



**Wright-Patterson Golf Courses
Environmental Management Plan
Wright-Patterson AFB, Ohio Jul 07**





Wright-Patterson AFB Golf Courses Environmental Policy

**In concert with the
Wright-Patterson 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 constantly reevaluate our processes
to achieve the highest standards
of environmental excellence.**

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 61
Potential ECQ 80

Final environmental challenges

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

- Historic district
- Threatened & endangered species
- Installation Restoration Program site
- Water quality, floodplains, & NPDES outfalls
- Wetlands
- Audubon Certified Sanctuary Program
- Bird/wildlife Aircraft Strike Hazard (BASH)
- Proposed force main project
- Air quality
- Invasive species

Where do we go from here?

The true measure of a successful GEM program is how well is it executed in the field each and every day. The installation golf and environmental staffs should continue to analyze, document, monitor, evaluate, revise, and implement changes based on lessons learned to ensure there are no impacts to the installation mission. The GEM Plan should be updated regularly and completely revised as required with the INRMP.

Analysis

Course descriptions

With over 30 years experience at the Wright-Patterson AFB golf courses, the Director of Golf has been directly responsible for many of the improvements and amenities offered at the 45-hole facility. The courses average 85,000 rounds per year at the two 18-hole and one 9-hole layouts. Blessed with hundreds of mature trees and quality routing and design, the Wright-Patterson AFB golf courses represent the cream of the Air Force Materiel Command Services recreational inventory.

PRAIRIE TRACE - WEST COURSE

Blessed by ample space and numerous and now large deciduous and evergreen trees, the Prairie Trace Golf Course West has always been the deserved “flagship” of the phenomenal Wright-Patterson golf courses. Since the course just received a major renovation to its greens by the internationally-renowned Columbus, Ohio golf architecture firm of Hurdzan/Fry, Prairie Trace’s large quantity of customers are in “high cotton”.

All 18 of the greens and the putting green were redesigned and rebuilt over the past year. The grand reopening ceremony was held in Jul 07 and golf is good once again in Dayton.

PRAIRIE TRACE – EAST COURSE

The nine-hole, so-called “reliever” course has proved to be a wise decision. Beginning golfers can hone their skills on a shorter and relatively easier golf course without the stress of holding up play. Intramural teams use the course nearly year round. And, although the East at Prairie Trace doesn’t offer the intense challenge desired by the so-called better player, it still provides a quality recreational experience – which is the bottom line for U.S. Air Force Services facilities.

TWIN BASE

Always the mysterious “sister” course on the other side of the base, the Twin Base Golf Course has come of age. Fiscal year 2007 marked the first time that the course operated under non-appropriated funding rules. Constructed in the early 1960s, the course was maintained using funds generated by the Civilian Welfare Fund.

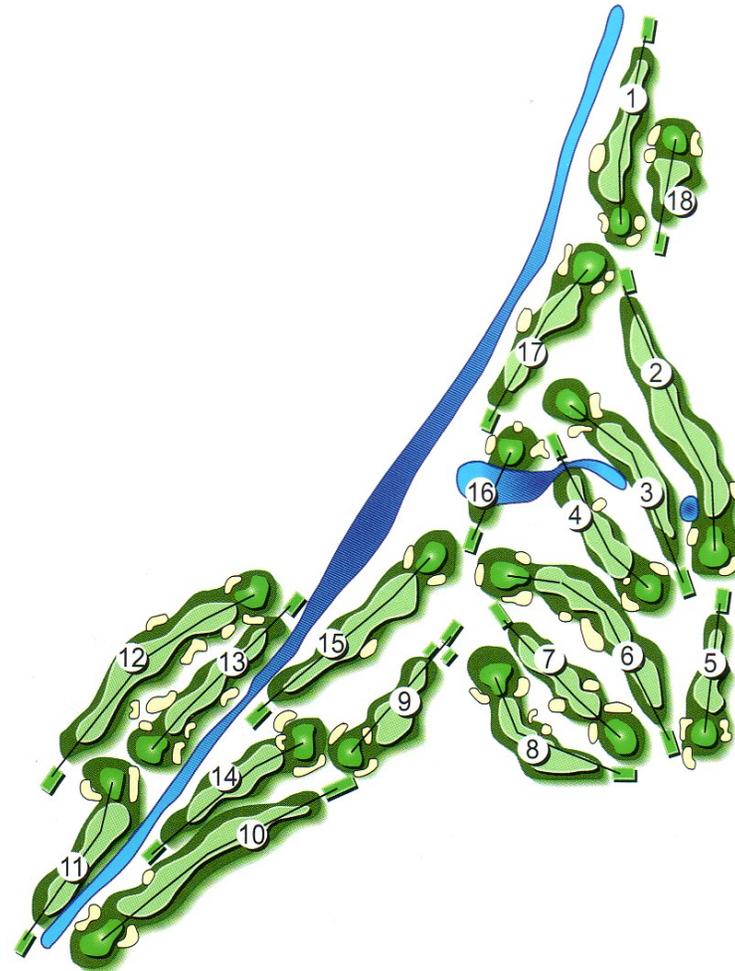
The course is top-rate though as the routing and design has always been interesting and challenging. The course has a small creek that manages to cross every one of its par fives in the least affable locations. The greens are generously sized and usually in phenomenal condition.



