Golf Course Environmental Management Plan

Tinker Air Force Base

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1 Introduction

Purpose of Plan

In 1996, the Air Force began development of the Golf Course Environmental Management (GEM) program which is a proactive initiative to foster better understanding of the environmental challenges facing golf courses worldwide. The goal of this Air Force Services Agency-approved program is to facilitate the creation of an environmentally friendly golf course facility while supporting the installation mission. The primary tenets of the GEM program are to minimize or eliminate potential negative environmental impacts, attain and maintain daily compliance with all appropriate regulations, and constantly examine all aspects of golf course management to achieve the highest standards of environmental excellence.

In 2004, the Air Force Center for Environmental Excellence (AFCEE) initiated the GEM process on Tinker AFB by conducting a golf course environmental baseline assessment (GCEBA, Appendix 1). This GEM Plan is the next step of the GEM planning process and is intended to guide natural resources conservation actions on Tinker's golf course for the next five years (FY2007-2011).

This plan complies with AFI 32-7064, *Integrated Natural Resources Management*, and is consistent with the land management goals of the Integrated Natural Resources Management Plan (INRMP).

Plan Organization

The GEM Plan consists of the following components:

Section 1 – Introduction

Section 2 – Environmental Challenges

Section 3 – Environmental Management Strategy

Section 4 – Best Management Practices

Policy Statement:

Tinker AFB supports and encourages sound environmental stewardship on its golf course. In demonstration of that commitment, the base has adopted the U.S. Air Force Golf Course Environmental Management Policy which states:

> ***In concert with the mission of the United States Air Force, 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 constantly reevaluate our processes to achieve the highest standards of environmental excellence.***

This overarching statement has directed development of this Plan and will guide future environmental-related management decisions on the golf course. More specific policies appear in Section 3 (Environmental Management Strategy).

2 Environmental Challenges

The GCEBA identified seven environmental challenges on Tinker's golf course. Additional challenges have been added by Tinker Environmental Management (EM) staff consistent with natural resources management policy and guidance outlined in the Tinker INRMP. The following describes each environmental challenge. To aid in management, and as appropriate and available, each challenge has been mapped (Appendix 2)

Challenge 1: Air Installation Compatibility Use Zone (AICUZ) (Map 1)

According to the General Plan, "DOD uses the AICUZ program to protect aircraft operational capabilities at its installations and to assist local government officials in protecting and promoting the public health, safety, and quality of life." Tinker's golf course is within the clear zone and accident potential zone (APZ) I which limits installation of buildings, certain plant materials, and other structures. The primary areas of concern are the golf course clubhouse and large trees which are located in the clear zone.

Challenge 2: Floodplains/Wetlands (Map 2)

Within the golf course boundaries shown in this plan, the course is comprised of a total of 189 acres. Eighty-six acres (46%) are within the 100-year floodplain (including National Wetlands Inventory wetlands). Of the 86 acres of floodplain, 72 acres (84%) are improved grounds (ie., intensively manicured turfgrass and paved surfaces/buildings), 1 acre (1%) is semi-improved grounds, and 13 acres (15%) are unimproved grounds (turf).

The primary environmental-related floodplain/wetland challenge that exists on the golf course is compliance with Executive Order 11988, Floodplain Management, which requires Tinker AFB to restore and preserve the natural and beneficial functions and values served by floodplains in carrying out its responsibilities.

Floodplains and wetlands provide many beneficial functions and values. Functions currently provided by the golf course floodplain include:

- protection of banks from erosion,
- attenuation of flood peaks,
- fish and wildlife habitat,

- flora and fauna migration corridors,
- nutrient filtering,
- water quality maintenance by acting as sediment repositories
- ground water recharge

Human-derived values from Tinker's floodplain include:

- recreational sites/opportunities (e.g., golf course),
- natural beauty,
- flood storage (reduce flood-related damage)
- non-point source pollutant (e.g., pesticides, fertilizers) filtering which improves water quality and ensures compliance with NEPDS permit limits and ensures continuance of base mission

Although these functions and values are realized, it is on a relatively small scale because the majority (84%) of the golf course floodplain is improved grounds which contributes very little to the functions and values stated above. The challenge lies in how to improve floodplain functions and values while at the same time providing a championship-level golf course.

Challenge 3: Water quality; Groundwater Management Unit; and Installation Restoration Program (IRP) sites (Map 3)

Water quality, both ground and surface water, are areas of ecological concern on the golf course. Portions of the golf course are located over potentially contaminated ground water plumes. This presents possible challenges during excavation activities (e.g., installation of a subsurface irrigation line).

Maintaining a balance between high water quality and a lush attractive golf course is an additional challenge. Significant applications of herbicides and fertilizers must be made to maintain the desired visual attractiveness of the course. However, these could lead to the harmful introduction of these chemicals into the adjacent waterways. Although there have been no specific water quality issues identified associated with these turf grass maintenance activities, no aquatic studies of the biotic life has been done. The current health and trend of the aquatic environments is unknown.

Challenge 4: Soils Uses and Limitations (Map 4)

Soils have many uses and limitations. Performance of trees is largely determined by the type soil the tree is growing in. Turfgrass irrigation schedules may vary from one area to another based on the underlying soil types. Ponds must be constructed on soils of low permeability to ensure they adequately hold water. The primary environmental challenge

associated with soils is that they may not support the specific desired improvements on the of golf course.

Another soil-related challenge is erosion. Currently, all pond shorelines and some creek banks are mowed to the waterline, primarily for aesthetic reasons and to permit course play. This lack of vegetative cover contributes to shoreline and creek bank erosion. Erosion results in soil loss, degraded water quality, sedimentation, and other problems. In some cases cart bridge stability has been compromised by erosion at the bridge abutments.

Challenge 5: Oklahoma Species of Concern; Migratory Birds; Bird/Wildlife Aircraft Strike Hazard (BASH) (Map 5)

Only one species of concern, the migrant loggerhead shrike *Lanius ludovicianus* spp *migrans*, has been identified as potentially occurring on the golf course. This is based on a single sighting during a 1995 sensitive species survey. However, due to difficulty in differentiating *Lanius ludovicianus* from *Lanius ludovicianus* spp *migrans* in the field, it was not certain as to whether this was the migrant race. Therefore, the actual status of this species on the golf course is uncertain.

Over 220 fish and wildlife species have been identified base-wide, many of which are expected to inhabit or visit the golf course; however, no comprehensive golf-course specific survey has been conducted. Status and trends of wildlife populations on the golf course are unknown.

Tinker AFB is located in the Central Migratory Flyway. Millions of waterfowl migrate through central Oklahoma via this flyway in the spring and fall of each year. Of particular concern is the potential attraction of migrant and resident geese. The large size and flocking habits of these birds pose significant bird/aircraft strike hazard potential. Since 2001, the United States Department of Agriculture (USDA) Wildlife Services has been contracted by Tinker AFB to provide wildlife control services for Tinker to include hazing and removing geese from the golf course. This has been effective in reducing waterfowl-related hazards.

Another species of particular concern is the Mississippi kite, a medium-sized raptor. Kites have historically nested on the golf course and can become very aggressive during the breeding season. Kites may attack golfers who come within close proximity to nest trees. Moreover, densities of this species appears to have risen substantially in recent years. Their soaring behavior, particularly late in the year when they soar in larger numbers, makes them significant potential bird aircraft strike hazards. Control of these birds in the golf course area will be important to ensuring a safe flying environment for aircraft utilizing Tinker's airfield and for golfers on the course.

Beaver have also caused conflicts with golf course landscaping goals by damaging/killing large shade trees. However, they also play an important role in the creek ecosystem ecology by providing pools, promoting creek aggradation in a degradation-dominated system, and other benefits and therefore should be managed to maintain a balance on the course.

Challenge 6: Environmental Exclusion Areas (Map 5)

No excavation is permitted in environmental exclusion areas. This challenge may limit certain golf course improvements, such as planting trees, running subsurface irrigation lines, etc. in the exclusion areas.

Challenge 7: Vegetation Management (Map 6)

Several vegetation management challenges have been identified on the golf course. Of the course's 189 acres, 169 acres (89%) are improved grounds, 7 acres (4%) are semi-improved grounds, and 13 acres (7%) are unimproved grounds. The improved grounds require intensive maintenance which limits use of manpower for other golf course improvements.

Semi-improved grounds are comprised of land that has been converted from turf grass to native tall grass. Invasive exotics such as Bermuda grass persists in some areas of the native grass stands, and larger ornamental grasses are spreading into the stands at some locations. Also, woody species are becoming established in disturbed areas within the westernmost grass stand.

Nutrient loads from fertilizers have caused aggressive aquatic weeds such as filamentous algae to become densely established in ponds causing them to become unattractive at certain times of the year. Grass carp have been used to provide some control; however, algae continues to be a problem.

