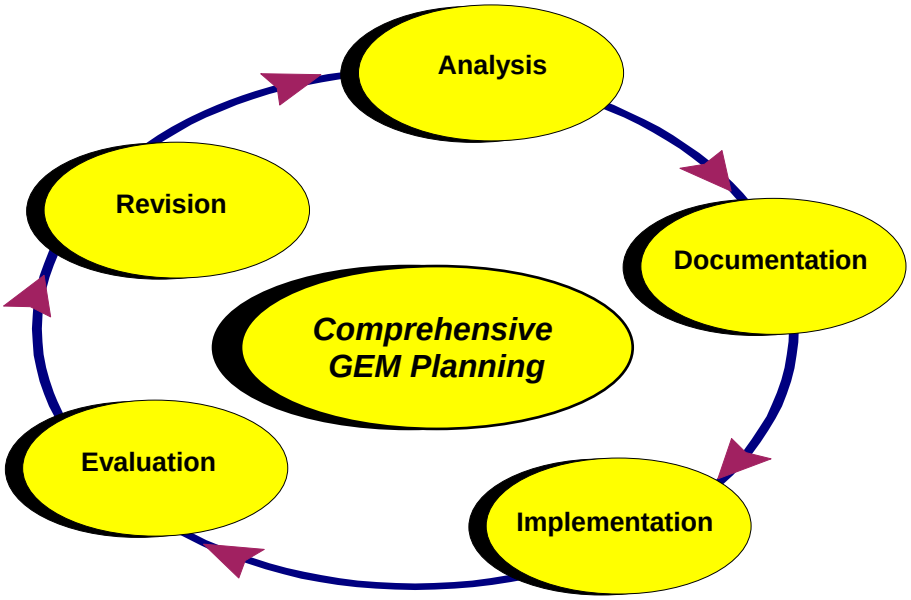
Pine Oaks Golf Course Robins AFB, Georgia

The pro shop is adequately sized and nicely appointed.

The Draft Golf course Environmental Management (GEM) Plan is the initial step in creating a successful ecosystem-based comprehensive GEM Plan. The intent of the GEM Plan is to provide an efficient management tool that will enable course managers 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 evolving environmental requirements while contributing to the local community.

The GEM Initiative

The goal of the GEM initiative is to facilitate the creation of an environmentally friendly approach to golf course management while protecting and promoting the great game of golf. 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. The comprehensive GEM planning process is the vehicle to document our successes while communicating directly with our customers, commanders, and local community.



GEM Process

The five steps of the GEM Process are based on continual improvement.

GEM 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 comprehensive GEM planning process. The GEM Plan is derived from several diverse environmental regimes to include the National Environmental Policy Act and the ISO 14001 environmental management system.

There are five basic steps in the implementation of the GEM Planning process:

- Analysis
- Documentation
- Implementation
- Evaluation
- Revision

Analysis

Experienced environmental managers realize the importance of assembling all of the data relevant to a problem prior to determining its best solution. Comprehensive analysis is the most important task of the GEM process. Properly completing the analysis is paramount to the long-term compatibility of a golf course's management practices with the local community's natural resource and environmental management goals and objectives.

The site assistance visit accomplishes several important activities to include:

- Site visit, interviews, and data collection
- Course specific analysis & miscellaneous facility review
- Compilation of the environmental compatibility quotient checklists
- Identification of potential environmental management challenges

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 the community and customers alike the environmental issues that challenge golf course managers as well as their plans to deal with them. In order to reach established environmental stewardship goals the golf course staff must consistently employ only those management practices that minimize or eliminate potential negative impacts to the environment.

GEM PLAN COMPONENTS

The GEM Plan is comprised of the following components:

- Map of the entire golf course facility grounds depicting locations of the significant environmental challenges and the golf course facilities
- Description, driver or requirement, objective and target for each of the environmental challenges
- Specific management approach to be employed by the golf course staff for with each environmental challenge

Implementation

Positive and decisive action is the only true measure of the success of the GEM Plan. 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.

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. Improvements can be easily accomplished by regularly evaluating golf course maintenance methods, practices, and management approaches to day-to-day issues in concert with the desire and ability to change.

Revision

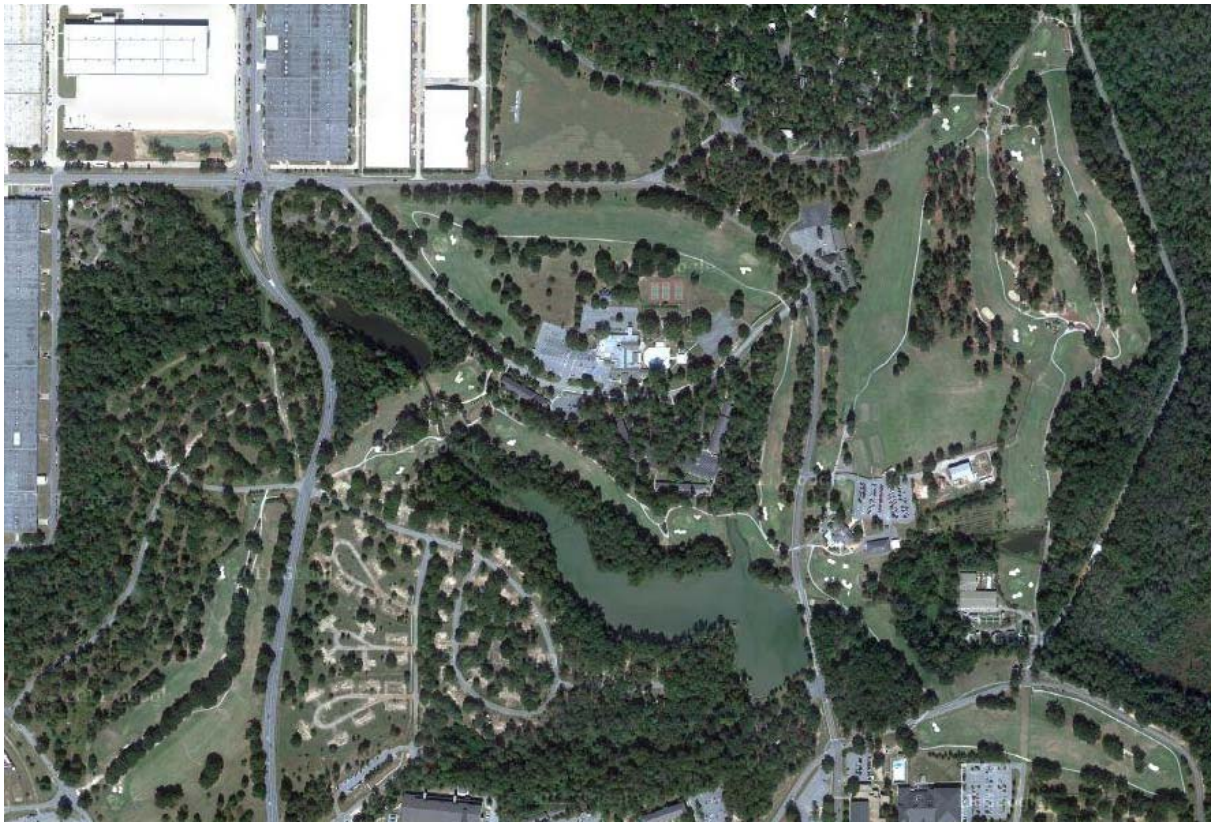
The very nature of a superior GEM Plan implies regular updates and revisions. Golf course managers and superintendents should be constantly looking for ways to improve their environmental stewardship. Acting on lessons learned is right behind initial implementation as the most important aspect of a successful GEM Plan.

