



***Bay Palms Golf Course  
Environmental Management (GEM) Plan  
MacDill AFB, FL***



**August 2009**



**San Antonio, Texas**



Bay Palms G.C.

***Bay Palms Golf Course  
Environmental Management  
Policy***

**In concert with the  
MacDill 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.**

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..... **Err**

**or! Bookmark not defined.**

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## **Executive Summary**

### **U. S. Air Force GEM Program**

The U. S. Air Force Golf Course Environmental Management (GEM) program is a proactive Air Force Center for 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 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 and; revision. This report document focuses on the first two steps while making preliminary recommendations for the third.

### **Environmental Compatibility Quotient (ECQ) scores**

The following is the summary of the environmental compatibility quotient (ECQ) scores for the site visit conducted in August 2009:

- **Actual ECQ = 72, Showing progress (Yellow)**
- **Potential ECQ = 87, Showing progress (Yellow)**

### **Potential or Final environmental challenges**

The following potential environmental challenges were identified in compiling this Final GEM Plan:

- Water quality
- Coastal zone management/erosion
- Ecosystem management
- Invasive species
- Surface water improvements
- Mangrove protection
- Wetlands
- Floodplains
- Environmental Restoration Program (ERP) sites
- Audubon Certified Sanctuary Program
- Migratory birds
- Air quality
- Threatened or endangered species

## **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/>).



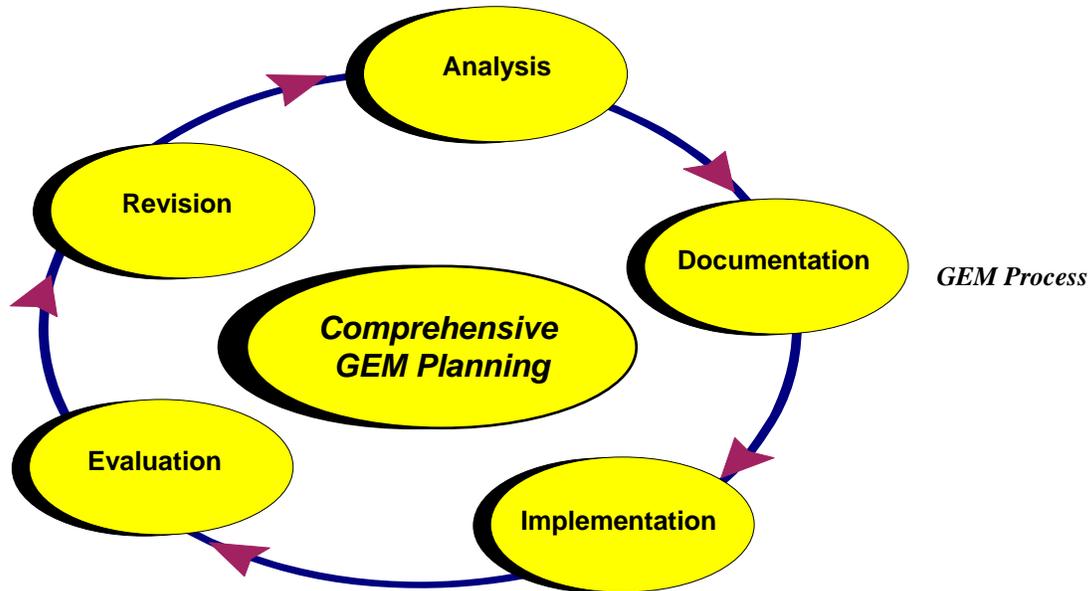
*Bay Palms Golf Course  
MacDill AFB, FL*

*Water features abound at Bay Palms.*

The golf course environmental baseline assessment (GCEBA), or 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 changing 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. In most cases, golf courses are being managed compatibly with the environment. The comprehensive GEM planning process is the vehicle to document our successes while communicating directly with our customers, commanders, and local community.



*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.

## **GCEBA COMPONENTS**

The GCEBA is comprised of the following components:

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

## **Documentation**

It is not enough just to know how to create a successful golf course environmental management program. There must be a written record documenting existing site data, maintenance practices, pesticide applications, and other historical golf course activities. By documenting what we know, we will be able to determine how to make better decisions in the future. The completed GEM Plan will assist in the daily management of the course while providing a convenient vehicle to communicate to 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.



*Bay Palms Golf Course  
MacDill AFB, FL*

*West central Florida offers enormous opportunities for aesthetic improvements.*

## **U.S. AIR FORCE GEM PLAN COMPONENTS**

The GEM Plan will be comprised of the following components:

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

### **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. The installation golf staff should consider adopting the GEM Initiative process and establish an environmental policy that minimizes or eliminates any and all potential negative environmental impacts.