Challenge 8: Greens renovation project

This project was identified in the GCEBA as one of the environmental challenges but was completed in 2005 and therefore is not addressed in this plan.

3 Environmental Management Strategy

This section outlines the strategy planned to address the aforementioned challenges and other environmental-related issues for the period of FY2007-2011. As appropriate, proposed improvements such as shoreline stabilization, vegetative screening, native grass conversion, and others have been mapped (Appendix 3). This map also depicts "evaluation areas," which require more detailed evaluation and design to correct areas which are particularly problematic in meeting both environmental and golf course play goals simultaneously. This section also includes policy statements that have been established to ensure the environmental challenges area properly addressed.

Challenge 1: Installation Compatibility Use Zone (AICUZ)

Objective 1: To meet clear zone requirements, demolish existing clubhouse, and remodel B-6001 as the new clubhouse, which is outside the clear zone. (This objective has been established for general planning purposes consistent with the Base General Plan; no completion date is set due to uncertainty of funding).

Policy: Trees shall not be planted in the area designated as clear zone.

Policy: Ensure flight safety is integrated in all aspects of course management.

Challenge 2: Floodplains/Wetlands

Objective 1: By 2011, improve floodplain and adjacent habitat functions by converting 18 acres of turfgrass to native grasses.

> **Activity 1:** By 2007, convert Areas 2a, 2b, 6, 10, 11a, 11b, and 18a to native grass.
>
> **Activity 2:** By 2008, convert Areas 18b and 12b to native grass.
>
> **Activity 3:** By 2009, convert Areas 3a, 3b, 4, 8, 11c, 14, and 17 to native grass (in preparation for future conversion to 6 acres of woodlands).
>
> **Metric:** Baseline data has not been established for tracking this objective. It will be tracked in conjunction with the development of metrics outlined in Objective 3 of the Green Infrastructure Plan. This objective will also be tracked by measuring indigenous fish & wildlife species richness, diversity, and abundance in converted areas as outlined in Challenge 5, Objective 2.

Challenge 3: Water quality; Groundwater Management Unit; and Installation Restoration Program (IRP) sites

Objective 1: By 2016, improve water quality by reducing pesticide and fertilizer inputs to waterways.

Activity 1: By 2009, develop pest profiles of all insect and disease organisms that are controlled on the course.

Activity 2: By 2010 and in conjunction with Objective 1 under Flora – Vegetation Management of the INRMP Conservation Strategy (Chapter 3), conduct golf course evaluation of pesticide and fertilizer application program and develop strategy to reduce total amounts of active ingredient of pesticides and fertilizer use on Tinker.

Task: Attend Integrated Pest Management training.

Activity 3: In 2008, conduct experimental mid-summer (July) prescribed burn on existing established westernmost native grass stand to control warm season weeds and thereby eliminate the need for herbicide use.

Activity 4: By 15 Oct each year, the golf course maintenance superintendent will report all previous fiscal year pesticide usages in pounds of active ingredient (AI) per acre to Civil Engineering.

Activity 5: By 2010, determine if the DOD pesticide active ingredient policy took into account chemical toxicity, and if not pursue possible policy changes.

Metric: This objective will be tracked by 1) measuring the total amount of active ingredient of herbicides applied on the golf course, 2) annual spring/summer measurements of the amount of pesticide and fertilizer derivatives present in the base creek systems, and 3) by use of a benthic index to assess status and trends of aquatic macroinvertebrates.

Policy: Golf course personnel must obtain a digging permit prior to any excavation on the golf course. Environmental Management will review and determine potential ground water issues associated with excavation through the permitting process.

Challenge 4: Soils Uses and Limitations

Objective: By 2007, provide access to Parts I (survey area; descriptions of the general soil map units; detailed soil map units; soil series in the area; and description of how the soils formed) and Part II (use and management of the soils and the major soil properties) of the Oklahoma County Soil Survey on Environmental Management's web site.

Metric: NA

Objective: By 2010, stabilize shoreline with mesophytic plants to eliminate bank sloughing and erosion to improve aesthetics, water quality, and wildlife habitat.

> **Metric:** This objective will be tracked by site evaluation of the presence or absence of shoreline erosion.

Challenge 5: Oklahoma Species of Concern; Migratory Birds; Bird/Wildlife Aircraft Strike Hazard (BASH)

Objective 1: By summer 2007, annually maintain golf course area diurnal raptor nesting at zero and minimize diurnal raptor foraging to ensure a safe aircraft flying environment off the end of Runway 12-30.

> **Activity 1:** By April 2007, initiate management program to discourage Mississippi kite nesting on golf course (USDA/CEV)
>
> **Metric:** This objective will be tracked by conducting annual surveys and comparing data with the 2006 raptor baseline data.

Objective 2: By 2016, increase golf course indigenous fish & wildlife species richness, diversity, and abundance while reducing bird aircraft strike hazard(BASH) potential.

> **Project 1:** By spring 2007, execute ***Inventory, Baseline NR (WWYK071005)*** to conduct seasonal herptofauna survey
>
> **Project 2:** By 2008, conduct seasonal baseline mammals, birds, and macroinvertebrates surveys
>
> **Activity 1:** By 2007, identify, preserve, and map all wildlife trees (e.g., mast-producing trees such as oaks and hickories; standing dead trees, or snags; live trees with significant dead branches ~ 20 cm in diameter) beneficial to the red-headed woodpecker (species of national conservation concern)
>
> **Metric:** This objective will be measured by periodic fauna monitoring surveys and compared to the 2007/2008 baseline data.

Policy: Beaver management shall employ use of tree protection measures (e.g., hardware cloth) to the maximum extent practicable for tree protection. Beaver removal shall only be accomplished when harm is being done to desirable trees and when all other control measures have been exhausted and proven ineffective.

Challenge 6: Environmental Exclusion Areas

No objectives were applicable to this challenge.

Challenge 7: Vegetation Management

Objective 1: By 2011, improve golf course urban forest health by implementing Tinker AFB Urban Forestry Ordinance.

> **Project 1:** By May 2007, complete ***Plan Revision, INMRP (Urban Forest Inventory(WWYK991080)****
>
> **Activity 1:** By 2008, develop and implement prioritized tree maintenance schedule taking into account retention/placement of certain dead trees/branches beneficial to fish and wildlife.
>
> **Activity 2:** By 2010, develop urban forest planting plan and grow out trees at tree farm to support plan
>
> **Metric 1:** This objective will be tracked in conjunction with the urban forestry metrics under the Flora Implementation Strategy of the INRMP.

Objective 2: By Sep 2008, eradicate invasive non-native grasses and woody plants in existing native grass stands.

> **Activity 1:** By 2007, treat/remove all non-native ornamental grasses that are beginning to invade easternmost native grass stand.
>
> **Activity 2:** Treat/remove all Bermuda grass in easternmost native grass stand by Sep 2008.
>
> **Activity 3:** Remove volunteer trees/shrubs in westernmost tall grass area by Oct 2008
>
> **Metric:** This objective will be tracked be visual inspections of native grass areas to determine the presence or absence of the non-natives/woody plants identified.

Policy: Develop and manage towards a championship level naturalist golf course dominated by vegetation native the Central Oklahoma/Texas Plains and Central Great Plains ecoregions.

Policy: Manage course consistent with the Tinker AFB Green Infrastructure Plan.

Policy: Manage the course urban forest in accordance with the TAFB Urban Forestry Ordinance.

Policy: Add habitat complexity and structure to benefit native fauna without increasing BASH hazards.

General: This section outlines miscellaneous objectives and activities

Objective 1: By 2011, apply for and receive certification as an Audubon Cooperative Sanctuary (Appendix 4)

Activity 1: By 2007, apply for and receive Environmental Planning Certificate

Activity 2: By 2007, apply for and receive Water Conservation Certificate

Activity 3: By 2008, apply for and receive Wildlife and Habitat Management Certificate

Activity 4: By 2009, apply for and receive Member/Public Involvement Certificate

Activity 5: By 2011, apply for and receive Integrated Pest Management Certificate

Activity 6: By 2011, apply for and receive Water Quality Management Certificate

Metric: This objective will be tracked by successful receipt of certificates and ultimate certification as an Audubon Cooperative Sanctuary by date specified.

Objective 2: By 2011, heighten golfer awareness such that a minimum of 75% of golfers utilizing Tinker's course are aware of and support golf course environmental initiatives, policies, and programs.

Activity 1: By 2007, develop and present story board providing information on outcome of urban forest inventory at the golf course.