Course Specific Analysis

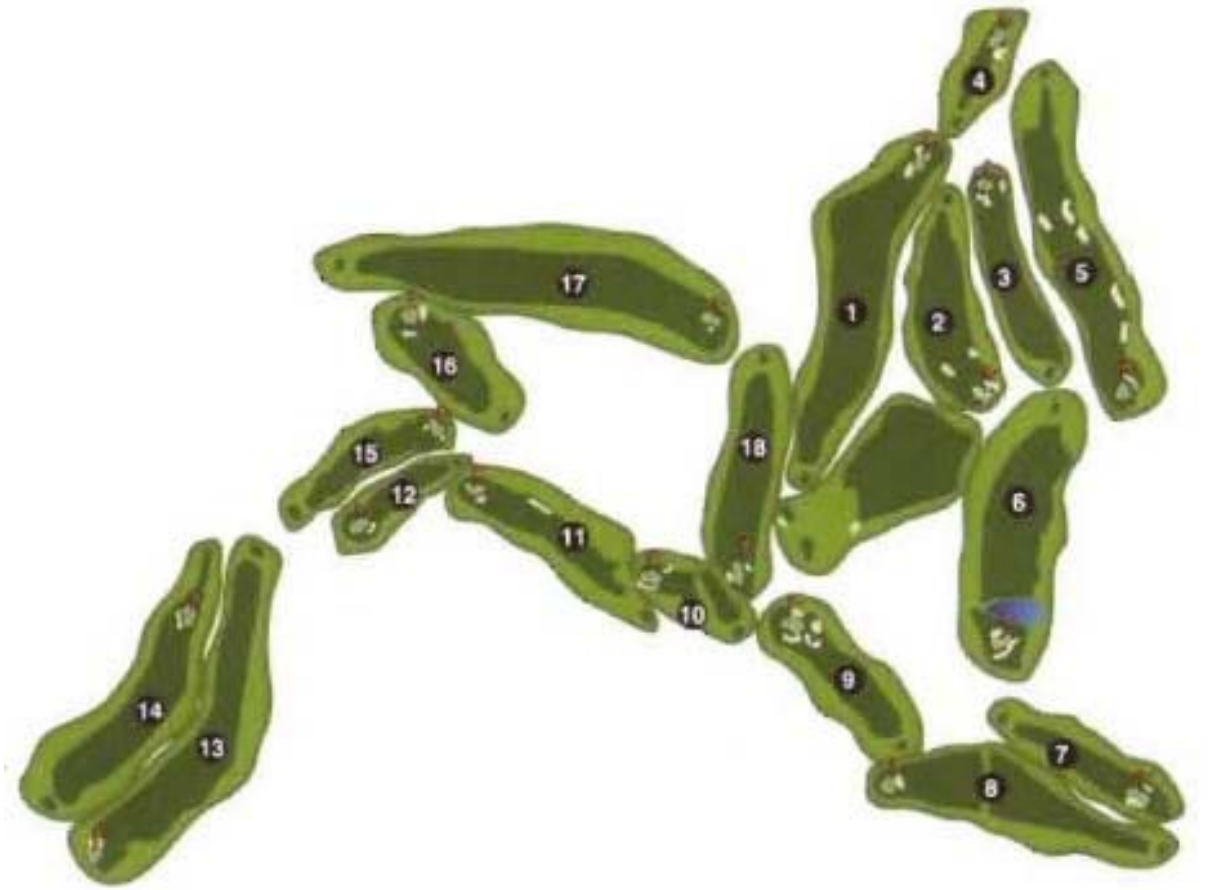
One of the most important tasks in the initial phase of the GEM process is the course specific analysis. From a general description of the course to the details of the course's history and makeup to the various observations on course playability, aesthetics and style of management, the course specific analysis establishes and communicates the context for the rest of the GEM Plan report.

Course Description

Robins AFB's Pine Oaks Golf Course satisfies and refreshes. Constructed 9 holes at a time over a decade spanning the late 1950s and 1960s, Pine Oaks Golf Course uniquely traverses several small parcels of land on the installation. At least 3 distinct sites are used to formulate the interesting and attractive 18-hole layout. Rolling parkland best describes the course as it tosses and tumbles over oak and pine studded relatively flat fairway landforms for much of the round.



Pine Oaks Golf Course, Robins AFB, Georgia



Pine Oaks Golf Course Layout Map

Course details

Architect		Civil Engineering
Year constructed		1959/1968/2004 (greens renovation)
Climate		Humid with high rainfall
Average annual precipitation		35-45 inches
Average growing season		220 days
Elevation		~280’ ASL
Prevailing wind direction		Southwest
Total facility acreage		350 acres
Total actively maintained acreage		120 acres
Par		36-35-71
Yardage/Rating/Slope		Blue- 6258/69.6/128 White- 6003/68.3/125 Black- 5309/70.8/124 Red- 5014/69.5/119
Turfgrass	Tees-	Tifway 419 Bermudagrass
	Fairways-	Tifway 419 Bermudagrass
	Greens	TifEagle Bermudagrass
	Roughs-	Tifway 419 Bermudagrass
Irrigation source - Sustainability rating		Potable - Red

Environmental Compatibility Quotient (ECQ) Checklists

Many diverse and complex aspects of golf course management have been revealed through the literature search conducted to compile this study. In order to simplify the process, these aspects have been summarized into eight main topics and incorporated into five distinct environmental compatibility categories.

- Planning & Compliance
- Operations & Maintenance
- Water Resource Management
- Conservation
- Pesticides & Pollution Prevention

The environmental compatibility quotient (ECQ) checklist questions have been compiled using examples from several environmental management resources and represent the best method currently available to determine the relative environmental compatibility of a golf course's management practices. The checklists can be used in many ways including:

- As a tool to establish a current snapshot or baseline of a golf course's relative environmental compatibility
- As a tool to identify areas for improvement or to demonstrate current successes
- As a self-assessment tool for the golf course manager and superintendent
- As documentation for an environmental award nomination
- As documentation for regulatory requirements or inquiries from customers, the media or the general public

Determining the Environmental Compatibility Quotient (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 relative status or quality of the environmental management program in regards to stewardship. Although several of the ECQ questions address compliance-related issues or practices, there are no formal requirements or mandates implied or actual connected to this process. The ECQ checklists establish two measures, or scores:

- **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 of the checklists. Maybe the most significant measure; the potential ECQ represents a level of compatibility that could be reached by fully implementing a particular practice or procedure.

The following ECQ checklists are a record of the interview conducted with the course superintendent during the visit.

Planning & Compliance				
#	Environmental Compatibility Indicator	Yes	Partial	No
1	Has management demonstrated that environmental stewardship is an important part of their responsibilities by initiating the Comprehensive Golf course Environmental Management (GEM) Planning process?	✓		
2	Is the GEM Plan complete, updated regularly and readily available to employees and customers?		✓	
3	Has the golf course adopted and posted an environmental policy?		✓	
4	Is a map of the property highlighting environmental challenges posted for employees and customers?			✓
5	Does management conduct a comprehensive annual evaluation for each identified environmental challenge and its management approach, objective and target?		✓	
6	Does the course have a written Tree Management Plan?		✓	
7	Is there a readily-available and regularly updated golf course-specific Integrated Pest Management Plan?		✓	
8	Is there a map of the course's areas that may require regular special care or attention?	✓		
9	Is there an up-to-date comprehensive golf course development plan or master plan that details the desired short- and long-term facility improvements?	✓		
10	Is there at least one project planned and funded for the next year that would increase the compatibility of the course's management program with comprehensive GEM planning goals and objectives?	✓		

Planning & Compliance Checklist (continued).

