



**Cardinal Creek Golf Course
Environmental Management Plan
Scott AFB, Illinois Jun 07**



Cardinal Creek Golf Course Environmental Policy

**In concert with the
Scott 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.**



Cardinal Creek Golf Course

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. AFI 32-7064 requires a GEM Plan as part of the Integrated Natural Resources Management Plan (INRMP).

The primary tenets of the GEM Program are to minimize or eliminate potential negative environmental impacts, 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 Compatibility Quotient

| | |
|----------------------|-----------|
| Actual ECQ | 68 |
| Potential ECQ | 82 |

Final environmental challenges

The following environmental challenges were identified during the GEM Plan process:

- Stormwater management/floodplain
- Airfield criteria
- Hole relocation project
- Wetlands
- Bird/wildlife Aircraft Strike Hazard (BASH)
- Irrigation water quality
- Environmental Restoration Project (ERP) site

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 completely revised during the next INRMP iteration update. The entire GEM process can be found on the regularly improved and updated GEM website at <http://www.afcee.brooks.af.mil/ec/golf/>.

Analysis

Course details

| | |
|----------------------------|--|
| Architect | Unknown/Gary Kern |
| Year constructed | 1953 / 1983 |
| Climate | Temperate |
| Average annual rainfall | 32" |
| Average growing season | 210 days |
| Winds/Prevailing Direction | North / south |
| Total Facility Acreage | 150 acres |
| Par | 36-36-72 |
| Yardage/Rating/Slope | Blue/6453/70.4/118 White/6139/68.9/114 Gold/5446/65.9/110 Red/5105/68.5/110 |
| Turfgrass | Zoysia |
| Tees- | Zoysia |
| Fairways- | Bentgrass/Poa |
| Greens | Mix |
| Roughs- | |
| Irrigation water source | Recycled (Effluent) |



Cardinal Creek Golf Course Layout

Course description

Situated hard between the east-west runway and the northern installation boundary, Scott AFB’s Cardinal Creek Golf Course is a testament to the dedication and professionalism of the 375th Services golf staff. In addition to the physical limitations- the course is financially challenged for many reasons including the fact that it is only open full time five months per year. Cardinal Creek’s staff still delivers one of the highest quality golfing experiences in the U.S. Air Force. The 18-hole course is typified by gently rolling terrain, pure bentgrass greens, and possibly the largest greenside and fairway bunkers around.

Potentially limiting factors include accessibility, the close proximity of the joint use airfield, isolated areas of poor drainage on several holes, and two relatively non-descript holes to finish the outward nine.



Cardinal Creek Golf Course Aerial Photo

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)



Unfortunately, the clubhouse violates airfield management criteria.

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



Cardinal Creek meanders through most of the golf course property.



A small pond guards the front right side of the 1st green.

| Overall Management Philosophy & Documentation | | | | |
|--|--|------------|----------------|-----------|
| # | Environmental Compatibility Indicator | Yes | Partial | No |
| 1 | Has installation environmental and golf 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 and/or completed, available, and updated regularly? | | ✓ | |
| 4 | Is a map of the property highlighting identified environmental challenges available, used in the environmental management decision-making process, and is it posted for customers? | | | ✓ |
| 5 | Are environmental challenges and their management method, target, and objective, and overall golf course GEM program goals evaluated at least annually and are they regularly communicated to employees, customers, management, and the local community? | | ✓ | |
| 6 | Are written records of water quality monitoring activities, results, and control measures collected and readily available? | ✓ | | |
| 7 | Is there an inventory of bird and mammal species maintained and readily available? | ✓ | | |
| 8 | Is there a general understanding of how course management practices may positively enhance or adversely impact the environment? | ✓ | | |
| 9 | Are the environmental impacts of pest control measures considered prior to their use as part of the course environmental management planning process? | ✓ | | |
| 10 | Are records of pest treatments and their effectiveness maintained and used to guide future pest control decisions? | ✓ | | |
| | Point totals for each column | 6 | 2 | 2 |

