



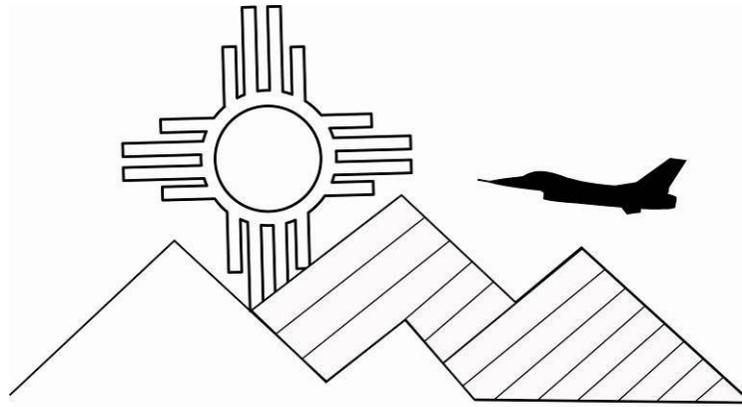
***Tijeras Arroyo Golf Course
Environmental Management (GEM) Plan
Kirtland AFB, New Mexico***



October 2008



San Antonio, Texas



Tijeras Arroyo GC

Tijeras Arroyo Golf Course Environmental Management Policy

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

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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 = 57, Getting started**
- **Potential ECQ = 72, Showing progress**

Potential or Final environmental challenges

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

- Nuisance species
- Migratory birds
- Energy conservation
- Installation Restoration Program (IRP) sites
- Proposed improvement projects
- Air quality

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/>).



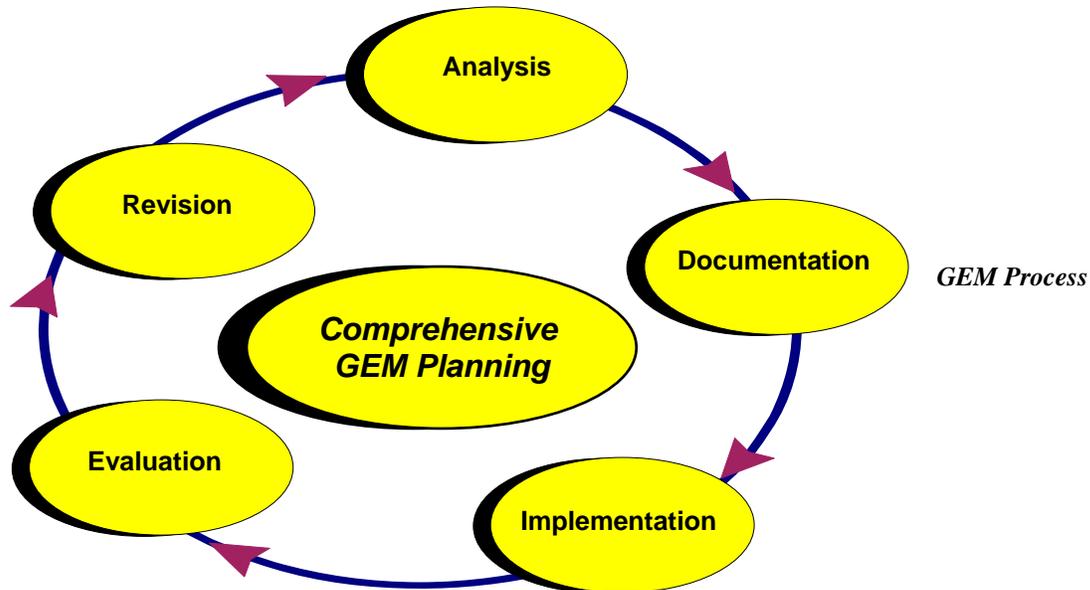
*Tijeras Arroyo Golf Course
Kirtland AFB, NM*

The 1st green is guarded by a huge sand bunker.

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.



*Tijeras Arroyo Golf
Course
Kirtland AFB, NM*

The course is ready for a complete bunker renovation project.

U.S. AIR FORCE GEM PLAN COMPONENTS

The GEM Plan will be comprised of the following components:

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

Implementation

Positive and decisive action is the only true measure of the success of the GEM Plan. By implementing new practices, whether to knowingly improve the course's role in the environmental stewardship of the installation or to just try new ideas to determine their value, will the golf staff and golfers benefit. The installation golf staff should consider adopting the GEM Initiative process and establish an environmental policy that minimizes or eliminates any and all potential negative environmental impacts.

