

***Plainsview Golf Course***  
**Environmental Management Plan**  
**Grand Forks AFB, ND      August 2007**



**In concert with the Grand Forks 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 Engineering & the Environment (AFCEE) initiative to foster a better understanding of the environmental challenges facing our golf courses worldwide. Armed with the support and approval of the Air Force Services Agency golf program, AFCEE's goal is to facilitate the creation of an environmentally friendly golf course facility while supporting the installation mission. 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, attain and maintain daily compliance with all appropriate regulations, and constantly examine all aspects of golf course management to achieve the highest standards of environmental excellence.

## GEM Program process

There are five steps in the GEM program process.

- Analysis
- Documentation
- Implementation
- Evaluation
- Revision



## Environmental Compatibility Quotient

<b>Actual ECQ</b>	<b>68</b>
<b>Potential ECQ</b>	<b>85</b>

## Final environmental challenges

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

- Tree management
- Water resource management
- Pesticide storage and application
- Airfield criteria violations
- Bird/Aircraft Strike Hazard (BASH)

## Where do we go from here?

The true measure of a successful GEM program is how well is it executed in the field each and every day. The installation golf and environmental staffs should continue to analyze, document, monitor, evaluate, revise, and implement changes based on lessons learned. The GEM Plan should be updated annually and revised during the next INRMP iteration update. The entire GEM process can be found on the regularly improved AFCEE GEM program website (<http://www.afcee.brooks.af.mil/ec/golf/>).

# Analysis

## Course details

Architect	Unknown
Year constructed	1971
Climate	Northern Temperate
Average annual rainfall	20-30 inches
Average growing season	Apr-Oct 200 days
Winds/Prevailing Direction	Northwest
Total Facility Acreage	140 acres
Par	36-36-72 (9 holes)
Yardage/Rating/Slope	Tee- Yards/Rating/Slope
	White/Blue- 6665/72/121
	Red/Yellow-5360/71/120
Turfgrass	Tees- Kentucky Bluegrass
	Fairways- Kentucky Bluegrass / Ryegrass mix
	Greens Penncross Creeping Bentgrass
	Roughs- Ryegrass / local variety mix

## Course description

Located on the south side of the installation, Grand Forks AFB's Plainsview Golf Course is a beautiful 9-hole course on 140 acres. As is typical of the North Dakota Prairie, the course is predominately flat with minimal topographical relief. The course measures 6665 yards for players utilizing the white and blue tees and 5360 yards from the Red/Yellow tees. The verification process was accomplished in August of 2006 by the North Dakota Golf Association.





**Plainsview 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).



*The Plainsview pro shop provides the necessary items.*

## 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)



#7 Tee



#1 Tee.

<b>Overall Management Philosophy &amp; Documentation</b>				
<b>#</b>	<b>Environmental Compatibility Indicator</b>	<b>Yes</b>	<b>Partial</b>	<b>No</b>
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?	✓		
	<b>Point totals for each column</b>	<b>9</b>	<b>1</b>	<b>0</b>

<b>Safety, Training, &amp; Awareness</b>				
<b>#</b>	<b>Environmental Compatibility Indicator</b>	<b>Yes</b>	<b>Partial</b>	<b>No</b>
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	All appropriate employees receive documented training on practices that may adversely impact worker health, 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 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?	✓		
	<b>Point totals for each column</b>	<b>10</b>	<b>0</b>	<b>0</b>

<b>Compliance</b>				
<b>#</b>	<b>Environmental Compatibility Indicator</b>	<b>Yes</b>	<b>Partial</b>	<b>No</b>
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?	✓		
	<b>Point totals for each column</b>	<b>5</b>	<b>5</b>	<b>0</b>

<b>Pesticide Use, Storage, &amp; Handling</b>				
<b>#</b>	<b>Environmental Compatibility Indicator</b>	<b>Yes</b>	<b>Partial</b>	<b>No</b>
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?	✓		
	<b>Point totals for each column</b>	<b>9</b>	<b>1</b>	<b>0</b>

<b>Pollution Prevention</b>				
<b>#</b>	<b>Environmental Compatibility Indicator</b>	<b>Yes</b>	<b>Partial</b>	<b>No</b>
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?	✓		
<b>Point totals for each column</b>		<b>10</b>	<b>0</b>	<b>0</b>

<b>Conservation Practices</b>				
<b>#</b>	<b>Environmental Compatibility Indicator</b>	<b>Yes</b>	<b>Partial</b>	<b>No</b>
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?		✓	
<b>Point totals for each column</b>		<b>4</b>	<b>2</b>	<b>4</b>