Activity 2: By Mar 2008, develop and present story board for golf course clubhouse on goals of the GEM Plan and to communicate importance of conservation practices on golf courses

Activity 3: By 2009, develop and present story board for golf course clubhouse on the findings of the fauna surveys.

Activity 4: By 2010, develop and present story board for golf course clubhouse on the uses and benefits of landscaping with native plants.

Activity 5: By 2011, hold Earth Day environmental awareness golf tournament.

Metric: This objective will be measured by a clubhouse survey at the end of 2011 to determine golfer's awareness of Tinker golf course environmental initiatives, policies, and programs.

*Note: Projects in bold are must funds

4 Best Management Practices

This section lists best management practices (BMP) by title as identified in the Tinker AFB Storm Water Pollution Prevention Plan (2002). Implementation of these practices is required to reduce the amount of pollutants discharged to storm water which ultimately leaves Tinker Air Force Base at Outfalls A2 (Crutcho Creek) and A3 (Kuhlman Creek). Current BMP's required for the golf course are:

BPM Title

Keep Equipment and Vehicles Clean

Maintain Equipment in Good Condition

Check Vehicles and Equipment for Leaks

Wash Equipment and Vehicles in Designated Area

Conduct Maintenance within a Building of Covered Area

Control Spills

Monitor Major Fueling Operations

Provide Absorbent Booms in Unbermed Fueling Areas

Expanded descriptions of each BMP are shown in Appendix J of the Tinker AFB Storm Water Pollution Prevention Plan (1997). Each BMP description includes:

- Description of potential pollutants and their sources addressed by the BMP
- Description of the BMP
- Frequency of BMP application (if applicable)
- Training needs
- Effectiveness and cost
- Limitations

Appendix 1

Tinker Golf Course
Environmental Baseline Assessment
Tinker AFB, OK May 04

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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 Environmental Excellence (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.

The primary tenets of the GEM Program are to minimize or eliminate potential negative environmental impacts, attain and maintain daily compliance with all appropriate regulations, and constantly examine all aspects of golf course management to achieve the highest standards of environmental excellence.

GEM Program process

There are five steps in the GEM program process.

- Analysis
- Documentation
- Implementation
- Evaluation
- Revision

Environmental challenges

The following environmental challenges were identified during the GCEBA process:

- Air Installation Compatibility Use Zone (AICUZ)
- Oklahoma Species of Concern/Migratory birds
- Bird/Wildlife Aircraft Strike Hazard (BASH)
- Floodplains/wetlands
- Water quality/Groundwater management unit & Installation Restoration Program (IRP) Sites
- Greens renovation project
- Archaeological sites

Where do we go from here?

Once the environmental challenges are identified, it is paramount that the golf course staff should determine their preferred management approach in the context of their ongoing, long-term goal of providing the best golfing experience for their customer's dwindling recreation resources.

Armed with this well-conceived, golf facility-based management approach, the golf staff should then coordinate with the environmental staff to ensure that there is consistency and compatibility with installation-wide natural resource and environmental management goals and objectives. Finally, the staff should proceed with the next steps in the GEM Program process documented in this study.

Introduction

The golf course environmental baseline assessment (GCEBA) is the initial step in the process of creating a successful ecosystem-based Golf Course Environmental Management (GEM) Plan.

The intent of the program is to provide an efficient, customer-driven management tool that will free up course managers and superintendents 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 installation's vital recreational opportunities.

Welcome to Tinker Golf Course!

The clubhouse's back patio can be a happenin' place.

Goal of the GEM Program

The goal of the U. S. Air Force GEM program is to facilitate the creation of an environmentally friendly golf course facility for its customers while supporting the installation mission. The Air Force Center for Environmental Excellence (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, the U. S. Air Force's golf courses are being managed compatibly with the environment. The GEM program is the vehicle to document our successes while communicating directly with our customers, commanders, and local community.

The 2nd green at Tinker Golf Course.

GEM Program 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 GEM Plan process. The latest requirements for the GEM Plan components are described and outlined on the AFCEE golf course environmental management program website: http://www.afcee.brooks.af.mil/ec/golf/. Detailed explanations and directions for completing the GEM Plan will be delineated in AFCEE's proposed handbook ***Golf and the Environment, Guidelines for the 21st Century***.

The GEM Program is derived from many diverse environmental regimes such as the National Environmental Policy Act, the Environmental Compliance Assessment and Management Program, and the ISO 14001 environmental management system. There are five basic steps in the implementation of the GEM Program process:

- Analysis
- Documentation
- Implementation
- Evaluation
- Revision

Creeks bisect several holes.

The greens are set to be rebuilt in the very near future.

Analysis

Experienced environmental managers realize the importance of assembling all of the data relevant to a problem prior to determining its best solution. Analysis is the first and most important task of the golf course environmental baseline assessment (GCEBA) and the GCEBA is the initial step in the process of creating an ecosystem-based Golf Course Environmental Management (GEM) Plan. Properly completing the GCEBA is paramount to the long-term compatibility of an installation's golf course management practices with the GEM Program, and more importantly, the U. S. Air Force'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 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 commanders and customers alike the environmental issues that challenge us on our golf course as well as our plans to deal with them. In order to reach the environmental stewardship goals set by the U. S. Air Force, we must consistently employ only those management practices that minimize or eliminate potential negative impacts to the environment.

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
- Environmental policy statement
- Booklet that describes the environmental management challenges on the GEM Plan map
- Specific practices employed 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 program recommendations

Implementation

Positive and decisive action is the only true measure of the success of a GEM Program. 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 Tinker staff should adopt the GEM Program Environmental Policy and immediately begin finding ways to minimize or eliminate any and all negative impacts to the environment.

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 Program. It is important for U. S. Air Force golf courses to show improvement over time. This can be easily accomplished by regularly evaluating golf course maintenance methods, practices, and management approaches to day-to-day issues and changing when appropriate.

Revision

The very nature of a superior GEM program implies that all documents be regularly maintained to represent the most current conditions. U. S. Air Force 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 Program. The GEM Plan should be kept as current as possible at all times. Ideally, it should be completely updated at least every three years.

Course Specific Analysis

One of the most pragmatic and enjoyable tasks in the GCEBA process is the course specific analysis. From a general overall description of the course to the details of the course's history and makeup to the various observations on the way the course plays, looks, and is managed, the course specific analysis sets the stage for the rest of the GCEBA report. It is comprised of the following tasks:

- Course description
- Course details
- Miscellaneous facilities examination

Dozens of new native oak trees have planted on the course. Unfortunately, they produce large acorns that will require removal prior to mowing creating an additional task for the maintenance crew.

Course description

Tinker AFB Golf Course, located along the north central boundary of the installation, is a fine layout with nearly unlimited potential. Dan Hayes and his superintendent, Charlie Tiede have the course's conditioning improvements on track as they finish the third year of a five-year plan. Lack of length, minimal teeing area, and poor soil conditions for the greens are about the only real issues with the golf course that have been identified in the past. The first two are no longer issues as the Tinker GC staff have recently added new tees and expanded teeing areas to many of the holes.

The greens are set for renovation this summer. The problems associated with the old-fashioned, "push-up" greens typical of military golf courses will finally be dispatched to the past. This major project will have major implications as to the overall quality and maintainability of the putting surfaces as well as the intrinsic value of the golfing experience to the many Tinker customers. This project should enable the golf course staff to use less irrigation, fertilizers, and pesticides while increasing the environmental compatibility of the course with Air Force and installation stewardship goals and objectives. The greens renovation project success is truly a testament to the patience and diligence of Mr. Hayes as well as his commitment to provide the best possible product for his customers. As a result, the Tinker Golf Course is one of the best values in the U.S. Air Force if not the Department of Defense.

Course details

Architect		Floyd Farley
Year constructed		1959
Climate		Warm sub-humid
Average annual rainfall		33“ including 9” snow
Average growing season		224 days
Elevation		Approx. 1200 feet MSL
Winds/Prevailing Direction		12-14 mph/SSE
Total Facility Acreage		244 acres w/ range
Par		36-36-72
Yardage/Rating/Slope		Gold- 6735/72.5/127
		Blue- 6368/70.7/124
		White- 6052/69.1/124
		Red- 5328/71.1/122
Golf course manager		Dan Hayes
Superintendent		Charlie Tiede
Turfgrass	Tees-	- Common
	Fairways-	- Common
	Greens	- Tif 328
	Roughs-	- Common/mixed

Tinker Golf Course is typical of the prairie landscape.

Tinker Golf Course Routing Plan

Tinker Golf Course Aerial Photo

Miscellaneous Facility Review

Although the course is primary to the enjoyment and eventual return of most of Course Name' customers, the support facilities play a huge role is the overall success of the operation. This section of the GCEBA will examine the following facilities for their aesthetic, functional, and environmental values:

- Clubhouse/pro shop/snack bar
- Maintenance complex
- Practice areas
- Pesticide mixing and storage
- Cart storage facility
- Infrastructure

Clubhouse is a composite of several facilities and is located on one of Tinker's main thoroughfares.