Evaluation

In order to ensure the highest quality of customer service and environmental stewardship, there must be continual self-evaluation and improvement. There also should be consistent, on-going measurement of the reduction or elimination of environmental impacts the newly implemented practices have on the course. For example, documenting the reduced use of inputs such as fertilizers, pesticides, and irrigation can be used to demonstrate the increased environmental stewardship of the golf course management practices as well as the overall value of the GEM initiative. It is important for golf courses to show improvement over time. Improvements can be easily accomplished by regularly evaluating golf course maintenance methods, practices, and management approaches to day-to-day issues in concert with the desire and ability to change.

Revision

The very nature of a superior GEM Plan implies that all documents be regularly maintained to represent the most current conditions. Golf course managers and superintendents should be constantly looking for ways to improve their environmental stewardship. Acting on lessons learned is right behind initial implementation as the most important aspect of a successful GEM Plan. The GEM Plan should be kept as current as possible at all times. Ideally, it should be updated annually and completely rewritten on the same cycle as the Integrated Natural Resources Management Plan.

Course Specific Analysis

One of the most pragmatic and enjoyable tasks in the baseline assessment portion of the GEM process is the course specific analysis. From a general description of the course to the details of the course's history and makeup to the various observations on course playability, aesthetics, and style of management, the course specific analysis sets the stage for the rest of the GEM Plan report.



Course Layout Map

Course Description

Nestled next to the Manzanita Mountains and bounded on the west by the Tijeras Arroyo, a large, normally dry desert wash, the golf course at Kirtland AFB embraces its central New Mexican environment. Turf flourishes only where the original 1976 irrigation system delivers water. The 18-hole, nearly 7000 yard track is nicely routed amongst the ancient talus slopes of the nearby mountain ranges. Numerous water-loving trees define the golfing corridors while several small, oddly-conceived and located ponds interfere with play along the way. All in all, Tijeras Arroyo is a fun golf course that is probably in its best condition ever - a living testament to the director's and the superintendent's love for the game and their customers.



Tijeras Arroyo Golf Course Aerial Photo, Kirtland AFB, NM



*Tijeras Arroyo
Golf Course
Kirtland AFB, NM*

Clean, clear air, refreshing breezes and mostly sunny skies typify the climate in Albuquerque, New Mexico.

Course Details

Architect	Unknown
Year constructed	1971
Climate	High desert
Average annual precipitation	10 inches
Average growing season	225 days
Elevation	5200 ft ASL
Prevailing wind direction	East/west
Total facility acreage	210 acres
Total actively maintained acreage	110
Par	36-36-72
Yardage/Rating/Slope	Black- 6971/71.9/127 Blue- 6574/69.9/123 Silver- 6268/68.5/120 Green- 5889/66.9/114
Turfgrass	Bluegrass/Bermudagrass
Tees-	Bluegrass
Fairways-	Pennecross
Greens	Bluegrass/fescue
Roughs-	
Irrigation source	Non-potable well supplemented with restoration effluent



*Tijeras Arroyo
Golf Course
Kirtland AFB, NM*

Nicely designed facility sign greets customers at course entry.

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)



*Tijeras Arroyo
Golf Course
Kirtland AFB, NM*

A new patio addition provides comfortable outdoor dining opportunities.

The following ECQ checklists are a record of the interview conducted with Tijeras Arroyo Golf Course manager, superintendent, and environmental staffer during the visit to Your Installation.

<u>Planning & Compliance</u>				
#	Environmental Compatibility Indicator	Yes	Partial	No
1	Has management demonstrated that environmental stewardship is an important part of their responsibilities by initiating the Comprehensive Golf course Environmental Management (GEM) Planning process?	✓		
2	Is the GEM Plan complete, updated regularly, and readily available to employees and customers?			✓
3	Has the golf course adopted and posted an environmental policy?		✓	
4	Is a map of the property highlighting environmental challenges posted for employees and customers?			✓
5	Does management conduct a comprehensive annual evaluation for each identified environmental challenge and its management approach, objective, and target?			✓
6	Does the course have a 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?		✓	
Totals		6	6	8

