



***Whispering Winds Golf Course  
Environmental Management (GEM) Plan  
Cannon AFB, NM***



**September 2009**



**San Antonio, Texas**



***Whispering Winds Golf Course  
Environmental Management  
Policy***

**In concert with the  
Canon AFB mission,  
we pledge to employ  
only those management practices  
that minimize or eliminate the potential  
for negative impacts to the environment  
and the surrounding community,  
ensure compliance with all  
appropriate regulations,  
and to regularly reevaluate our processes  
to achieve the highest standards  
of environmental excellence.**

## Table of Contents

<b>Table of Contents</b> .....	<b>ii</b>
<b>Executive Summary</b> .....	<b>3</b>
U. S. Air Force GEM Program .....	3
GEM Program process .....	3
Environmental Compatibility Quotient (ECQ) scores .....	3
Environmental challenges.....	3
Where do we go from here? .....	4
The GEM Initiative .....	4
<b>GEM Process</b> .....	<b>5</b>
Analysis .....	5
GCEBA components .....	6
Documentation .....	6
U.S. Air Force GEM Plan components.....	7
Implementation .....	7
Evaluation.....	7
Revision.....	7
<b>Course Specific Analysis</b> .....	<b>8</b>
Course Description .....	8
Course Details .....	9
<b>Environmental Compatibility Quotient (ECQ) Checklists</b> .....	<b>10</b>
Determining the Environmental Compatibility Quotient (ECQ) .....	10
ECQ Scoring Scale.....	10
Planning & Compliance .....	11
Operations & Maintenance .....	13
Water Resource Management.....	15
Conservation .....	17
Pesticides & Pollution Prevention .....	19
Environmental Compatibility Quotient Summary .....	21
Environmental Compatibility Quotient Scoring Scale.....	21
<b>Environmental Challenges</b> .....	<b>22</b>
Assessing environmental challenges.....	23
Bird/wildlife Aircraft Strike Hazard (BASH) .....	24
Wetlands .....	26
Water quality & watershed protection.....	28
Migratory birds .....	32
Invasive species.....	34
Threatened or endangered species .....	36
<b>Implementation</b> .....	<b>38</b>
GEM Plan goals & objectives .....	38
GEM Plan best practices .....	39
<b>Conclusion</b> .....	<b>39</b>
The gallery.....	39
<b>Bibliography</b> .....	<b>42</b>



## 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 Month Year:

- **Actual ECQ = 75, Showing progress**
- **Potential ECQ = 90, Advanced**

### Environmental challenges

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

- Bird/Wildlife Aircraft Strike Hazard (BASH)
- Wetlands
- Migratory birds
- Water quality and watershed protection
- Invasive species
- 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/>).



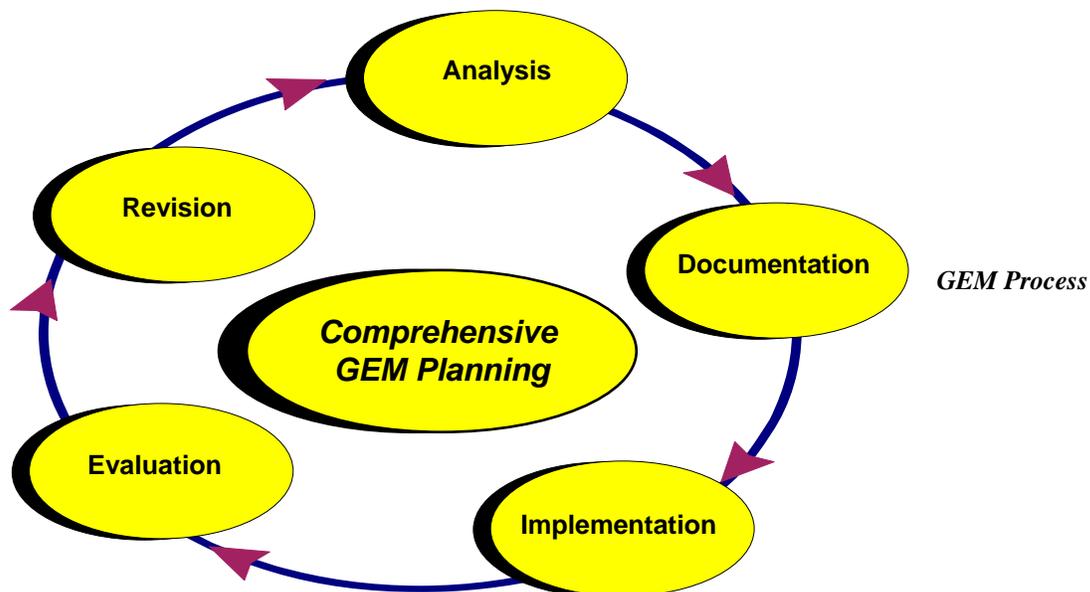
*Whispering Winds  
Golf Course  
Cannon AFB, NM*

*Cannon AFB regularly leads the Air Force in satisfied golf customers.*

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.