| Safety, Training, & Awareness | | | | |
|--|---|------------|----------------|-----------|
| # | Environmental Compatibility Indicator | Yes | Partial | No |
| 1 | Are all golf course employees familiar with the GEM program and are they trained on the importance of environmental compliance with the goals and objectives of the program as it applies to their specific duties? | | | ✓ |
| 2 | Are all appropriate employees trained to be familiar with U. S. Air Force, federal, state, and OSHA regulations that apply to the storage, handling, and disposal of all chemicals potentially used on the property? | ✓ | | |
| 3 | Are all employees aware of the potential risks to human health and the environment of chemical use, storage, and disposal? | ✓ | | |
| 4 | Do all maintenance employees receive documented training applicable to their specific work duties that may adversely impact on- and off-site water quality and wildlife species and their habitats? | ✓ | | |
| 5 | Is a current copy of Material Safety Data Sheets (MSDS) for all chemicals used anywhere on the golf course property maintained and readily available for use by regularly trained employees? | ✓ | | |
| 6 | Do all appropriate employees receive regular, documented training on potential OSHA issues associated with their specific duties? | ✓ | | |
| 7 | Are all golf course pesticide applicators active participants in a respiratory and/or pulmonary testing program? | ✓ | | |
| 8 | Are all pesticides, fertilizers, and other chemicals 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 planned or recently completed spraying of any chemical or fertilizer that may potentially be hazardous to human health or general public safety? | | ✓ | |
| 10 | Are key staff members trained regarding water quality and conservation issues pertinent to the course and their particular duties? | ✓ | | |
| | Point totals for each column | 8 | 1 | 1 |

| Compliance | | | | |
|-------------------------------------|--|------------|----------------|-----------|
| # | Environmental Compatibility Indicator | Yes | Partial | No |
| 1 | Are the fuel storage/delivery area and associated equipment managed in accordance with federal, state, and local regulations? | ✓ | | |
| 2 | Are installation environmental staff members regularly consulted on pertinent course management discussions and plans? | ✓ | | |
| 3 | Are there golf course staff meetings where environmental management issues are regularly discussed with all employees? | ✓ | | |
| 4 | Do the director of golf and the superintendent attend all internal and external ESOHCAMP in-briefings and out-briefings? | ✓ | | |
| 5 | Do the director of golf and/or the superintendent coordinate their input on the various management plans that affect or include the golf course with installation environmental staff? | ✓ | | |
| 6 | Have all environmental challenges been physically identified and mapped to aid the golf staff's daily management efforts? | | | ✓ |
| 7 | Has appropriate impact analysis (NEPA) been performed on all proposed actions on or affecting the golf course property? | ✓ | | |
| 8 | Are oil containers used to collect old oil in good condition and correctly labeled? | ✓ | | |
| 9 | Has the golf course staff assisted the installation environmental staff with the required Golf course Environmental Management Plan requirements? | ✓ | | |
| 10 | Were there less than two major golf course facility-related findings during the last official ESOHCAMP visit? | ✓ | | |
| Point totals for each column | | 9 | 0 | 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 pest populations that notify management include findings into a report or guide for future use? | ✓ | | |
| 2 | Are there written pest profiles of common pest species with a variety of potential control measures including cultural, biological, physical, and mechanical controls prior to treating the problem on the course? | ✓ | | |
| 3 | Are there established, documented, and utilized aesthetic and functional thresholds for effective management of pests that may also reduce chemical use? | | ✓ | |
| 4 | Is there a specially designed pesticide mixing area where all mixing is performed by appropriately trained personnel? | ✓ | | |
| 5 | Has a current list of all pesticides and other chemicals stored or used at the golf facility recently been provided to the appropriate Fire Department(s)? | ✓ | | |
| 6 | Is there a written, readily available, and regularly updated Integrated Pest Management Plan for the entire golf course 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); - the pest or purpose for which the pesticide was applied; and the date and place of application. | ✓ | | |
| 9 | Is the chemical storage structure/area well ventilated, fire resistant, and locked with access limited to select personnel? | ✓ | | |
| 10 | Are there designated and documented "no spray" areas around pond, river, stream, or lake edges and have they been communicated to pesticide applicators? | | ✓ | |
| Point totals for each column | | 8 | 2 | 0 |