Locker rooms are first class.

Clubhouse

The clubhouse at Tinker Golf Course may not be attractive but at least its old. Tinker's key golf building is almost a half century old and some of the band-aids are wearing thin. Despite this criticism, the facility does function rather well for its customers. The lunch crowd is enthusiastic and the pro shop is full of everything one may need to improve their golfing experience. Office space is ample but like most facilities, storage space is definitely lacking. Two major renovations have kept the clubhouse functioning with the first occurring in 1967 and the latest in 1984. The biggest hurdle is the fact that a portion of the clear zone cuts through the facility. This is a constraint that cannot be overcome.

Maintenance complex

While the maintenance complex is unattractive, cramped, and lacking on storage space, it seems to function relatively well for Superintendent Charlie Tiede and his staff. Being able to keep expensive equipment and parts such as PVC pipe indoors is highly desirable but not always possible in today's minimally budgeted world. Improvements should be programmed if they haven't already to deal with these shortcomings in the future.

Superintendent Charlie Tiede's office.

Storage space is limited inside the main maintenance complex facility.

The maintenance complex yard is the default storage area.

Practice areas

Tinker Golf Course is outfitted with all of the necessary practice area components. A large driving range and short game practice green complete with bunkers is located across the street from the clubhouse. A large putting green is well sited near the 1st and 10th tees. Each of these areas are highly used and integral to the success of the operation.

The practice green is a popular spot prior to competitions.

Covered pesticide mixing area minimizes wastewater quantities.

Pesticide mixing and storage

Superintendent Charlie Tiede's pesticide mixing and storage areas are in total compliance and well maintained. While being relatively low tech and functional, the mixing area and storage compartment are being to show their age. Since the course is located over one of the installation's groundwater management units, any spills or dysfunctional equipment could be significant. Caution and frequent inspection are already part of the staff's daily routine and should continue.

The cart storage facility is sited close to the clubhouse.

Cart storage facility

The cart storage facility is a typical U.S. Air Force building- sound in structure and functionality, lacking in beauty and "extras". The structure is located nearby the clubhouse and is not screened from customer view or access. It is sufficiently sized for the fleet maintained by Dan Hayes and provides a typically high priority income stream to the course's bottom line.

Infrastructure

This section examines important elements of a quality golf course that are difficult to group into another category. Cart paths are in good condition. The parking lot is in good condition and is not large enough to satisfy the peak demands of Tinker's customers. Landscape development attempts have been successful and should be continued where appropriate. There is a site amenity group near most teeing areas and the course signage could be improved.

Tinker GC has some of the best bridges in the U.S. Air Force.

Determining the Baseline (ECQ)

The following is a brief compilation of some of the responses in each of the ten Environmental Compatibility Quotient (ECQ) categories obtained in an interview with the superintendent and the manager conducted during the site visit.

ECQ Categories

- Overall Management Philosophy & Documentation
- Safety, Training, And Awareness
- Compliance
- Pesticide Use, Storage, & Handling
- Pollution Prevention
- Conservation Practices
- Water Resources
- Maintenance Practices
- Customer Relations & Education
- Miscellaneous Special Projects & Activities

Key to checklist responses

- **Yes** = Practice is complete or ongoing and can be verified.
- **Partial** = Practice has been initiated but needs further attention and improvement.
- **No** = Practice is not in place.

ECQ Checklists

The Environmental Compatibility Quotient (ECQ) checklists are a convenient method of assessing the overall performance, implementation, and completeness of an installation's Golf Course Environmental Management Plan. The checklists can be used in many ways including:

- As an analytical tool while compiling a Golf Course Environmental Baseline Assessment like this one.
- As a self-assessment tool for the golf course manager or superintendent.
- As an award nomination evaluation by a Golf Course Assessment Team (GCAT).

Everything a golfer may need to enjoy their round.

Interpreting the 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
93-100%	Advanced
83-92%	Getting there
73-82%	Showing progress
63-72%	Early stages
Less than 62%	Just started

The 9th hole is one of the best at Tinker Golf Course.

A Mississippi kike soars overhead possibly searching for a nest site.

Overall Management Philosophy & Documentation

#	Environmental Compatibility Indicator	Yes	Partial	No
1	Has management demonstrated that the environment is an important part of their responsibilities by initiating the GEM Planning process?	✓		
2	Has the golf course adopted and posted an Environmental Policy?	✓		
3	Is the GEM Plan underway or completed, available, and updated regularly?		✓	
4	Is a map of the property highlighting environmental opportunities or constraints such as water features, sensitive landscapes, threatened or endangered species habitat, special management zones, etc. used in the environmental management decision-making process and is it posted for customers?		✓	
5	Environmental goals, objectives, issues, projects, and progress are evaluated at least annually and are regularly communicated to employees, customers, management, and the local community?		✓	
6	Are written records of water quality monitoring activities, results, and control measures readily available?	✓		
7	Is there an inventory of bird and mammal species documented, maintained, and readily available?	✓		
8	Is there a general understanding of how course management practices may positively enhance or adversely impact wildlife species and their habitats?	✓		
9	Are the environmental impacts of pest control measures such as leaching and runoff potential, toxicity to non-target organisms, soil absorption capacity, pesticide persistence, water solubility, and effects on soil microorganisms and non-target species considered as part of the course management planning process?	✓		
10	Are records of pest treatments employed and their effectiveness maintained and used to guide future pest control decisions?	✓		
	Point totals for each column	**7**	**3**	**0**

Safety, Training, & Awareness

#	Environmental Compatibility Indicator	Yes	Partial	No
1	All employees are familiar with the overall GEM Plan and are trained on the importance of environmental compliance with the goals and objectives of the program?		✓	
2	All appropriate employees are trained to be familiar with U. S. Air Force, federal, OK, and OSHA regulations that apply to storage, handling, and disposal of chemicals used on the property?	✓		
3	All employees are aware that chemical use, storage, and disposal and their potential risks to human health and the environment?	✓		
4	All employees are trained to understand that poor management practices may adversely impact worker health, on- and off-site water quality, local soil health, and wildlife species and their habitats?	✓		
5	A current copy of all Material Safety Data Sheets (MSDS) for all chemicals used anywhere on the golf course property is maintained and readily available for use by employees?	✓		
6	All employees receive regular, documented training on all potential OSHA issues?	✓		
7	Are all golf course pesticide applicators active participants in a local respiratory and pulmonary testing program?	✓		
8	Pesticides, fertilizers, and other chemicals are stored on appropriate shelving in an approved storage facility?	✓		
9	Are golfers 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 that may be hazardous to human health and safety?	✓		
10	Are key staff members trained regarding water quality and conservation issues?	✓		
	Point totals for each column - Response percentage	**9**	**1**	**0**

Compliance

#	Environmental Compatibility Indicator	Yes	Partial	No
1	Is fuel storage/delivery managed in accordance with federal, OK and local regulations?	✓		
2	Are installation environmental staff members included in on-going course management discussions and plans at scheduled meetings?	✓		
3	Are there regularly scheduled golf course staff meetings to discuss environmental management issues?	✓		
4	Does the director of golf and the superintendent attend ESOHCAMP in-briefings and out-briefings?		✓	
5	Does the director of golf and/or the superintendent coordinate with installation environmental staff on the various management plans that affect or include the golf course?		✓	
6	Have all necessary permits been secured and/or updated and their requirements satisfied in a timely manner?	✓		
7	Has appropriate impact analysis (NEPA) been performed on all proposed actions on or affecting the golf course property?	✓		
8	Are containers used to store used oil in good condition, not leaking, and clearly labeled?	✓		
9	Has the golf course staff has submitted their proposed management approach to the identified environmental challenges to the installation environmental staff for coordination and review?			✓
10	Were there less than two major golf course facility-related findings during the last official ESOHCAMP visit?	✓		
	Point totals for each column - Response percentage	**7**	**2**	**1**

