



***Manatee Cove Golf Course  
Environmental Management (GEM) Plan  
Patrick AFB, Florida***



**January 2010**



**San Antonio, Texas**





## ***Manatee Cove Golf Course Environmental Management Policy***

**In concert with the  
Patrick 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, protect existing  
natural resources and improve natural  
communities to the extent allowable,  
ensure compliance with all  
appropriate regulations,  
and to regularly reevaluate our processes  
to achieve the highest standards  
of environmental excellence.**

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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
- Revision

### Environmental Compatibility Quotient (ECQ) scores

The following is the summary of the environmental compatibility quotient (ECQ) scores for the site visit conducted in January 2010:

- **Actual ECQ = 76, Showing progress (Yellow)**
- **Potential ECQ = 92, Advanced (Green)**

### Environmental challenges

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

- Bird/wildlife Aircraft Strike Hazard (BASH)
- Water quality
- Threatened or endangered species
- Installation Restoration Program (IRP) sites
- Invasive species
- Airfield safety criteria
- Explosive ordinance safety criteria
- Floodplains
- Nuisance wildlife
- Migratory birds

## **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/>).



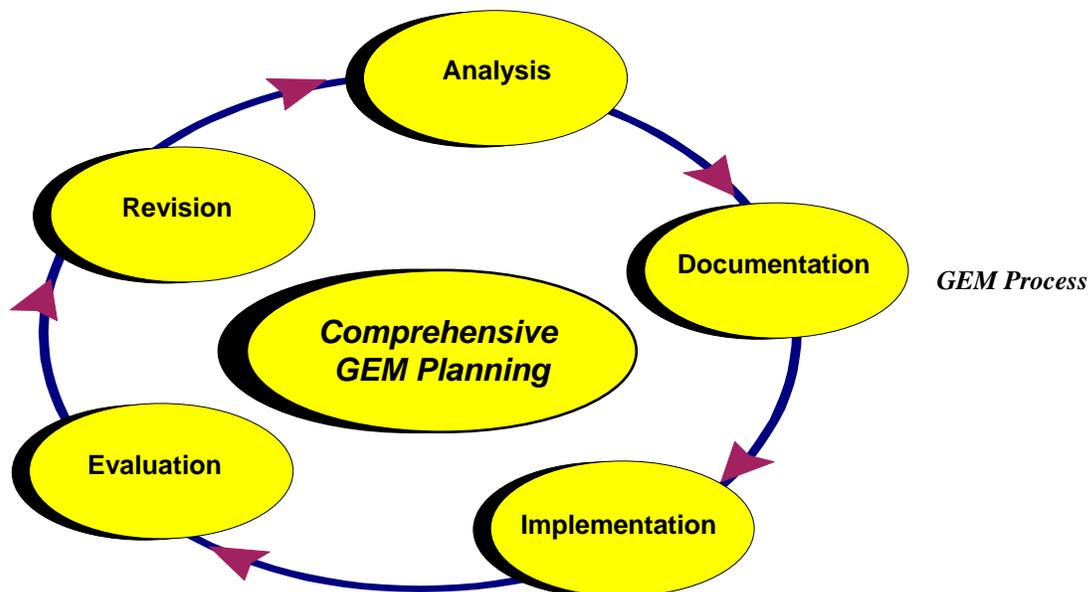
*Manatee Cove  
Golf Course  
Patrick AFB, FL*

*Birds and water features are dominant elements at Manatee Cove.*

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. Golf courses are being managed in consideration of environmental and resource constraints. The comprehensive GEM planning process is a vehicle to document and communicate our challenges and successes to 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.

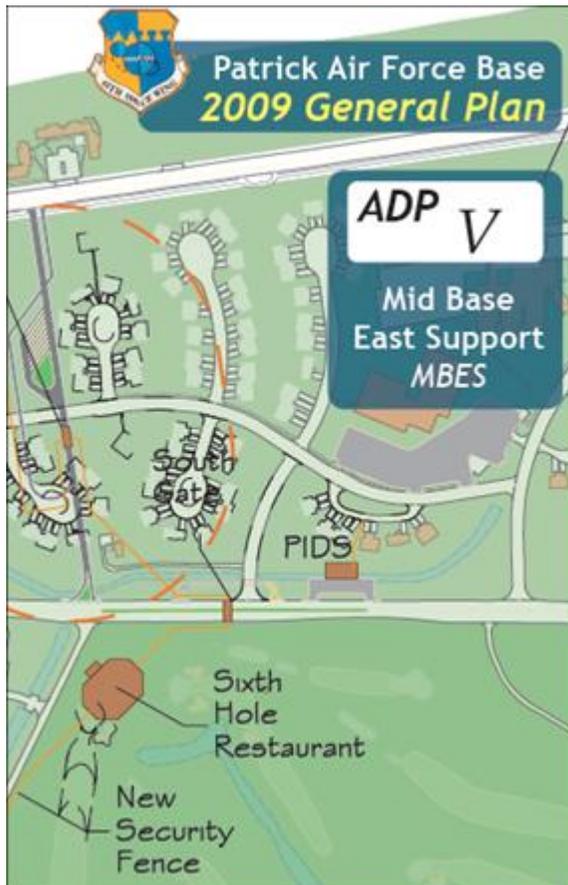
## GCEBA COMPONENTS

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.