### **Evaluation**

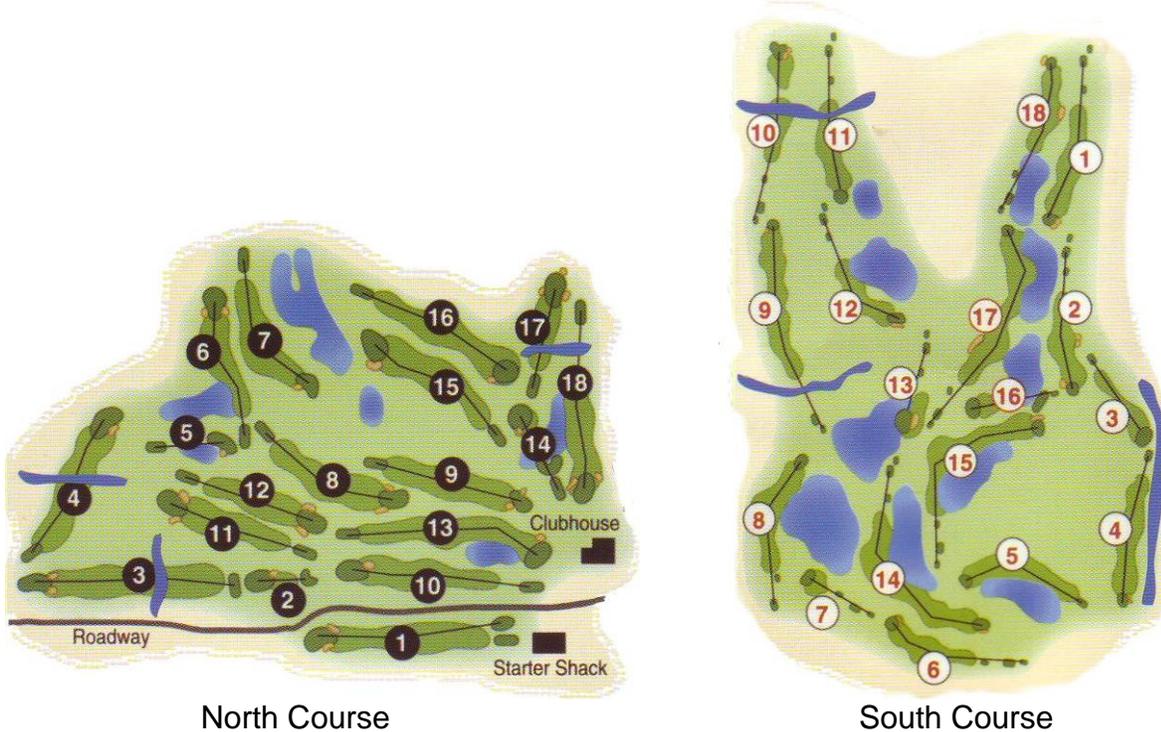
In order to ensure the highest quality of customer service and environmental stewardship, there must be continual self-evaluation and improvement. There also should be consistent, on-going measurement of the reduction or elimination of environmental impacts the newly implemented practices have on the course. For example, documenting the reduced use of inputs such as fertilizers, pesticides, and irrigation can be used to demonstrate the increased environmental stewardship of the golf course management practices as well as the overall value of the GEM initiative. It is important for golf courses to show improvement over time. 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 that all documents be regularly maintained to represent the most current conditions. 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. 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.

## Course Specific Analysis

One of the most pragmatic and enjoyable tasks in the baseline assessment portion 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 sets the stage for the rest of the GEM Plan report.



## Course Description

The 36-hole Bay Palms Golf Course facility is a unique Air Force asset. Located on a peninsula with Hillsborough Bay to the east and Tampa Bay to the west, water is a prominent component of the landscape. The North Course is nearly 60 years young and offers eighteen great golf holes enjoyable to all levels of golfers. Although the course's greens are the old, traditional "push-up" construction variety, the superintendent and his staff consistently provide high quality playing conditions.

The 18-hole South Course is a relative youngster in comparison having been constructed in 1984. Nearly surrounded by wetlands or coast line, the South features a more modern design style with large greens situated amongst large mounds and captive sand bunkers.

Environmental challenges abound at the courses, the installation and the state. Florida is a sensitive environment and the Bay Palms Golf Course is a microcosmic case study in action. The golf staff is dedicated to the mission readiness, stewardship, compliance, quality of life and integration precepts of the integrated natural resource management plan.



**Bay Palms Golf Course Aerial Photo, MacDill AFB, FL**

**General Information**

Climate	Humid gulf coast
Average annual precipitation	50 inches
Average growing season	300 days
Elevation	25 feet ASL
Prevailing wind direction	Southwest
Total facility acreage	500 acres
Total actively maintained acreage	320 acres
Turfgrass	419 Hybrid Bermudagrass
Tees-	419 Hybrid Bermudagrass
Fairways-	Tifdwarf Bermudagrass
Greens	Mix
Roughs-	
Irrigation source	Recycled, non-potable treated effluent

**North Course Details**

Architect	Ron Garl
Year constructed	1950
Par	<b>North Course 36-36-72</b>
Yardage/Rating/Slope	Blue/6446/70.4/120 White/6183/69.2/118 Gold/5589/66.3/110 Red/5401/71.0/117

**South Course Details**

Architect	Civil Engineering
Year constructed	1984
Par	<b>South Course 35-37-72</b>
Yardage/Rating/Slope	Blue/6768/72.2/121 White/6244/69.5/118 Gold/5364/65.7/109 Red/5074/69.6/119

## **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 sources including Audubon International, Center for Resource Management, and Committed to Green. The ECQ checklists 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 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.

### **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)

The following ECQ checklists are a record of the interview conducted with Bay Palms Golf Course manager and superintendent during the visit to MacDill AFB, FL.

<b><u>Planning &amp; Compliance</u></b>				
<b>#</b>	<b>Environmental Compatibility Indicator</b>	<b>Yes</b>	<b>Partial</b>	<b>No</b>
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 Tree Management Plan complete with planting plan and maintenance schedule?		✓	
7	Is there a written and regularly updated Integrated Pest Management Plan for the entire golf course property?	✓		
8	Is there a map of the course's "hot spots" or specific 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 improvements to the facility?		✓	
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	Have all employees been familiarized with the GEM Plan and are they trained regularly on the importance of environmental performance and compliance with its goals and objectives?		✓	
12	Are environmental management issues regularly discussed during staff meetings?	✓		
13	Are the actual amounts of each pesticide or fertilizer on the facility available in writing for every application over the last year?	✓		
14	Has the facility attained full certification in the Audubon Cooperative Sanctuary Program or similar industry-recognized environmental management program?		✓	
15	Are employees trained in their native language on the benefits of minimizing potential negative impacts?	✓		
16	Are comprehensive written records maintained to measure and document the environmental compatibility of the entire facility's management practices?		✓	
17	Are there documented functional and aesthetic thresholds integrated into pest control decisions?		✓	
18	Is there a written comprehensive Water Resources Management Plan that delineates the care of each of the course's water features?			✓
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 the maintenance activities and their performance been examined to determine the potential to negatively impact an identified environmental challenge?		✓	
	<b>Totals</b>	<b>8</b>	<b>8</b>	<b>4</b>

<b><u>Operations &amp; Maintenance</u></b>				
#	Environmental Compatibility Indicator	Yes	Partial	No
1	Is there a written, regularly updated and comprehensive Turfgrass Management Plan for each type of turf and playing area?		✓	
2	Are there designated natural or minimally maintained buffers around sensitive landforms or features and/or core wildlife habitats?	✓		
3	Are green, tee, and fairway mowing heights maintained at levels that do not excessively stress important playing surfaces?	✓		
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 and map?	✓		
7	Is there at least one project planned and funded for the next year that would improve the course's protection of the environment?	✓		
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	Has there been an examination of all aspects of the operation for potential negative impacts for the snack bar/restaurant, clubhouse, pro shop, pesticide mixing and storage facilities, fuel storage and delivery areas, and maintenance complex?	✓		
10	Have all employees received documented training that would increase their awareness of environmental stewardship goals and objectives?		✓	