*Whispering Winds  
Golf Course  
Cannon AFB, NM*

*Quality golfing experience begins with the facility sign.*

## **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**

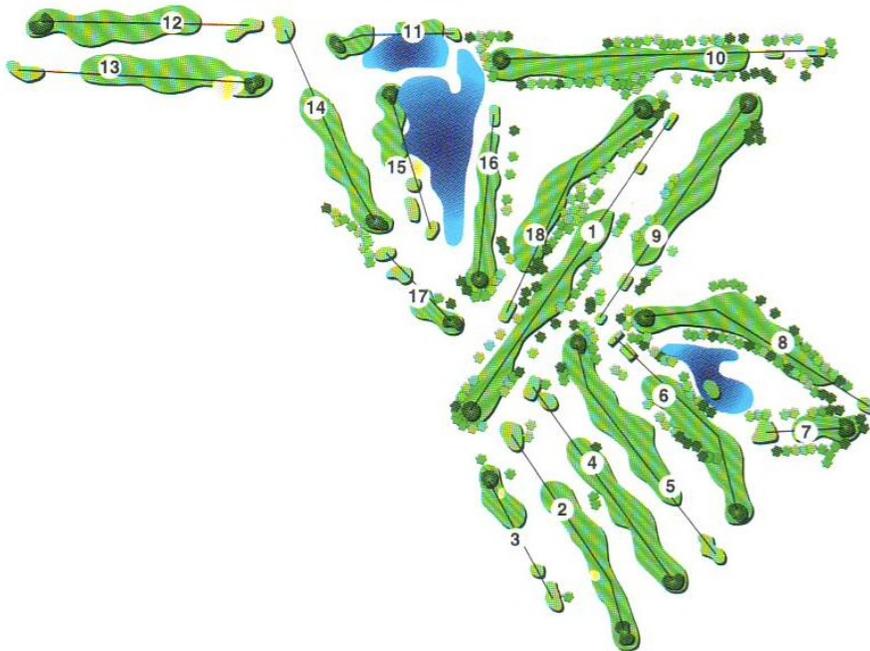
In order to ensure the highest quality of customer service and environmental stewardship, there must be continual self-evaluation and improvement. There also should be consistent, on-going measurement of the reduction or elimination of environmental impacts the newly implemented practices have on the 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.



*Whispering Winds  
Golf Course  
Cannon AFB, NM*

*Whispering Winds Golf Course layout plan*

## Course Description

Another typical military course, the Whispering Winds links evolved to its current 18-hole configuration one 9-hole segment at a time. As a living testament to the surrounding natural landscape, the course is relatively flat and vegetatively non-descript. Nevertheless, the recreation value is high as the Whispering Winds superintendent and staff of four part time individuals keeps playing conditions high.

The course is still a challenge as the wind never seems to be blowing at a whisper pace. Howling is more like it! Experienced locals know how to keep the ball under the sirocco and count on their short games to keep their scores low.

The course is rife with invasive Siberian elm trees much to the chagrin of course management. Some of the trees are reaching mature size and the brittle nature of the tree along with its general unworthiness will create problems soon and in the future.



**Whispering Winds Golf Course Aerial Photo**

**Course Details**

Architect	Self-help / Pittman & Roe Engineering
Year constructed	1956 / 1994
Climate	Arid/semi-arid high prairie
Average annual precipitation	18 inches
Average growing season	190-210 days
Elevation	4280 feet ASL
Prevailing wind direction	West
Total facility area	~140 acres
Total actively maintained area	116 acres
Par	35-35-70
Yardage/Rating/Slope	Blue- 6032/66.9/112 White- 5591/65.3/107 Red- 4954/64.8/99
Turfgrass	Bermudagrass / perennial ryegrass
Tees-	Bermudagrass / perennial ryegrass
Fairways-	Bentgrass
Greens	Bermudagrass / perennial ryegrass
Roughs-	Reclaimed water supplemented with harvested rainwater (Green)
Irrigation source	

## 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 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 Whispering Winds Golf Course maintenance personnel.