*Proposed "Sixth Hole Restaurant may have impacts.*

*Manatee Cove  
Golf Course  
Patrick AFB, FL*

## **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.



*Manatee Cove Golf Course Layout*

### **Manatee Cove Golf Course Description**

Over the years, Patrick AFB's Manatee Cove Golf Course regularly provides a quality golf experience for more customers than any other 18-hole Air Force facility. The recent greens renovation by golf architects, Hurdzan-Fry, is beginning to pay dividends as rounds are up. The course is challenging and extremely playable. The Robert Trent Jones-designed course is nearly 7000 yards from the back and is typical of most Florida layouts as it is lacking in major elevation changes. In keeping with Trent Jones, Sr. tradition, the greens at Manatee Cove are large and rolling to test the golfers as well as to allow several pin locations to accommodate the heavy play. Management is in a constant fight against salt buildup in the soil profiles as the Atlantic Ocean is not far from the course's boundary on the east and the brackish Indian River to the west. Seemingly nonstop winds buffet the grounds around the clock. Well managed facilities, motivated staff, quality recreation values, and a wonderful, year round climate conducive to golf is the not so secret recipe at Manatee Cove.



**Manatee Cove Golf Course**



*Manatee Cove  
Golf Course  
Patrick AFB, FL*

*Course management has undertaken an aggressive native grass installation program.*

**Manatee Cove Golf Course Details**

Architect	Robert Trent Jones, Sr./Hurdzan Fry
Year constructed	1961 / 2006
Average annual precipitation	56 inches
Average growing season	335 days
Elevation	Just above sea level (~0-20' ASL)
Prevailing wind direction	North, east and south
Climate	Warm, humid and tropical
Total acreage / actively maintained	286 / 160 acres
Par	36-36-72
Yardage/Rating/Slope	Blue- 6808/71.9/123 White- 6452/70.3/118 Gold- 6099/69.1/116 Red- 5636/72.9/127 Green- 5020/69.4/124
Turfgrass	Tifway 419 Bermuda grass
Tees-	Tifway 419 / Common Bermuda grass
Fairways-	Paspalum
Greens	Common Bermuda grass mix
Roughs-	Recycled / <b>Green</b>
Irrigation source / Sustainability rating	

## 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 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 fully implementing a particular practice or procedure.

### ECQ Scoring Scale

Percent Responses Yes

or Partial per Category Level

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

The following ECQ checklists are a record of the interview conducted with Manatee Cove Golf Course superintendent during the installation site visit.

<b>Planning &amp; Compliance</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 readily-available and regularly updated Integrated Pest Management Plan specifically written 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 environmental targets being met based on an annual review or as needed basis?			✓
17	Are there documented functional or aesthetic thresholds integrated into pest control decisions?	✓		
18	Is there a written comprehensive Golf Course 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 all maintenance procedures been examined to determine their potential to negatively impact an identified environmental challenge?		✓	
	<b>Totals</b>	<b>7</b>	<b>5</b>	<b>8</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 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 all aspects of the golf course property other than the course for potential negative environmental impacts?	✓		
10	Have all employees received documented training that would increase their awareness of the GEM program 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 helps to eliminate the potential for spreading of disease or other contamination?	✓		
14	Are electric motor-powered equipment or vehicles being utilized where 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>13</b>	<b>3</b>	<b>4</b>

<b><u>Water Resource Management</u></b>				
#	Environmental Compatibility Indicator	Yes	Partial	No
1	Are written records of water quality monitoring activities, results, and pollution control measures readily available and used to establish appropriate maintenance practices?		✓	
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	Are triploid, non-reproducing 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, excessive aquatic plant growth, etc.?	✓		
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 properly functioning flow meters employed 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 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	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 increase the course's water use efficiency?		✓	
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>14</b>	<b>4</b>	<b>2</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, 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	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 species on or near the course?	✓		
9	Is there a comprehensive and readily available Drought Management Plan for the entire golf course facility?			✓
10	Has there been a demonstrated 2% annual reduction in potable water use since FY07?			✓

**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 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	Has the use of petroleum products been tracked and has there been a demonstrated 2% reduction each year since FY05?			✓
16	Is there an inventory of bird and mammal species documented, maintained and readily available?	✓		
17	Is there a comprehensive Energy Management Plan compiled for the entire golf course facility demonstrating a 3% annual reduction since FY03?			✓
18	Have all damaged or degraded habitats due to construction or maintenance of the course been fully restored or improved?	✓		
19	Has the entire property been examined for archaeological, cultural or historical resources?	✓		
20	Is the irrigation pump station an energy efficient, variable frequency drive?	✓		
	<b>Totals</b>	<b>13</b>	<b>0</b>	<b>7</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?		✓	
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 recorded and mapped to guide future pest control decisions?		✓	
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 made by a certified fertilizer applicator 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 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>16</b>	<b>2</b>	<b>2</b>



Manatee Cove  
Golf Course  
Patrick AFB, FL

The golf staff is committed to environmental protection.