Pesticide Use, Storage, & Handling

#	Environmental Compatibility Indicator	Yes	Partial	No
1	Are there trained scouts on staff other than the superintendent to monitor turf and plant health and pest populations regularly using a process to notify management of pest problems and organized into a report or guide so that they can be used for future pest control solutions?	✓		
2	Are there written pest profiles of common pest species with a variety of potential control measures pre-evaluated including alterations in cultural management, biological, physical, and mechanical controls prior to treating the problem on the course?	✓		
3	Are there established and documented aesthetic and functional thresholds for all managed areas to effectively manage pest populations and reduce chemical use?	✓		
4	Is there a specially designed pesticide mixing area where all mixing is performed by appropriately trained personnel?	✓		
5	Has a list of pesticides and other chemicals stored or used at the golf facility been provided to the appropriate Fire Department(s)?	✓		
6	Is there a written Integrated Pest Management Plan readily available and updated in use at the facility?	✓		
7	If personal protective equipment is required for pesticide use, storage, or handling, is it available for use by trained individuals?	✓		
8	Are written and readily available records maintained of all applications of pesticides made by certified applicators, including the following? - the quantity of each pesticide used - the chemical or common name of the active pesticidal ingredient(s) (not the product name) - the pest or purpose for which the pesticide was applied --the date and place of application.	✓		
9	Is the chemical storage structure/area locked, well ventilated, fire proof, and access is limited to select personnel?	✓		
10	Are food storage and prep areas properly cleaned to reduce the likelihood of pest infestations and required pesticide applications?	✓		
	Point totals for each column - Response percentage	**10**	**0**	**0**

Pollution Prevention

#	Environmental Compatibility Indicator	Yes	Partial	No
1	Are there designated "no-mow" areas (other than ponds) and "no spray zones" and buffer areas around pond, river, stream, or lake edges and have they been communicated to mower operators and pesticide applicators?	✓		
2	Has the Installation Spill Plan been amended to include the golf course facility and is there a spill containment kit at each required location and are spill containment procedures in place?	✓		
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 to contain spills?	✓		
5	Are liquid products stored below dry products and are dry materials stored on pallets or shelves to keep them off the floor?	✓		
6	Have all the golf facility employees regularly received documented and approved HAZCOM and safety and health training?	✓		
7	Are grass clippings blown off equipment with compressed air instead of or prior to washing?		✓	
8	Are gasoline, motor oil, brake and transmission fluid, solvents, and other chemicals used to operate or maintain equipment and vehicles prevented from directly or indirectly entering water bodies?	✓		
9	Has the watershed in which the course resides and contributes runoff to been identified and mapped to aid the golf course staff in the management of their facility?	✓		
10	Are appropriate quantities of fertilizers applied during weather conducive to reducing the potential for leaching and runoff?	✓		
	Point totals for each column - Response percentage	**9**	**1**	**0**

Conservation Practices

#	Environmental Compatibility Indicator	Yes	Partial	No
1	Are recycling containers conveniently provided for customer and employee use throughout the golf course facility?		✓	
2	Are there officially and appropriately designated minimally maintained areas on the golf course facility grounds?	✓		
3	Has the irrigation system or its components recently been upgraded to reduce inefficiency, malfunction, and overall water use?	✓		
4	Has all "non-target" irrigation (ponds, natural, or out of play areas, etc.) been eliminated or minimized?	✓		
5	Have flow meters been installed to monitor water use and detect potential waste?	✓		
6	Has the entire golf course facility property been examined for critical habitats, threatened or endangered species, wetlands, floodplains, and historical/cultural resources?	✓		
7	Are employees encouraged to minimize their trips around the course to conserve on the use of fossil fuels?			✓
8	Does the snack bar utilize reusable plates and silverware for use by customers throughout the facility's operating hours?	✓		
9	Have all potential "no-mow" area maintenance practices been coordinated with the installation BASH officer and environmental management personnel?	✓		
10	Are all motorized golf course equipment checked regularly for excessive air polluting emissions?			✓
	Point totals for each column - Response percentage	**7**	**1**	**2**

Water Resources

#	Environmental Compatibility Indicator	Yes	Partial	No
1	Are water features regularly monitored for algae, erosion, excessive aquatic plant growth, fish kills, and sedimentation?	✓		
2	Are wash and wastewater kept from making direct contact with surface water and are they recycled or allowed to filter through a vegetative area when cleaning and maintaining equipment?	✓		
3	Outdoor irrigation of non-golf course landscape areas are regularly monitored and maintained for leaks and efficient performance?	✓		
4	Has the golf course staff coordinated with stormwater management planning requirements from the installation's environmental staff?	✓		
5	Have part circle irrigation heads been installed where possible to preserve water resources and reduce maintenance while minimizing potential negative impacts to surrounding minimally maintained areas?	✓		
6	Are all water feature maintenance tasks coordinated with the installation natural resource manager and bird/wildlife aircraft strike hazard officer?	✓		
7	Has the irrigation system been completely checked for proper water distribution in all irrigated areas and are water leaks fixed in a timely manner?	✓		
8	Are moving water bodies such as streams or creeks that pass through the golf course regularly monitored for water quality both upstream and downstream of the course?	✓		
9	If required, does the facility have a Drought Management Plan written, ready, and available if, or when, irrigation restrictions may be instituted and required by the community or the installation?	✓		
10	Are water quality problems immediately reported to supervisors or regulatory agencies (if required) for appropriate action?	✓		
	Point totals for each column	**10**	**0**	**0**

Maintenance Practices

#	Environmental Compatibility Indicator	Yes	Partial	No
1	Is there a written, regularly updated, and readily available Golf Course Maintenance Plan?	✓		
2	Does the Maintenance Plan include individual plans to include Integrated Pest Management, Tree Management, Hazard Communication, Drought Management, Water Feature Management, and a Site-Specific Spill Prevention Response Plan?	✓		
3	Are green, tee, and fairway mowing heights maintained at reasonable levels without continually stressing turf or maximizing chemical inputs?	✓		
4	Are there regular procedures in place to continually improve soil health such as topdressing, organic amendments, aeration, and drainage?	✓		
5	Is there a map of the course's "hot spots" requiring special care or regular attention?		✓	
6	Is all maintenance equipment maintained and cleaned in a manner that eliminates the potential for spreading of pest or disease contamination?	✓		
7	Has there been a complete examination for potential negative environmental impacts of all aspects of the golf course facility operation including the snack bar and grill, clubhouse, pro shop, and maintenance complex?	✓		
8	Is contour mowing used to conserve fuel and increase playability and aesthetics?	✓		
9	Have all playing surfaces been inventoried and mapped for soil types including soil structure, nutrient levels, organic content, compaction, and water infiltration?		✓	
10	Are soil tests and plant tissue analysis used to determine nutritional requirements?	✓		
	Point totals for each column - Response percentage	**8**	**2**	**0**

Customer Relations & Education

#	Environmental Compatibility Indicator	Yes	Partial	No
1	Are the course manager and superintendent involved in a regularly updated, documented, and on-going customer educational program?	✓		
2	Is there a conveniently located and highly visible place at the course or clubhouse where golf course environmental management notices and informational messages are regularly posted for customers?	✓		
3	Do the course manager and superintendent actively communicate with customers to determine and document their points of view?	✓		
4	Is there active and regular communication with the golf management staff, civil engineering, environmental management, the Services manager, and commanders by course management?	✓		
5	Does the golf staff regularly survey their customers on how they rate the various elements of the golf course facility?	✓		
6	Is there consistent and attractive signage around the course and grounds that would increase the awareness of the average golfer to the environmental management practices employed?	✓		
7	Are there signs appropriately located to warn golfers of hazards when drinking reclaimed or otherwise non-potable water?	✓		
8	Are there interpretive signs posted to highlight key habitats or have appropriate areas been designated "Environmentally Sensitive Zones" per USGA rules?			✓
9	Are course staff members trained regularly on how to improve their dealings with customers?	✓		
10	Are there clinics provided to teach beginning golfers the basics of the game and to teach all levels of golfers the rules of the game?	✓		
	Point totals for each column	**9**	**0**	**1**

Miscellaneous Special Projects & Activities

#	Environmental Compatibility Indicator	Yes	Partial	No
1	Are there projects planned and funded for the near future that would demonstrate the compatibility of the course's management methods with protection of the environment?	✓		
2	Are there projects planned and funded to reduce the course's potential negative environmental impacts?	✓		
3	Are there tournaments or other events planned that may educate customers on the environmental challenges faced by the golf staff at this installation?	✓		
4	Are there regular field trips for local students or other local community groups hosted at the course?	✓		
5	Are there projects planned to eliminate or minimize a potential erosion problem?	✓		
6	Does the course have a native tree installation program complete with planting plan and maintenance schedule?	✓		
7	Are any of the local schools or universities involved in educational or research activities at your course?		✓	
8	Are there special facility-wide recycling programs underway?	✓		
9	Is your course an active participant in the USAF Golf Environmental Management Program?	✓		
10	Has your facility been nominated by your MAJCOM for the golf course environmental management award in the last 3 years?			✓
	Point totals for each column	**8**	**1**	**1**

ECQ Summary

#	Environmental Compatibility Quotient Category	Yes	Partial	No
1	Overall Management Philosophy & Documentation	7	3	0
2	Safety, Training, & Awareness	9	1	0
3	Compliance	7	2	1
4	Pesticide Use, Storage, & Handling	10	0	0
5	Pollution Prevention	9	1	0
6	Conservation Practices	7	1	2
7	Water Resources	10	0	0
8	Maintenance Practices	8	2	0
9	Customer Relations and Education	9	0	1
10	Miscellaneous Special Projects & Activities	8	1	1
	Composite point total/response percentage	**84**	**11**	**5**

GCEBA Results

Tinker Golf Course, Tinker AFB, OK

- Actual ECQ (# of "Yes") = 84 or "Getting there"

- Potential ECQ (Actual ECQ plus "Partial") = 95 or "Advanced"

Conclusion

Tinker Golf Course provides a quality recreational resource as well as attractive open space that is a positive aspect of the installation's environment. Director of Golf, Dan Hayes, has established a high level of customer satisfaction through personal experience, hard work, and propensity to hire the best people available. With the new greens renovation project pending, the course will be among the best the U.S. Air Force has to offer. Mr. Hayes and his staff do still have challenges to overcome but, if the past is any indication, things will be just fine.