**Operations & Maintenance Checklist (continued).**

#	Environmental Compatibility Indicator	Yes	Partial	No
11	Are containers used to store used oil for equipment maintenance in good condition, not leaking, and clearly labeled?	✓		
12	Are oil/water separators and/or golf course wash racks operating properly and correctly maintained?	✓		
13	Are all golf course vehicles and equipment maintained and cleaned in a manner that eliminates the potential for spreading of disease or other contamination?	✓		
14	Are biodiesel and/or ethanol products utilized everywhere they may be appropriate?	✓		
15	Are waste products such as oil, grease, tires, and batteries stored in a covered container and disposed of properly off site?	✓		
16	Does the superintendent use hand held GPS units to assist in GIS mapping of the golf course areas?			✓
17	Are energy efficiency ratings factored into equipment purchases for use throughout the facility?	✓		
18	Has the entire facility been studied to quantify solid waste streams to identify functions that produce the greatest quantities?	✓		
19	Are at least 90% plates, cups, and utensils in use by the restaurant/snack bar facility reusable rather than disposable?	✓		
20	Does course management utilize a web-based golf course planning tool for every day decision-making and recordkeeping?			✓
	<b>Totals</b>	<b>16</b>	<b>2</b>	<b>2</b>

<b><u>Water Resource Management</u></b>				
<b>#</b>	<b>Environmental Compatibility Indicator</b>	<b>Yes</b>	<b>Partial</b>	<b>No</b>
1	Are written records of water quality monitoring activities, results, and pollution control measures readily available?	✓		
2	Where appropriate, are slow-release fertilizers and/or spoon-feeding techniques used to reduce the potential for runoff impacts and nutrient loading to water quality?	✓		
3	Does the irrigation system operate using computerized controllers based on real-time evapotranspiration rates?	✓		
4	Are the golf course sprinklers and outdoor irrigation of non-golf course areas and indoor plumbing regularly monitored and maintained for proper distribution and leaks?	✓		
5	Have low-flow water saving devices been installed wherever possible?	✓		
6	Is at least 65% of the irrigation water for the golf course property recycled or non-potable?	✓		
7	Are there projects planned and funded that may eliminate or minimize a potential water quality or erosion problem?			✓
8	Are water features regularly monitored for algae, erosion, excessive aquatic plant growth, eutrophication, and sedimentation?	✓		
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 there flow meters for monitoring total 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 or nutrient, salt or total suspended solid parameters?	✓		
15	Is water quality data regularly collected to establish baseline conditions and maintenance procedures for all water features on the property?			✓
16	Are settling ponds and/or detention ponds used to effectively remove sediments and pollutants from entering important water features?	✓		
17	Are biological processes such as the addition of grass carp or white amur used to control unwanted aquatic vegetation in major water features?			✓
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?	✓		
	<b>Totals</b>	<b>16</b>	<b>0</b>	<b>4</b>

<b><u>Conservation</u></b>				
#	Environmental Compatibility Indicator	Yes	Partial	No
1	Is all motorized equipment maintained for efficient operation that would minimize the potential of creating excessive air polluting emissions?	✓		
2	Has the entire golf course property been examined for critical habitats, state 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 connect natural areas to facilitate wildlife movement through the course property by returning an area to its natural state or revising maintenance procedures?	✓		
6	Have all necessary permits been secured and are they updated and their requirements satisfied in a timely manner?	✓		
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 exotic species on or near the course?	✓		
9	Is there a comprehensive and readily available Drought Management Plan for the entire golf course facility?		✓	
10	Is there at least one project planned and funded that may minimize or eliminate the course's potential negative environmental impacts?	✓		

**Conservation Checklist (continued).**

#	Environmental Compatibility Indicator	Yes	Partial	No
11	Does management harvest storm water to supplement irrigation water supplies for use anywhere on the golf course facility grounds?	✓		
12	Are at least 85% of plants used in landscaped areas drought-tolerant native trees, shrubs, groundcovers, or their cultivars?	✓		
13	Are there signs posted to highlight key habitats or have appropriate areas been designated "Environmentally Sensitive Zones" per The Rules of Golf?	✓		
14	Has a comprehensive energy audit been conducted for the entire golf course facility?	✓		
15	Are all employees trained to understand that poor management practices may adversely impact worker and environmental health and welfare?	✓		
16	Is there an inventory of bird and mammal species documented, maintained, and readily available?	✓		
17	Are food, shelter, and nesting attributes of plant species for landscape development considered during the design/selection process?	✓		
18	Have all damaged or degraded habitats due to construction or maintenance of the course been fully restored?	✓		
19	Has the entire property been examined for archaeological, cultural, or historical resources?	✓		
20	Is the irrigation pump station a variable speed model for energy efficiency?	✓		
<b>Totals</b>		<b>18</b>	<b>2</b>	<b>0</b>

<b><u>Pesticides &amp; Pollution Prevention</u></b>				
#	Environmental Compatibility Indicator	Yes	Partial	No
1	Are there established, documented and communicated minimally maintained and fertilizer and pesticide application buffer areas around water features or sensitive landscapes?		✓	
2	Is the equipment wash rack adequately covered to minimize or 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 at a designated wash rack where pollution prevention measures are employed?	✓		
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 playing area) of each pesticide used; - the area (SF/SM) and quantity of each pesticide used; - the chemical or common name of the 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 recorded and mapped to guide future pest control decisions?		✓	
12	Other than the head 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 IPMIS being used to track activities including surveillance and biological, cultural, mechanical, and chemical controls?			✓
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	Is there a regularly updated Water Pollution Abatement Plan readily available for the golf course property?			✓
19	Are golfers adequately notified in the pro shop and on the first and tenth tees about the day's planned or recently completed spraying of any chemical or fertilizer?	✓		
20	Are there written pest profiles for common regional pests along with alternative potential control measures readily available?	✓		
	<b>Totals</b>	<b>14</b>	<b>3</b>	<b>3</b>