<b>Environmental Compatibility Quotient Summary</b>			
Environmental Compatibility Category	Yes	Partial	No
<b>Planning &amp; Compliance</b>	<b>7</b>	<b>5</b>	<b>8</b>
<b>Operations &amp; Maintenance</b>	<b>13</b>	<b>3</b>	<b>4</b>
<b>Water Resource Management</b>	<b>14</b>	<b>4</b>	<b>2</b>
<b>Conservation</b>	<b>13</b>	<b>0</b>	<b>7</b>
<b>Pesticides &amp; Pollution Prevention</b>	<b>16</b>	<b>2</b>	<b>2</b>
<b>Totals</b>	<b>63</b>	<b>14</b>	<b>23</b>

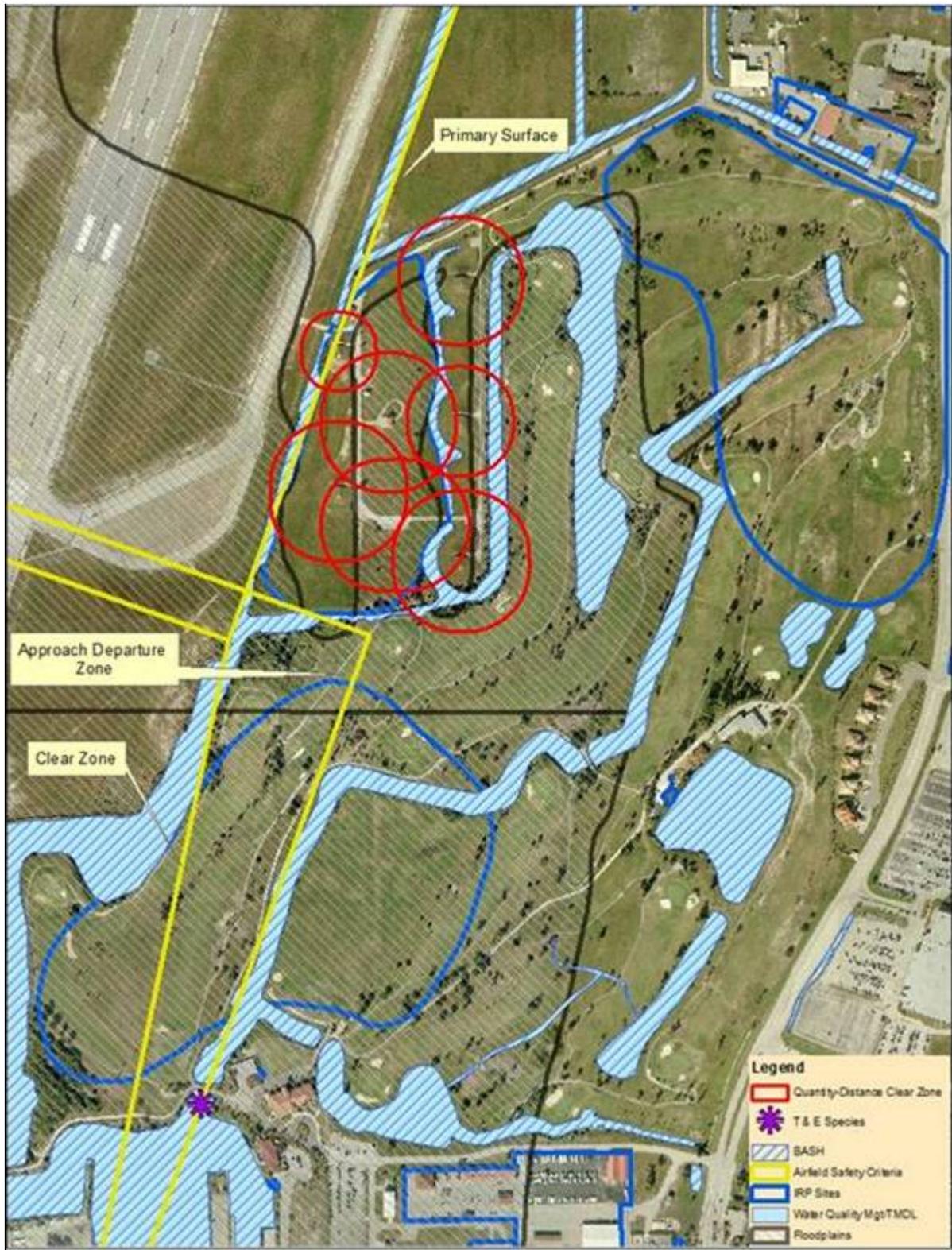
Key to checklist responses

- **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

**Jan 10 – Manatee Cove Golf Course ECQ:**

- **Actual ECQ = 63, Just started (Red)**
- **Potential ECQ = 77, Showing progress (Yellow)**

<b>Environmental Compatibility Quotient Scoring Scale</b>	
Total Yes or Partial Responses	Environmental Compatibility Level
<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>



**Manatee Cove Golf Course  
Environmental Challenges Map**



*Manatee Cove  
Golf Course  
Patrick AFB, FL*

*Relatively recent clubhouse construction project has been a success.*

## **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. 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:

- Bird/wildlife Aircraft Strike Hazard (BASH)
- Water quality
- Wetlands
- Threatened or endangered species
- Installation Restoration Program (IRP) sites
- Invasive species
- Airfield safety criteria
- Explosive ordinance safety criteria
- Floodplains
- Nuisance wildlife
- Migratory birds

## **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**

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 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.