<b>Water Resources</b>				
<b>#</b>	<b>Environmental Compatibility Indicator</b>	<b>Yes</b>	<b>Partial</b>	<b>No</b>
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?	✓		
<b>Point totals for each column</b>		<b>8</b>	<b>0</b>	<b>2</b>

<b>Maintenance Practices</b>				
<b>#</b>	<b>Environmental Compatibility Indicator</b>	<b>Yes</b>	<b>Partial</b>	<b>No</b>
1	Is there a written, regularly updated, and 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 for potentially agronomically challenging soil types?	✓		
10	Are soil tests and plant tissue analysis used to determine nutritional requirements?		✓	
<b>Point totals for each column</b>		<b>8</b>	<b>2</b>	<b>0</b>

<b>Customer Relations &amp; Education</b>				
<b>#</b>	<b>Environmental Compatibility Indicator</b>	<b>Yes</b>	<b>Partial</b>	<b>No</b>
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?		✓	
	<b>Point totals for each column</b>	<b>3</b>	<b>3</b>	<b>4</b>

<b>Miscellaneous Special Projects &amp; Activities</b>				
<b>#</b>	<b>Environmental Compatibility Indicator</b>	<b>Yes</b>	<b>Partial</b>	<b>No</b>
1	Are there projects 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 projects planned and funded to reduce the course's potential negative environmental impacts?		✓	
3	Are there tournaments or other events planned that may educate customers on the environmental challenges faced by the golf staff?	✓		
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 special facility-wide recycling programs underway?	✓		
9	Is your course an active participant in the USAF Golf Environmental Management Program?		✓	
10	Has your facility been nominated by your MAJCOM for the golf course environmental management award in the last 3 years?			✓
	<b>Point totals for each column</b>	<b>2</b>	<b>3</b>	<b>5</b>

## ECQ Summary

#	Environmental Compatibility Quotient Category	Yes	Partial	No
1	Overall Management Philosophy & Documentation	9	1	0
2	Safety, Training, & Awareness	10	0	0
3	Compliance*	5	5	0
4	Pesticide Use, Storage, & Handling	9	1	0
5	Pollution Prevention	10	0	0
6	Conservation Practices*	4	2	4
7	Water Resources	8	0	2
8	Maintenance Practices	8	2	0
9	Customer Relations & Education*	3	3	4
10	Miscellaneous Special Projects & Activities*	2	3	5
	<b>Composite point total/response percentage</b>	<b>68</b>	<b>17</b>	<b>15</b>

### Aug 07 of checklist GCEBA Results

#### Plainsview Golf Course, Grand Forks AFB, ND

- Actual ECQ (# of “Yes”) = 68 (Getting Started-Red)

- Potential ECQ (Actual ECQ plus “Partial”) = 85 (Showing Progress-Yellow)

\* = Category requires 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 has determined 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 has determined the best management approach that satisfies the goals of the golf facility from the course playability and customer satisfaction perspectives. The golf staff's preferred management approach has been coordinated with the installation's environmental staff for refinement, coordination, and approval.

The entire process can be viewed at the AFCEE GEM website (<http://www.afcee.brooks.af.mil/ec/golf/>).

### FINAL ENVIRONMENTAL CHALLENGES

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

- Tree management
- Water resource management
- Pesticide storage and application
- Airfield criteria violations
- Bird/Aircraft Strike Hazard (BASH)



*An active junior program is a sign of good management.*



*Tree management issues in the clear zone.*



**Plainsview Golf Course Environmental Challenges Map**



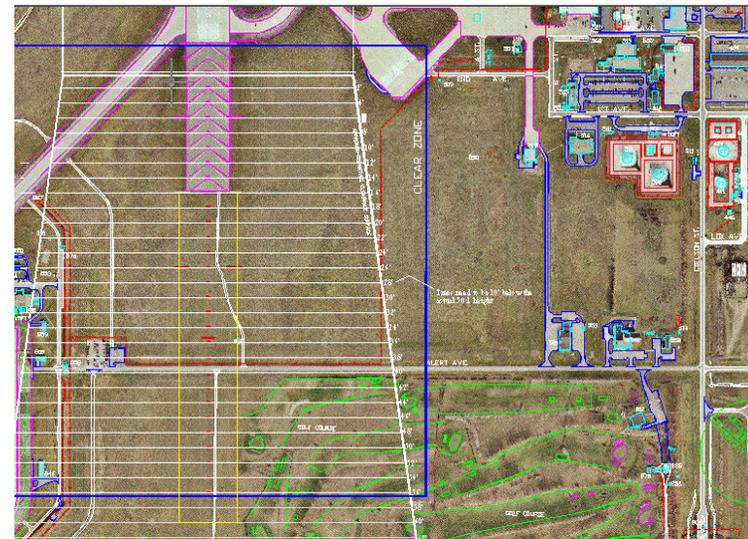
Current tree placement at Plainsview Golf Course.