| Pollution Prevention | | | | |
|-----------------------------|---|------------|----------------|-----------|
| # | Environmental Compatibility Indicator | Yes | Partial | No |
| 1 | Are there designated and documented "minimally-maintained" or natural vegetative buffer areas around pond, river, stream, or lake edges and have they been communicated to mower operators and pesticide applicators? | | ✓ | |
| 2 | Is there a readily available copy of the Installation Spill Plan that includes the golf course facility and is there a spill containment kit at each required location with spill containment procedures in place? | ✓ | | |
| 3 | Does the chemical storage area have a sealed metal or concrete floor and are all liquid 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 appropriate pallets or shelves to keep them off the floor? | ✓ | | |
| 6 | Do all golf facility employees regularly receive documented and approved HAZCOM and safety and health training? | ✓ | | |
| 7 | Are grass clippings removed from 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? | | | ✓ |
| 10 | Are appropriate quantities of fertilizers applied during weather conducive to reducing the potential for leaching and runoff? | ✓ | | |
| | Point totals for each column | 8 | 1 | 1 |

| 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 appropriately designated and mapped 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 irrigation system flow meters been installed to monitor water use and detect potential waste? | ✓ | | |
| 6 | Has the entire golf course facility property been examined for landfills, critical habitats, threatened or endangered species, wetlands, floodplains, and historical/cultural resources or other environmentally sensitive features? | ✓ | | |
| 7 | Are employees encouraged to minimize their trips around the course to conserve on the use of fossil fuels and minimize potentially harmful exhaust emissions? | ✓ | | |
| 8 | Do the restaurant and/or snack bar utilize reusable plates and silverware for use by customers throughout the facility’s operating hours? | | | ✓ |
| 9 | Have the annual maintenance practices for the designated “minimally-maintained” or natural areas been coordinated with the installation Bird/Wildlife Aircraft Strike Hazard (BASH) officer and installation environmental management personnel? | | | ✓ |
| 10 | Are all motorized golf course equipment regularly checked for excessive air polluting emissions? | ✓ | | |
| Point totals for each column | | 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 equipment wash or wastewater kept from directly entering surface water and are they recycled or allowed to filter through a vegetative area? | ✓ | | |
| 3 | Are outdoor irrigation of non-golf course landscape areas regularly monitored and maintained for leaks and efficient performance? | ✓ | | |
| 4 | Has the golf course staff coordinated with the installation’s environmental staff on potential storm water management planning requirements? | | | ✓ |
| 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, natural, or water feature areas? | ✓ | | |
| 6 | Are all water feature maintenance tasks coordinated with the installation Bird/Wildlife Aircraft Strike Hazard (BASH) officer and installation environmental management personnel? | | ✓ | |
| 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 that pass through the golf course such as streams or creeks regularly monitored both upstream and downstream of the course for overall water quality? | ✓ | | |
| 9 | Does the facility have an approved written and readily available Drought Management Plan if, or when irrigation restrictions may be required by the community or the installation? | | | ✓ |
| 10 | Is there a comprehensive, up to date, and readily available written Water Resource Management Plan for the entire golf course facility? | | | ✓ |
| Point totals for each column | | 6 | 1 | 3 |

| 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 such as Integrated Pest Management, Tree Management, and Hazard Communication? | | ✓ | |
| 3 | Are green, tee, and fairway mowing heights maintained at reasonable levels that do not unduly stressing turf or requiring additional chemical inputs? | ✓ | | |
| 4 | Are there regular and documented procedures in place to continually improve overall course soil health such as topdressing, organic amendments, aeration, and drainage improvements? | ✓ | | |
| 5 | Is there an up to date and readily-available map of the course's "hot spots", or those areas requiring special care or regular attention? | | | ✓ |
| 6 | Is all maintenance equipment cleaned in a manner that minimizes or eliminates the potential for spreading of pest or disease contamination? | ✓ | | |
| 7 | Has there been a complete examination of all aspects of the golf course facility operation (including the snack bar and grill, clubhouse, pro shop, cart storage facility, and maintenance complex) for potential negative environmental impacts? | ✓ | | |
| 8 | Is contour mowing used to conserve fuel and increase playability and aesthetics? | ✓ | | |
| 9 | Have all playing surfaces been inventoried and mapped to identify potentially challenging soil types? | | ✓ | |
| 10 | Are soil tests and/or plant tissue analysis used to determine nutritional requirements? | ✓ | | |
| | Point totals for each column | 7 | 2 | 1 |