<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>10</b>	<b>9</b>	<b>1</b>

<b><u>Operations &amp; Maintenance</u></b>				
<b>#</b>	<b>Environmental Compatibility Indicator</b>	<b>Yes</b>	<b>Partial</b>	<b>No</b>
1	Is there a written, regularly updated and 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>0</b>	<b>4</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>2</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, 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>17</b>	<b>2</b>	<b>1</b>

<b><u>Pesticides &amp; Pollution Prevention</u></b>				
<b>#</b>	<b>Environmental Compatibility Indicator</b>	<b>Yes</b>	<b>Partial</b>	<b>No</b>
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>16</b>	<b>2</b>	<b>2</b>



*Whispering Winds  
Golf Course  
Cannon AFB, NM*

*The eastern New Mexico climate is hard on trees.*

<b>Environmental Compatibility Quotient Summary</b>			
<b>Environmental Compatibility Category</b>	<b>Yes</b>	<b>Partial</b>	<b>No</b>
<b>Planning &amp; Compliance</b>	<b>10</b>	<b>9</b>	<b>1</b>
<b>Operations &amp; Maintenance</b>	<b>16</b>	<b>0</b>	<b>4</b>
<b>Water Resource Management</b>	<b>16</b>	<b>2</b>	<b>2</b>
<b>Conservation</b>	<b>17</b>	<b>2</b>	<b>1</b>
<b>Pesticides &amp; Pollution Prevention</b>	<b>16</b>	<b>2</b>	<b>2</b>
<b>Totals</b>	<b>75</b>	<b>15</b>	<b>10</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

**June 2009 - Whispering Winds Golf Course ECQ:**

- Actual ECQ = 75, **Showing progress**
- Potential ECQ = 90, **Advanced**

<b>Environmental Compatibility Quotient Scoring Scale</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>



**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 potential environmental challenges were identified during the GEM process:

- Bird/Wildlife Aircraft Strike Hazard (BASH)
- Wetlands
- Migratory birds
- Water quality and watershed protection
- Invasive species
- Threatened or endangered species

## **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 (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.



*Whispering Winds  
Golf Course  
Cannon AFB, NM*

*Trees bordering clubhouse and putting green are both good and bad.*



*Whispering Winds  
Golf Course  
Cannon AFB, NM*

*Geese are a major contributor to the BASH environmental challenge at Cannon AFB.*

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

BASH is defined as the threat of aircraft collision with birds during flight operations. Although most bird strikes do not result in aircraft damage, some strikes have led to major damage and/or serious aircraft accidents. According to Bird Strike Committee USA, bird and other wildlife (primarily mammals) strikes result in over \$600 million in damage to U.S. and civilian air traffic every year. To date, more than half of the strikes are reported at low flight altitudes (<100 ft); however, strikes have occurred up to 37,000 feet. Military aircraft used by AFSOC may be more vulnerable than other DoD aircraft because many AFSOC missions require flying at low altitudes.

Another problematic species that is being addressed by the pest management group at Cannon is the black-tailed prairie dog. At one time there were seventeen very active populations on MAFR and limited numbers on Cannon. Today, a small number of prairie dogs are found on MAFR and the population on Cannon has increased dramatically throughout the airfield. Prairie dogs are attractive prey to many raptor species, and their burrows attract burrowing owls. Controlling this species is complicated as it is a federal species of concern and listed by the state as sensitive taxa.

### **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.

### Management approach

- Coordinate pond and stream maintenance procedures with installation environmental management staff
- Install only BASH-approved plant material listed in the INRMP
- Secure membership on BASH Working Group and attend all meetings
- Ensure minimally-maintained or non-play areas are mowed in accordance with airfield mowing criteria or on a requirement basis (7-14") wherever practicable in accordance with AFPAM 91-212

### Target

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



*Whispering Winds  
Golf Course  
Cannon AFB, NM*

*The Black-tailed is the primary species of prairie dog  
in eastern New Mexico.*



*Whispering Winds  
Golf Course  
Cannon AFB, NM*

*This wetland is located alongside the 7<sup>th</sup> hole.*

## **WETLANDS**

Playas are an important part of the prairie ecosystem as they provide the majority of the standing water in the region. Most of the animals native to the shortgrass prairies will use playas as a water source and foraging area. Migrating waterfowl and shorebirds utilize this habitat during migration. Most playas on Cannon have been converted to intensely maintained, lined golf course ponds. Runoff from the golf course and adjacent housing area has created a permanently inundated, nutrient rich aquatic environment. Algal problems (i.e., extensive blooms) resulted and sterile grass carp (*Ctenopharyngodon idella*) were stocked to alleviate the problem. Canada geese (*Branta canadensis*) and Mississippi kite (*Ictinia mississippiensis*) are often seen around the golf course ponds.