### TREE MANAGEMENT

Originally, the course was constructed so that fairways were lined with a variety of poplar trees. Several trees are reaching the end of their life span and are showing affects of age such as dieback and reduced disease resistance. Some trees are experiencing the effects of long overdue thinning and/or pruning maintenance operations, and are limiting individual tree growth potential in some areas of the course. Historical management of course trees has been reactive with no written planned effort used as a guide to maximize resource benefits.

Historical tree management is linked to issues with trees in the airfield clear zone and penetration of the 50:1 approach/departure surfaces. As such, since 1999 the following have been removed and replaced on the golf course:

YEAR	REMOVALS	REPLACEMENTS
1999	0	0
2000	36	92
2001	100	70
2002	5	0
2003	31	0
2004	109	0
2005	0	109
2006	0	0
2007	0	0
	<b>281</b>	<b>271</b>



Airfield obstruction/clear zone area encompasses Greens 1, 2, 3 and 4

The 281 tree removals were replaced with 271 trees over the years. Any replacements relocated within these sensitive airfield zones were low-growing shrubs or trees suitable for the airfield requirements.

Most of the replacements as shown in the above figure were planted outside of the airfield surfaces, or within the approach/departure zone. There are still a few trees that will eventually penetrate the 50:1 approach/departure zone, and they will have to be removed.



*Tree replacement plan/trees in violation.*

#### **Driver/requirement**

- 319 ARW OPLAN 91-202 (BASH)
- AFI 32-1026, Planning and Design of Airfields
- 14 CFR, FAR Part 77, Subpart C
- DoD Instruction 4165.57
- AFI 32-7063, Air Installation Compatible Use Zone (AICUZ) Program
- AFI 32-7064, Integrated Natural Resource Management Program

#### **Management Practice**

Current course manning and appropriate tree care education limits the amount of tree maintenance that can be accomplished in a single year as all maintenance of interior course trees is the responsibility of the Plains View Golf course staff.

The exterior trees to the course are maintained by the local grounds maintenance contractor. A plan for tree maintenance is needed to appropriately schedule the limited work force, and is integral to this management plan

Several projects have been embarked upon since the 1990s to address tree height issues that are located in the clear zone and the 50:1 approach/departure surface of the GFAFB airfield. This shall be an ongoing effort, and work activities in these areas regarding tree plantings/removals should be coordinated appropriately and integrated into this plan.

The course is home to over a thousand trees offering aesthetic appeal to golfers and wildlife alike. Better management and planning of this resource is needed to improve natural resource planning and satisfy requirements of golf course and airfield management. Tree species diversity on the course is lacking and should be addressed using native species to increase the biological health and integrity of the urban forest as a whole.

Many trees outlining the fairways are reaching the end of their lifespan. They are overcrowded and beginning to show signs of dieback. It is recommended to thin tree lines and plant suitable

replacements along the fairways where possible. Eventually all of the tree lines will need replacement, but beginning the thinning/replacement process sooner rather than later will further the longevity and health of current trees plus ease the burden of cost to implement this project.

Any fairways that are lined with poplars inside the clear zone should not be thinned, as it will encourage growth of those left and may become an airfield obstruction. Review of the course however does show that most poplars from the clear zone area have been removed.

Ensure that any trees planted in airfield sensitive zones crossing the golf course are low growing or appropriate shrubs. Any tree plantings should be native to allow for best health and longevity to reduce costs for golf course maintenance and potential removals due to tree growth failure. The green plan outlines which tree varieties have successful growth rates on the installation. Planting of these tree species should be optimized to increase biodiversity and reduce risk of disease.

The staff assistance visit (SAV) report completed in July 2005 also noted that several trees were leaning due to damage by mowers. After review of this information it is possible that mowers were responsible for some of this damage, but in addition trees often are subject to wind damage here in the northern plains. Regardless of the cause, the trees should have a turf void circle around each tree to protect them.

In addition, all new trees planted should have tree guards, a 2 foot diameter of mulch, and be staked to adequately protect and ensure proper growth of the tree. Stakes can be removed after the new tree is established, but mulching should continue to protect the tree from mower hits following the SAV recommendation of turf-void circles.