Wright-Patterson Golf Courses Aerial Photo

West Course –details

Architect	CE/Unknown-Hurzdan/Fry
Year constructed	1922 - 2006
Climate	Temperate
Average annual rainfall	35 inches
Average growing season	240 days
Winds/Prevailing Direction	West/east
Total Facility Acreage	250 acres
Par	36-36-72
Yardage/Rating/Slope	Blue/6745/72.4/130 White/6348/70.7/126 Yellow/5824/68.4/121 Red/5173/69.3/116
Turfgrass	Bentgrass/Poa annua
Tees-	Bentgrass
Fairways-	Dominant Xtreme Bent
Greens	Bluegrass/Ryegrass
Roughs-	
Irrigation water source	Non-potable groundwater



Prairie Trace Golf Course – West Layout



Prairie Trace Golf Course - West Aerial Photo

East Course –details

Architect	Civil engineering/Unknown
Year constructed	1922
Climate	Temperate
Average annual rainfall	35 inches
Average growing season	240 days
Winds/Prevailing Direction	West/east
Total Facility Acreage	100 acres
Par	35 (9 holes)
Yardage/Rating/Slope	White/2732/66.3/118 Red/2411/66.5/106
Turfgrass	Bentgrass/Poa annua
Tees-	Bentgrass
Fairways-	Bentgrass
Greens	Bentgrass
Roughs-	Bluegrass/Ryegrass
Irrigation water source	Non-potable groundwater



Prairie Trace Golf Course – East Layout



Prairie Trace Golf Course - East Aerial Photo



Twin Base Course –details

Architect	William Diddle
Year constructed	1959/1962
Climate	Temperate
Average annual rainfall	35 inches
Average growing season	240 days
Winds/Prevailing Direction	West/east
Total Facility Acreage	250 acres
Par	36-36-72
Yardage/Rating/Slope	Blue/6903/71.7/128 White/6418/69.8/124 Yellow/5592/66.0/116 Red/5177/69.9/115
Turfgrass	Bentgrass/Bluegrass
Tees-	Bluegrass
Fairways-	Penncross/Wash. Bent
Greens	Bluegrass/Ryegrass
Roughs-	Non-potable groundwater
Irrigation water source	



Twin Base Golf Course Layout



Twin Base 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)



A small creek comes into play on several holes at Twin Base.

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)



The 16th is the Prairie Trace West's signature hole.



First putt ceremony on the grand reopening of Prairie Trace West.

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 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	3	1

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 on their 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	All employees receive regular, documented training on all 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	7	1	2

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	6	1	3

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	7	1	2

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	2	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 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 officially 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	4	4	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 Feature 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 maintained and 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	3	0

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	7	1	2

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 regular 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	Are any of the local schools or universities involved in educational or research activities at your course?	✓		
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		5	0	5

ECQ Summary

#	Environmental Compatibility Quotient Category	Yes	Partial	No
1	Overall Management Philosophy & Documentation*	4	5	1
2	Safety, Training, & Awareness	7	1	2
3	Compliance	6	1	3
4	Pesticide Use, Storage, & Handling	7	1	2
5	Pollution Prevention	8	2	0
6	Conservation Practices*	4	4	2
7	Water Resources	6	1	3
8	Maintenance Practices	7	3	0
9	Customer Relations & Education	7	1	2
10	Miscellaneous Special Projects & Activities*	5	0	5
	Composite point total/response percentage	61	19	20

Jul 07 – Wright-Patterson Golf Courses, Wright-Patterson AFB, OH

- Actual ECQ (# of “Yes”) = 61 (“Just started” **Red**)

- Potential ECQ (Actual ECQ plus “Partial”) = 80 (“Showing progress” **Yellow**)

* = Category requires improvement or attention



Wright-Patterson can claim two of the best superintendents in the U.S. Air Force.