A wetland delineation and completed for Cannon and MAFR in 2005. No waters of the U.S. were found on MAFR; however, several areas on Cannon, including the golf course ponds and North Playa Lake, required a determination. It was determined that all water bodies and drainages within the Cannon are isolated and not subject to regulation under the CWA. In 2006, the U.S. Army Corps of Engineers (USACE) concurred with a 2005 delineation report that concurred that none of the water bodies on Cannon are waters of the U.S. There was a question regarding the status of the North Playa Lake due to NPDES permits issued to Cannon by the USEPA for wastewater and storm water discharges to the lake; however, it is the Base's contention that the permits are no longer warranted and will not be renewed when they expire (Estok 2006; Poore 2006).

## **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
- 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 the year.

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



*Whispering Winds  
Golf Course  
Cannon AFB, NM*

*Relatively close mowing is regularly performed nearby the wetland boundary.*



*Whispering Winds  
Golf Course  
Cannon AFB, NM*

*Protecting the quality of the main golf course pond is an important aspect of the installation and the golf course environmental management plan.*

## **WATER QUALITY & WATERSHED PROTECTION**

“Storm water runoff at Cannon is entirely contained on base and either evaporates or infiltrates into the ground. An insignificant amount of storm water may migrate off the installation at very isolated areas, such as the extreme northeast and northwest corners. Approximately 50 percent of the storm water runoff from Cannon is conveyed to two playa lakes either by drainage ditches, storm sewers, or sheet flow. Most runoff from along the flight line is conveyed to the South Playa Lake. Storm water north of the Fire/Crash Rescue Facility spreads out and evaporates on the eastern side of Runway 4/22. Runoff also collects in several ponds and a wetland located on the golf course.”

“Several man-made impoundments are present on Cannon and MAFR. On Cannon, three impoundments exist on the golf course and North Playa Lake located along the installation’s eastern boundary. Both North Playa Lake and a golf course pond receive effluent from the wastewater treatment plant. Other than a curious bio-fouling problem that was the subject of a 2004 study, there are no known water quality concerns at any of these impoundments. Negligible recurrence of the filamentous growth has occurred.” Liners are beginning to fail and need repair or replacement.

Ground discharges are covered under a Ground Water Discharge Permit. The NPDES permit covers discharges from Cannon’s on-base wastewater treatment plant (WWTP) into the North Playa Lake and the golf course pond. The Environmental Protection Agency (EPA) issued the permit (NM0030236) with an effective date of April 1, 2006, and an expiration date of March 31, 2011.



*Whispering Winds  
Golf Course  
Cannon AFB, NM*

*Irrigation pond liner is in need of repair or replacement.*

The INRMP states “The historic playa watershed system of Cannon has been impacted by the construction of roads, flight lines, and industrial and residential buildings. The playa lake basins have all been impacted by past excavation or fill activities. Additionally, the playas now receive large quantities of water from channelized drainage systems from the cantonment area and Chavez West housing area (golf course ponds), the flight line (South Playa), and the Munitions Storage area. Although it is impossible to restore the playa watershed systems, it is important to maintain compliance with regulations for discharges, enhance the natural functions of watersheds, and decrease erosion and sedimentation on Cannon.”

The only known fish population on Cannon AFB are in the golf course ponds which were stocked with sterile grass carp (*Ctenopharyngodon idella*) to control algal blooms in 1996.

The restroom on the course is currently connected to a septic system that is not working properly. Civil engineering has submitted a Work Request to connect it to sanitary sewer system. The tank needs to be pumped out and checked regularly as overflows may occur.