#	Environmental Compatibility Indicator	Yes	Partial	No
11	Are all employees familiar with the GEM Plan and are they trained regularly on the importance of its overall goals and objectives?		✓	
12	Are environmental management issues regularly discussed during staff meetings?	✓		
13	Are the quantities and application rates of each pesticide or fertilizer used over the last year on the facility available in writing?	✓		
14	Has the golf facility maintained compliance with all environmental regulations over the past year (no notice of violations or enforcement actions)?	✓		
15	Are employees trained in their native language on GEM Plan and compliance with its intent and specific goals and objectives?	✓		
16	Does the golf manager and superintendent facilitate and assist with compilation and implementation of the GEM Plan and its inherent goals and objectives as a quantifiable portion of their daily activities?	✓		
17	Are there documented functional and/or aesthetic thresholds integrated into pest control decisions?		✓	
18	Is there a written comprehensive Golf Course Water Resources Management Plan that describes the care for each of the course's water-related activities?			✓
19	Are employees trained on what to do in case of a spill and have spill containment kits been provided at all appropriate locations?	✓		
20	Have all maintenance procedures been examined to determine their potential to impact the course's identified environmental challenges?		✓	
	Totals	**10**	**8**	**2**

Operations & Maintenance				
#	Environmental Compatibility Indicator	Yes	Partial	No
1	Is there a written, regularly updated and readily-available comprehensive Turfgrass Management Plan for the entire facility?	✓		
2	Does the design and condition of the Maintenance Complex facility positively contribute to the stated installation environmental stewardship goals contained in the INRMP?		✓	
3	Are mowing heights maintained at levels that do not excessively stress important playing surfaces and increase chemical or fertilizer inputs?	✓		
4	Are aeration, topdressing and other drainage improvements regularly implemented to improve soil health and minimize or eliminate inputs of pesticides or fertilizers?	✓		
5	Are soil tests or plant tissue analysis regularly used to determine turfgrass nutritional requirements?	✓		
6	Is the information collected in soil tests and plant tissue analysis integrated into a regularly updated Nutrient Requirement Plan?	✓		
7	Is there at least one project planned and funded for the next year that would mitigate the potential for environmental impacts due to the course's operational or maintenance procedures?	✓		
8	Are all appropriate employees trained to be familiar with (national, federal, state, and OSHA) regulations that apply to storage and handling of potentially hazardous materials used on the property?	✓		
9	Have all aspects of the golf course property other than the course been examined for potential environmental impacts?	✓		
10	Have all employees received documented annual training that would increase their awareness of the stated installation GEM program policy and this Plan’s goals and objectives?		✓	

Operations & Maintenance Checklist (continued).

#	Environmental Compatibility Indicator	Yes	Partial	No
11	Are used oil containers in good condition, not leaking and clearly labeled?	✓		
12	Are golf course wash racks operating and maintained properly?		✓	
13	Are all golf course vehicles and equipment maintained and cleaned in a manner that would eliminate the potential for spreading of disease or other contamination?	✓		
14	Is electric motor-powered equipment or vehicles being utilized where appropriate and/or required due to air quality or other environmental concerns?	✓		
15	Are waste products such as oil, grease, tires and batteries stored and disposed of properly?	✓		
16	Are hand held GPS units to map golf course areas to assist the environmental management process?			✓
17	Are energy efficiency ratings factored into equipment purchases for use throughout the facility?	✓		
18	Has the golf facility been studied to quantify and minimize solid waste streams?	✓		
19	Are at least 90% of restaurant/snack bar facility plates, cups and utensils reusable rather than disposable?			✓
20	Is a web-based, course management tool used for every day decision-making and recordkeeping?			✓
	Totals	**14**	**3**	**3**

Water Resource Management

#	Environmental Compatibility Indicator	Yes	Partial	No
1	Are records of water quality monitoring activities, results and pollution control measures readily available and used to implement appropriate maintenance practices?		✓	
2	Are slow-release fertilizers and/or spoon-feeding techniques used to reduce the potential for runoff impacts and nutrient loading to water features?	✓		
3	Does the irrigation system use regularly calculated real-time evapotranspiration rates?			✓
4	Is the golf course irrigation and plumbing systems regularly monitored and maintained?	✓		
5	Have low-flow water saving devices been installed wherever possible?	✓		
6	Are sterile triploid grass carp or similar fish species used to control unwanted aquatic vegetation in major water features?	✓		
7	Is there at least one project planned and funded that would minimize or eliminate a potential water quality or erosion problem?		✓	
8	Are water features regularly monitored for algae, erosion and excessive aquatic plant growth?	✓		
9	Are low impact design (LID) principles such as using vegetative or drainage filters to cleanse parking lot runoff prior to leaving the property?	✓		
10	Are there signs appropriately located to warn golfers of the potential hazard of drinking recycled or otherwise non-potable water?	✓		

Water Resource Management Checklist (continued).

#	Environmental Compatibility Indicator	Yes	Partial	No
11	Are accurate flow meters used to monitor total potable and non-potable water use?	✓		
12	Has the irrigation system or its components recently been upgraded to reduce or eliminate inefficiency and overall water use?		✓	
13	Is there a map of the watershed in which the golf course property resides and location(s) of floodplains and storm water drainage that exists on the property?	✓		
14	Is the quality of the irrigation water regularly checked to determine overall quality including parameters like pH, nutrient, salt or total suspended solids?		✓	
15	Is water quality data regularly collected to establish baseline conditions and maintenance procedures for all water features on the property?		✓	
16	Is at least 75% of the water used for irrigating the golf course property from recycled or other non-potable sources?			✓
17	Is there at least one project planned and funded that would decrease the course's dependency on potable water use?		✓	
18	Have the property's Water Quality Management Zones been identified and mapped based on industry-standard risk factors?			✓
19	Has the property's water features been studied to determine the aquatic and amphibious species population?	✓		
20	Has the property been examined for potentially significant wetlands or associated sensitive water-based habitats?	✓		
	Totals	**11**	**6**	**3**

Conservation				
#	Environmental Compatibility Indicator	Yes	Partial	No
1	Is all motorized equipment maintained to minimize the potential of excessive air polluting emissions?	✓		
2	Has the entire golf course property been examined for critical habitats, species of concern and threatened or endangered species?	✓		
3	Are all manmade ponds or other large water features adequately lined to minimize or eliminate losses?	✓		
4	Are employees encouraged to minimize their trips around the course to conserve on the use of fossil fuels?	✓		
5	Have efforts been made to physically connect natural areas to facilitate wildlife movement through the course property?	✓		
6	Are required operating permits current, updated and adequately maintained?	✓		
7	Are recycling containers conveniently provided for customer and employee use throughout the golf course facility?		✓	
8	Has there been a study to determine the presence of invasive species on or near the course?	✓		
9	Is there a comprehensive and readily available Drought Management Plan for the entire golf course facility?	✓		
10	Are there records maintained and readily-available documenting a 2% annual reduction in potable water use as well as a 2% reduction in overall water use?	✓		

Conservation Checklist (continued).

#	Environmental Compatibility Indicator	Yes	Partial	No
11	Has there been a demonstrated 2% annual reduction in irrigation water use starting in FY10?	✓		
12	Are a majority of plants used on the Approved Installation Plan List and are drought-tolerant native trees, shrubs, groundcovers, or their cultivars?	✓		
13	Are there areas appropriately designated and signed as "Environmentally Sensitive Zones" per The Rules of Golf?	✓		
14	Has a comprehensive energy audit been conducted for the entire golf course facility?			✓
15	Is there a comprehensive Energy Management Plan compiled for the entire golf course facility demonstrating a 3% annual reduction?			✓
16	Is petroleum product use being tracked to demonstrate a minimum of 2% annual reduction?	✓		
17	Is there an inventory of bird and mammal species documented, maintained and readily available?	✓		
18	Have all damaged or degraded habitats as result of construction projects or other work on or near the course been fully restored?		✓	
19	Has the entire property been adequately examined to protect potentially existing archaeological, cultural or historical resources?	✓		
20	Is the irrigation pump station an energy efficient, variable frequency drive?			✓
	Totals	**15**	**2**	**3**

Pesticides & Pollution Prevention

#	Environmental Compatibility Indicator	Yes	Partial	No
1	Are there established, documented and communicated fertilizer and pesticide application buffer areas around water features and/or sensitive landscapes?	✓		
2	Is the pesticide mixing location and spray equipment loading area adequately covered to eliminate collection of precipitation?	✓		
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 and does it have at least 150% of total storage volume secondary containment?	✓		
5	Are liquid products stored below dry products and are dry materials stored on pallets or shelves to keep them off the floor?	✓		
6	Has the least toxic pest control strategy been identified for each of the most common pests and is it always used first when an action threshold is reached?	✓		
7	Is equipment cleaned with compressed air or blowers on part of the course instead of, or prior to washing?	✓		
8	Are leachate potentials of pesticides considered in the integrated pest management process?	✓		
9	Does the fuel storage/delivery area comply with local, state, federal, or other applicable regulations?	✓		
10	Are written records maintained of all applications of pesticides to include: - the pest and treatment type (preventative/curative); - the location (specific area) of each pesticide used; - the area (SF/SM) & quantity of each pesticide used; - the chemical & common name of active ingredient(s); - the date, location, or purpose of the application?	✓		

Pesticides & Pollution Prevention Checklist (continued).