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 GEM process:

FINAL ENVIRONMENTAL CHALLENGES

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

- Historic district
- Threatened & endangered species
- Installation Restoration Program site
- Water quality, floodplains, & NPDES outfalls
- Wetlands
- Audubon Certified Sanctuary Program
- Bird/wildlife Aircraft Strike Hazard (BASH)
- Proposed force main project
- Air quality
- Invasive species

Image removed due to the perceived potential threat to security.

Prairie Trace Golf Course – West Environmental Challenges

Image removed due to the perceived potential threat to security.

Prairie Trace Golf Course – East Environmental Challenges

Image removed due to the perceived potential threat to security.

Twin Base Golf Course Environmental Challenges



The Prairie Trace clubhouse is architecturally compatible with nearby Wright-Patterson AFB historical district.

HISTORIC DISTRICT

General summary information not provided.

Driver/requirement

- Archeological and Historical Preservation Act (16 U.S.C. 469)
- National Historical Preservation Act

Objective

Support the historical district planning guidelines when provided.

Management Practices

- Implement annually coordinated tree and shrub maintenance plan

Target

- Coordinate any major tree pruning or removal projects that could possibly impact the visual quality of the historical district or its viewsheds



The eastern massasauga has been seen at the Twin Base course.

THREATENED & ENDANGERED SPECIES

“Although candidate species are not yet afforded the protection of the ESA, the USFWS strongly encourages DoD facilities to initiate conservation actions to slow or halt the decline of such species during the interim period. The eastern massasauga rattlesnake is listed as endangered by the State of Ohio. "Massasauga" means "great river mouth" in Chippewa, so named because it is usually found in wet areas including wet prairies, marshes, and low areas along rivers and lakes. They avoid open water and heavily wooded areas, and seem to prefer the

cover of broad-leafed plants, emergents, and sedges (ODNR 2005a).” This small rattler is non-aggressive and has been observed at the far western edge of the Twin Base Golf Course by the maintenance staff both dead and alive.

The Indiana bat is a federally-listed endangered species that “only occur at WPAFB during summer”. The Indiana bat form colonies from May to August in wooded areas in either live or dead trees. Clearing of these wooded areas diminishes available summer habitat for this diminutive species with a 10 inch wingspan.

In addition, the INRMP lists several plants, including the bald eagle, clubshell, and a nondescript moth, the blazing star stemborer as protected, threatened, or endangered.

Driver/requirement

- Endangered Species Act

Objective

Maintain compliance with the recommendations of the WPAFB Natural Resource Manager in accordance with state and federal regulations.

Management Practices

- Support the survey of eastern massasauga rattlesnakes conducted by the Ohio Department of Natural Resources
- Educate customers and maintenance staff on how to deal with the venomous, yet relatively harmless – at least to humans – species

- Notify the WPAFB Natural Resource Manager when encountered

Image removed due to the perceived potential threat to security.

This INRMP map shows how the Indiana bat habitat occurs all around the Wright-Patterson AFB golf courses.

Target

- Ensure that no large trees will be removed between 15 April and 15 September without prior coordination and approval from WPAFB Natural Resource Manager
- Preserve all species of the eastern massasauga through customer & staff education & training
- Encourage customers and staff not to harass or kill these snakes



LF07 is a challenge to both Prairie Trace West and Twin Base courses.

erosion or exposed debris. There are digging restrictions for irrigation repairs or other landscape or construction activities in this area of the Prairie Trace West course.

Landfill 7, encompassing about 18 acres in OU4 (see Figure 3), was in operation from 1952 to 1962 as a trench and cover operation that accepted general refuse. The land currently supports the WPAFB equestrian facility. Differential settlement is visible throughout the horse stable complex; the parking lot had subsided in some places, and the horse barns are sagging and shifting”.