#### **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)
- Cannon AFB Ground Water Discharge Permit

**Objective**

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

**Management approach**

- Consult with installation environmental staff to ensure that golf course maintenance practices are fully compliant with complex water-related regulations with special consideration for compliance with the Cannon Ground Water Discharge Permit to include:
  - Maintaining signage to warn of reclaimed wastewater use
  - Maintaining 200 foot irrigation buffer around all wellheads
  - Manage irrigation system to ensure protection of ground water quality
  - No irrigating during excessive wind events
  - Log all chemical fertilizer applied to each location receiving irrigation and provide report annually to civil engineering/environmental staff
  - Maintain two feet freeboard in golf course irrigation pond unless pumping to storm drain system during heavy precipitation events where a written report will be provided to civil engineering/environmental within a week of the event
- 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
- Prepare for expiration of Environmental Protection Agency (EPA) issued permit (NM0030236)
- 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
- Drip pans under dispensing units
- Site personnel perform visual inspections of the area
- Security fencing installed
- Operational protocol understood by employees
- Spill response equipment is available
- Inspections performed
- Activity performed inside facility
- Secondary containment for fuel storage tank

**Target**

Maintain compliance with the Cannon Ground Water Discharge Permit at all times.

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 the year.

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.



*Whispering Winds  
Golf Course  
Cannon AFB, NM*

*Aerator helps keep water quality at its peak.*



*Whispering Winds  
Golf Course  
Cannon AFB, NM*

*The Mississippi kite deserves a customer warning sign when nesting.*

### **MIGRATORY BIRDS**

The INRMP states “The federal government is legally mandated to protect and maintain healthy migratory bird populations and to ensure the conservation of more than 800 species of migratory birds and their habitats by domestic legislation and through international conventions and treaties. The INRMP credits the golf course as a significant “landscaped area” that “provide[s] important habitat for neotropical migratory birds”.”

Six federal avian species of conservation concern were found during the 2004 and/or 2008 surveys to include Northern harrier, Prairie falcon, Long-billed curlew, Burrowing owl, Cassin’s sparrow and Lark bunting.

Two species of conservation concern are spring/fall migrants or winter residents (northern harrier, prairie falcon), four (lark bunting, long-billed curlew, burrowing owl and Cassin’s sparrow) are summer residents/nesting species and spring/fall migrants.

### **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.



*Whispering Winds  
Golf Course  
Cannon AFB, NM*

*The protected Mississippi kite is a beautiful bird of prey.*

**Management approach**

- 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.



*Whispering Winds  
Golf Course  
Cannon AFB, NM*

*The Mississippi kites think a golf course is one of the best nesting areas around.*



*Whispering Winds  
Golf Course  
Cannon AFB, NM*

*Unfortunately, invasive Siberian elms were planted in large numbers in the early days of Whispering Winds Golf Course history.*

## **INVASIVE SPECIES**

The INRMP utilizes ecosystem management as its primary focus. Accordingly, the INRMP states “two major components of ecosystem management are biodiversity conservation and control of exotic and invasive species. For biodiversity the goal is to maintain or re-establish viable populations of native species on AF controlled lands when practical and consistent with the military mission. The primary goals associated with control of exotic and invasive species is to determine presence/absence of these species and, where necessary, to develop and implement plans to control or eradicate these species. To increase the effectiveness of control, management plans for the control of exotic and invasive species should be a cooperative effort with federal, state, and/or local agencies, and adjoining landowners

Invasive species, particularly plants, are under the purview of the integrated pest management program; however, invasive plant species are also of particular interest to natural resources personnel due to cattle outleasing, erosion, and degradation of important, natural habitats. There are up to 20 species identified as potentially invasive in the local Cannon AFB region. These include field bindweed, saltcedar and Siberian elm.

## **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)
- Alaska Statutes 03.05.010, 03.05.030 and 44.37.030

### **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
- 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 request an invasive species survey from the environmental staff and assist with the completion of an approved plan to contain or reduce these species according to the accompanying schedule.



*Whispering Winds  
Golf Course  
Cannon AFB, NM*

*Pond banks are a great place for invasive species to establish themselves.*



*Whispering Winds  
Golf Course  
Cannon AFB, NM y*

*The yellow-billed cuckoo (Coccyzus americanus occidentalis).*

### **THREATENED OR ENDANGERED SPECIES**

Although no resident listed threatened or endangered species are known at Cannon AFB, Although no resident threatened or endangered species are known to occur at Cannon AFB, surveys conducted between 2004 and 2008 revealed three federal species of concern: Burrowing owl (federal species of concern, summer resident/nester); yellow-billed cuckoo (federal species of concern, state-sensitive, rare); and black-tailed prairie dog (federal species of concern, state-sensitive, resident).