*Manatee Cove  
Golf Course  
Patrick AFB, FL*

*There is a potential compliance issue with the course maintenance complex’s wash pad.*



*Manatee Cove  
Golf Course  
Patrick AFB, FL*

*Water birds congregate around the course's water features.*

### **BIRD/WILDLIFE AIRCRAFT STRIKE HAZARD (BASH)**

Situated between two major bodies of water Patrick AFB and the Manatee Cove Golf Course are in an area of significant bird activity and species diversity. The Bird Hazard Reduction Plan lists gull, egret, little and great blue heron, pelican, coot, willet, yellow legs, killdeer, plover, black skimmer, osprey, and kestrel hawk as potential concerns to aircraft safety. The golf course staff must coordinate any and all activities that affect this issue directly with the installation flying safety office. U. S. Air Force golf courses must never be connected in any way to BASH related aircraft or flying crew damage or losses.

### **Driver/requirement**

- Bird/Wildlife Aircraft Strike Hazard (BASH) Plan, 91-212
- AFI 13-213, Airfield Management
- AFI 32-1053, Pest Management Program
- FAA Advisory Circular 150/5200-33A, Hazardous Wildlife Attractants On Or Near Airports
- AFI 91-202, The U. S. Air Force Mishap Prevention Program
- AFPAM 91-212, Bird/Wildlife Aircraft Strike Hazard (BASH) Management Techniques
- UFC 3-260-01, Airfield and Heliport Planning and Design
- AFD 91-2, Safety Programs

### **Objective**

In direct support of the installation's mission, the golf staff shall continue to cooperate and assist the environmental and airfield management staffs with BASH reduction efforts to minimize or eliminate the potential for installation BASH concerns as a result of golf course management practices.

**Management approach**

- Attend all BASH Working Group meetings
- Eliminate all unnecessary vegetation around water bodies
- Continue to assist installation airfield and environmental managers with BASH concerns on the golf course
- Manage all minimally-maintained areas in accordance with airfield mowing criteria
- Report large bird concentrations to Airfield Manager or designated representative
- Coordinate with Airfield Manager or designated representative and flight safety officer to ensure golf course improvements are deconflicted with BASH program and do not increase bird hazard for flight operations

**Target**

Initiate consultation immediately and regularly thereafter to ensure compliance with airfield management and BASH criteria.

Complete comprehensive Golf Course Tree Management Plan that identifies potentially BASH-contributing species and implement annual maintenance schedule.



*Manatee Cove  
Golf Course  
Patrick AFB, FL*

*Cormorants can gather in large numbers.*



*Manatee Cove  
Golf Course  
Patrick AFB, FL*

*Protecting the quality of Manatee Cove's water features is a complex task.*

## **WATER QUALITY**

The protection of the many, interconnected water bodies are probably the main environmental concern for Patrick AFB managers. The golf course water bodies have the potential to receive inputs of pesticides, herbicides and fertilizer from course maintenance activities. A pond enhancement project has been undertaken that has "initiated to provide both a better habitat for fish located with the pond and a new habitat to the birds and other animals located around the pond".

According to a storm water study memorandum, the "PAFB golf course was constructed before storm water treatment requirements were implemented. The east and west canals which discharge to the Banana River were excavated to provide drainage of the golf course (refer to Figure 2). Overflow structures with sluice gates were constructed at the discharge point of the canals to control the water levels in the canals. The east canal receives storm water runoff from approximately golf course 118 acres."

Another water quality issue is the condition of the installation watershed. In order to quantify this issue, a study was undertaken to conduct a Total Maximum Daily Loads (TMDL) site compliance investigation and watershed model investigation. The purpose of this investigation was to create a comprehensive watershed assessment that would baseline the condition of the watershed and drainages within the installation that would provide a process for analyzing the watershed's current condition, the likely causes of these conditions, and recommendations for what must be done to protect and help restore the watershed to optimal levels as required from a TMDL perspective.