| Customer Relations & Education | | | | |
|---|--|------------|----------------|-----------|
| # | Environmental Compatibility Indicator | Yes | Partial | No |
| 1 | Are the course manager and superintendent involved in an on-going and documented customer environmental management educational program? | | | ✓ |
| 2 | Is there a highly visible location at the course or clubhouse where golf course environmental management notices and informational messages are regularly posted for the education and enjoyment of customers? | | | ✓ |
| 3 | Do the course manager and superintendent actively communicate with customers to determine their points of view? | ✓ | | |
| 4 | Is there documented, regular communication by course management with installation civil engineering, environmental, and leadership on GEM program issues or concerns? | | ✓ | |
| 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 around or near recycled or otherwise non-potable water? | ✓ | | |
| 8 | If applicable, have areas of the course been designated "Environmentally Sensitive Zones" per USGA rules? | ✓ | | |
| 9 | Are course staff members regularly trained on how to improve their dealings with customers? | ✓ | | |
| 10 | Are there clinics provided to teach beginning golfers the basics of the game to include the rules as well as the environmental challenges faced by the golf staff at their facility? | | ✓ | |
| | Point totals for each column | 5 | 2 | 3 |

| Miscellaneous Special Projects & Activities | | | | |
|--|--|------------|----------------|-----------|
| # | Environmental Compatibility Indicator | Yes | Partial | No |
| 1 | Are there project(s) planned and funded for execution in the near future that would demonstrate the compatibility of the course's management methods with GEM program initiatives? | | ✓ | |
| 2 | Are there project(s) 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? | | | ✓ |
| 4 | Are there field trips hosted at the course for local students or other community groups? | ✓ | | |
| 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 | Have any of the local schools or universities been involved in educational or research activities at your course within the last three years? | ✓ | | |
| 8 | Are there 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 | 4 | 2 | 4 |

ECQ Summary

| # | Environmental Compatibility Quotient Category | Yes | Partial | No |
|----|--|-----------|-----------|-----------|
| 1 | Overall Management Philosophy & Documentation | 6 | 2 | 2 |
| 2 | Safety, Training, & Awareness | 8 | 1 | 1 |
| 3 | Compliance | 9 | 0 | 1 |
| 4 | Pesticide Use, Storage, & Handling | 8 | 2 | 0 |
| 5 | Pollution Prevention | 8 | 1 | 1 |
| 6 | Conservation Practices | 7 | 1 | 2 |
| 7 | Water Resources | 6 | 1 | 3 |
| 8 | Maintenance Practices | 7 | 2 | 1 |
| 9 | Customer Relations & Education* | 5 | 2 | 3 |
| 10 | Miscellaneous Special Projects & Activities* | 4 | 2 | 4 |
| | Composite point total/response percentage | 68 | 14 | 18 |

Jun 07 - Cardinal Creek Golf Course, Scott AFB, IL

- Actual ECQ (# of “Yes”) = 68 (Red “Just started”)

- Potential ECQ (Actual ECQ plus “Partial”) = 82 (Yellow “Showing progress”)

* = Category may need improvement or attention



Environmental challenges

One of the important results of the GCEBA process is the identification of potential environmental challenges to be addressed in the long-term GEM Planning process. After determining the relative significance and validation of each potential environmental challenge, the installation golf and environmental staffs should determine the set of final challenges that will be actively managed in the GEM Plan. Armed with the list of final environmental challenges, the golf staff should determine the best management approach that satisfies the goals of the golf facility from the course playability and customer satisfaction perspectives. Then the golf staff's preferred management approach should be coordinated with the installation's environmental staff for refinement, coordination, and approval.

Ultimately, the combined environmental and golf staff team should proceed toward finalizing the GEM Plan. The entire process can be viewed at the AFCEE GEM website (<http://www.afcee.brooks.af.mil/ec/golf/>). The following final environmental challenges were identified during the GCEBA process:



Purple loosestrife is almost as attractive as it is invasive.

FINAL ENVIRONMENTAL CHALLENGES

The following final environmental challenges were identified during the GEM Plan process:

- Stormwater management/floodplain
- Airfield criteria
- Hole relocation project
- Wetlands
- Bird/wildlife Aircraft Strike Hazard (BASH)
- Irrigation water quality
- Environmental Restoration Project (ERP) site

Cardinal Creek Golf Course Environmental Challenges



Cardinal Creek's flow can be an easily managed trickle or a raging, out of control serpentine monster.