*Invasive species control has been going on since 2004.*

<b><u>Environmental Compatibility Quotient Summary</u></b>			
<b>Environmental Compatibility Category</b>	<b>Yes</b>	<b>Partial</b>	<b>No</b>
<b>Planning &amp; Compliance</b>	<b>8</b>	<b>8</b>	<b>4</b>
<b>Operations &amp; Maintenance</b>	<b>16</b>	<b>2</b>	<b>2</b>
<b>Water Resource Management</b>	<b>16</b>	<b>0</b>	<b>4</b>
<b>Conservation</b>	<b>18</b>	<b>2</b>	<b>0</b>
<b>Pesticides &amp; Pollution Prevention</b>	<b>14</b>	<b>3</b>	<b>3</b>
<b>Totals</b>	<b>72</b>	<b>15</b>	<b>13</b>

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

**August 2009 - Bay Palms Golf Course ECQ:**

- **Actual ECQ = 72, Showing progress (Yellow)**
- **Potential ECQ = 87, Showing progress (Yellow)**

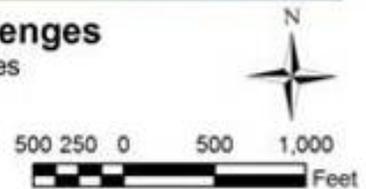
<b><u>Environmental Compatibility Quotient Scoring Scale</u></b>	
<b>Total Yes or Partial Responses</b>	<b>Environmental Compatibility Level</b>
<b>90-100%</b>	<b>Advanced (Green)</b>
<b>70-89%</b>	<b>Showing progress (Yellow)</b>
<b>69% or less</b>	<b>Just started (Red)</b>



-  Floodplain
-  Wetlands/Water Quality
-  ERP Sites

### Environmental Challenges

Bay Palms Golf Courses  
MacDill AFB, FL  
Aug 09



## Environmental Challenges Map

## Environmental Challenges

One of the important results of the GEM process is the identification of significant environmental challenges for consideration in the GEM Plan. Along with the newly established baseline, the GEM Plan consists of a map and description of the final environmental challenges and the prescribed approach to their management. In addition, the GEM Plan includes a comprehensive list of future environmental management goals and objectives and a course-specific set of best practices.

The following environmental challenges were identified during the GEM process:

- Water quality
- Coastal zone management/erosion
- Ecosystem management
- Invasive species
- Surface water improvements
- Mangrove protection
- Wetlands
- Floodplains
- Environmental Restoration Program (ERP) sites
- Audubon Certified Sanctuary Program
- Migratory birds
- Air quality
- Threatened or endangered species



*Bay Palms  
Golf Course  
MacDill AFB, FL*

*Water-related environmental challenges dominate at Bay Palms.*

## **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 devising management practices.

### **DRIVER/REQUIREMENT**

Challenges are defined as “things that are bigger than the course”. Some of the reasons behind why a particular issue becomes a challenge are important to recognize and understand. 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 inside front cover), 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.



*Bay Palms  
Golf Course  
MacDill AFB, FL*

*Nicely executed interpretive signs add a touch of class to the golfing experience.*



*Bay Palms  
Golf Course  
MacDill AFB, FL*

*Water quality issues are common in golf course water features such as this, the installation overall and the State of Florida.*

## **WATER QUALITY**

There are several aspects associated with the water quality environmental challenge. The courses are full of water features. There are about 20 acres of small, unnamed impoundments, about 14 in total, on the north and south golf course. The surficial aquifer is highly susceptible to groundwater contamination, primarily due to shallow water table depth and permeable sediments. MacDill AFB operations have affected this aquifer. Underground storage tanks, landfills, and the golf courses are sources of known contamination.

According to the INRMP, the management of MacDill's golf courses is a natural resources-related program that creates non-point pollution problems for the MacDill AFB watershed. Most other sources of contamination are within the responsibility of other environmental programs. MacDill has several plans that outline how the installation strives to protect its watershed, and therefore its water quality. Although the plans are separate documents, they all emphasize the elimination of pollution streams into surface water or groundwater systems. These management plans seek to reduce or eliminate contaminants to the environment which will degrade or damage natural ecosystems and impact wildlife. Consequently, these management plans are inextricably linked to the INRMP by striving for the same goals, to reduce pollution which, in turn, damages base ecosystems. One of the measures that will increase the success of our efforts will be to decrease the potential for negative impacts of golf course and grounds maintenance activities on water quality.

One of the primary functions of the golf course at MacDill is the disposal of waste water treatment plant (WWTP) effluent. WWTP effluent, or recycled water, is pumped to a holding pond with a four million gallon capacity. An irrigation pump station, located at the northwest end of the holding pond, pumps the treated water

from the pond to the north and south golf courses. Golf course irrigation is the primary method of effluent disposal for the MacDill WWTP. The MacDill wastewater treatment plant is classified as a 100% reuse treatment facility. The suspended solids in the irrigated water is less than five parts per million which meets Florida's wastewater discharge standards.

One of the issues is the overall quality of the water as it affects highly-stressed, highly-managed turfgrass areas like golf greens. According to course management, the greens are constantly fighting algae in the irrigation water. When applied to the greens, the decreased water quality tends to seal the greens in a "cellulose-like" film. Turfgrasses maintained at greens height are highly susceptible to stress that leads to disease and thinning, discolored turf or worse. Irrigation water quality test reports are not getting to the golf staff for their use in managing this problem as well.

#### **Driver/requirement**

- Clean Water Act, Section 401
- National Pollutant Discharge Elimination System
- Safe Drinking Water Act
- Federal Water Pollution Control Act of 1977 (Clean Water Act), as amended (33 U.S.C. 1251-1376)

#### **Objective**

Minimize or eliminate the potential negative impacts of golf course maintenance activities on water quality and vice versa.

#### **Management approach**

- Floor drains are directed to sanitary drains with oil water separator
- Operational protocol understood by employees
- Drums stored on pallets
- Dumpsters covered
- All material and waste stored inside buildings or cabinets
- Covered wash rack with grass cuttings trap
- Tanks are double walled
- Repair activities are performed under a covered area
- Covered & bermed pesticide/herbicide storage and mixing area
- Flammables stored in secure cabinets
- Site personnel perform visual inspections of the area
- Security fencing installed
- Operational protocol understood by employees
- Spill response equipment is available
- Drip pans under dispensing units
- 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

- Secure all water quality monitoring reports for use in management

### **Target**

Eliminate the potential for degradation of the water resources at the course by establishing, documenting and communicating all pesticide and fertilizer application buffers to appropriate personnel prior to the end of FY11.