*Manatee Cove  
Golf Course  
Patrick AFB, FL*

*Sluice gates like this one control golf course runoff into the Banana River.*

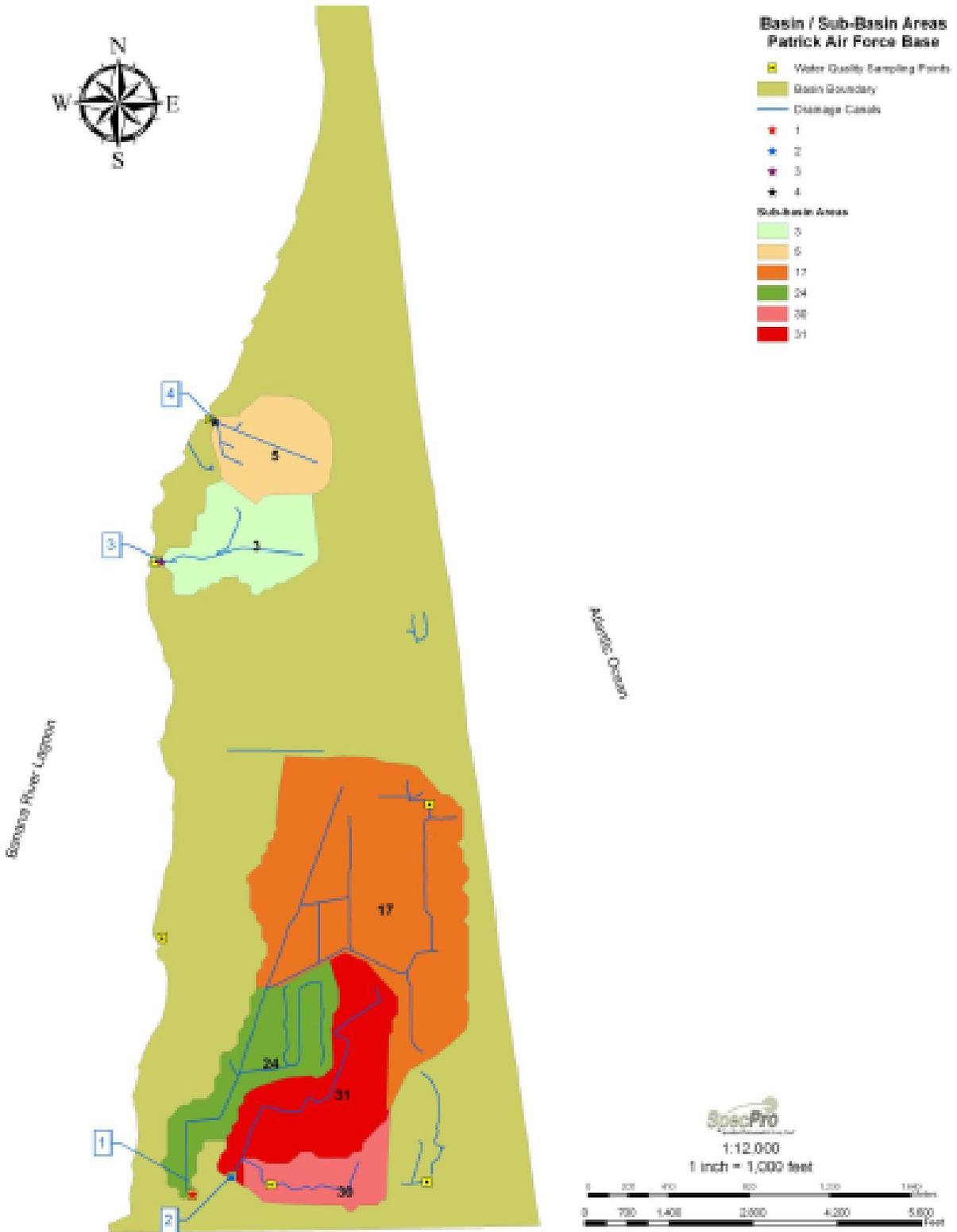
According to the surface water samples taken by the TMDL study, “the golf course is the dominant source for 77% of TP (total phosphorous) and 62% of TN (total nitrogen) discharging to the Banana River. The study attributed the majority of these nutrients to fertilizer use on the golf course and continues with “there are multiple projects that are currently in progress that will affect the nutrient loading to the Banana River. The PAFB Regional Stormwater Management System is having a large impact on the TMDLs due to the scope of the project. In this effort, the southern end of the base, including the golf course, will become regionalized for stormwater allowing for the water to collect in the main pond system of the golf course by blocking off the southern outfall and forcing the water to move through the entire system and out through outfall 1. By having a longer treatment time the nutrients should be removed before the water is discharged into the BRL.” Best management practices will be identified to address nutrient loadings.

#### **Driver/requirement**

- Clean Water Act, Section 401
- National Pollutant Discharge Elimination System (NPDES)
- Safe Drinking Water Act
- Federal Water Pollution Control Act of 1977 (Clean Water Act), as amended (33 U.S.C. 1251-1376)
- St. Johns River Water Management District and Florida Department of Environmental Protection regulations on TMDL reductions and point source nutrient limits

#### **Objective**

Ensure that golf course management practices never diminish installation or community water quality.



*Patrick's watershed is comprised of several basins and sub-basins.  
Sub-basin 24, 30 and 31 are on the golf course.*

**Management approach**

- Consult with installation environmental staff to ensure that golf course maintenance practices are fully compliant with complex 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
- Drums are stored on pallets
- Spill response equipment is provided
- Dumpsters are covered
- All material and waste is stored inside buildings or cabinets
- Wash rack is covered and is equipped with a grass cuttings trap
- Fuel tanks are double walled
- Secondary containment provided for fuel storage tanks
- Pesticide/herbicide storage and mixing area is covered & bermed
- Flammables are stored in secure cabinets
- Site personnel regularly perform visual inspections of the area
- Security fencing is installed



*Manatee Cove  
Golf Course  
Patrick AFB, FL*

*Some of Manatee Cove's water features have been dredged to remove excess vegetation.*

**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 non-compliant water resource aspects prior to the end of CY 2010.



*Manatee Cove  
Golf Course  
Patrick AFB, FL*

*Jurisdictional wetlands are present behind the first hole's teeing area and include the marina and its waterway connection to the Banana River.*

## **WETLANDS**

Despite the huge quantity of water bodies on and around Patrick AFB, there are only a few jurisdictional wetlands on the installation. The largest of these wetlands is home to the marina and is in close proximity to the first teeing area and the clubhouse. The wetland is also home to manatees during the proper time of year. "A 'jurisdictional waters' delineation was completed by the Army Corps of Engineers (COE) in June 2006 and is officially valid for five years." Wetlands are "those areas that are inundated by surface or ground waters that support plants and animals that need saturated or seasonally saturated soil to grow and reproduce. Wetland ecosystems are considered to be some of the most biologically productive of all habitats."