Observations

- Stellar example of quality coordination and team work with installation environmental staff
- Need to compile and document actions already taken to create "continuity" document
- Utilize installation environmental management geographic information system and civil engineering digital aerial photographs for mapping requirements
- Need to secure computer hardware and software upgrades to increase overall efficiency and provide high speed internet access
- Expanded training for all employees a must to completely realize GEM goals
- Consider using AFCEE for on-site golf course environmental management training
- Lack of funding hinders training plans
- Business tempo and training scheduling makes it difficult to involve much of the staff at one time
- Assemble all documents in one place
- Do more than what is required
- Inconsistent interpretations of compliance actions among installation, MAJCOM, and ECAMP evaluators confuse
- Ensure ECAMP results are outstanding
- Relationship with installation environmental and engineering staff is exemplary

- Further reduce solid waste streams from clubhouse operations
- Although pesticide facility is functional, consider purchasing state of the art facility and relocating nearby maintenance complex
- Increase communication with customer on conservation practices that are in place
- Continue building relationships with installation natural resources manager and other environmental professionals
- Provide detailed input to the scheduled update of installation integrated natural resources management plan (INRMP)
- Increased training and involvement of staff on integrated pest management procedures
- Compile written pest profiles of common pest species
- Increase number of trained scouts on the maintenance staff
- Create a location to communicate environmental management goals and maintenance plan in the clubhouse
- Continue to involve installation youth through rules and instruction clinics
- Conduct field trips at the course for local school children
- Enlist the assistance of local city and county officials on golf course environmental planning initiatives
- Initiate Earth Day environmental awareness golf tournament

Areas needing improvement

The ECQ Summary on the previous page highlights the following areas for relative improvement at Tinker AFB:

- **Overall Management Philosophy & Documentation**
- **Compliance**
- **Conservation Practices**

The gallery

This section of the report will be where some of the more revealing photographs (of the literally hundreds taken during the site visit) of pests, maintenance practices, and other areas where improvements may be made to create the best possible golf facility.

The driving range gets a lot of use.

Customer circulation patterns can create unsightly areas.

Several bird boxes have been installed throughout the course.

The greens renovation project should improve customer satisfaction.

A "hard" edge along the pond banks can decrease maintenance.

Curbing and careful design can help increase function and aesthetics.

Stringed trimmers and mowing equipment can damage young trees.

Erosion, left unchecked, may eventually threaten this bridge.

Dense shade from mulberry trees create weak, thin turf in fairways.

Environmental challenges

One of the important results of the GCEBA process is the identification of significant environmental challenges to be addressed in the long-term GEM Planning process. Ideally, the golf staff will address each issue from the best way to satisfy the goals of the golf facility and acceptable levels of course playability and customer satisfaction. The golf staff's preferred management approach for these issues should then be coordinated with the installation's environmental staff for refinement, coordination, and approval.

The GEM Plan would then consist of the environmental challenges, the approach to their management, a map showing where these challenges occur on the golf course, a booklet that describes the mapped challenges, goals and objectives for future years, and a set of best management practices.

The following environmental challenges were identified during the GCEBA process at Tinker Golf Course, Tinker AFB, OK:

- Air Installation Compatibility Use Zone (AICUZ)
- Oklahoma Species of Concern/Migratory birds
- Bird/Wildlife Aircraft Strike Hazard (BASH)
- Floodplains/wetlands
- Water quality/Groundwater management unit & Installation Restoration Program (IRP) Sites
- Greens renovation project
- Archaeological sites

AIR INSTALLATION COMPATIBILITY USE ZONE (AICUZ)

According to the General Plan, "DoD uses the AICUZ program to protect aircraft operational capabilities at its installations and to assist local government officials in protecting and promoting the public health, safety and Quality of Life". The AICUZ program focuses on three areas; the clear zone and Accident Potential Zones (APZ) I and II. The clear zone and APZ I are the most significant. Unfortunately, a portion of the clubhouse and surrounding area at Tinker Golf Course is in the clear zone. This is a violation of the AICUZ program's planning criteria. Potential plans to move to other nearby facilities and possibly constructing a new clubhouse outside of the clear zone have been discussed. The most important impact to the golf staff's daily management of the facility would have to be how their proximity to the airfield contributes to other environmental challenges such as BASH and water feature related maintenance procedures.

Also, most of the golf course is in APZ I. Other than having aircraft regularly flying low overhead and constantly dealing with excessively higher than desirable noise levels, the golf course and its customers are safe.

OKLAHOMA SPECIES OF CONCERN/MIGRATORY BIRDS

Central Oklahoma to include Oklahoma City and Tinker AFB is a major migration corridor for millions of ducks and geese. Their normal migration periods are Feb-May in the spring and Sep-Nov in the fall. In addition to these waterfowl, egrets, herons, blackbirds, grackels, and gulls regularly migrate through this area.

The migratory Mississippi kite frequents the golf course and can be a concern during nesting season for customers and the staff. Native to South America, Mississippi kites return annually to where they were born. The parents get aggressive after eggs have been laid and fledglings emerge.

A regular visitor to Oklahoma, the Mississippi kite perches near the clubhouse at Tinker Golf Course during the site visit.

Flocking birds and aircraft do not mix!

BIRD/WILDLIFE AIRCRAFT STRIKE HAZARD (BASH)

According to the BASH Plan, 139 species of birds have been identified as inhabitants or migrants at Tinker AFB. Flocking birds and larger water fowl and birds of prey are the main concern. The golf course is located directly in line with the runway. This underscores that almost every major maintenance activity at the course should be coordinated with the Tinker safety office and BASH personnel. Any changes to these activities must be cleared prior to their implementation to ensure compatibility with installation goals to protect the flying mission and its assets- aircraft and Airmen.

Creeks like this one are associated with 100- and 500-year floodplains.

FLOODPLAINS/WETLANDS

The Tinker Golf Course is home to several water bodies. Any management or maintenance activities with the potential to impact them with pesticides, herbicides, or fertilizers must be minimized. Three ponds and two streams, the Crutcho and Kuhlman, add challenge and beauty to the course while complicating its care and environmental stewardship efforts. Any changes to the established maintenance procedures should be cleared with environmental management prior to any action being taken.

WATER QUALITY/GROUNDWATER MANAGEMENT UNIT & INSTALLATION RESTORATION PROGRAM (IRP) SITES

The golf course is located above a designated groundwater management unit where IRP sites OT009, Crutcho Creek and OT010, Kuhlman Creek are located. It is unclear what cleanup activities are proposed or underway at these sites. The golf staff should investigate further. According to the General Plan, the two IRP sites can be described as “north industrial runoff and storm sewer outfalls, with no constraints to development or risk and they are scheduled for closure in 2008.

Open bodies of water are considered wetlands yet are not considered jurisdictional wetlands.

Turf buffers, no mow, and no spray zones should be created around appropriate water features and the staff should receive regular training. Greater use of slow release fertilizers should be employed whenever possible. Pesticides should be never be applied when potentially severe rainfalls are predicted or expected.

Dan Hayes has wisely shared the pending greens project plans.

GREENS RENOVATION PROJECT

One of the most exciting and exasperating projects a course and its staff can endure is a major reconstruction of their greens. Add to this the desire to continue to be open for its customers and the course's economic well-being and it becomes an ordeal. Countless challenges and customer complaints will be part and parcel to each and every day until its completion. The Tinker staff will be having a memorable summer and fall in 2004. The environmental analysis for this project has been completed in accordance with 32 CFR 989.