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 2010.



*Bay Palms  
Golf Course  
MacDill AFB, FL*

*Cattails are a sign of shallow depths and decreased water quality.*



*Bay Palms  
Golf Course  
MacDill AFB, FL*

*Erosion along the South Course is slowly eating away the golf course property.*

### **COASTAL ZONE MANAGEMENT/EROSION**

There is extensive shoreline erosion occurring due to a lack of vegetation, particularly in the southeastern portion of the base which is largely undeveloped. Shoreline areas not normally driven on in the south end of the base near the golf course were planted in mangrove in the spring of 1995 and 1996. These areas were later restored as part of the SWIM program to remove invasive species that had taken hold and to restore hydrology. Plantings along the southern shoreline have been successful, and shoreline erosion is reducing in these areas.

The installation environmental staff currently has a program to stabilize the shoreline in this area. They are installing oyster domes to create an oyster reef which will help reduce wave energy, trap sediment, and eventually permit the establishment of marsh grass and mangroves. The oyster reef will be completed in March 2010. Marsh grass planting will be conducted within 6 months of completion. Including the golf staff would be another positive step forward.

### **Driver/requirement**

- Section 307 of the Coastal Zone Management Act of 1972, as amended
- Coastal Zone Management Act, as amended (16 U.S.C. 1451 *et. seq.*)
- Estuary Protection Act (16 U.S.C. 1221-1226)
- AFI 32-7064, Integrated Natural Resource Management
- 15 Code of Federal Regulations (CFR) 923.3

### **Objective**

Ensure that all aspects of the golf course maintenance operation that may potentially impact the management of coastal zones are in accordance with the installation consistency determination or natural resource manager approval.

**Management approach**

- Continue to work closely with installation environmental staff on all coastal zone or erosion management practices

**Target**

Regularly consult with installation environmental staff to ensure appropriate actions are being taken by all parties.



*Bay Palms  
Golf Course  
MacDill AFB, FL*

*Coastal regeneration and protection project showing signs of success.*



*Bay Palms  
Golf Course  
MacDill AFB, FL*

*Ecosystem management techniques require an informed, big picture perspective.*

## **ECOSYSTEM MANAGEMENT**

As stated early in the INRMP, “The comprehensive goal of ecosystem management for Air Force installations is to maintain and improve the sustainability and biological diversity of native ecosystems while supporting the military mission.” Although not a legal requirement, “ecosystem management is a management philosophy that will help achieve biodiversity protection and maintain fully functional natural resources.”

Ecosystem management embraces an ecological approach, partnerships since ecosystems cross political boundaries, public participation, securing the best information available for managing natural resources and an adaptive management approach that utilizes incrementally applied techniques as they become known.

The major concern for the golf staff is the first item in the previous list – an ecological approach. Rather than managing for a single species, a holistic or ecosystem-wide approach is employed. This can result in large areas being claimed as “habitat” or wildlife management areas. Not an overly significant concern yet an issue to stay keenly aware of potentially-intrusive developments.

### **Driver/requirement**

- Department of Defense (1994)

### **Objective**

Maintain compliance with appropriate regulations at all times.

### **Management approach**

- Ensure the GEM Plan is current and regularly updated
- Coordinate regularly with installation engineering and environmental staff on daily maintenance procedures

**Target**

Continue to maintain constant compliance with all environmental regulations and their requirements.



*Bay Palms  
Golf Course  
MacDill AFB, FL*

*An example of the difficulties of ecosystem management. The small, grassy peninsula has been removed from regular maintenance may allow invasive species like Brazilian pepper to gain another foothold in the landscape. Good practice or not?*



*Bay Palms  
Golf Course  
MacDill AFB, FL*

*Brazilian pepper has taken over many areas of Florida and is the number one invasive plant species.*

### **INVASIVE SPECIES**

Brazilian pepper is a particularly aggressive invader of native habitat areas. Dozens of acres are lost annually due to encroachment by the pepper. This project will focus resources on eliminating Brazilian pepper from the golf course which is the last remaining area that has not been treated for maintenance control of the species. Eradication will involve physically cutting down and removing the trees and spraying the cut stumps with herbicide.

Other species known to be an undesirable invasive include Chinese tallow, lead tree, cogon grass, grapevine, melaleuca, mimosa and Australian pine.

### **Driver/requirement**

- Federal Noxious Weed Act of 1974
- Executive Order 13112, Invasive Species, February 3, 1999
- National Invasive Species Act (1996)
- Plant Protection Act (2000)
- Federal Noxious Weed Act of 1976 (7 U.S.C. 2801)

### **Objective**

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

**Management approach**

- Regularly inspect likely areas for invasives to establish themselves
- Work with installation environmental staff to contain or reduce invasives
- When possible, restore native species and habitat conditions
- Train all pertinent 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 indigenous plant materials whenever possible

**Target**

Regularly assist with invasive species survey and completion of an approved plan to contain or reduce these species according to the accompanying schedule.



*Bay Palms  
Golf Course  
MacDill AFB, FL*

*Racoons have been known to extract food and personal items like glasses and wallets from unsuspecting golfers' carts on the South Course. By the way, who is invading whom?*



*Bay Palms  
Golf Course  
MacDill AFB, FL*

*There are many areas on Bay Palms for potential SWIM projects.*

### **SURFACE WATER IMPROVEMENTS**

Surface Water Improvement Management (SWIM) is jointly conducted by MacDill AFB and the Southwest Florida Water Management District (SWFWMD). Phase I of a SWIM project included the restoration of 14 acres of wetlands near the wastewater treatment plant. Phase I was completed in 1997. Phase II of the SWIM project began in 1999. The Phase II project restored approximately 36 acres of coastal wetlands in areas along the southeastern shoreline. The Phase II project removed Brazilian pepper and other invasive species, restored natural hydrology in existing tidal creeks and basins, and replanted the disturbed portions of the site with native species. The Phase II project was highly successful and MacDill AFB has maintained both the Phase I and Phase II SWIM restoration areas as invasive species free. MacDill AFB will work with SWFWMD to identify another location and plan and implement a third SWIM project during 2005-09.