<u>Operations & Maintenance</u>				
#	Environmental Compatibility Indicator	Yes	Partial	No
1	Is there a written, regularly updated and comprehensive Turfgrass Management Plan for each type of turf and playing area?	✓		
2	Are there designated natural or minimally maintained buffers around sensitive landforms or features and/or core wildlife habitats?	✓		
3	Are green, tee, and fairway mowing heights maintained at levels that do not excessively stress important playing surfaces?	✓		
4	Are aeration, topdressing and other drainage improvements regularly implemented to improve soil health and minimize or eliminate inputs of pesticides or fertilizers?	✓		
5	Are soil tests or plant tissue analysis regularly used to determine turfgrass nutritional requirements?	✓		
6	Is the information collected in soil tests and plant tissue analysis integrated into a regularly updated Nutrient Requirement Plan and map?		✓	
7	Is there at least one project planned and funded for the next year that would improve the course's protection of the environment?	✓		
8	Are all appropriate employees trained to be familiar with (national, federal, state, and OSHA) regulations that apply to storage and handling of potentially hazardous materials used on the property?	✓		
9	Has there been an examination of all aspects of the operation for potential negative impacts for the snack bar/restaurant, clubhouse, pro shop, pesticide mixing and storage facilities, fuel storage and delivery areas, and maintenance complex?	✓		
10	Have all employees received documented training that would increase their awareness of environmental stewardship goals and objectives?			✓

Operations & Maintenance Checklist (continued).

#	Environmental Compatibility Indicator	Yes	Partial	No
11	Are containers used to store used oil for equipment maintenance in good condition, not leaking, and clearly labeled?	✓		
12	Are oil/water separators and/or golf course wash racks operating properly and correctly maintained?	✓		
13	Are all golf course vehicles and equipment maintained and cleaned in a manner that eliminates the potential for spreading of disease or other contamination?	✓		
14	Are biodiesel and/or ethanol products utilized everywhere they may be appropriate?	✓		
15	Are waste products such as oil, grease, tires, and batteries stored in a covered container and disposed of properly off site?	✓		
16	Does the superintendent use hand held GPS units to assist in GIS mapping of the golf course areas?			✓
17	Are energy efficiency ratings factored into equipment purchases for use throughout the facility?	✓		
18	Has the entire facility been studied to quantify solid waste streams to identify functions that produce the greatest quantities?	✓		
19	Are at least 90% plates, cups, and utensils in use by the restaurant/snack bar facility reusable rather than disposable?			✓
20	Does course management utilize a web-based golf course planning tool for every day decision-making and recordkeeping?			✓
Totals		15	1	4

<u>Water Resource Management</u>				
#	Environmental Compatibility Indicator	Yes	Partial	No
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?	✓		
Totals		11	4	5

<u>Conservation</u>				
#	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?	✓		
Totals		12	2	6

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

Pesticides & Pollution Prevention Checklist (continued).

#	Environmental Compatibility Indicator	Yes	Partial	No
11	Are all pesticide applications recorded and mapped to guide future pest control decisions?	✓		
12	Other than the head superintendent, are there trained scouts on staff to monitor turf and plant health and pest problems?	✓		
13	Are there scouting forms utilized and are they collected and organized into a report or guide for use in future pest control decisions?			✓
14	Is IPMIS being used to track activities including surveillance and biological, cultural, mechanical, and chemical controls?	✓		
15	Are current copies of all Material Safety Data Sheets (MSDS) for all chemicals used anywhere on the golf course property maintained and readily available?	✓		
16	Are fertilizers and pesticides stored in separate facilities?	✓		
17	Is the chemical storage structure/area locked, well ventilated and fire resistant and is access limited to appropriate personnel?	✓		
18	Is there a regularly updated Water Pollution Abatement Plan readily available for the golf course property?			✓
19	Are golfers adequately notified in the pro shop and on the first and tenth tees about the day's planned or recently completed spraying of any chemical or fertilizer?	✓		
20	Are there written pest profiles for common regional pests along with alternative potential control measures readily available?		✓	
Totals		13	2	5



*Tijeras Arroyo
Golf Course
Kirtland AFB, NM*

Numerous existing trees like these short-lived Lombardy poplars will soon need to be removed and or replaced.