### **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 water feature 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
- Compile a comprehensive Water Resource Management Plan for the entire golf course facility
- Ensure that golf course maintenance practices are fully compliant with complex water regulations

**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 2010.



*Manatee Cove  
Golf Course  
Patrick AFB, FL*

*Ducks maneuver through dense duck weed on one of the ponds.*



*Manatee Cove  
Golf Course  
Patrick AFB, FL*

*The American alligator suns along one of Manatee Cove's water features.*

### **THREATENED OR ENDANGERED SPECIES**

An excerpt from past Integrated Natural Resources Management Program listed 19 threatened, endangered, or special concern species observed on Patrick AFB. The list includes stellar species such as the course's namesake, the Florida Manatee, which, along with the American alligator and the southeastern American kestrel are the only ones that specifically occur on the golf course grounds.

A large number of water birds have been observed using golf course ponds, vegetated areas surrounding the airfield, as well as areas along the Banana River shoreline. In addition to the BASH problem, a major concern for birds in these areas is the water quality.

The INRMP states there are no "federally listed rare or endangered plant species" on Patrick AFB. However, the following threatened or endangered plants listed by the State of Florida or FNAI have been observed on the installation: spider lily; beach star; inkberry; and prickly pear cactus. State law also affords some protection to the black mangrove, red mangrove, and white mangrove which occur along the Banana River shoreline and the edges of some canals". These plants have a small chance of being a problem for the golf course facility. Awareness may prove to be the best defense.

### **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
- Federal Species Conservation Ordinance

**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

**Target**

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



*Manatee Cove  
Golf Course  
Patrick AFB, FL*

*Photo credit:  
Phillip Colla*

*The endangered Florida manatee can be seen in waters near the teeing area on Manatee Cove's first hole.*



*Manatee Cove  
Golf Course  
Patrick AFB, FL*

*Despite significant expenditures and effort, the Brazilian pepper still thrives in Florida.*

### **INVASIVE SPECIES**

One of the stated objectives of the INRMP is to “identify and eradicate exotic and invasive species”. The golf course management staff should assist in that effort. This is especially true when considering the number and variety of potential invasive species habitat on the golf course. In addition, the entire state of Florida has undertaken the mammoth task of eliminating plant materials foreign to the United States. Of special concern are the so-called invasive exotics, that is, non-native plants that aggressively reproduce with little to no natural controls. These plants can clog waterways, replace less hardy natives, and generally take over the landscape. The Manatee Cove Golf Course grounds are home to at least melaleuca, Torpedo grass, hydrilla and Brazilian pepper.

Several large-scale efforts have already been undertaken by the installation to eliminate Brazilian pepper groves on the course. The golf staff has been integral to these efforts and should continue to facilitate removal of invasive species. Based on observation of the areas after removal operations, a comprehensive and professional landscape development scheme should integrate native plants that will minimize erosion and improve aesthetics while not decreasing playability for the average Manatee Cove golfer.

### **Driver/requirement**

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

**Objective**

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

**Management approach**

- Never knowingly install a listed or potentially invasive species
- Regularly inspect likely areas for invasives to establish themselves
- Work with installation environmental staff to contain or reduce invasives
- 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

**Target**

Assist the environmental staff with the compilation of an invasive species survey and completion of an approved plan to contain or reduce undesirable varieties prior to the end of FY10.



*Manatee Cove  
Golf Course  
Patrick AFB, FL*

*Melaleuca trees are native to Australia and have been designated as an invasive species in the State of Florida.*



*Manatee Cove  
Golf Course  
Patrick AFB, FL*

*The airfield is nearby the golf course at Patrick AFB.*

### **AIRFIELD SAFETY CRITERIA**

Patrick AFB has two active runways. Each of the runways has specific airfield safety criteria to include a clear zone. Both clear zones are free of obstructions. As can be observed from the Environmental Challenges map on page 23, both the clear zone and the approach departure zone occur over golf course property. Extreme care must be taken by golf course management in this area. The mission is the primary consideration for all maintenance practices.

### **Driver/requirement**

- AFI 32-7063, Airfield Installation Compatible Use Zones, (AICUZ)
- UFC 3-260-1, Airfield & Heliport Planning & Design

### **Objective**

Assist with the elimination of all airfield criteria waivers and continue coordination and communication with airfield managers on maintenance practices.

### **Management approach**

- Assist installation managers in providing a safe and efficient airfield

### **Target**

Regularly consult with installation airfield management to ensure mitigation or elimination of potential impacts.



*Manatee Cove  
Golf Course  
Patrick AFB, FL*

*Several water quality monitoring wells occur on the course.*

### **INSTALLATION RESTORATION PROGRAM (IRP) SITES**

There are several landfills in the area of the Manatee Cove Golf Course. These landfills were operated from the 1940s to 1961. Operations at Landfill 1, which is located approximately 250 yards southeast of the property, began in 1940 and ended in 1948. Landfill 2, located approximately 250 yards to the north was active between 1950 and 1956, while Landfills 3 and 4 operated from 1956 to 1961. Landfills 3 and 4 are located approximately 625 and 450 yards to the northwest and west of the property, respectively. The areas overlying these landfills have been developed since the time of their closure in 1961. The Base Commissary, Base Exchange, and Base Housing are now located on or near Landfill 1, while Landfills 2 and 4 underlie the golf course.

In addition to elevated concentrations of arsenic studies also documented elevated levels of cadmium. Although elevated from background concentrations, these levels were well below clean up levels for direct residential exposure. The report suggested these elevated levels might have resulted from the use of wastewater treatment plant (WWTP) effluent in golf course irrigation.