The Phase III SWIM project is currently under design. Modeling, design, and permitting are expected to be complete in FY2011 at which point construction will occur. Construction is expected to take 6 months. The Phase III project site is in the southeastern portion of the golf course and to the west around Lewis Lake. The installation has secured \$470K in grant money to support the Phase III SWIM project.

#### **Driver/requirement**

- Southwest Florida Water Management District (SWFWMD) Surface Water Management and Improvement Act of 1987
- Section 371.451 Florida Statutes

#### **Objective**

Assist all SWIM efforts.

**Management approach**

- Facilitate all SWIM efforts without damage to golf course facilities or hindering customers

**Target**

Regularly communicate with installation environmental staff to ensure SWIM project success.



*Bay Palms  
Golf Course  
MacDill AFB, FL*

*View from the bridge on one of the South Course holes during high tide after a good thunderstorm. Surface water concerns come and go.*



*Bay Palms  
Golf Course  
MacDill AFB, FL*

*Edge of a South Course fairway is visible on the far right of the photo. Tampa Bay is a major player for the Bay Palms staff.*

### **MANGROVE PROTECTION**

In 2005-09 special efforts will be undertaken to inform both base decision-makers and the general public of the value (and legal protection) afforded by mangroves. This effort will include personal communication with persons involved with grounds maintenance and commanders at MacDill AFB. It will also include the installation of educational signage along the coastline leg of the MacDill interpretative nature trail (when constructed) or the golf course.

Mangroves growing along drainage ditches within urban areas are viewed as detriments to security (blocking fields of vision) and proper drainage (clogging ditches) by some. In late 2002, MacDill AFB outlined their plans to implement a drainage ditch maintenance program which would include the removal of mangrove and other vegetation. In early 2003, the base has received permission from the FDEP, in the form of an exemption from permitting, to remove vegetation (including mangroves) from any manmade drainage features in accordance with a ditch maintenance exemption described in Florida Administrative Code 40D-4.015(12)(j).

The USCOE followed suit and issued the base a permit for ditch maintenance in late 2003. The USCOE permit presented specific requirements for revegetation of the any tidally influenced ditches with mixture of paspalam (salt tolerant) and Bahia sod once the tree and shrub vegetation was removed.

#### **Driver/requirement**

- Florida Administrative Code 40D-4.015(12)(j)

**Objective**

Protect all mangrove habitats located on or near the golf course.

**Management approach**

- Continue to consult with installation environmental staffers to ensure compatibility of golf course and mangrove management practices

**Target**

Regularly request site visits from installation environmental staffers to ensure compatibility of golf course and mangrove management practice.



*Bay Palms  
Golf Course  
MacDill AFB, FL*

*Nice interpretive signs dot the edge of the South Course.*



*Bay Palms  
Golf Course  
MacDill AFB, FL*

*Areas like this one on the South Course can be maintenance, playability and regulatory headaches.*

## **WETLANDS**

MacDill AFB has high quality wetlands. Past studies estimated there may be up to 900 acres of wetlands on the installation. Issues involved with them are not politically volatile or threatening to the military mission. The most critical wetland issue is the invasion of wetlands by Brazilian pepper, an aggressive exotic plant species that grows so rapidly that they out compete native vegetation. In this way Brazilian pepper threatens the ecological integrity of many wetlands on MacDill AFB.

The golf course is replete with wetlands. Unfortunately, many of the ponds are physically connected to wetlands and drainage ways into the bays. All maintenance activities will need to be conducted with intimate knowledge of these connections to prevent potential negative effects.

### **Driver/requirement**

- Clean Water Act, Section 404
- National Pollutant Discharge Elimination System (NPDES)
- Executive Order 11990, Protection of Wetlands

### **Objective**

Ensure that all water bodies continue to be free of pollutants potentially attributable to a golf course management practice.

### **Management approach**

- Establish, document and communicate fertilizer and pesticide application buffers to all appropriate employees or service providers
- Consult with environmental staff prior to any changes in creek bed or pond bank maintenance

- Comply with all requirements included in the approved installation SWPPP
- Ensure all spill prevention procedures and spill kits are in place and all pertinent employees are adequately trained to correctly and promptly perform required actions in an emergency situation
- 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

### **Target**

Eliminate the potential for degradation of the water resources at the golf course by establishing, documenting and communicating all pesticide and fertilizer application buffers to appropriate personnel prior to the end of 2010.

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

Ensure that all water bodies continue to be free of pollutants potentially attributable to a golf course management practice.

Correct all potentially non-compliant wetlands related aspects prior to the end of CY 2011.



*Bay Palms  
Golf Course  
MacDill AFB, FL*

*Cattails are considered an invasive species in fresh water wetlands and ponds.*



*Bay Palms  
Golf Course  
MacDill AFB, FL*

*High groundwater levels, regular precipitation and poor drainage plus being in the 100-year floodplain is a heavy burden for managers.*

## **FLOODPLAINS**

According to the INRMP, approximately 80% of the installation is in the 100-year floodplain. Floodplain maps of the golf course indicate that the entire facility is within the 100-year boundary. Tropical storms, especially major hurricane events, put the course in jeopardy. Salt water inundation is harmful or worse to turf and other vegetation. Winds uproot trees and spread debris throughout the area.

Another major consideration in light of new projects to upgrade or improve the golf course facility is the requirement to prepare a FONPA for every proposal. A Finding of No Practical Alternative must be prepared for each project and is not a significant barrier but it does add cost, and potentially, time to the effort.

### **Driver/requirement**

- Clean Water Act, Section 401
- Clean Water Act
- National Pollutant Discharge Elimination System
- Executive Order 11988, Flood plain Management, May 24, 1977

### **Objective**

Maintain compliance with all floodplain-related laws and regulations through regular consultation with the installation environmental staff.

### **Management approach**

- Consult with environmental staff prior to any changes in coastline or pond bank maintenance
- Comply with all requirements included in the approved installation SWPPP
- Ensure all spill prevention procedures and spill kits are in place and all

pertinent employees are adequately trained to correctly and promptly perform required actions in an emergency situation

- Prepare a Finding of No Practical Alternative (FONPA) for each proposed project

**Target**

Eliminate the potential for degradation of the water resources at the golf course by establishing, documenting and communicating all pesticide and fertilizer application buffers to appropriate personnel prior to the end of the year.