<u>Environmental Compatibility Quotient Summary</u>			
Environmental Compatibility Category	Yes	Partial	No
Planning & Compliance	6	6	8
Operations & Maintenance	15	1	4
Water Resource Management	11	4	5
Conservation	12	2	6
Pesticides & Pollution Prevention	13	2	5
Totals	57	15	28

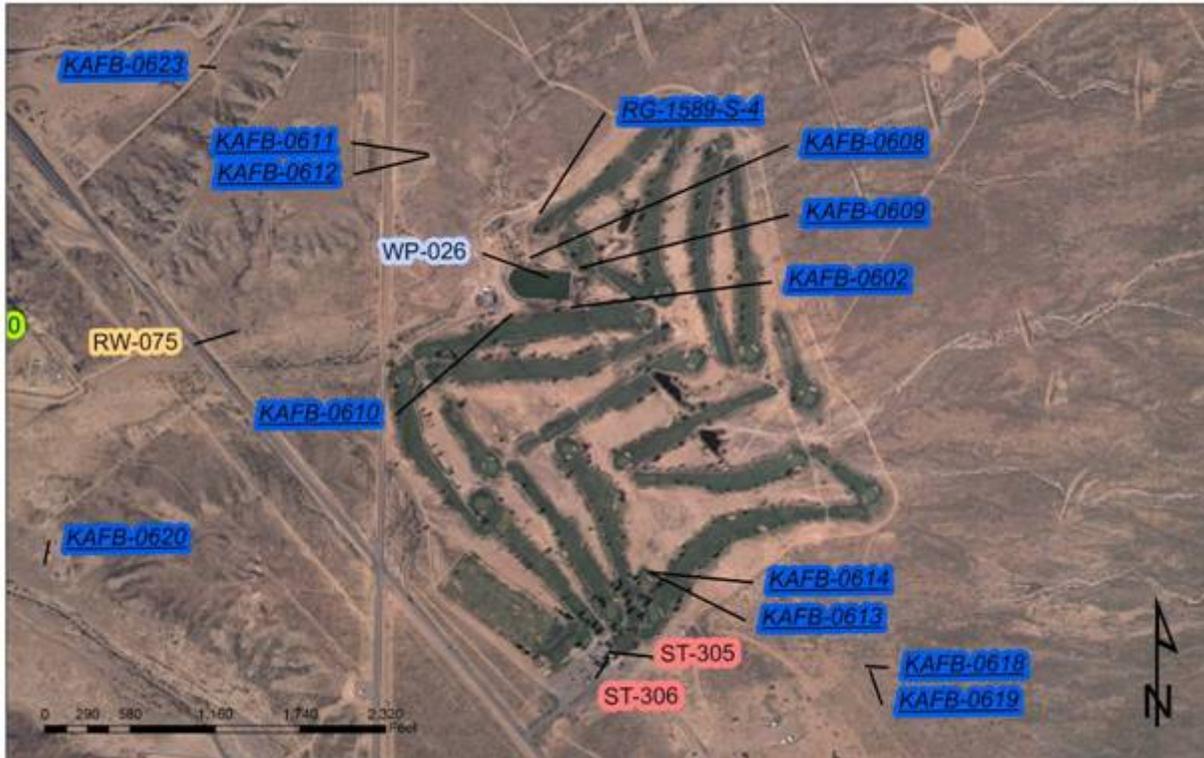
Key to checklist responses

- **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

Oct 08 – Tijeras Arroyo Golf Course ECQ:

- Actual ECQ = 57, Just started (**Red**)
- Potential ECQ = 72, Showing progress (**Yellow**)

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



Environmental Challenges Map

Environmental Challenges

One of the important results of the GCEBA process is the identification of significant environmental challenges to be addressed in the GEM Plan. Ideally, the golf staff will address their management approach to each challenge to accomplish course and local community environmental management objectives while still attaining acceptable levels of course playability and customer satisfaction. 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:

- Nuisance species
- Migratory birds
- Energy conservation
- Installation Restoration Program (IRP) sites
- Proposed improvement projects
- Air quality

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 page 2), and established objectives and targets is the heart of the GEM Plan.