#	Environmental Compatibility Indicator	Yes	Partial	No
11	Are all pesticide applications performed by licensed personnel and are they recorded and mapped?	✓		
12	Other than the superintendent, are there trained scouts on staff to monitor turf and plant health and pest problems?	✓		
13	Are there scouting forms utilized and are they collected and organized into a report or guide for use in future pest control decisions?			✓
14	Is there an established aesthetic or functional threshold for each of the course's most common pests that may help reduce pesticide and fertilizer inputs?	✓		
15	Are current copies of all Material Safety Data Sheets (MSDS) for all chemicals used anywhere on the golf course property maintained and readily available?	✓		
16	Are fertilizers and pesticides stored in separate facilities?			✓
17	Is the chemical storage structure/area locked, well-ventilated and fire-resistant and is access limited to appropriate personnel?	✓		
18	Are all fertilizer applications performed by licensed or certified personnel and are they recorded and mapped to guide future actions?			✓
19	Are golfers adequately notified in the pro shop and on the first and tenth tees about planned application of any chemical or fertilizer?	✓		
20	Are there readily-available written pest profiles for common regional pests that include potential alternative control measures?	✓		
	Totals	**17**	**0**	**3**

Pine Oaks
Golf Course
Robins AFB, Georgia

Spring in Georgia is a wonderful time.

Environmental Compatibility Quotient Summary

Environmental Compatibility Category	Yes	Partial	No
Planning & Compliance	**10**	**8**	**2**
Operations & Maintenance	**14**	**3**	**3**
Water Resource Management	**11**	**6**	**3**
Conservation	**15**	**2**	**3**
Pesticides & Pollution Prevention	**17**	**0**	**3**
Totals	**67**	**19**	**14**

Key to checklist responses

- **Yes** = Practice is complete or ongoing and can be verified
- **Partial** = Practice has been initiated yet is not completed
- **No** = Practice is not in place

March 2011 - Pine Oaks Golf Course ECQ:

- **Actual ECQ = 67, Just started (Red)**
- **Potential ECQ = 86, Showing progress (Yellow)**

Environmental Compatibility Quotient Scoring Scale

Total Yes or Partial Responses	Environmental Compatibility Level
90-100%	**Advanced (Green)**
70-89%	**Showing progress (Yellow)**
69% or less	**Just started (Red)**

Environmental Challenges Map

Environmental Challenges

One of the important results of the GEM process is the identification of significant environmental challenges to be addressed in the GEM Plan. Challenges are defined as "things that are bigger than the course". Some of the reasons behind a particular challenge are important to recognize and understand. Ideally, the golf staff will address their management approach to each challenge to accomplish course and local community environmental management objectives while still attaining acceptable levels of course playability and customer satisfaction.

Identified environmental challenges

The following environmental challenges were identified during the GEM process:

- Cultural resources
- Erosion control
- Water use
- Water quality
- Protected species
- Invasive species
- Potential hole relocation
- Audubon Certified Sanctuary Program

Assessing environmental challenges

The assessment of the environmental challenges is probably the most crucial as it provides a prioritized list of coordinated actions significant to the long-term success of the golf facility. The finalized GEM Plan will include the description, driver or requirement, management practice, objective, and target:

DESCRIPTION
Once the challenge has been identified, a short description and a few historical or statistical details assist greatly in understanding the key factors in devising management practices.

DRIVER/REQUIREMENT
A driver or requirement may be a local, regional, or national law, regulation, or initiative that creates the requirement to protect species, habitat, or preserve a resource such as open space or unique ecosystems.

OBJECTIVE
Objectives are the overall goals for environmental performance focusing specifically on management activities associated with each challenge and the potential for impacts. The objective should directly relate to the environmental policy.

MANAGEMENT APPROACH
A course's approach to managing environmental challenges in accordance with the driver or requirement, environmental policy (see page 2), and established objectives and targets is the heart of the GEM Plan.

TARGET
The target is the time frame and/or quantifiable unit of measure to achieve the established objectives.

Pine Oaks Golf Course Robins AFB, Georgia

The greens at Pine Oaks were renovated in 2004.

Pine Oaks
Golf Course
Robins AFB, Georgia

Archaeological studies have been conducted on the course.

CULTURAL RESOURCES

According to the installation cultural resource manager, "Information about an installation's cultural resources is sensitive and must be protected according to law. Robins AFB identifies and protects its historic buildings and archaeological sites through compliance with laws and regulations. The base's commitment to preserving the heritage of Middle Georgia is guided by the Integrated Cultural Resources Management Plan that identifies the cultural resources on the Base and emphasizes management goals and objectives.

The Pine Oaks Golf Course at Robins AFB contains several archaeological resources. Proposed actions that may impact archaeological sites at the golf course must be coordinated with the cultural resources manager. Many minor actions can be approved quickly via the Comprehensive Programmatic Agreement (PA) that Robins AFB has with the Georgia State Historic Preservation Office (SHPO.) These minor actions do however, usually require on-site monitoring by the base archaeologist. Actions that are not allowed by the Comprehensive PA require consultation with the Georgia SHPO and 12 culturally affiliated Native American tribes.

Soils of the golf course are exposed to natural erosion, which may expose artifacts. Inadvertent finds should be left in place. If however, artifacts are picked up, they should be given to the Pine Oaks Golf Course. The Pine Oaks Golf Course should then contact the cultural resources manager so that the artifact(s) can be properly catalogued and curated with the rest of the collection."

Driver/requirement

- Archaeological and Historical Preservation Act (16 U.S.C. 469)
- National Historic Preservation Act

- Air Force Policy Directive (AFPD) 32-70, Environmental Quality
- AFI 32-7065, Cultural Resources Management
- AFPD 84-1, Historical Information, Property, and Art
- Archaeological and Historic Preservation Act, 16 U.S.C. 469-469c-2
- Archeology and Historic Preservation: Secretary of the Interior's Standards and Guidelines, 48 Federal Register 44716-44742, September 29, 1983
- Archaeological Resources Protection Act (ARPA), 16 U.S.C., 470aa-470mm Cooperative Agreements for Management of Cultural Resources, 10 U.S.C. §2684
- Curation of Federally-Owned and Administered Archaeological Collections, 36 CFR § 79
- DoD Directive 4710.1, Archaeological and Historic Resources Management, June 21, 1994
- DoD Instruction 4715.3, Environmental Conservation Program, May 3, 1996
- Indian Graves Act

Objective
Comply at all times with the prescribed practices enclosed in the Cultural Resources Management Plan (CRMP).

Management approach
- Regularly consult with installation cultural resource manager to ensure constant compliance with the Cultural Resources Management Plan (CRMP)
- Take into account cultural resources in management and development of its facilities
- Submit forms AF-103, *Work Clearance Request*, and AF-332, *Work Request,* DoD 1391, *Military Construction Project Data* for timely review and approval prior to commencing project work
- Report any cultural resources encountered in construction or maintenance work to the Cultural Resource Manager (CRM) and protect them from damage or theft
- Request a cultural resources surveys prior to conducting significantly different management activities that have the potential to impact cultural resources
- Assist in developing an erosion control plan for identified sites

Target
Ensure that there are no impacts to cultural amenities attributable to the golf course staff or its management practices.

Continue to work closely with cultural resources manager as required to realize environmental challenge objective.

Pine Oaks
Golf Course
Robins AFB, Georgia

Erosion near the 11th green is headed toward creek.

EROSION CONTROL

Through hard lessons learned from the past, information about an installation's archaeological or cultural resources is sensitive and must be protected according to the law as well as by painstakingly created procedures by many caring individuals and entities over a long period of time. Accordingly, the golf course is the site of cultural resources that are still being discovered. Soils are exposed and natural soil erosion has enabled some of the resource specimen to become visible to the casual observer. Care must be taken to protect these resources from impacts by the golf course staff as well as to purposeful, or even casual, "plundering" by customers or uninvited guests. The installation archaeologist should be consulted before any and all digging occurs at Pine Oaks Golf Course.

Driver/requirement

- Clean Water Act, Section 401

Objective

Soil erosion control measures are implemented during all construction projects and monitored by quality assurance and environmental personnel.