INSTALLATION RESTORATION PROGRAM (IRP) SITE

Historically, Wright-Patterson AFB has hosted several industrially-based logistic missions. Accordingly, like other similar military installations, several areas have been designated as cleanup sites for the installation to manage and maintain. Some of these areas occur on or near the Wright-Patterson golf courses.

The IRP report states that “Landfill 3 is in OU4, in the southeastern section of Area C of Wright-Patterson AFB. The landfill operated as a surface dump and burn operation from about 1940 to 1944 and covered approximately three acres. It underlies the tenth hole of the Military Golf (West) Course and is currently covered with grass and shrubs, with no observed

Image removed due to the perceived potential threat to security.

The dashed blue line defines the LF07 boundary.

The report continues with “Refuse has reportedly been uncovered during grass seeding and planting operations, indicating that only a thin soil cover exists over portions of the landfill. A section of the west side of the landfill has steep, 10- to 20-foot slopes where scrap metal and concrete rubble were exposed. An area adjacent to the northwestern edge of Landfill 7 is referred to as the *drum staging area*, and an area northwest of the landfill, where scattered drums were located, is referred to as the *drum disposal area*. The exact boundaries of these sites have not been accurately defined. In 1990, 125 drums were recovered from these sites, including 96 empty drums and 29 that were disposed of at a hazardous waste facility”.

Driver/requirement

- CERCLA/RCRA

Objective

Never allow digging to occur over or around landfills unless properly coordinated with installation restoration program manager in advance.

Management Practices

- Communicate all general landfill boundaries and depths to golf maintenance staff and any contractors working on or near the golf course property

Target

- Ensure that all digging permits are completed by the installation restoration program manager prior to beginning work



A small creek crosses several holes on the Twin Base course.

WATER QUALITY, FLOODPLAINS, & NPDES OUTFALLS

According to the INRMP, “WPAFB contains a 190-mile storm water collection and drainage system consisting of open drainage ditches, swales, culverts, and buried pipe. Twenty-three storm water drainage areas with defined discharge points (outfalls) are located through the base. The outfalls discharge to the Mad River, Hebble Creek, Trout Creek, and Bass Lake. All of the outfalls are permitted under WPAFB’s NPDES Permit. In the eastern, northern, and western portions of Area C, storm water flows primarily overland to undefined (non-point) discharge points along the Mad River, Hebble Creek, and an unnamed stream. All storm water runoff from WPAFB ultimately flows into the Mad River.

Image removed due to the perceived potential threat to security.

INRMP map shows installation floodplains and drainage pattern.

As described in Section 6.2.2.2 of the INRMP, there is potential for numerous hazardous materials used on WPAFB to contact storm water and, eventually, surface water or groundwater. WPAFB has established a Storm Water Pollution Prevention Team to manage storm water issues and prevent pollution. WPAFB has developed a Storm Water Management Plan and a Storm Water Pollution Prevention Plan (SWP3) in compliance with the provisions of the federal CWA, its implementing regulations, and the Ohio Water Pollution Control Act. The SWMP provides guidance for minimizing the potential for contaminants to contact storm water. Measures include monitoring storm water outfalls in accordance with the NPDES permit; public education, outreach, and participation; detection and elimination of illicit discharges; pre- and post-construction site runoff control; and pollution prevention measures. The

SWP3 addresses best management practices for storm water during specific activities and processes, such as aircraft deicing.

A Spill Prevention Control and Countermeasures (SPCC) Plan was developed in 2000 and updated in 2006. The SPCC Plan provides guidelines for minimizing the potential for spills on base, to prevent any spill from leaving the base, and to ensure that the cause of any spill is corrected. WPAFB also maintains greater than 600 site-specific spill plans. WPAFB personnel and contractors are educated about storm water pollution prevention. Public outreach, including brochures, training, signage, and community events are described in the SWMP.



Somewhere behind the perfectly compliant required sign and vegetative "buffer" is the Prairie Trace East 7th hole pond.

Water quality is monitored in accordance with WPAFB’s NPDES permit, which requires monthly or biweekly sampling at the 23 permitted outfalls. Samples include testing for suspended and dissolved solids, oil and grease, glycol (deicing fluid), and several semi-volatile organic chemicals, and measurement of pH, DO, and temperature. The WPAFB Storm Water Management Program actively seeks opportunities to reduce the discharge of pollutants from base operations that could adversely impact storm water quality.