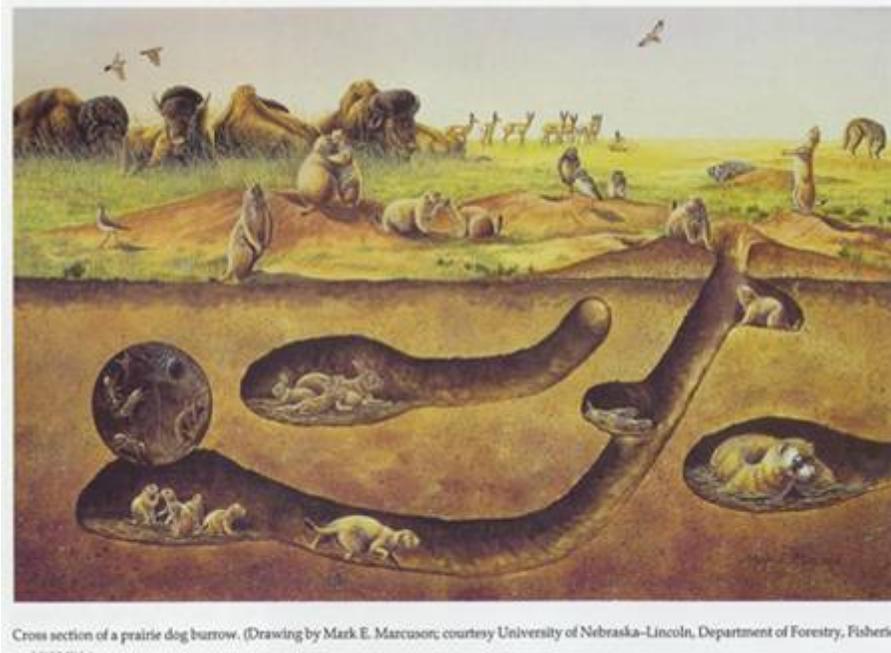
TARGET

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



*Tijeras Arroyo
Golf Course
Kirtland AFB, NM*

Prairie dogs are as cute as they are destructive!



Cross section of a prairie dog burrow. (Drawing by Mark E. Marcuson; courtesy University of Nebraska-Lincoln, Department of Forestry, Fisheries

Prairie dogs often make their homes among many other burrowing species.

*Tijeras Arroyo
Golf Course
Kirtland AFB, NM*

Nuisance species

According to the NMSU Guide L-201, “New Mexico is the home of the black-tailed and Gunnison prairie dogs. Black-tailed prairie dogs occupy most of the eastern half of the state, and Gunnison prairie dogs are found in the western half. One of the first considerations is to determine if you have a problem. Although prairie dog control may be necessary for health concerns and other reasons, most control programs are undertaken because the rodents remove important vegetation. Prairie dogs clip and remove vegetation near their burrows, eating the vegetation and cutting it for nesting material. Prairie dogs also cut vegetation to maintain space and remove cover that might hide predators. In general, if there are at least 10–15 prairie dog mounds per acre, the value of lost vegetation justifies the cost of a control program. If there are fewer than 10–15 mounds per acre, the cost of treatment usually outweighs the value of lost vegetation. If, however, prairie dog control is implemented to prevent or eliminate further expansion, considerations other than vegetation loss may justify the control effort.”

The Prairie Dog Management Environmental Assessment states that among several other areas of Kirtland AFB, the Tijeras Arroyo Golf Course “Prairie dogs will not be allowed in these areas due to land use conflicts, risk to human health and safety, and threat to military operations.”

Additionally, the INRMP states under golf course pests “Mosquitoes represent a particular problem on the golf course and are controlled through physical, biological and chemical means. Other golf course pests include coontail, anthracnose foliar blight, gray snow mold or typhula blight, puncture vines, broadleaf plantain, and common mallow.

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
- Consider the addition of raptor poles to encourage natural control of nuisance mammal species

Target

Eliminate all nuisance pests on the actively maintained portions of the golf course by 2012 as permitted or allowed by the installation environmental management staff.



*Tijeras Arroyo
Golf Course
Kirtland AFB, NM*

Both the Gunnison's and the Black-Tailed prairie dogs occur in New Mexico.



*Tijeras Arroyo
Golf Course
Kirtland AFB, NM*

Athene cunicularia, or burrowing owl, occurs throughout the western United States.

Migratory birds

Burrowing owls are among the most interesting native American. They are usually easy to see as they are active in the daylight hours and are fairly tolerant of human activity. According to the Burrowing Owl Plan, they “prefer flat open areas with short vegetation and available burrows, these owls are often seen sharing abandoned fields, channels, parks, or other open areas around cities, areas with crops, and rangelands. They also inhabit many types of ‘artificial habitats’, such as airfields, parking lots, sports fields, and golf courses. Although the 2007 study notes that only one breeding pair has been known to occupy the course, managers must be prepared to properly care for these migratory animals. The Burrowing Owl Plan states that the Tijeras Arroyo Golf Course “has short, maintained vegetation, and due to watering, an abundance of prey. Although the 2007 pair was very productive (producing eight fledglings), there was evidence of poison found around the owl burrow. This issue is under investigation.