Six federal avian species of conservation concern were also found during the 2004 and/or 2008 surveys to include Northern harrier, Prairie falcon, Long-billed curlew, Burrowing owl, Cassin's sparrow and Lark bunting. One State sensitive mammal species, red fox, also occurs on Cannon AFB.

### **Driver/requirement**

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

### **Objective**

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

**Management approach**

- Ensure that maintenance practices for all identified potential threatened or endangered species habitats are coordinated with environmental staff

**Target**

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



*Whispering Winds  
Golf Course  
Cannon AFB, NM*

*The ubiquitous burrowing owl is officially designated as a species of concern by the U.S. Fish and Wildlife Service.*



*Whispering Winds  
Golf Course  
Cannon AFB, NM*

*The red fox is listed as a state sensitive species for New Mexico.*

## **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.

- Adopt and post a copy of the golf course's environmental policy statement and a map of the identified environmental challenges
- Conduct an annual review of maintenance practices and how they may affect an identified environmental challenge and the management approach, objective and target
- Request a comprehensive energy audit from appropriate installation personnel for the entire golf course facility
- Create and use scouting forms to document pest conditions and organize them into a report to guide future pest control decisions
- Compile written pest profiles for all common regional pests

**Objectives** are defined as actions or results that are desired to be accomplished prior to the next INRMP update in 2015.

- Compile a written comprehensive Water Resource Management Plan for the entire golf course facility that includes a Drought Management Plan
- Ensure that all oil/water separators are operating properly and are correctly maintained
- Install real-time evapotranspiration rate irrigation system computer controller
- Acquire and install an adequate cover for wash rack

## **GEM Plan best practices**

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

- Verticut greens often and leave holes open
- Increased aeration to monthly with ¼" solid tines



*Whispering Winds  
Golf Course  
Cannon AFB, NM*

*Clean and organized work spaces are often the safest.*

## **Conclusion**

Although the Whispering Winds Golf Course staff must deal with several environmental challenges in their daily tasks, they still provide a high quality golfing experience. The installation regularly leads the Air Force in customer satisfaction. This statement is evident upon visiting the course and meeting its staff. From the golf course manager to the fine snack bar employees, the golf facility provides a friendly recreational atmosphere. Combine this with a professional environmental staff and a nice golf course design and you have a successful operation with a bright future for the residents of Cannon AFB and the surrounding community.

## **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.



*Railroad ties do not perform over the long term.*



*Trees define fairways and shade important play areas.*



*On-course restroom facility uses a failing septic system.*



*Pond is beginning to become overgrown.*



*Bilingual signage increases safety.*



*Some of Whispering Winds' holes lack definition.*



*Aeration is an important aspect of water quality.*



*Supplemental irrigation tank and pump house.*



*Cart washing on sidewalk shows acid etching.*



*Well-designed and maintained safety board.*



*Green is losing competition with tree roots.*



*Snack bar packs 'em in for lunch every day.*

## 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.

**27<sup>th</sup> Special Operations Wing**, *Pre-Final Integrated Natural And Cultural Resources Management Plan, Plan Years 2009 – 2014*, Cannon Air Force Base, Clovis, New Mexico,

**27 SOW/SE**, *BASH Plan*, 27<sup>th</sup> Special Operations Wing, Cannon AFB, NM, 1 May 09.

**Olson, William C.**, New Mexico Environment Department Ground Water Quality Bureau, *Discharge Permit Renewal and Modification, DP-873, Cannon Air Force Base Letter*, Santa Fe, NM, 30 Jan 09.

**Flores, Miguel I. & Shahriyar, Syed A.**, Authorization to Discharge Under the National Pollutant Discharge Elimination System, Dallas, TX, 27 Feb 06.

**27 SOCES/CEOUE**, *CY 2008 Installation Pest Management Plan, Cannon Air Force Base, New Mexico*, Jan 07.

**New Mexico Environment Department**, *Discharge Permit Renewal and Modification, DP-873, Cannon Air Force Base*, letter to Commander, 27<sup>th</sup> Special Operations Wing, 30 Jan 09.



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

For additional assistance or more information, please contact:  
**AFCEE GEM Program Manager – 210-536-5630 - DSN 240-5630**  
**AFCEE/TDB, 3300 Sidney Brooks, San Antonio, TX 78235-5112**  
**[afcee.td.awag@brooks.af.mil?subject=golf](mailto:afcee.td.awag@brooks.af.mil?subject=golf)**

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