Ensure areas subject to potential soil erosion are regularly monitored by quality assurance and environmental personnel and control measures are implemented promptly when necessary.

Management approach

- Comply with all requirements included in the approved installation SWPPP
- Implement pre-approved soil erosion control measures for all construction projects
- Regularly monitor erosion-prone areas

- Enlist frequent inspections by appropriate environmental personnel
- Improve all identified erosive areas with recommended rip rap, sod, organic mulches or other best practice

Target
Ensure that all potentially erosive construction projects are monitored by quality assurance and environmental personnel.

Comply with all erosion control guidance, measures and best management practices at all times.

Pine Oaks
Golf Course
Robins AFB, Georgia

Sediment is coming off cart path construction project where adequate vegetative cover has yet to occur.

Pine Oaks
Golf Course
Robins AFB, Georgia

Pine Oaks is using potable water for their irrigation needs.

WATER USE

Air Force policy includes pointed statements that concerted efforts to "promote and investigate opportunities for using treated wastewater for irrigation" are paramount for installations currently using potable, drinking-quality water. Golf courses should only be irrigated with recycled water supplies or other non-potable sources if available. Section 6.5 of the RAFI 32-7064 directs the golf staff to implement water conservation practices. "the Pine Oaks Golf Course shall immediately develop and implement a plan approved by 78 CEG/CEV for water conservation Best Management Practices (BMPs), in order to comply with the Memorandum of Agreement entered into between the Georgia Golf Course Superintendent's Association (GGCSA) and Georgia EPD, dated May 2004. The Plan shall be updated at least annually, by 1 Mar, and submitted to 78 CEG/CEV for approval. The annual update shall include documentation of any adjustments or modifications to implemented or planned BMPs, along with a schedule of implementing proposed changes. It is never too early for a golf course to begin efforts to determine the potential for other water supplies. Robins AFB environmental and golf staffs have begun pursuit of alternative water supplies through filing of a work order to secure a feasibility study specific to this purpose.

According to the INRMP, the "78 CES/CEV enforces the Georgia DNR Environmental Protection Division (EPD) statewide watering restrictions. This includes publishing informative pamphlets concerning water restrictions and water conservation measures applicable to Robins AFB. Water conservation initiatives include recommending native, drought-resistant vegetation that can be used for landscape and area plantings, replacing less drought-tolerant vegetation when possible, and promoting and exploring opportunities for using treated wastewater for irrigation of the Golf Course which would require approval from the US Environmental Protection Agency (USEPA) and/or the State of Georgia as well as an approved National

Pollutant Discharge Elimination System (NPDES) permit."

Potential alternative sources of irrigation water supplies abound at Robins AFB. Groundwater sources may be accessible with the installation of a new well. According to a website, under Georgia state law, any party withdrawing more than 100,000 gallons of water per day (on a monthly average), on a system-wide basis, from surface water or groundwater, should have a state approved withdrawal permit. Specifically, an agricultural groundwater withdrawal permit will be required by law.

Surface water may provide another source for golf course irrigation. Once again, Georgia state law requires an agricultural storm water withdrawal permit for any golf course using surface water for irrigation.

Since 2 Jun 10, the Georgia Water Stewardship Act has allowed daily outdoor watering for purposes of planting, growing, managing or maintaining ground cover, trees, shrubs or other plants only between the hours of 4 p.m. and 10 a.m. by anyone whose water is supplied by a water system permitted by the Environmental Protection Division. Exceptions to this rule that may apply to the Pine Oaks Golf Course that allow irrigation "at any time of the day by anyone" include:

- "Use of reclaimed waste water by a designated user from a system permitted by the Environmental Protection Division of the department to provide reclaimed waste water;
- Irrigation of new and replanted plant, seed, or turf in landscapes, golf courses, or sports turf fields during installation and for a period of 30 days immediately following the date of installation;
- Use of water withdrawn from private water wells or surface water by an owner or operator of property if such well or surface water is on said property;
- Irrigation of athletic fields, golf courses or public turf grass recreational areas;"

Robins AFB adopted this water use policy in January 2010.

Driver/requirement

- Executive Order 13123, Greening the Government Through Efficient Energy Management
- Executive Order 13423, Strengthening Federal Environmental, Energy and Transportation Management
- Energy Independence & Security Act
- Energy Policy Act
- Executive Order 13514, Federal Leadership in Environmental, Energy, and Economic Performance
- Integrated Natural Resources Management, RAFB Instruction 32-7064, Civil Engineering, 8 Jan 02
- Georgia Water Stewardship Act, 2 Jun 10
- Georgia Statewide Water Management Plan and Water Conservation Implementation Plan, Rules for Outdoor Water Use, RSG-391-3-30
- Memorandum of Agreement, Georgia Golf Course Superintendent's Association (GGCSA) and Georgia EPD, May 04

Objective
Greatly reduce or eliminate use of potable water for irrigating any of the golf course grounds by contributing to the region-wide conservation of all water resources while still providing the best quality golfing experience for customers.

Management approach

- Compile and implement a comprehensive Water Resource Management Plan to include a Drought Management Plan and other water conservation practices for the entire golf course facility
- Water only as much as the turf needs and the soils can absorb
- Obtain a new computerized irrigation system provides accurate, current water use information
- Continued use of recycled water that is not subject to restrictions during regional shortages
- System is regularly checked for efficient operations
- Facility-wide drought management plan in the works
- Secure funding to install irrigation system using harvested storm water
- Explore possibility of securing sustainable and affordable new water supplies through the construction of an installation-operated sanitary sewage treatment plant

Target
Maintain vigilance on water quality and water conservation concerns at all times.

Secure project funding for irrigation system installation prior to 2013.

This pump house is the heart of one of two systems in use for the golf course irrigation.

Pine Oaks
Golf Course
Robins AFB, Georgia

Pine Oaks
Golf Course
Robins AFB, Georgia

This outfall is located near the 6th green.

WATER QUALITY

The golf course water bodies have the potential to receive inputs of pesticides, herbicides and fertilizer from course maintenance activities. Extreme care should be taken to ensure that projects are undertaken to accomplish appropriate goals for the right reasons that support the mission of safely flying airplanes.

The INRMP states that concerted efforts to "promote and investigate opportunities for using treated wastewater for irrigation" should be undertaken. We believe in the very near future that all golf courses will only be irrigated with recycled water supplies. It is never too early for a golf course to begin studies to determine the feasibility and the potential quality and quantity of the valuable resource.

INRMP Management Objectives and Actions #4 is to "Protect jurisdictional wetlands and Waters of the U.S. to sustain "no net loss" and prevent degradation of existing quality, function and value of wetland, surface water, and floodplain resources on water quality". Objective 4.2 states "maintain the existing level of water quality in lakes and streams and improve surface water quality as necessary" while listing a sub-objective to "minimize the application of chemical pesticides through the use of appropriate pest control products and application techniques and substitute with non-chemical controls, where effective, to reduce the amount of chemical pesticides entering lakes and streams, especially at the Golf Course" Obviously, protection of the community's water quality is a prime concern.

Driver/requirement

- Environment Agency Groundwater Protection Policy
- Federal Water Pollution Control Act of 1977 (Clean Water Act), as amended (33 U.S.C. 1251-1376)

- National Pollutant Discharge Elimination System (NPDES)
- Safe Drinking Water Act
- Executive Order 12088, Federal Compliance with Pollution Standards, 13 Oct 78
- 40 CFR 144.6, Underground Injection Control (UIC)

Objective
Ensure that water bodies are never subject to pollution from any golf course management practice.

Management approach
- Consult with installation environmental staff to ensure that golf course maintenance practices are fully compliant with complex water-related regulations
- Compile a comprehensive Water Resource Management Plan for the entire golf course facility
- Establish, document and communicate pesticide and fertilizer application buffers around all water features
- Direct floor drains to sanitary drains with oil/water separator
- Store drums on pallets
- Ensure spill response equipment is available and personnel are trained
- Cover all dumpsters
- Store materials and waste inside buildings or cabinets
- Cover wash rack and collect and regularly dispose of grass clippings properly
- Perform all repair activities under a covered area
- Cover and berm pesticide/herbicide storage and mixing areas
- Store flammables in properly located, secure cabinets
- Use drip pans under dispensing units

Target
Eliminate the potential for degradation of the water resources by immediately establishing, documenting and communicating all pesticide and fertilizer application buffers to appropriate personnel.