According to the installation environmental staff, “while there are various “Land Use Controls” due to the presence of landfills, the requirement to maintain the integrity of the cap probably most impacts golf course operations. Any invasive activities (digging, trenching, etc.) that might breach the cap require coordination well in advance with the IRP office. The landfill boundaries shown on the map on the next page are approximate at best. Care should be exercised when planning invasive activities anywhere in proximity to one of the landfill units.”

### **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**

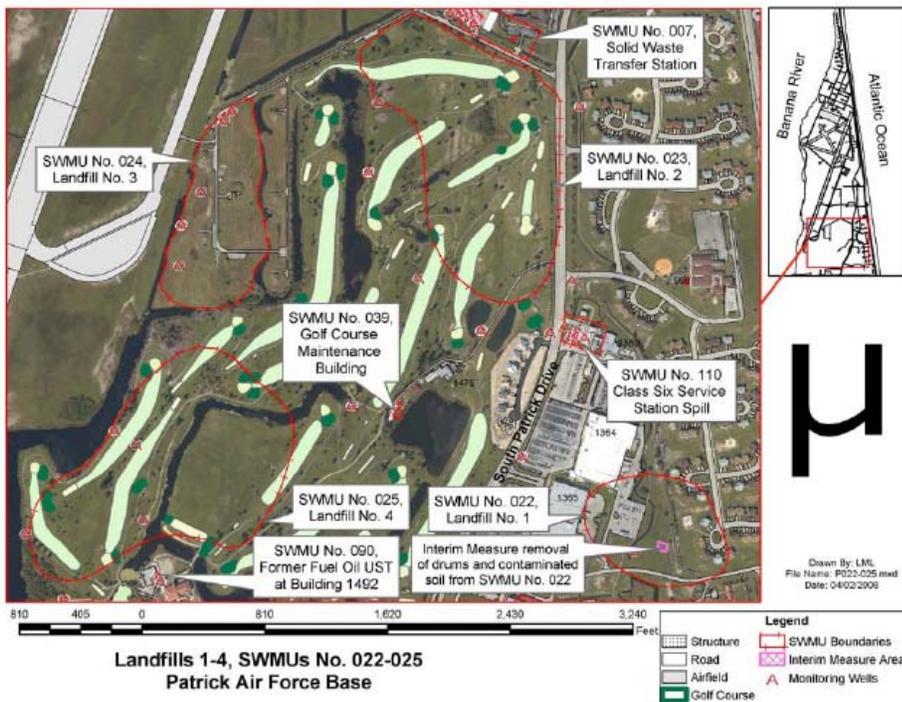
Ensure daily compliance with restoration program site requirements.

**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.



Manatee Cove  
Golf Course  
Patrick AFB, FL

*Three landfills occur on golf course property.*



*Manatee Cove  
Golf Course  
Patrick AFB, FL*

*Explosive storage on Patrick AFB is in close proximity to Manatee Cove Golf Course.*

## **EXPLOSIVE SAFETY STANDARDS**

There are nine explosive storage areas and four "hot" cargo loading areas on Patrick AFB. The areas comprise approximately 180 acres of land, including their respective Quantity Distance (QD) clear zones. As evidenced by the information on the Environmental Challenges map on page 23, at least four holes on the Manatee Cove Golf Course are affected by the QD arcs. Care must be taken to ensure the safety of both customers and employees as this important mission requirement is maintained in such close proximity to the golf course.

### **Driver/requirement**

- Air Force Policy Directive (AFPD) 91-2, Safety Programs
- DoD 6055.9-Std, DoD Ammunition and Explosives Safety Standards
- Air Force Manual (AFMAN) 91-201, Explosives Safety Standards

### **Objective**

No losses due to inadequate explosives safety communication or planning.

### **Management approach**

- Limit access to affected areas during times of increased risk to personnel or property
- Warn all customers and employees of potential risks

### **Target**

Continue to act immediately upon notification of potential increased risk.

Maintain compliance with all land use restrictions.



*Manatee Cove  
Golf Course  
Patrick AFB, FL*

*100- and 500-year flood zones occur on Patrick AFB and Manatee Cove.*

## **FLOODPLAINS**

Due to the lack of significant variances in topography on Patrick AFB, floodplains extend beyond the coastal dune and wetlands and into portions of the developed land on the installation. Portions of the golf course property lie within the 100-year and 500-year floodplains.

According to the INRMP, “PAFB does have areas lying in defined floodplains. The elevation of the 100-year floodplain is five feet on the west side of the oceanfront along the Atlantic Ocean. The east side of the dune (next to the ocean) has a 100-year floodplain elevation of eight feet.” The golf course is highly susceptible to flooding and is regularly inundated during high precipitation events.

The INRMP continues with the most important aspect of managing a facility located in a floodplain: “Executive Order 11988 requires all federal agencies to provide leadership and take action to reduce the risk of flood loss; to minimize the impacts of floods on human safety, health, and welfare; and to restore and preserve the natural and beneficial values served by floodplains in acquiring, managing and disposing of Federal lands; providing Federally undertaken, financed, or assisted construction and improvements; and conducting Federal activities and programs affecting land use. Air Force installations have the responsibility to determine if proposed actions will occur in a floodplain, evaluate and document the potential effects; and consider alternatives to avoid these effects and incompatible development in the floodplain”.