STORMWATER MANAGEMENT/FLOODPLAIN

Cardinal Creek, which flows from the northwest to the east through the golf course property, is subject to potential flooding. There is a 100-year floodplain associated with the creek. According to the INRMP, a floodplain and watershed survey was conducted in 2005. This information is being used to develop a Floodplain Management Plan and Watershed Management Plan. These documents are still in progress.

Driver/requirement

- Clean Water Act

Objective

Ensure that golf course management practices are fully compliant with all stormwater and floodplain requirements and regulations.

Management Practices

- Coordinate creek maintenance procedures with installation environmental management staff
- Establish fertilizer and pesticide application buffers and communicate to applicators

Target

- Continually maintain compliance with appropriate stormwater and floodplain regulations and requirements



Pest management is a recurring requirement during the golf season..

AIRFIELD CRITERIA

The Cardinal Creek Golf Course has always been intimately connected with the airfield at Scott AFB. In 1964, waiver SC 5010 was granted for lateral safety zone and airfield clear zone criteria violations by MATS/MAMCE. In 1987, Scott AFB's airfield was redesignated as joint use when the Mid America Airport was created as a result of Chicago's O'Hare Airport expansion. This put further strain on the nearly collocated golf course and airfield as the FAA promptly installed a sign in the center of the 9th fairway declaring "off limits" to all – golfers and Cardinal Creek staffers alike! Due to improved relations and increased understanding on all sides of this important challenge, these signs have been removed. Regardless, the waiver is still active.

At the request of then AMC/CE, BG Fox, AFCEE conducted a feasibility study for the proposal to move the offending holes to a newly cleared site – the former Cardinal Creek Housing area. The study determined that at least 10 holes, the clubhouse, cart facility, driving range, and putting green were within the airfield criteria boundaries. Two options were compiled that mitigated these violations to some degree.

Driver/requirement

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

Objective

Eliminate all airfield criteria waivers and continue coordination and communication with airfield managers.



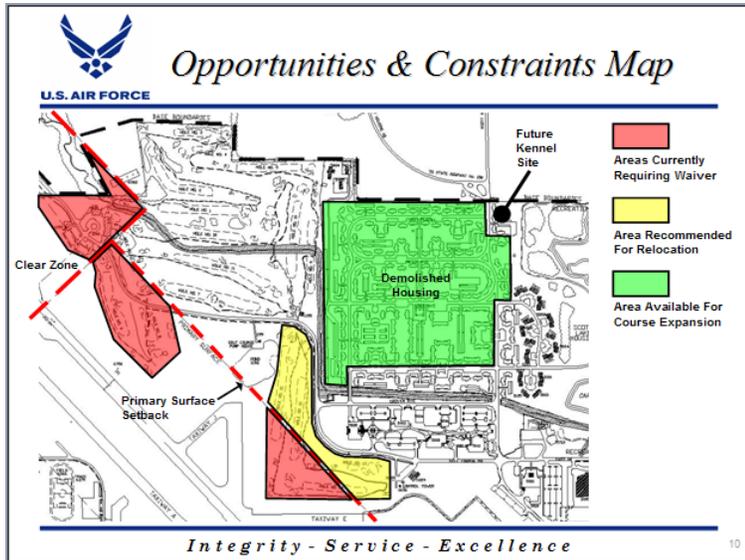
Signs like this one line the 9th, 14th, and 15th holes.

Management Practices

- Mow all minimally-maintained areas adjacent to the airfield in accordance with 7-14" requirement
- Secure funding to implement the relocation of the golf holes and other golf facilities creating waiver requirements

Target

- Eliminate all golf-related waivers by 2010



An AFCEE feasibility study identified several airfield violations.

HOLE RELOCATION PROJECT

In 2001, at the request of the HQ AMC/CE, AFCEE conducted an airfield safety and golf course relocation feasibility study. The study concluded that all or part of nine different holes, the clubhouse and its parking area, cart storage facility, putting green, and the driving range were violated either the primary surface or clear zone airfield criteria. The study estimated that a minimum of \$1.5M was required to relocate the golf holes and at least \$6.4M to relocate all violating facilities.

AFCEE conducted a follow-up study in May 2003. The report is available on the GEM website at: <http://www.afcee.brooks.af.mil/ec/golf/docs/ScottGolfCourseRedesign.pdf>.