Driver/requirement

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

Objective

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

Management approach

- Work closely with installation environmental staff to document presence of migratory birds such as the burrowing owl and follow all provided maintenance guidelines
- Never allow prairie dog management or any other management practice to harm or kill migratory bird species

Target

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



*Tijeras Arroyo
Golf Course
Kirtland AFB, NM*

Abandoned prairie dog burrows can provide a home for the burrowing owl if they are located away from human activity.



*Tijeras Arroyo
Golf Course
Kirtland AFB, NM*

The irrigation pump house and controller is a great source of energy savings.

Energy conservation

Energy use has become a major concern for nearly everyone worldwide in the last few years. The phenomenal rise in gas prices has fueled increased costs for nearly every commodity. Utilities such as electrical are not immune to this trend. The course management desires to install solar panels to assist in their greening of the golf course facilities. Sustainable operations begin with sustainable planning. The sustainability efforts of golf course management are laudable and should receive complete support and approval. Solar panel installation is another initiative. The clubhouse and possibly the maintenance complex could provide an efficiency opportunity for energy savings.

Driver/requirement

- Executive Order 13123, Greening the Government Through Efficient Energy Management
- Executive Order 13423, Strengthening Federal Environmental, Energy and Transportation Management
- Energy Independence & Security Act

Objective

Meet all presidential and regulatory directives on energy conservation.

Management approach

- Consider energy efficiency prior to all equipment purchases throughout the facility
- Pursue solar energy generation modifications to the clubhouse

Target

Attain comprehensive compliance with all directives within prescribed milestones for the entire golf course facility.



*Tijeras Arroyo
Golf Course
Kirtland AFB, NM*

The clubhouse is a primary consideration for solar panel installation.



*Tijeras Arroyo
Golf Course
Kirtland AFB, NM*

Preserving groundwater quality is serious business at Kirtland AFB.

Installation Restoration Program (IRP) sites

Several monitoring wells can be observed throughout the Tijeras Arroyo Golf Course facility property. Test results of Kirtland's Well #7 revealed high nitrate concentrations – much higher than allowed for drinking water. The installation's solution to this challenge was to pipe the water from #7 to the golf course where it could be used for irrigation purposes. Several water hazards, now lined as part of the remediation, store this water prior to its use to nurture the turfgrasses.

Driver/requirement

- AFI 32-7020, The Environmental Restoration Program
- Resource Conservation Recovery Act (RCRA)

Objective

Ensure daily compliance with restoration program site requirements.

Management approach

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

Target

Immediately integrate direction into regular maintenance practices.



*Tijeras Arroyo
Golf Course
Kirtland AFB, NM*

The new cart storage facility is near the proposed site for the new maintenance complex relocation.

Proposed improvement projects

One of the most common recurring problems with Air Force golf is the relative age and functionality of a course's irrigation system. Water is the lifeblood of a golf course – especially one located in a low precipitation area like New Mexico. Inefficient pumps waste energy and water. Out of date or non-functioning controllers inhibit flexibility and stewardship efforts. Leaking pipes waste tremendous amounts of water and worn out sprinklers and nozzles do a poor job of getting the water where it is needed without creating puddles and poor playing conditions. All of these reasons are why Tijeras Arroyo Golf Course managers believe they need and deserve a new state of the art irrigation system.

Another proposed project for the Kirtland AFB golf management staff is the relocation of the maintenance complex. The facility currently sits on the far west side of the property. The wash rack, which, according to the environmental staff, is the only approved location to wash any type of equipment. The golf equipment must be driven across the entire course to be washed or then return to the maintenance complex. In addition, the fuel tank for the same equipment is also on the east side of the property near the wash rack. The golf course management staff desires to relocate the maintenance complex near the wash rack and the fuel tank which just happen to be near the tree nursery and the new golf cart storage facility.

Driver/requirement

- National Environmental Policy Act
- AFI 32-7060, Environmental Impact Analysis Process

Objective

Ensure that all project proposals receive appropriate impact analysis well in advance of scheduled implementation of the proposed action.