## **Driver/requirement**

- Clean Water Act, Section 401
- National Pollutant Discharge Elimination System (NPDES)
- Executive Order 11988, Flood plain Management, 24 May 77

- AFI 32-7041, Water Quality Compliance, 10 Dec 03

**Objective**

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

**Management approach**

- Assist with the preparation of a Finding of No Practical Alternative (FONPA) for each potentially proposed project within 100-year floodplain
- Consult with environmental staff prior to any changes or repairs to creek bed or 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

**Target**

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



*Manatee Cove  
Golf Course  
Patrick AFB, FL*

*The golf course in inundated after Tropical Storm Fay in 2009.*



*Manatee Cove  
Golf Course  
Patrick AFB, FL*

*Nuisance species can significantly damage important golf course playing surfaces.*

## **NUISANCE SPECIES**

Like many golf courses, Manatee Cove is home to several animal species that end up being either bothersome to customers and the maintenance staff or destructive to the course itself. These nuisance species include skunk, armadillo, opossum and raccoon. These species tear away turfgrasses in their search for grubs. Birds can also cause similar damage.

The American alligator can also be categorized as a nuisance species. In this case, though, it is their potential to harm customers and employees that makes them more than a nuisance. Any alligator that acts aggressive in any way is usually dealt with by experts.

## **Driver/requirement**

- Customer expectations for acceptable quality playing conditions
- Real property protection
- Land use conflicts
- Risk to human health and safety
- Threat to military operations

## **Objective**

Minimize the damage caused by controllable nuisance pests.

## **Management approach**

- After complete coordination with all appropriate installation personnel, take all permitted actions to control nuisance pests

**Target**

Control nuisance species on the actively maintained portions of the golf course by the end of CY2011 as permitted or allowed by the installation environmental management staff.



*Manatee Cove  
Golf Course  
Patrick AFB, FL*

*Traps are used to remove raccoons and other nuisance species from the golf course.*



*Manatee Cove  
Golf Course  
Patrick AFB, FL*

*Fascinating bird species abound on the course.*

### **MIGRATORY BIRDS**

The INRMP states that Patrick AFB is “located on a barrier island, a type of ecosystem that supports many species of plants and animals. Barrier islands along the Atlantic coast are especially important to nesting sea turtles, populations of small mammals, and as foraging and roosting habitat for a variety of resident and migratory birds. It continues stating that “the 45 Safety Wing reviews all projects to ensure compliance with the Migratory Bird Treaty Act (MBTA), which provides for protection against intentional and incidental take, and compliance with Executive Order 13186, January 10, 2001, *Responsibilities of Federal Agencies to Protect Migratory Birds*.

Unless permitted by regulations, the MBTA provides that it is unlawful to pursue, hunt, take, capture or kill; attempt to take, capture or kill; possess, offer to or sell, barter, purchase, deliver or cause to be shipped, exported, imported, transported, carried or received any migratory bird, part, nest, egg or product, manufactured or not.”

The installation has a federal depredation permit for that covers all migratory bird species, either resident or migratory. Control methods vary from keeping the grass mowed to a specific height, scaring the birds away using air cannons, screamer devices, and/or bird scare shot to depredation and shooting which is used as a last resort.

Since the golf course is home to several large waterfowl that are covered under the Migratory Bird Treaty Act, extreme caution should regularly be exercised when performing maintenance practices that have any chance to cause harm.

**Driver/requirement**

- Migratory Bird Treaty Act, as amended (16 U.S.C. 703 *et. seq.*)
- 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 Conservation Act

**Objective**

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

**Management approach**

- Discourage nest construction
- Employ harassment/hazing techniques to move protected bird species
- Use approved irritants as applicable
- Utilize the depredation permit as the last option
- Work closely with installation environmental staff to document presence of migratory birds such as the burrowing owl and follow all provided maintenance guidelines

**Target**

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



*Manatee Cove  
Golf Course  
Patrick AFB, FL*

*The great blue heron is a prominent waterfowl species regularly observed at the Manatee Cove Golf Course as well as the State of Florida.*

## 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 the roadmap for their future. The GEM Plan is an example of the quality a cooperative effort can produce. Let's get something done and better take care of the environment, our community and our customers.

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

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

- Adopt and post environmental policy and environmental challenge map for employees and customers
- Conduct and document introductory GEM training for all employees
- Compile and implement a Drought Management Plan for the entire golf course facility

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

- Request a comprehensive energy audit to be conducted for the entire golf course facility and compile findings in an Energy Management Plan that may demonstrate a 3% reduction in energy use since FY03
- Ensure that all fertilizer applications are executed by a certified fertilizer applicator and that each application is recorded and mapped to guide future actions
- Compile a written comprehensive Water Resource Management Plan for the entire golf course facility

## 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. Sustainable installations are possible with a coordinated and concerted effort by all. Implementation of the GEM program embraces continual improvement and environmental stewardship while supporting the mission of 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.



*Recently installed native grasses reduce mowing.*



*Protection of IRP site landfill caps is imperative.*



*Birds and water quality are a major concern.*



*Monitoring wells help managers assess cleanup efforts.*



*Failed asphalt curbing is in need of repair.*



*Clubhouse snack bar does a brisk business.*



*New superintendent has the course in fine condition.*



*Brazilian pepper is a tough invasive species to control.*



*Emergent vegetation provides cover for birds.*



*Manatees can be seen in this water feature.*



*Sparkling snack bar kitchen area.*



*The jury is still out on the new transition bunkers.*

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

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