ARCHAEOLOGICAL SITES

According to the General Plan, the land occupied by the golf course "is possibly sensitive from a an archaeological perspective". There are potentially "buried archaeological sites" along Crutcho Creek and its flood deposits. The golf course staff should be aware of this challenge and consult with installation historical preservation personnel to determine if there are any special requirements.

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Air Force Center for Environmental Excellence
Technical Directorate
Environmental Science Division

For additional assistance or more information, please contact:

GEM Program Mgr
210-536-3719 - DSN 240-3719
AFCEE/TDE, 3300 Sidney Brooks, San Antonio, TX 78235-5112

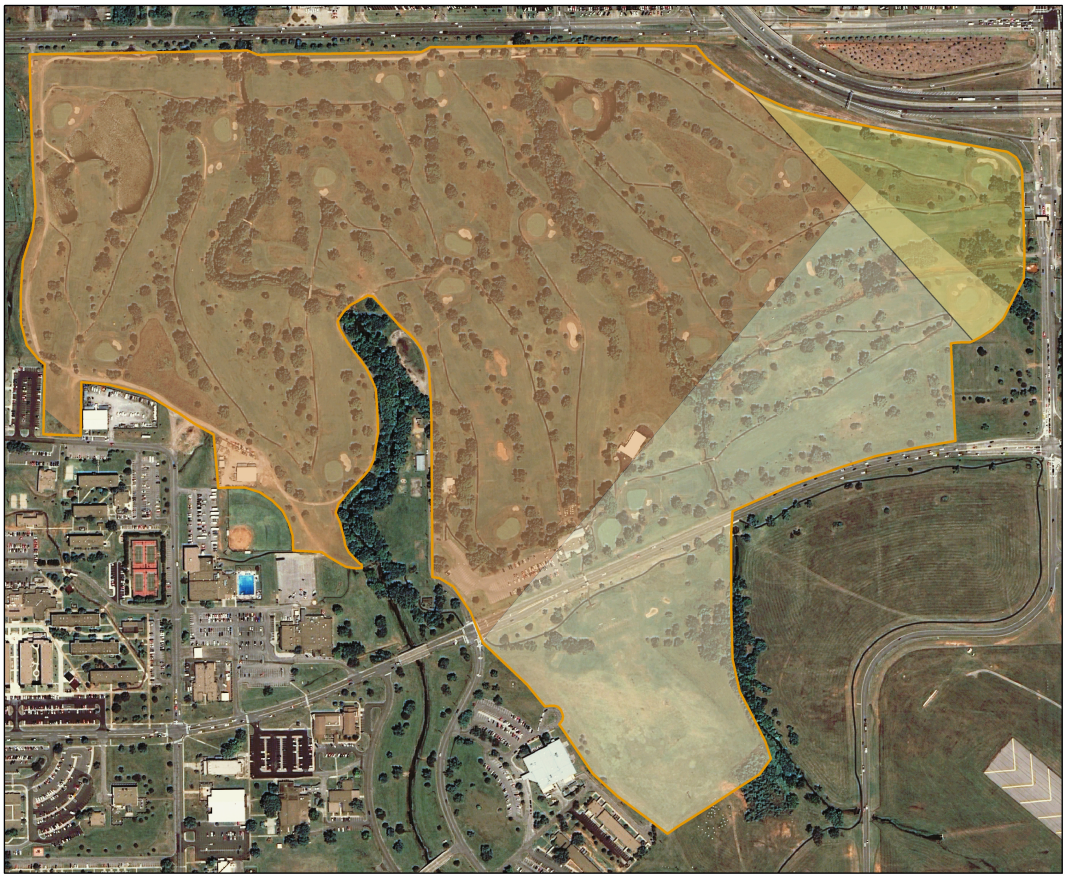
Please visit our Golf Course Environmental Management Program website:
http://www.afcee.brooks.af.mil/ec/golf/

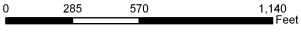
Appendix 2 (Map 1)

Golf Course Environmental Management (GEM) Plan

Environmental Challenges

AICUZ



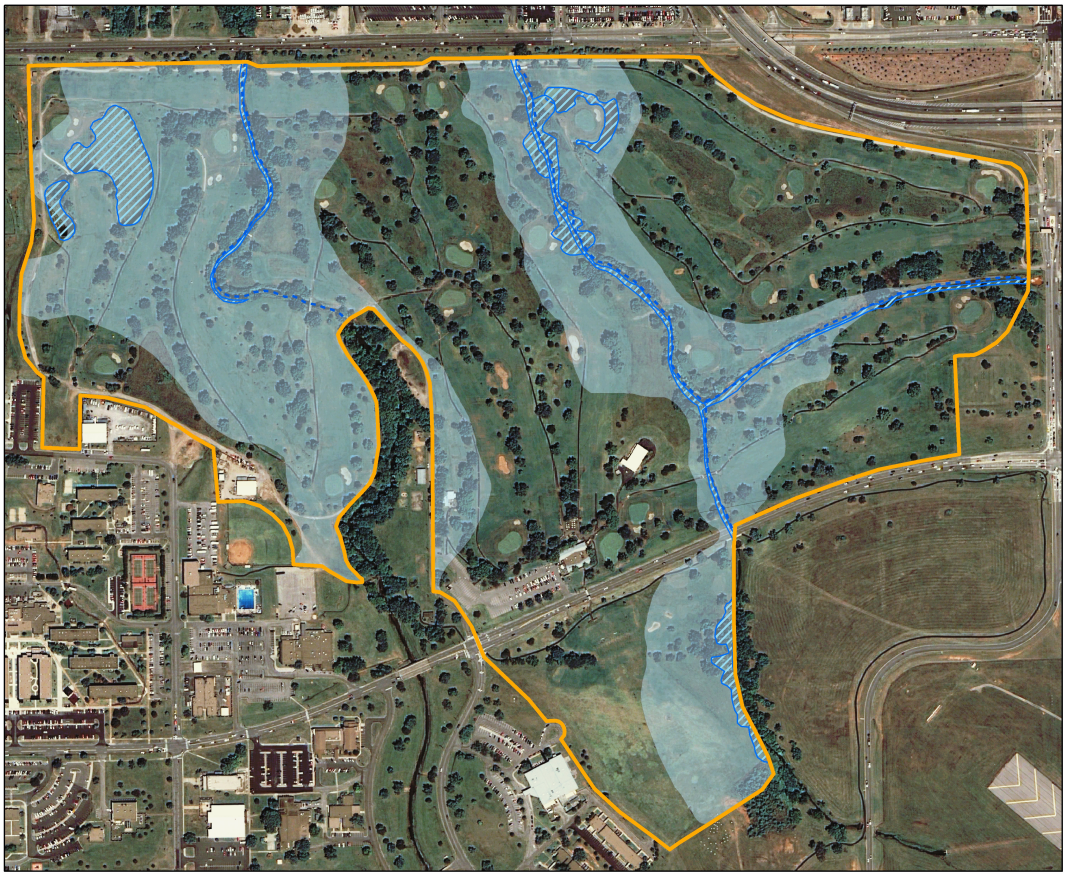


Appendix 2 (Map 2)