Maintain positive relationship with civil engineering and environmental staffers to attain and maintain compliance without delay on all water-related regulations and requirements.

Correct all potentially non-compliant water resource aspects prior to the end of CY 2012.

Establish and map all buffers prior to the end of FY12.

Pine Oaks
Golf Course
Robins AFB, Georgia

Photo credit:
Ed McDowell

The Ocmulgee skullcap potentially occurs on or near the golf course.

PROTECTED SPECIES

One of the most contentious issues facing environmental managers throughout DoD is dealing with plants, animals, or other critters protected under the Endangered Species Act. Fortunately for the Pine Oaks staff, their golf course has no species receiving protection under the law. Robins AFB does have ten state-listed rare plant species on the installation. One, the Ocmulgee skullcap, has been identified as residing along the 5th fairway of the Pine Oaks Golf Course. The staff has altered its mowing practices to allow the plant to sow its seed every year. The course has also posted signs to inform employees and customers of the plant's presence to further decrease the potential for negative impacts.

Driver/requirement

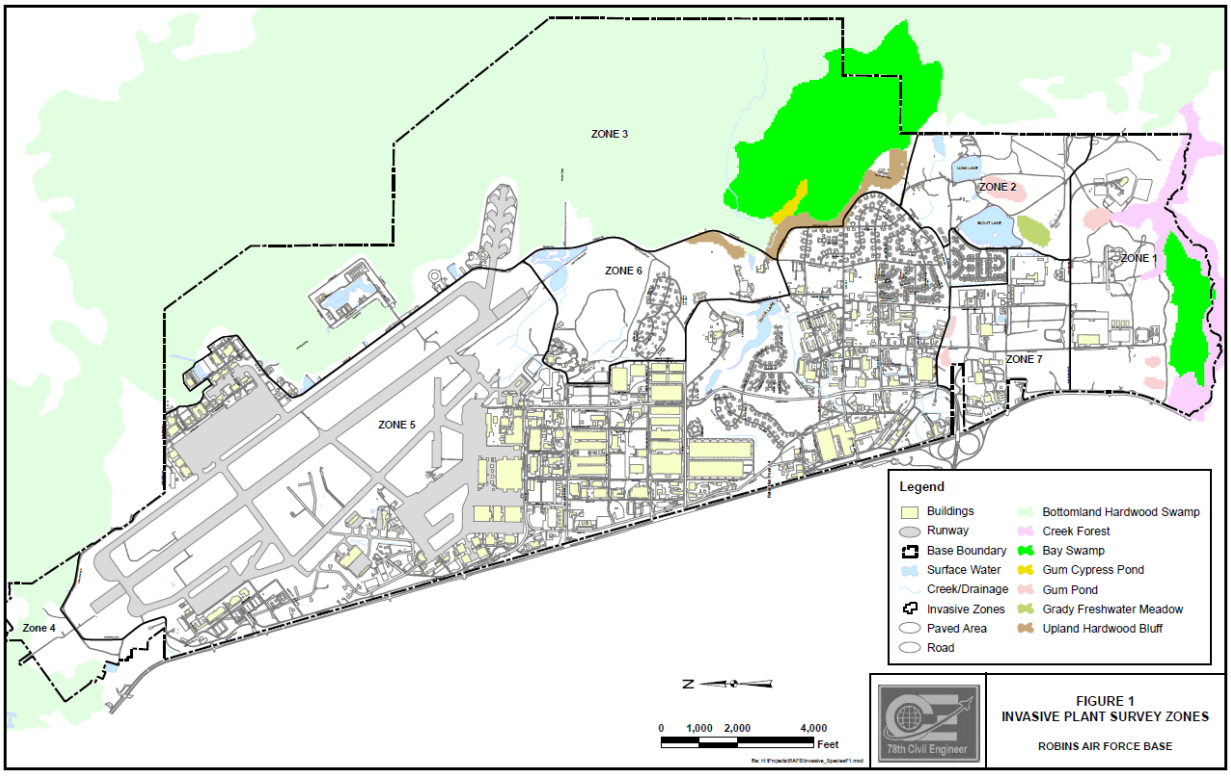
- Endangered Species Act of 1973, as amended (16 U.S.C. 1531-1543)
- USAFI 32-7064, Integrated Natural Resources Management, 21 October 1996
- Air Force Policy Directive (AFPD) 32-70, Environmental Quality, 20 July 1994

Objective

Never allow a management practice to negatively impact a known threatened or endangered species on or near the golf course.

Management approach

- Ensure that the maintenance practices for all identified potential threatened or endangered species habitats are regularly coordinated with installation environmental staff
- Contribute to the recovery of threatened and endangered by continuing to protect, restore, and maintain populations of native threatened and endangered species within the guidelines of ecosystem management



The Pine Oaks Golf Course is in Zone 5 and 6 Invasive Plant Survey map.

INVASIVE SPECIES

According to the installation's *Final Invasive Species Plan*, "invasive plant species are nonnative plants that are likely to cause environmental, human health or economic harm. Not all nonnative plant species are considered invasive. An invasive species is any species, including its seeds, spores, or other biological material capable of propagation, that is not native to a given ecosystem. They often develop large populations that out-compete and displace native species and can reduce habitat quality, diversity and wildlife value. Invasive species also may be referred to as nuisance, alien, non-indigenous, exotic, or undesirable plants".

Several undesirable plants are identified in the plan as occurring on or near the golf course property. These species include Chinese tallow, privet, China berry, privet, wisteria, English ivy, Japanese honeysuckle, multiflora rose, silktree, nandina and winter creeper. Alligator weed is another invasive species found in golf course water features. Several specific areas were identified for treatment activities in the plan to include: Fence behind Pine Oaks Golf Course, 12th Green; Duck Lake shoreline-shallow water; Reservoir shoreline west of Pine Oaks Golf Course, 15th Fairway; Forested area south of golf course maintenance area and tree farm and; Upland Hardwood Bluff between Hannah Road and Pine Oaks Golf Course, Fairway No. 5.

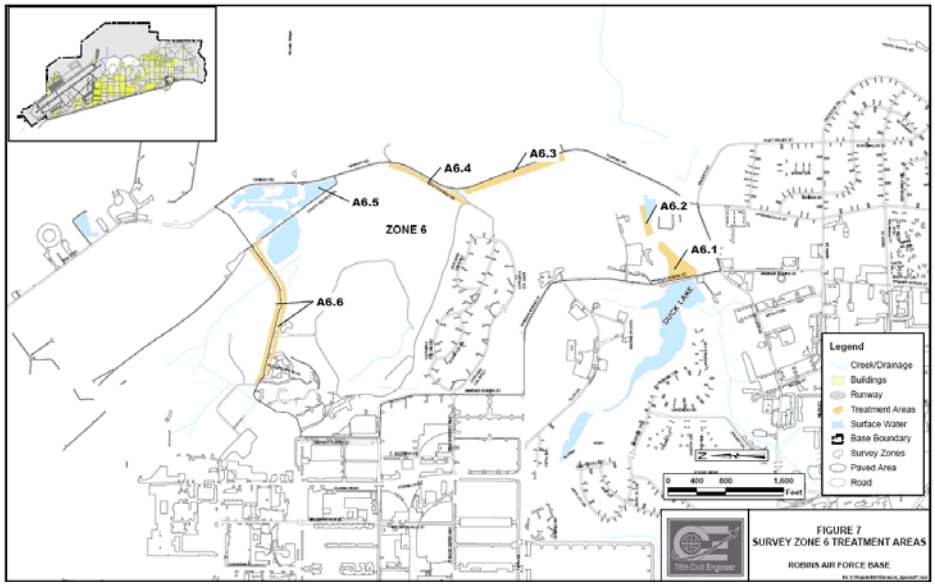
Driver/requirement

- Endangered Species Act of 1973, as amended
- Federal Noxious Weed Act (1974)
- Non-indigenous Aquatic Nuisance Prevention and Control Act (NANPCA) of 1990, as amended

- Lacey Act, as amended
- Federal Plant Pest Act
- Plant Protection Act
- Presidential Memorandum: Environmentally and Economically Beneficial Practices on Federal Landscaped Grounds (1994)
- Memorandum of Understanding for the establishment of a Federal Interagency Committee for the Management of Noxious and Exotic Weeds (FICMNEW) (1994)
- Executive Order (EO) 13112, Invasive Species (1999)
- EO 11990, Protection of Wetlands
- EO 12148, Greening the Government Through Leadership in Environmental Management (2000)
- Plant Protection Act (2000)
- Department of Defense Instruction (DODI) 4715.3, Environmental Conservation Program
- Department of Defense Directive (DODD) 4150.7, Pest Management Program and DODI
- 4150.7, Pest Management Program
- Air Force Instruction (AFI) 32-7064, Integrated Natural Resources Management
- AFI 32-1053, Pest Management Program
- Robins Air Force Base Instruction (RAFBI) 32-7064, Integrated Natural Resources Management

Objective

Prevent introduction and establishment of invasive species to reduce their impact on the environment, economy and health of the United States.