*Trees along the golf course.*

Developing a tree inventory that categorizes tree species, condition, and hazard risk would optimize the limited labor force of the golf course to care for their trees. The database would easily identify which trees have the highest maintenance priority and help direct the shop activities of the day. The database would also allow the staff to track their maintenance activities reducing the amount of time spent trying to remember what they have already accomplished, or what areas haven't been maintained yet.

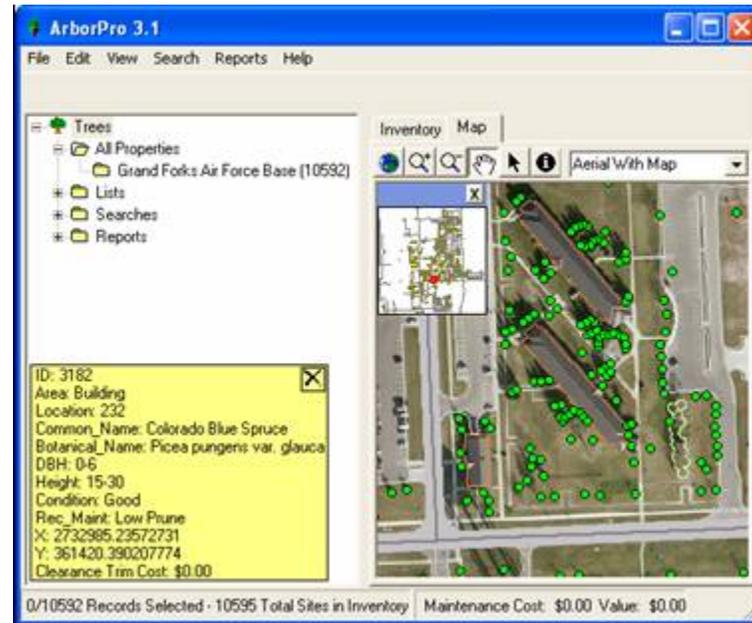
## Target

AFI 32-7064, chapter 11.5 on urban forestry recommends a tree inventory detailing size, species, condition, and maintenance requirement. The GFAFB INRMP document also recommends obtaining this management tool to facilitate better use of base resources. Scheduled completion of tree inventory is FY 2008.

## Objectives

- Appropriate tree management integrates all management activities in a way that sustains, promotes, and restores the health and integrity of the environment.
- Complete a golf course tree inventory that assesses species, size, tree condition, maintenance required, and hazard risk.
- Ensure proper maintenance and tree care of existing golf course trees to maximize their health and longevity to complement golf course management objectives
- Maintenance logs need to be kept of pruning cycles, removals, replacements, diseases, clear zone issues, and damage.
- Consider historical lessons learned regarding tree removal, species varieties, plantings, and integration w/airfield clear zone and obstruction programs
- Only plant approved trees from list found in Appendix A
- Ensure that plantings are easily maintainable and are coordinated with base tree board (maintenance, community planning, and natural resources)

- New plantings must be compatible with the airfield clear zone and obstruction programs
- Utilize the installation green plan, architectural compatibility guide, and integrated natural resources management plan to create continuity in all new work and facility grounds upgrades.



*Base Wide Tree Inventory (non-golf course area).*

## WATER RESOURCE MANAGEMENT

There are no wetlands in the interior of the golf course, but are rather found on the perimeter of the golf course. You cannot dump, fill, or dredge in wetlands without a permit. Permits must be sought from the Environmental Management Flight and the Army Corps of Engineers.

Storm water management planning is coordinated with Environmental Management staff via the 332 process. Appropriate storm water permits and plans are generated as needed when projects are implemented under review of the base storm water manager.

There are some problematic drainage swales that tend to back-up every spring causing foot and golf cart traffic problems. Appropriate landscaping via a bridge, well placed rock, and appropriate vegetation may help alleviate this problem, and add to the aesthetics of the course.

Other comments and suggestions were discussed in the 2005 SAV report as follows:

“The golf course is flat and surface drainage tends to flow north. My observations revealed that much of the flow does not work due to areas that are high as water flow can not find it’s way off the course. Along number 6 and 7, another situation exists. A perimeter levee was constructed on the south side with eliminated natural flow from these two holes. Now water just sits with no place to go. The one ditch, recently worked by CE, was in front of number 1 green. Proper depth was added at the north end to allow for slope, but this ditch did not go into the course far enough to pick up low areas on 5 and 8. The ditch stops at the portable restroom.