Driver/requirement

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

Objective

Secure funding for the implementation of the hole relocation project.

Management Practice

- Assist environmental, planning, and programming staff members with the definition and implementation of this project

Target

- Implement proposed solution by 2010



The old housing area is gently rolling and features many large trees.



This May 2003 drawing was the result of a follow-on AFCEE visit to accomplish “groundtruthing” of Option 2 to ensure that positive site features and, trees were optimized while minimizing the potential for environmental impacts.

WETLANDS

The Final Wetlands Delineation Report identifies three areas of the Cardinal Creek Golf Course property as palustrine emergent wetlands. Palustrine emergent wetlands are dominated by emergent and rooted herbaceous hydrophytes, excluding mosses and lichens. These plants are typically perennial, can

tolerate water at their base, but they cannot survive long periods in which they are completely submerged. Emergent wetlands are found throughout the United States and include freshwater marshes, freshwater tidal marshes, wet prairies, sloughs, the shallow vegetated zones along rivers and lakes, prairie potholes, bogs and fens.

The report also deemed that the pond near the clubhouse is classified as a Water of the United States. This pond and nearby associated wetlands (R1 and R2) are jurisdictional and vegetated with “broad-leaf cattail, canary grass, jewelweed, ash saplings, seedbox, and rice cutgrass”. The smaller wetland (AA) located behind the cart storage facility was considered nonjurisdictional by the report.

Driver/requirement

- Clean Water Act, Section 404
- Executive Order 11990, Protection of Wetlands

Objective

Never violate Section 404 requirements as a result of golf course management practices.

Management Practices

- Establish appropriate fertilizer and pesticide application buffers along all identified wetlands
- Coordinate in advance all maintenance practices within boundaries, if any, with installation environmental management personnel

Target

- Within 45 days of approval of management approach by the installation environmental staff, the golf staff will conduct training and visit each wetland with appropriate maintenance personnel to confirm buffer locations



Still a mystery to the golf staff, someone has entered the golf course property and “officially delineated” wetlands.



The former Cardinal Creek Housing Area awaits cleanup and reuse.

ENVIRONMENTAL RESTORATION PROJECT (ERP) SITE

The former Cardinal Creek housing area was closed in 1999 and 808 housing units were demolished in 1999-2000. Environmental analysis revealed that chlordane used in the past around the housing foundations violated Illinois state environmental regulations triggering restoration requirements. Clean up actions have been delayed due to cost.

The hole relocation project is proposed in this area and could allow the U.S. Air Force to avoid expensive restoration activities. The new holes would function as a cap for the chlordane. When combined with appropriate land use controls state regulators and airfield managers should be excited and satisfied.

Driver/requirement

- CERCLA

Objective

Ensure that the Cardinal Creek housing area is utilized for the proposed golf hole relocation project to minimize expenditures and to eliminate undesirable airfield criteria wavers.

Management Practices

- Work with installation commanders and environmental staffers to ensure final remedial action is the golf hole relocation project

Target

- Implement proposed golf hole relocation project at earliest possible time.



The wire grid over the irrigation pond minimizes waterfowl activity.

BIRD/WILDLIFE AIRCRAFT STRIKE HAZARD (BASH)

As mentioned above, the Scott AFB airfield is directly adjacent to Cardinal Creek. According to the BASH Plan, “The Scott AFB Golf Course and its associated water features may also attract a variety of birds and other wildlife species and mitigation measures may need to be expanded on and around this facility.” Every possible measure should be taken to ensure that the golf staff minimizes the potential BASH at their facility.

The Draft 375 BASH Plan also states “Stands of forest and brush [to include Cardinal Creek GC] attract roosting birds such as crows, blackbirds, starlings, and grackles, and perching raptors such as red-tailed hawks, American kestrels, and turkey vultures, as observed during the fall 2006 visit. They also provide staging areas for the extensive flocks of blackbirds and starlings in nightly preparation for ultimate movement to their roosting sites. Forested areas and brush also provide feeding and security cover for large mammals such as deer and coyotes.”

The Plan commends the golf staff for their efforts in minimizing BASH concerns. “The retention [irrigation] pond on the Scott AFB Golf Course near the approach end of Runway 14R was covered with a wire grid system that has been very effective at deterring birds from accessing this open water source.”