Management approach

- Complete appropriate work request and impact analysis forms to ensure that environmental documentation is complete prior to taking any action
- Consult with installation impact analysis program manager at earliest possible time

Target

Initiate all projects by completing an AF Form 332 and AF Form 813 as soon as feasible.



*Tijeras Arroyo
Golf Course
Kirtland AFB, NM*

The heart of the irrigation system at Tijeras Arroyo is the main pond near the 11th and 12th holes.



*Tijeras Arroyo
Golf Course
Kirtland AFB, NM*

Pristine skies and clean air are the norm in Albuquerque.

Air quality

According to the INRMP, “Air quality at Kirtland AFB is a function of several factors, including the quantity and dispersion rates of pollutants in the region, temperature, the presence or absence of inversions, and topographic and geographic features of the region. The Albuquerque Environmental Health Department performs air quality functions in Albuquerque, and the Albuquerque-Bernalillo County Air Quality Control Board governs them. The 1990 amendments to the Clean Air Act (CAA) require federal agencies to conform to the affected State Implementation Plan (SIP) with respect to achieving and maintaining attainment of National Ambient Air Quality Standards and addressing air quality impacts. The CAA General Conformity Rule states that nonattainment and maintenance areas must conform to the applicable SIP. Kirtland AFB is covered by a Carbon Monoxide Maintenance Plan.

Kirtland AFB’s mission-related air emissions are from training exercises, aircraft engine testing, activities related to aircraft refueling and maintenance, explosive ordnance disposal, fuel storage and distribution, and corrosion control activities. Non-mission related air emissions come from external combustion, internal combustion engines, and vehicle refueling and maintenance.”

Driver/requirement

- Clean Air Act

Objective

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

Management approach

- Encourage employees to minimize their trips on and around the course
- Ensure equipment cleaning solution containers are closed at all times
- Eliminate all aerosols from maintenance and clubhouse inventories
- Replace 2-cycle powered equipment as funding and technology allow
- Prepare policy to alter maintenance staff work plans during announced regional air quality health alert days
- Discourage use of non-paved maintenance trails during extremely dry and windy conditions

Target

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



Implementation

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

GEM Plan goals & objectives

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

- Post a map highlighting the identified environmental challenges for both employees and customers
- Deliver and document environmental training to all employees
- Establish, document and communicate fertilizer and pesticide application buffers to all appropriate employees

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

- Compile and implement Tree Management, Drought Management and Water Resource Management Plans for the entire facility
- Map the courses "hot spots" that require special care or attention
- Compile and begin implementation of a comprehensive Golf Course Development Plan
- Regularly monitor the quality of the course's irrigation water
- Ensure that only drought-tolerant native plant materials are used in developing the landscape
- Repair all degraded or damaged landscapes due to construction or maintenance of the course

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.

- Acquired license to specifically deal with primary nuisance species
- Utilized environmental restoration project to secure long term irrigation source



*Tijeras Arroyo
Golf Course
Kirtland AFB, NM*

Your descriptive caption here.

Conclusion

The Tijeras Arroyo Golf Course is under new management. The improvements are obvious to all. The snack bar is full for lunch. The course's greens are smooth as velvet and the number of rounds is up – in a down market! Hiring folks with energy and desire is really paying off. It is time for the rest of us to rally round and help these fine folks out. Take an afternoon and tee it up at Kirtland. It will be a great time spent.

Environmentally, the course is also in fine condition. Securing a long term water supply along with the establishment of new and better relationships with installation environmental managers are two great steps toward sustainability. The journey awaits. Let's get started!

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.



Burrowing owls provide a unique challenge.



The overall quality of the course is greatly improved.



Nitrate-laden waters fill the golf course ponds.



Wash rack is a recurring source of water quality concerns.



Poor drainage fronting the green and bunker hinder play.



Tree nursery success is questionable.



Battery-driven golf carts assist with air quality compliance.



Many natural areas occur throughout the course .



Maintenance complex provides minimal indoor storage.



Prairie dog war zone at the driving range.



Soils are eroding into the golf hazards/Well#7 ponds.



Emergent vegetation is showing up in the irrigation pond.

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**Air Force Center for Engineering & the Environment
Technical Directorate
Natural Infrastructure Division**

For additional assistance or more information, please contact:
AFCEE GEM Program Manager – 210-536-4995 - DSN 240-4995
AFCEE/TDN, 3300 Sidney Brooks, San Antonio, TX 78235-5112
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/>