This waterway bisects the Prairie Trace West course.

In addition to chemical pollutants, soil erosion and runoff of sediment-laden storm water may affect surface water bodies. Most upland areas on WPAFB do not have high potential for significant soil erosion. However, sites where soil is exposed, such as

construction sites, may contribute soil to storm water runoff. For projects involving disturbance of land 1 acre or greater in size, a Notice of Intent must be filed, a NPDES permit for construction must be issued, and a site-specific SWP3 must be developed, implement, and enforced. The Storm Water Program Manager reviews the site-specific SWP3s. Typical storm water run off controls for construction sites include silt fences, detention ponds, rock berms, drainage swales, and hay bales.

Storm Water Program personnel periodically evaluate construction sites to ensure SWP3s are implemented. Prompt revegetation of disturbed sites minimizes the potential for soil erosion and runoff. Projects on WPAFB that result in vegetation removal and soil disruption must be restored with appropriate seed, and in some cases topsoil, during the spring or fall. The Base Natural Resources Program Manager must approve seed selection and timing of planting. Temporary or “cover crop” seeding is not acceptable unless it is used for the purpose of temporarily stabilizing the soil until the project is completed.”

Driver/requirement

- Clean Water Act

Objective

In direct support of the stormwater management program, the golf course staff shall coordinate all activities that could possibly be detrimental to the quality of stormwater or surface water resources with installation environmental professionals.



Water-loving willows have been planted on the Twin Base course to help minimize wet conditions.

Management Practices

- Designate, communicate, and map established pesticide and fertilizer application buffers
- Finalize SPCC Plan for new maintenance complex
- Become a member of the Wright-Patterson AFB Storm Water Pollution Prevention Team and attend meetings
- Regularly train the maintenance staff on stormwater issues and practices

Target

- Maintain constant compliance with all installation stormwater management practices

- Supply final SPCC Plan to installation stormwater & natural resource managers within 30 days and update it as required

WETLANDS

According to the INRMP, “Forty-four wetlands covering approximately 20.5 acres were identified within the limits of WPAFB in 2004”. Ironically, the INRMP does not show any of these areas occurring within or near the golf course properties, the installation environmental mapping data shows nearly all of the Twin Base Golf Course as a wetland.

Driver/requirement

- 33 CFR 328.3(b)
- Clean Water Act, Sections 401 & 404
- Executive Order 11990, Protection of Wetlands
- Ohio Administrative Code, Section 3745
- Ohio Revised Code, Section 6111.021

Objective

Ensure that the quality of the wetlands area on or near the golf course property will not be diminished in any way as a result of a recurring golf course management practice.

Management Practices

- Minimize all chemical and fertilizer inputs on or near the designated wetland areas

Target

- Immediately modify maintenance plan as required to meet objective above
- Communicate any changes to maintenance plan to employees responsible for applications



Membership in the Audubon program means much more than just paying the \$200 annual fee.

AUDUBON CERTIFIED SANCTUARY PROGRAM

According to the INRMP, “In 2003, the Prairie Trace Golf Club achieved designation as a Certified Audubon Cooperative Sanctuary by the Audubon Cooperative Sanctuary System (Zeh 2003). To reach certification, the course demonstrated that it maintains a high degree of environmental quality in a number of areas. These include environmental planning, wildlife and habitat management, outreach and education, chemical use reduction and safety, water conservation, and water quality management. Trees and shrubs were planted to provide habitat for wildlife, and nest boxes were installed for birds.”

Truly maintaining certification is a significant task – especially when the bulk of the effort falls on the superintendent. Membership costs \$200 per year. Case studies and other updates are among potential recurring requirements. The golf course superintendent is usually the only person to accomplish these duties. In reality, the dichotomy between membership in an organization that encourages creation and maintenance of habitats for birds and supporting a flying mission is a decision only the installation can make. In the end, the only true measure of a quality environmental program is the expert completion and implementation of the GEM Plan every day on the course.

Driver/requirement

- Installation flying mission
- BASH program

Objective

Ensure that compliance with Audubon Cooperative Sanctuary requirements does not hinder the Wright-Patterson AFB mission in any way.