Pine Oaks Golf Course Robins AFB, Georgia

Invasive species occurrence on the Pine Oaks Golf Course.

Management approach

- Implement an installation-coordinated golf course program to minimize or eliminate the introduction of exotic plants and animal species
- Never knowingly install a listed or potentially invasive species
- Regularly inspect likely areas for invasives to establish themselves
- When possible, restore native species and habitat conditions
- Train all appropriate employees on the latest invasive species identification and control measures
- Restore disturbed areas dominated by invasive species to natural vegetation where practical and consistent with mission requirements
- Utilize native or non-invasive indigenous plant materials whenever possible

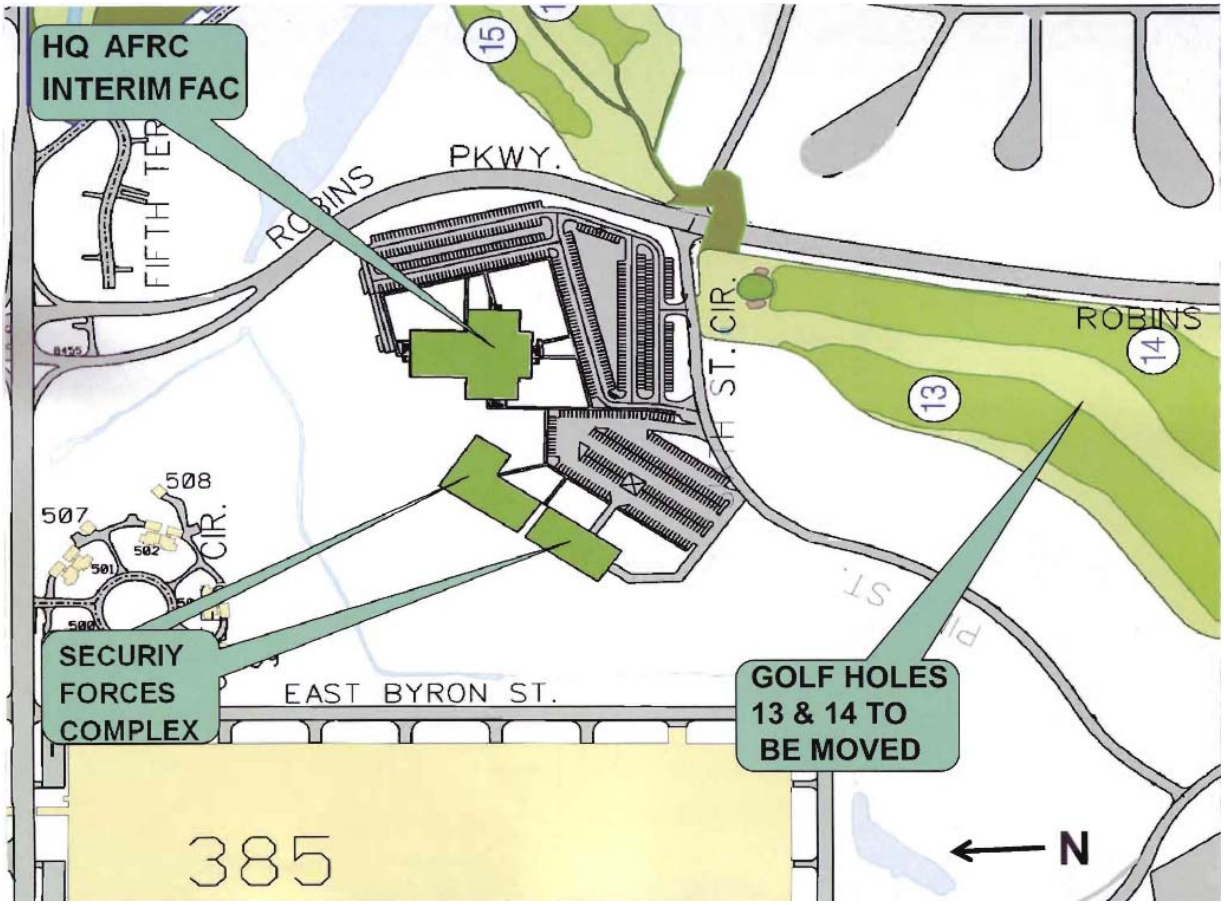
Target

Regularly assist the environmental staff with the compilation of an invasive species survey and completion of an approved plan complete an approved plan using integrative pest management techniques to contain, reduce or eliminate invasive species prior to the end of FY14.

The Chinese tallow is an especially invasive species spreading throughout the southeastern United States.

Pine Oaks
Golf Course
Robins AFB, Georgia

Photo credit:
Wikipedia



This Area Development Plan identifies a potential desired change in the golf course layout.