*Bay Palms  
Golf Course  
MacDill AFB, FL*

*At times it is hard to tell if the water in these drainage structures is coming or going.*



*Bay Palms  
Golf Course  
MacDill AFB, FL*

*Water quality monitoring locations are a sure sign of ERP sites.*

### **ENVIRONMENTAL RESTORATION PROGRAM SITES**

SWMU2 – Landfill at Golf Course: Groundwater and soil contaminated with metals above residential FDEP groundwater cleanup target levels (GCTLs) and soil cleanup target levels (SCTLs), but below industrial GCTLs and SCTLs.

Non-residential use of both soils and groundwater. Land use controls will prohibit the use of groundwater as a potable water source, and contact with contaminated surface soils by future residents. This area is currently used for industrial purposes.

#### **Driver/requirement**

- AFI 32-7020, The Environmental Restoration Program
- Resource Conservation Recovery Act (RCRA)
- Comprehensive Environmental Response, Compensation, and Liability Act, (CERCLA)
- Superfund Amendments and Reauthorization Act (SARA)

#### **Objective**

Ensure daily compliance with restoration program site requirements.

#### **Management approach**

- Abide with all specified land use controls (LUCs)
- Work closely with installation restoration program manager to ensure compliance

#### **Target**

Immediately integrate specified land use controls into regular maintenance practices.



*Bay Palms  
Golf Course  
MacDill AFB, FL*

*The Audubon program encourages birds and their habitat.*

### **AUDUBON CERTIFIED SANCTUARY PROGRAM**

The Audubon Certified Sanctuary Program is based in New York State and is a pioneer in the golf and environment field. Heavily supported by the United States Golf Association, the program is recognized around the world as a champion of wildlife, especially birds, and their habitats. The program requires annual membership fees and regular provision of data and case study information usually provided by the golf staff as the program is not a compliance issue for installation civil engineering or environmental.

#### **Driver/requirement**

- Commander or management desire/direction

#### **Objective**

Obtain international recognition through a private environmental concern.

#### **Management approach**

- Secure 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 requirements

#### **Target**

Comply with deadlines from private environmental concern.



*Bay Palms  
Golf Course  
MacDill AFB, FL*

*Coots are protected migratory birds.*

## **MIGRATORY BIRDS**

The INRMP lists 24 species of birds that are listed as threatened, endangered, or a species of special concern under Federal or state regulations. As a matter of fact, it is significantly easier to list those not covered by the Migratory Bird Treaty Act. They are the rock dove, European starling and the English sparrow. All other birds are covered! The key to management is to be aware of this fact and act accordingly.

### **Driver/requirement**

- Migratory Bird Treaty Act
- Bald Eagle Act of 1940 (16 U.S.C. 668-668d)
- Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds, January 10, 2001
- Migratory Bird Treaty Act, as amended (16 U.S.C. 703 *et. seq.*)
- Migratory Bird Conservation Act

### **Objective**

Ensure that golf course management practices consider the protection of all migratory birds and their habitats.

### **Management approach**

- Work closely with installation environmental staff to document presence of migratory birds and follow all provided maintenance guidelines

### **Target**

Immediately begin migratory bird management consultation with the installation environmental staff.



*Bay Palms  
Golf Course  
MacDill AFB, FL*

*A great blue heron securing another meal at Bay Palms Golf Course restaurant.*



*Bay Palms  
Golf Course  
MacDill AFB, FL*

*A roseate spoonbill shows off balancing skills while trying to cool off during the mid-day heat.*



*Bay Palms  
Golf Course  
MacDill AFB, FL*

*New fuel tank is in tune with design, containment and emission requirements.*

## **AIR QUALITY**

The CAA of 1970 directed the United States Environmental Protection Agency (USEPA) to develop, implement, and enforce strong environmental regulations that would ensure cleaner air for all Americans. In order to protect public health and welfare, the USEPA developed concentration-based standards called National Ambient Air Quality Standards (NAAQS). The USEPA established both primary and secondary NAAQS under the provisions of the CAA. Primary standards define levels of air quality necessary to protect public health with an adequate margin of safety. Secondary standards define air quality levels necessary to protect public welfare (i.e., soils, vegetation, property, and wildlife) from any known or anticipated adverse effects.

NAAQS currently are established for six air pollutants (known as criteria air pollutants) including carbon monoxide (CO), nitrogen oxides (NO<sub>x</sub>), ozone (O<sub>3</sub>), sulfur oxides (SO<sub>x</sub>), measured as sulfur dioxide [SO<sub>2</sub>], lead (Pb), and particulate matter. Particulate matter standards incorporate two particulate classes: (1) particulate matter with an aerodynamic diameter less than or equal to 10 micrometers [PM<sub>10</sub>] and (2) particulate matter with an aerodynamic diameter less than or equal to 2.5 micrometers [PM<sub>2.5</sub>].

MacDill AFB is located in Hillsborough County within the West Central Florida Intrastate Air Quality Control Region (AQCR), as defined in 40 CFR 81.96. The Environmental Protection Commission (EPC) of Hillsborough County has received full air permitted delegation from the State. This allows the EPC, exclusively, to conduct permitting determinations, process applications, and issue air pollution permits for most facilities. According to 40 CFR 81.310, Hillsborough County is in attainment or unclassifiable for all criteria pollutants.

NOx and CO are the primary pollutants that are emitted at MacDill AFB, and the majority of these emissions are from boilers that primarily burn natural gas and generators that burn diesel fuel. MacDill AFB is currently considered a Major Source for NOx and in October 1999 the EPC of Hillsborough County issued a Title V permit to MacDill AFB which established specific conditions for the operation of boilers, fuel transfer and storage, and paint booths. The golf course club house has a hot water boiler and the maintenance area has gasoline and diesel storage tank, which are included as insignificant emissions units in the Title V permit. Any changes and/or additions will create environmental challenges and permitting requirements.

**Driver/requirement**

- Clean Air Act

**Objective**

Minimize or eliminate excessive emissions from golf course equipment, vehicles and equipment care.