Management Practices

- Deliver annual fee and other program requirements in a timely manner
- Coordinate all field-related Audubon requirements with installation BASH Manager

Target

- Meet annual fee delivery deadline

Image removed due to the perceived potential threat to security.

The hatched area on this map from the INRMP shows a “no waterfowl zone” around the airfield contiguous to the Prairie Trace golf courses.

BIRD/WILDLIFE AIRCRAFT STRIKE HAZARD (BASH)

One of the INRMP’s stated 17 natural resource management goals is to “Support the WPAFB Bird/Wildlife Aircraft Strike Hazard (BASH) Program”. Since BASH is one of the few potentially mission-related golf course management environmental challenges, all efforts of the golf staff must be focused on compliance with the established installation standards and requirements.

Driver/requirement

- Installation flying mission
- BASH program

Objective

Ensure that all minimally-maintained and water feature buffer areas are in constant compliance with installation BASH program requirements.

Management Practices

- Comply with BASH program maintenance requirements on all non-playing areas (as defined by the golf staff) to include 7-14” mowing and removal of all vegetation near ditches and drains, minimize installation of trees and shrubs that may attract birds or deer
- Coordinate with Civil Engineering on improvements or modifications to defined non-golf playing areas involving control of vegetation, surface water resources, and habitat for birds and wildlife
- Become a member of the Bird Hazard Working Group and regularly attend all meetings

Target

- Ensure 100% of BASH concern areas are in compliance by Jun 08

PROPOSED FORCE MAIN PROJECT

As funds become available, a proposed project for a new sanitary sewage force main is set to cut directly through the Twin Base Golf Course. Although the Twin Base golf staff has been directly involved with the project, there are still concerns as several holes will be subject to the work. Irrigation piping and control wires are the largest worry. To their credit, the designers have tried to locate the new force main to minimize destruction of the actual golf holes. The key

to a successful project is to secure a good contractor that appreciates the efforts of the golf maintenance staff’s investment in the property and keeps unnecessary damage to a minimum – if there is any at all.

Image removed due to the perceived potential threat to security.

This drawing shows the proposed force main that cuts directly through the Twin Base Golf Course.

Driver/requirement

- Construction contractor digging on the golf course property

Objective

Ensure that the construction contractor is informed of all underground utilities along with specific rules on how the work is to be performed as the golf course remains open.

Management Practices

- Attend all force main construction project meetings to ensure that the golf course and its customers are protected
- Assemble complete set of digital photographs of the proposed project construction limits prior to start of the work

Target

- No occurrences of force main project contractor damaging areas outside of necessary project limits
- All digging coordinated with contractor prior to actual operations in the field
- Customers warned in advance of work to ensure their enjoyment and safety

AIR QUALITY

According to June 2000 environmental assessment, Wright-Patterson AFB is in a maintenance area for ozone and that the Regional Air Pollution Control Agency governs the Metropolitan Dayton area to include the installation. All actions within the region must conform with applicable state and federal implementation plans. Wright-Patterson AFB focuses its concern on emission of the ozone precursors nitrogen oxide and volatile organic compounds.

Driver/requirement

- Clean Air Act section 176 (c)
- 40 CFR 93.153

Objective

Minimize or eliminate all extraneous air emissions due golf course management procedures.

Management Practices

- Regularly check all maintenance equipment for excessive and potentially polluting emissions
- Ensure employees are encouraged to minimize their vehicle trips around the course

Target

- No extraneous air emissions due golf course management procedures or faulty, poorly tuned or maintained equipment



New minimally-maintained areas at the Twin Base Golf Course may have exacerbated the Canada thistle problem for the short term.

INVASIVE SPECIES

The INRMP lists Canada thistle (*Cirsium arvense*) as an invasive species occurring on the Twin Base Golf Course. The State of Ohio lists this species as a noxious weed. Several other species are identified as occurring in “wasteground” which includes golf courses. The desire to control of invasive plants is relatively obvious, especially to a golf course superintendent. Less obvious are reasons listed in the INRMP include potential hindrance to wetlands management and suppression of reforestation and resulting habitat for threatened species such as the Indiana bat.

Driver/requirement

- Executive Order 13112

Objective

In direct support of the efforts of the state and the installation natural resource program manager, the golf staff will strive to minimize the proliferation of the Canada thistle or other listed invasive species.