Driver/requirement

- AFI 13-213, *Airfield Management*
- AFI 32-1053, *Pest Management Program*
- FAA Advisory Circular 150/5200-33A, *Hazardous Wildlife Attractants On Or Near Airports*

Objective

Continue to maintain the entire golf course facility in accordance with airfield management guidelines.

Management Practices

- Eliminate all unnecessary vegetation around water bodies
- Mow all minimally-maintained areas in accordance with airfield maintenance standards (usually a requirement-based mowing height of 7-14")
- Maintain wire grid system over the irrigation pond
- Attend all Bird Hazard Working Group meetings

Target

Ensure that the Cardinal Creek Golf Course is always in compliance with airfield management guidelines established by the U.S. Air Force and the Federal Aviation Administration.



Since the recycled water used for irrigation at Cardinal Creek GC arrives with a pH of nearly 10, a sulfur burner is employed for treatment prior to use.

IRRIGATION WATER QUALITY

Prior to the new irrigation system installed in 2005, the course maintenance staff constantly fought calcium buildup in the course's sprinkler heads. This was due to the use of highly basic treated effluent that featured high salts and a pH of 9.9. As part of the new system, a sulfur burner was installed to treat the high pH and mitigate the calcification problem in the sprinklers. Accordingly, large quantities of high grade sulfur are needed during the high irrigation season. Sulfur dioxide is a by-product of the process creating a potential for safety concerns for the irrigation technician and the rest of the golf staff.

Driver/requirement

- Ability to maintain greens at the current highest quality standard

Objective

Ensure that pH of irrigation water is maintained at a level compatible with the agronomic requirements of Cardinal Creek Golf Course.

Management Practices

- Maintain sulfur burner according to manufacturer’s recommendations at all times
- Ensure anyone using or maintaining sulfur burner is adequately trained and utilizes personal protective equipment as required

Target

Perform regular and annual maintenance as required by manufacturer.

GEM Plan goals & objectives

Goals are defined as actions or results that should be accomplished in the next year prior to the annual update of the Integrated Natural Resources Management Plan.

- Develop and post a map of environmental challenges on the golf course
- Coordinate with the installation's environmental staff on potential storm water management planning requirements
- Designate, document and communicate "no spray" areas around pond, river, stream, or lake edges

Please see the AFCEE GEM program website (<http://www.afcee.brooks.af.mil/ec/golf/>) for more information.)

Objectives are defined as actions or results that are desired to be accomplished prior to the next INRMP update currently scheduled for 2011.

- To complete all requirements for designation as an Audubon Certified Sanctuary Program golf course by the year 2010
- Compile and implement a native tree installation program complete with planting plan and maintenance schedule

- Compile a comprehensive written Water Resource Management Plan to include a Drought Management Plan for the entire golf course facility

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. The following best practices are in use at Cardinal Creek Golf Course, Scott AFB, IL:

- Incorporate GEM program materials into new employee orientation and training
- Maintain wire grid system over irrigation pond to minimize potential BASH concerns for this important golf course function

Please see the AFCEE GEM program website (<http://www.afcee.brooks.af.mil/ec/golf/>) for more information.



Conclusion

The Civil Engineering Squadron’s unit environmental coordinator program should provide the key oversight to assist in improving the ability of the golf and environmental staffs to work together to better support the Scott AFB mission. In the final examination, access may be the only other major issue facing the Scott AFB environmental and golf staff members.



Most of the course’s poorly drained areas are close to the airfield.

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 within the limited budget and support of the mission.



The pond left and behind the 2nd green (flagstick is just visible in background) has become unsightly with plant growth. In addition, the retaining wall is failing and may be a safety hazard for players and employees alike.



Massive sand bunkers typify the Cardinal Creek linkscape.



Some plants have exceeded their usefulness and should be removed.



Landscape development and a spot of color are a nice touch.



A sinkhole on the 12th has received little to no attention.



Did a leaking ice machine contribute to creating a wetland?



Cardinal Creek's greens may be the best in the Air Force right now.



Sink holes in the 10th fairway are caused by failed storm drain.



A comprehensive Tree Management Plan would be a valuable tool.



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<http://www.afcee.brooks.af.mil/ec/golf/>