Golf Course Environmental Management (GEM) Plan

Environmental Challenges

Floodplains and Wetlands

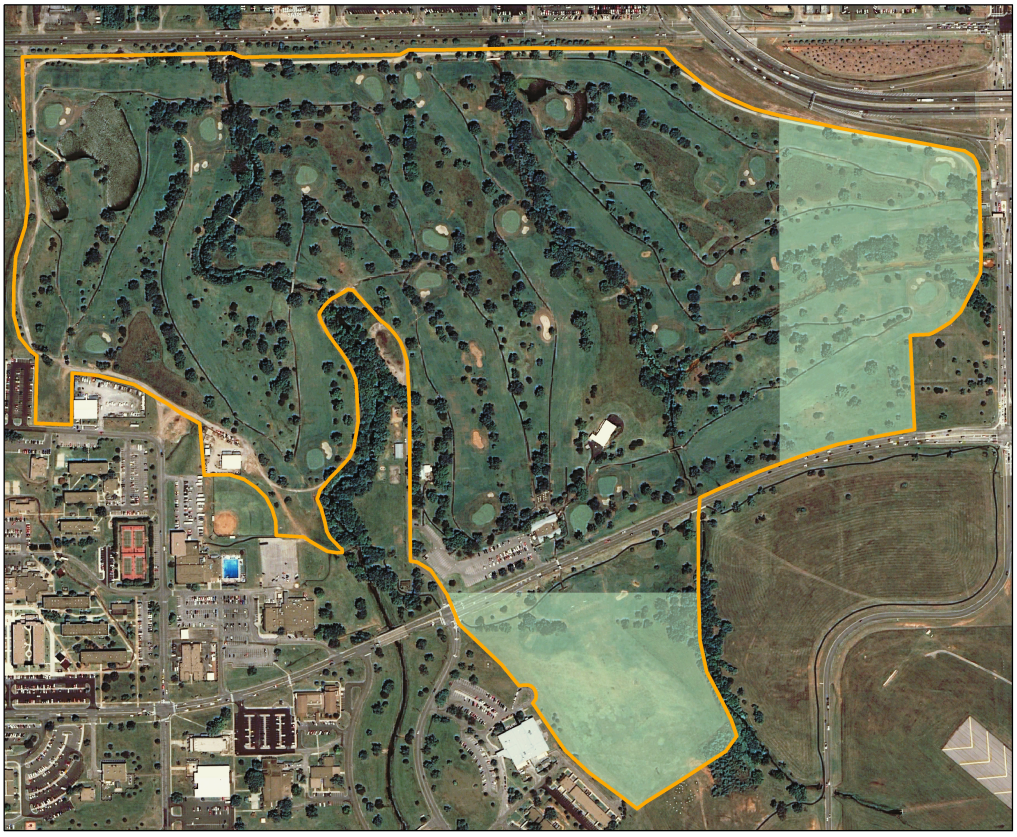


N
W E
S

Golf Course Boundary
NWI Wetlands
100 Year Floodplain (USACE)
Creeks

0 255 510 1,020
Feet

Appendix 2 (Map 3)



Golf Course Environmental Management (GEM) Plan

Environmental Challenges

IRP Sites

N
W E
S

Golf Course Boundary
IRP Site CG037

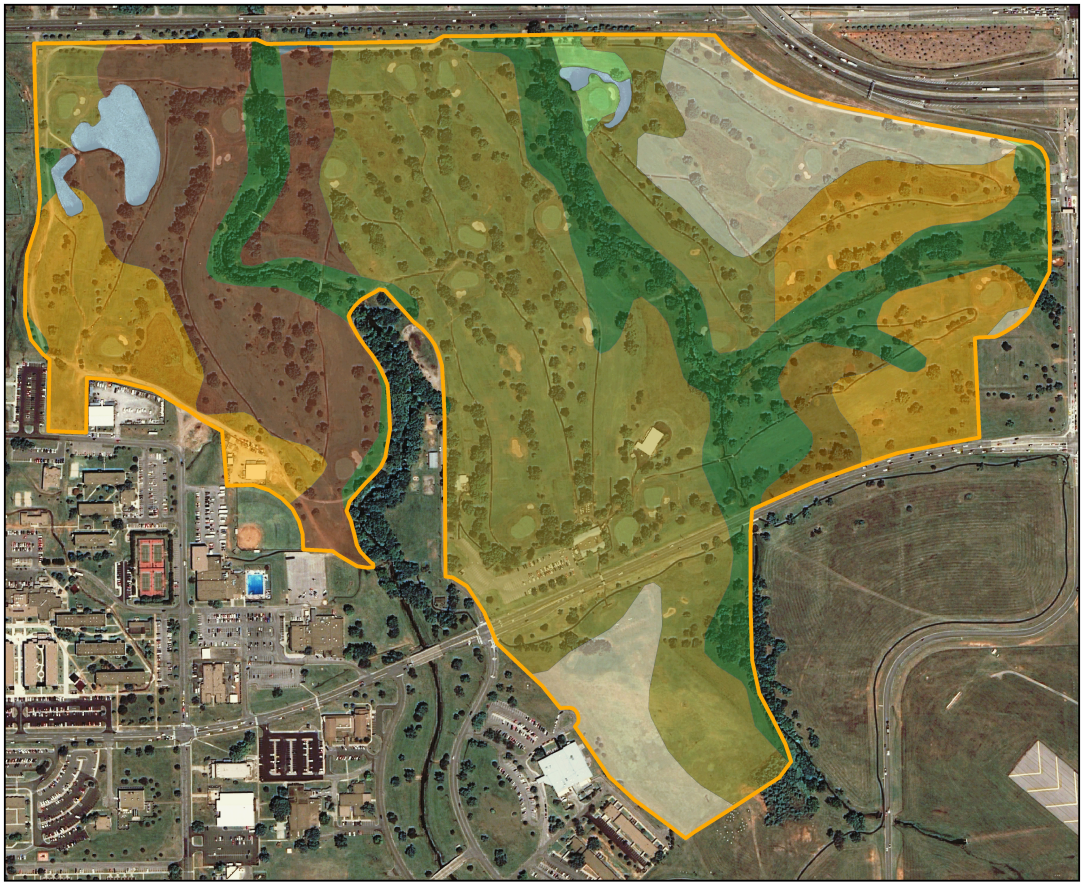
0 270 540 1,080 Feet

Appendix 2 (Map 4)

Golf Course Environmental Management (GEM) Plan

Environmental Challenges

Soil Types



N
W E
S

- Golf Course Boundary
- Ashport silt loam
- Kirkland-Urban land complex
- Lawrie loam
- Lawrie-Urban land complex
- Norge-Urban land complex
- Renthin-Urban land complex
- Urban land
- Water
- Zaneis-Urban land complex

0 285 570 1,140 Feet

Appendix 2 (Map 5)

Golf Course Environmental Management (GEM) Plan

Environmental Challenges
Sensitive Species and
Environmental Exclusion Areas

N
W E
S

Golf Course Boundary
Environmental Exclusion Area
Shrike Sighting

0 275 550 1,100
Feet

Appendix 2 (Map 6)

Golf Course Environmental Management (GEM) Plan

Environmental Challenges
Improved, Semi-improved and Unimproved Grounds

N
W E
S

- Golf Course Boundary
- Improved Grounds - Paved/Built
- Improved Grounds - Turf
- Semi-improved Grounds
- Umimproved Grounds
- 100-Year Floodplain

0 275 550 1,100 Feet


Appendix 3
Golf Course Environmental Management (GEM) Plan
(Proposed Environmental Improvements)
Golf Course Boundary
Shoreline Stabilization (Proposed)
Buildings
Evaluation Area
Oak Trees (Proposed)
Redbud Grove (Proposed)
Mexican Plum Grove (Proposed)
Evergreen Screen (Proposed)
Bent Grass Sod Nursery
Bermuda Grass Sod Nursery (Proposed)
Woodlands (Proposed)
Area 3a (0.69 Acres)
Area 3b (1.03 Acres)
Area 4 (0.30 Acres)
Area 5 (1.37 Acres)
Area 11c (1.50 Acres)
Area 14 (0.99 Acres)
Area 17 (0.46 Acres)
Native Grass Area (Existing)
Native Grass Area (Proposed 2008)
Area 2a (2.1 Acres)
Area 2b (.21 Acres)
Area 9 (7.17 Acres)
Area 11b (1.6 Acres)
Native Grass Area (Proposed 2007)
Area 6 (1.48 Acres)
Area 11a (.73 Acres)
Area 12b (0.73 Acres)
Area 18a (1.38 Acres)
Native Grass Area (Proposed 2008)
Area 18b (1.85 Acres)
Greens (Putting/Chipping/Target)
Fairways
Tees (Fairway/Practice/Lesson)
Mounding
Driving Range
Ponds
Pond Expansion (Proposed)
N
0
100
200
400
Feet

APPENDIX 4

Audubon Cooperative Sanctuary Program

The Audubon Cooperative Sanctuary Program is a cooperative effort between the United States Golf Association (USGA) and Audubon International that promotes ecologically sound land management and the conservation of natural resources. Its positive impact extends beyond the boundaries of the golf course and helps benefit surrounding communities. Golf courses work towards certificates of recognition in six categories:

Environmental Planning

Each club generates a written plan outlining their goals and proposed projects. It provides a useful tool for clubs to monitor their progress in meeting their goals.

Wildlife and Habitat Management

Management of non-play areas is crucial to providing habitat for wildlife on the golf course. Emphasis is given toward maintaining the best possible habitat for the course

considering its location, size, layout, and type of property.

Member/Public Involvement

Gaining the support of golfers for an environmental program is an invaluable asset. Focus is placed upon generating public awareness through education. Recognition of tasks well done continually reinforces the worth of the program.

Integrated Pest Management

A comprehensive and responsible program to control pests will ensure a healthy environment for both people and wildlife. Managing turf areas with environmental sensitivity requires educating workers and members about plant management, pesticide application, and use of fertilizers.

Water Conservation

Consumption of precious water resources remains an issue at most golf courses. Attention is directed toward irrigation systems, recapturing and reuse of water resources, maintenance practices, and turfgrass selection.

Water Quality Management

Questions about the impact of golf course chemical use on the water quality of lakes, streams, and groundwater sources abound. Strategies are devised to monitor water quality, protect wetlands, reduce erosion, filter runoff, and, if warranted, improve conditions.