Management Practices

- Regularly inspect newly designated minimally-maintained areas for Canada thistle and other potentially invasive species and consult with installation natural resources for best control

Target

- Reduce occurrence of Canada thistle on golf course property by 50% by Sep 08
- Reduce of invasive species on golf course property by 90% by Sep 10

GEM Plan goals & objectives

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

- Determined by installation GEM team (none provided to date)

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

- Determined by installation GEM team (none provided to date)

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:

- Individual Integrated Pest Management Plans for each major category of golf course pests are included in the installation integrated pest management plans

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 installation mission. In addition, conserving precious water supplies through the application of science, engineering, and demonstrated environmental stewardship may be the only other major issue facing the Wright-Patterson AFB environmental and golf staff members.



Great customer service and high quality products are evident throughout the facilities of the Wright-Patterson AFB golf courses.

Table D-6. Golf Course IPMP for Turf Insects.

Pest:								Turf Insects
Purpose:								Golf Course Pest Management
Site(s):								Prairie Trace and Twin Base Golf Courses
Surveillance:								Visual inspections by golf course superintendents or designees.
Frequency:								Routine, included with daily golf course maintenance. White grubs should be monitored more frequently in immature (larva) stages when they are large enough to be observed but small enough to be vulnerable to insecticides.
Mechanical and Physical Pest Management Techniques:								None.
Chemical Application Action Thresholds:								Action thresholds are low on fairways, greens, and tees as turf damage will rapidly impair playability. There is higher tolerance of weeds in the rough, especially at a distance away from the fairways (lower use areas), resulting in less chemical applications in these areas.
Pesticides Used:								All turf insecticides are purchased locally (see below list).
Areas to be Avoided:								Avoid surface water.
Areas to be Treated with Caution:								Lakes and streams.
Precautions for Sensitive Areas:								Applied by trained personnel.
Trade Name	Chemical	Manufacturer	EPA No	Conc. (%)	Form	Diluent	Final Conc.	
Delta Guard	Deltamethrin	Bayer	432-285	4.75	Flowable	Water		
Dunban Pro	Chlorpyrifos	Dow/Elanco	82719-188	22.5	Emulsion	Water	1.5 oz/1000 ft	
Mach 2 1.5 G	Halofenozide	Rohmid	69075-4	1.5	Granular	None	1.5 - 2.3 lb/1000 ft	
Mach 2 Liquid	Halofenozide	Rohmid	69075-2	22.3	Solution	Water	1.5 - 2.2 lb/1000 ft	
Merit 0.5 G	Imidacloprid	Bayer	3125-451	0.5	Granular	None	1.4 lb/1000 ft	
Merit 75 WP	Imidacloprid	Bayer	3125-439	75	Wettable Powder	Water	0.0013	
Sevin 6.3 G	Carbaryl	Lasco	10404-81	6.3	Granular	None	1 - 2.5 lb/1000 ft	
Sevin SL	Carbaryl	Lasco	284-335-10404	41.2	Flowable	Water	1.5 - 8 oz/1000 ft	
Talstar GC	Bifenthrin	FMC Corp	279-3158	7.9	Flowable	Water	0.125 - 0.25 oz/1000 ft	
Tempo 20	Cyfluthrin	Bayer	3125-462	20	Solution	Water	220 gram/lac 0.75	
Triumph 4E	Isazofos	Novartis	100-643	48.8	Solution	Water	oz/1000 ft	
Turcam	Bendiocarb	Not-Am	45630-59	78	Solution	Water	1 - 2 oz/1000 ft	

Individual pest management plans are a best practice worthy of emulation by all U.S. Air Force golf course managers.

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 16th is highly regarded for its risk-reward design.



The parkland Prairie Trace Golf Course at its finest.



The new maintenance complex sits just off the 17th fairway.



The new greens are a joy to play and easier to maintain.



The pond on the 7th at the East has an out of control “buffer”.



Greens at the East course are more typical of Air Force golf.



Ornamental grasses make this one tough bunker.



Drinking water safety is a primary consideration for W-P customers.



There are several creek crossings at the Twin Base Golf Course.



Landscape development has proved to be a worthy investment.



Deception combined with quality bunkering makes for tough golf.



Large trees are a blessing until fungi season begins.



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