**Management approach**

- Replace older equipment when funding allows
- Encourage employees to minimize their trips on and around the course
- Ensure equipment cleaning solution containers are closed at all times
- Eliminate all aerosols from maintenance and clubhouse inventories
- Replace 2-cycle powered equipment as funding and technology allow

**Target**

Perform scheduled annual engine overhauls and regular equipment maintenance as necessary to minimize or eliminate excessive exhaust emissions.



*Bay Palms  
Golf Course  
MacDill AFB, FL*

*The gopher tortoise is a state-protected species.*

### **THREATENED OR ENDANGERED SPECIES**

Federal-listed threatened or endangered animal species that are found on or potentially occur in the vicinity of MacDill AFB listed in the INRMP include many species. The endangered list includes the West Indian manatee, wood stork, Bachman's warbler, Atlantic green turtle, red cockaded woodpecker, American alligator, Bald eagle, Audubon's crested caracara, Florida scrub jay, Roseate tern, Piping plover, Arctic peregrine falcon, Eastern indigo snake and the Atlantic loggerhead turtle.

There is only one threatened or endangered plant species confirmed in the area. The INRMP states that "MacDill does however have sea oats and sea grapes on its shoreline. These plants are protected at MacDill AFB, not as threatened or endangered species, but under Florida Statutes Chapter 161.242. The purpose of this regulation is to protect the beaches and shores of the state from erosion by preserving natural vegetative cover to bind the sand. This regulation states: "It is unlawful for any purpose to cut, harvest, remove, or eradicate any of the grass commonly known as sea oats or *Uniola paniculata* and *Coccolobis uvifera* commonly referred to as sea grapes from any public land or from any private land without consent of the owner of such land or person having lawful possession thereof."

### **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
- Florida Statutes Chapter 161.242

**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 staffers

**Target**

Regularly request a site assessment and review of current management practices from the appropriate installation environmental manager.



*Bay Palms  
Golf Course  
MacDill AFB, FL*

*Bald eagles nest on MacDill AFB.*

## Implementation

Setting goals and objectives is an important step in the implementation of an installation's GEM Plan. Implementation is the single best evidence that the installation GEM team is working well together in their task of supporting the mission.

### **GEM Plan goals & objectives**

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

- Post a map of the environmental challenges for employees and customers
- Conduct a comprehensive annual evaluation of the management approach for each of the identified environmental challenges
- Map the course's areas that require special care or attention
- Ensure that all employees are familiar with the GEM Plan and regularly receive documented training on environmental stewardship, performance, compliance and goals and objectives
- Complete the compilation of a comprehensive Turfgrass Management Plan
- Ensure chemical storage area is fully compliant
- Use web-based IPMIS to track pest management activities

**Objectives** are defined as actions or results that are desired to be accomplished prior to the next INRMP update in 2014.

- Compile a comprehensive master plan for the entire golf facility that details potential short- and long-term improvements
- Attain full certification for the Audubon Certified Sanctuary Program
- Compile a written comprehensive Golf Course Water Resource Management Plan including a Drought Management Plan for the entire golf facility
- Utilize handheld GPS units to assist in mapping the golf course
- Acquire and implement a web-based golf course planning tool for everyday decisions and recordkeeping
- Establish, document and communicate minimally-maintained fertilizer and pesticide application buffers around water features and sensitive landscapes



*Bay Palms  
Golf Course  
MacDill AFB, FL*

*One of the many quality playing surfaces found throughout the Bay Palms Golf Course.*

## **Conclusion**

Bay Palms Golf Course provides some of the finest outdoor recreation opportunities available in the Air Force inventory. The 36-hole facility has turned the corner on budget concerns and is providing an excellent golfing experience. Considering the number of environmental challenges and number of customers handled daily this is amazing. Bay Palms may have the highest quantity of environmental challenges of any U.S. Air Force golf course. The water-related challenges alone could keep an environmental manager busy. Accordingly, continuing to build quality relationships with the installation's environmental and civil engineering staff should be a priority.

## **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.



*Nutsedge heaven along the 1<sup>st</sup> of the South Course.*



*Treatment plant overflow causes drainage problems.*



*These palms were standing not long before this photo.*



*Landscape additions can be a maintenance headache.*



*Improvements to maintenance complex help compliance.*



*The great blue heron is a magnificent animal.*



*Several Australian natives exist on the North Course.*



*Dozens of waterfowl species call the course home.*



*Vegetation can cause many pond management problems.*



*Brazilian pepper has a foothold at Bay Palms.*



*Sensitive design preserves important habitat.*



*Shelters need work – and ADA-accessible design tweaks.*

## **Bibliography**

**Audubon International**, Environmental Performance Audit, *Integrated Environmental Management*, Golf Course Superintendents Association of America, New Orleans, LA, February 2000.

**The Center for Resource Management**, *Golf & the Environment: Charting a sustainable future*. Environmental Principles for Golf Courses in the United States, Salt Lake City, UT, 1996.

**Bushman, William H.**, *A Process to Quantify the Environmental Compatibility of Golf Course Management Practices*, University of Texas at San Antonio, Thesis, The University Of Texas At San Antonio, College of Sciences, Department of Earth and Environmental Sciences, May 2003.

**Bushman, William H.**, *Comprehensive Golf Course Environmental Management Planning*, Golf Course Superintendents Association of America, Atlanta, GA, February 2006.

**HQ AFSVA**, *Staff Assistance Visit Golf Course Maintenance Report*, Jan 07.

**HQ AFSVA**, *Staff Assistance Visit Golf Course Maintenance Report*, Jan 08.

**6 CES/CEVN**, *Environmental Assessment for Replace Golf Course Maintenance Facility*, MacDill AFB, Florida, Apr 01.

**6<sup>th</sup> Civil Engineer Squadron Environmental Flight**, *Storm Water Pollution Prevention Plan*, MacDill AFB, Florida, Jul 08.

**6 CES/CEVR**, *Site Summaries for Site 48, SWMU78 and SWMU25*, Aug 07.

**ESOH CAMP Assessors**, *Pre-decision Copy, ESOHCAMP Corrective Action Plan*, MacDill AFB (MAC-EX0905), Jun 09.

**Florida Department of Environmental Protection**, *Florida Friendly Best Management Practices for Protection of Water Resources by the Green Industries*, 2008.

**Florida Department of Environmental Protection**, *Best Management Practices for the Enhancement of Environmental Quality on Florida Golf Courses*, Jan 07.



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