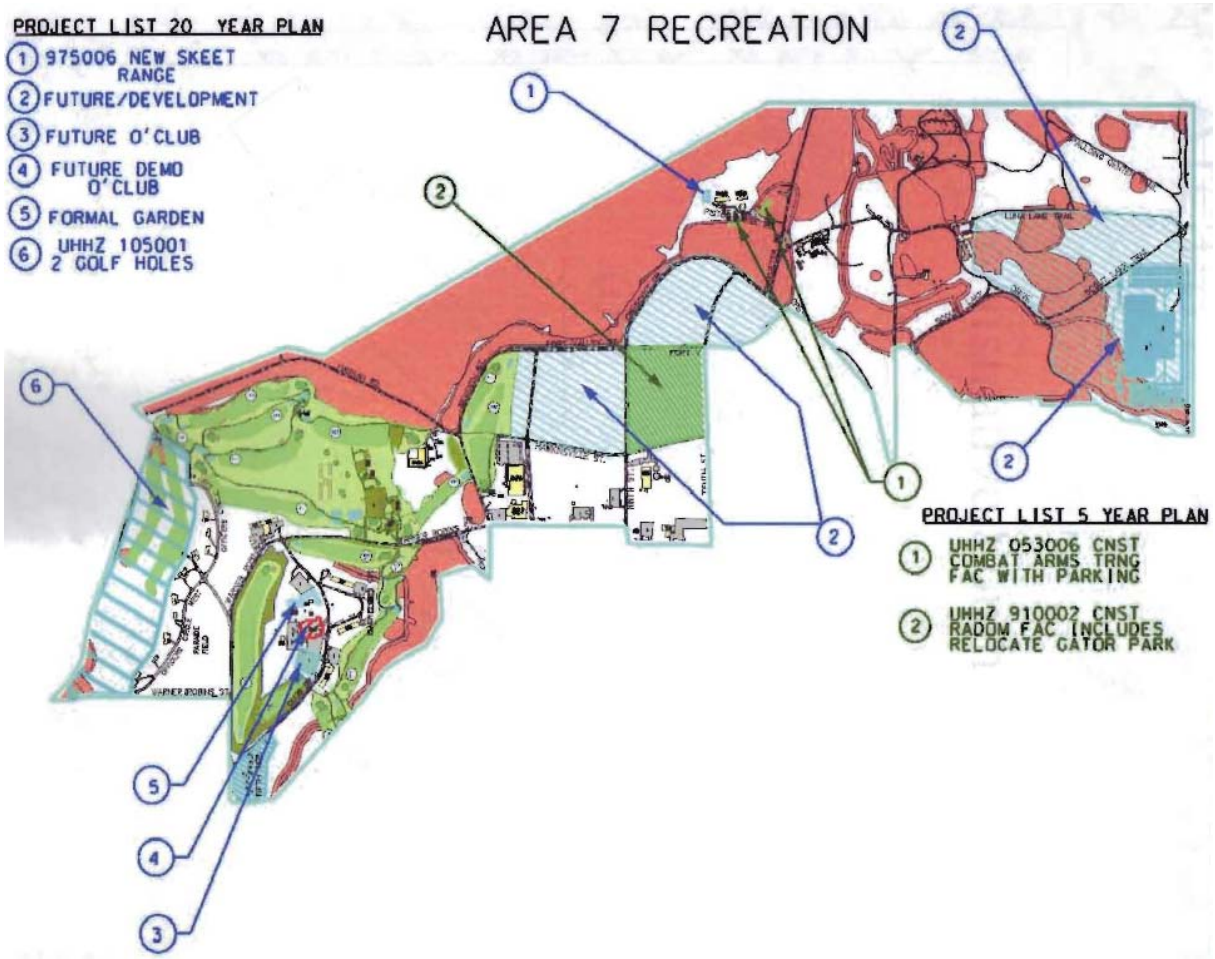
POTENTIAL HOLE RELOCATION

In the installation community planner-furnished 2010 Robins AFB Area Development Plans, there is a potential to relocate Pine Oaks Golf Course holes 13 and 14. The Area 8 – Admin (South) plan lists opportunities that include the new AFRC Campus across Robins Parkway from the existing golf holes; new mission or expansion of Avionic Aircraft Support Area; new PMEL facility; and new 6th Street extension from Page Street to the new AFRC Campus. In addition to the impact to the golf course itself having to move the two holes, constraints and issues of the proposed area development plan include Duck Lake; cultural resources; and Lakeside and Pine Oak housing demolition.

The Area 7 Plan shows a possible solution of where the golf holes will be relocated. Further study is required to ensure that the golf course hole sequencing and playability is appropriate. AFCEE/TDB would embrace a request for assistance on this issue to ensure the resulting final concept plan accommodates planning, mission and golf course requirements.

Driver/requirement

- Mission support
- Customer-oriented improvements
- National Environmental Policy Act
- AFI 32-7060, Environmental Impact Analysis Process



Area Development Plan 7 depicts a possible future golf course layout.

Objective

Ensure that all proposed projects on or near golf course property receive appropriate coordination with all interested parties well in advance of scheduled implementation.

Management approach

- Utilize completed final concept plan for relocation direction in the future project's Request for Proposal
- Ensure that the RFP includes requirement to hire a qualified golf course architect to prepare construction documents
- The selected golf architect shall provide a list of recommended golf course builders for the A-E to procure cost proposals for the construction
- The selected golf architect should be utilized during construction for golf course-specific Title II duties to ensure quality performance by the selected golf course builder
- Golf course manager and superintendent must be integral to entire golf course project process

Pine Oaks
Golf Course
Robins AFB, Georgia

Current location of holes 13 and 14 require golfers to use an undersized tunnel.

Target

Coordinate all aspects of impact mitigation and ensure golf course facility is fully functional as soon as possible.

Pine Oaks
Golf Course
Robins AFB, Georgia

Mature trees casting dense shade hinders growing quality turf on the 13th hole.

Pine Oaks Golf Course Robins AFB, Georgia

Audubon International has complex requirements for certification.

AUDUBON CERTIFIED SANCTUARY PROGRAM

Pine Oaks Golf Course staff is proactively pursuing fully certified status in the Audubon Cooperative Sanctuary Program as created and managed by Audubon International, the former state of New York Audubon chapter. The program is internationally recognized for its contribution to the increased environmental stewardship of golf courses. Unfortunately, U. S. Air Force golf courses should almost never manage to increase, restore, create or enhance wildlife habitats, one of the Audubon program's primary goals. The mission of the golf course is to provide recreational opportunities on quality turf while supporting the overall mission of the U. S. Air Force. Great care should be exercised on the types of improvements and management practices that may be adopted while in pursuit of certification**.**

Driver/requirement

- Installation management desire
- Additional non-mandatory and recurring tasking

Objective

Receive additional international stewardship recognition through a private environmental concern.

Management approach

- Obtain application form and pay recurring annual fee
- Comply with all requests from private environmental concern
- Ensure that program certification efforts are not contrary to installation natural resource management objectives or mission accomplishment
- Enlist AFCEE GEM program manager assistance

Target

Complete all necessary forms and other requirements per private environmental concern deadlines.

Submit requested data and annual payment.

Implementation

No plan is worth the time it took to compile it if it does not generate or include active implementation in the field. The golf course management staff should use the following goals and objectives as a roadmap for their future. The GEM Plan should be kept as current as possible at all times. Ideally, it should be updated annually and completely rewritten on the same cycle as the Integrated Natural Resources Management Plan.

GEM Plan goals & objectives

Goals are defined as actions or results that should be accomplished within the next year.

- Establish an area of the clubhouse, maintenance complex and other highly visible areas to post the environmental policy and the environmental challenges map for customers and employees
- Finalize and implement a golf course-specific Integrated Pest Management Plan
- Ensure all employees are familiar with the GEM Plan and receive documented regular training to increase their awareness of the environmental policy and this Plan's goals and objectives
- Complete erosion control project
- Provide recycling containers throughout the course for use by customers and employees
- Request appropriate personnel to conduct an energy audit for the entire golf facility and integrate findings into an Energy Management Plan to demonstrate reductions
- Finish repairing all degraded habitats due to construction projects

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

- Assist installation natural resource managers with initiatives such as Watchable Wildlife by utilizing native plants with good wildlife value on the golf course
- Complete and implement a Tree Management Plan specific to the golf course property
- Complete and implement a comprehensive Golf Course Water Resource Management Plan to include mapping water quality management zones and a golf course-specific Drought Management Plan
- Examine all maintenance practices to determine their potential to impact the environmental challenges identified in this document
- Repair and maintain wash racks in good working order
- Conduct feasibility study to determine alternative irrigation source and implement project to use non-potable water that integrates an energy efficient variable frequency drive pumping station
- Implement scouting form process to assist with pest management decisions

Pine Oaks
Golf Course
Robins AFB, Georgia

Golf cart wash rack is not working properly and has proved to be hard to maintain.

Conclusion

The U. S. Air Force Golf Course Environmental Management (GEM) program is a proactive Air Force Center for Engineering & the Environment (AFCEE) initiative to foster a better understanding of the environmental challenges facing our golf courses worldwide. The GEM Plan is an example of the quality a cooperative effort can produce and improve the way we take care of the environment, our community and our customers

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. Chapter 11 of AFI 32-7064 requires a GEM Plan as part of the Integrated Natural Resources Management Plan (INRMP).

Sustainable installations are possible with a coordinated and concerted effort by all. Implement the GEM program, as it embraces continual improvement and environmental stewardship while steadfastly supporting the missions of the installation and the U.S. Air Force.

The gallery

On the following pages are some of the more revealing photographs of challenges, maintenance practices, and other areas of the golf course facility.

Clubhouse has numerous opportunities to share info.

Minimally-maintained areas are coming of age.

Bank treatment on 5th tee has failed.

Golfers & employees must cross busy street.

Plastic almost never is worth the trouble to install.

New culvert appears to have minimal capacity for flooding.

The course is a fun test for all skill levels.

Water feature maintenance is a large task.

Recycling is a daily activity.

Tunnel experiences are not always positive.

Blue bird boxes are stationed all over the course.

These crape myrtles' form is ruined forever.

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Air Force Center for Engineering & the Environment
Technical Division
Built Infrastructure Branch

For additional assistance or more information, please contact:
AFCEE GEM Program Manager – 210-395-8391 - DSN 969-8391
AFCEE/TDB, 2261 Hughes Ave, Suite 155, Lackland AFB, TX 78236-9853
afcee.td.awag@brooks.af.mil?subject=golf

Please visit our Golf Course Environmental Management Program website:
http://www.afcee.lackland.af.mil/gem