Major grade work must be preformed to allow for proper course drainage. Once completed, the golf course will be able to open sooner after a wet spell, allow for improved mowing, and may resolve some of the misquito breeding areas. If number 6 and 7 can not be incorporated into the north flow channels, then large french drains will need to be constructed with underground drain lines runing to the gravel holes from the wet areas. A french drain is a large deep hole filled with 2-3 inch gravel at remote rough locations. Then installed lines can remove standing water to improve playing areas. This may be a process used on other holes if standing water can not be incorporated in the northbound swales.

Removing water off the course is more important to turf health than applying proper moisture. In your area with cooler temperatures, the grass on fairways and roughs, not affected by standing water, is thick and healthy. But where water stands for long periods, the turf is dead!”

The SAV report further recommended to:

“Work through your appropriate channels to have CE grade all the north flowing channels and to take them to as many low areas as possible. If any low areas are not accessible, have them dig large french drains in remote rough locations. An off season project can be worked to install underground drain lines to

these french drains. All constructed areas will need to be re-grassed. Seeding will work if areas are properly prepped and the new seed carefully maintained, but sodding is a much better and faster method of repair on the golf course playing surfaces.”

Other water resource problems include lack of a drought management plan and an outdated irrigation system.



*Drainage issues at Plainsview Golf Course.*

### Driver/requirement

- Storm Water Permit, NDR 05-0314, North Dakota Pollutant Discharge Elimination System
- Clean Water Act

### Management Practice

Some management efforts have focused on handling of waste water on the course. Waste water is effectively recycled using a bio-stax system located near the wash pad. For example grass clippings are washed from equipment, and recycled in this tank system. Unrecycled water does not come into contact with surface water. Recycled water is reused or discharged down the sanitary sewer.

Leaks and efficiency of the existing irrigation system are monitored, and it is known that our current system needs replacement or updating to improve course irrigation efficiency. However, circle irrigation heads have been installed where possible to conserve water resources. The system is regularly checked for proper water distribution in irrigated areas and leaks are repaired in a timely manner.

A booster pump has been purchased to reduce hot spots along the course to ensure mechanical, timely watering versus hand watering events. The pump should reduce watering time, and improve the course irrigation system.



*The 8<sup>th</sup> fairway has a severe drainage problem.*

Existing management of drainage areas has implemented a couple of different techniques. Cores are taken from the greens when they are punched for aeration and placed in low areas to reduce standing water and fill in the area. Small ditches have been dug to direction water into the larger drainage ditches to help reduce standing water as well. In the past a ditch was created from fairway 9 thru fairway 1 into the roadside ditch along fairway 1 and from fairway 4 thru fairway 1 into said ditch. There are several more areas that need attention (see map).

### **Target**

Remain in compliance with the Clean Water Act targeting any wetlands, ditches, storm drainage swales, or other low spots retaining water that may be involved in projects. The base has a Storm Water

Permit, NDR 05-0314, North Dakota Pollutant Discharge Elimination System. Golf Course manager shall coordinate all projects with environmental staff via the base wide 332 system to ensure compliance with these laws. Submittal of 332 for drainage of fairways will be completed and awaiting FY 2008 funding. The long-awaited irrigation system replacement project is also currently unfunded.

Be in compliance with the Clean Water Act targeting any wetlands, ditches, storm drainage swales, or other low spots retaining water that may be involved in projects. The base has a Storm Water Permit, NDR 05-0314, North Dakota Pollutant Discharge Elimination System. Golf Course manager shall coordinate all projects with environmental staff via the base wide 332 system to ensure compliance with these laws.

### **Objectives**

The best management practice the course could implement is getting a new irrigation system to replace the current antiquated one. The manager does have a 332 request in for a new system, and therefore it remains a product of funding. An improved irrigation system would eliminate hot spots, reduce water usage, reduce time needed for watering, and ensure the course is not over watered.

The course does implement night watering events to conserve water for the base populace use during the day. In addition, during drought and high temperature times, the course uses a water injection system on

the greens allowing 15 minutes of watering time for each.

To further improve water management, the drainage system needs to be examined, a design made and implemented. The drainage system has been fixed haphazardly over the years to remedy bad drainage areas with no comprehensive plan in place. It would be beneficial to make a project (submit a 332) to develop a holistic plan, and then begin to implement.



*Richardson's ground squirrel is a common pest at Plainsview.*

## **PESTICIDE STORAGE AND APPLICATION**

The golf course's pest management mission is to maintain an aesthetically pleasing course that offers excellent playing conditions for its customers.

There are a few buildings that make up the golf course maintenance facilities. The main building consists of the superintendent office and maintenance area. Other buildings located within the maintenance area

are the pesticide storage sheds, and equipment storage building.

Integrated pest management incorporates the use of multiple techniques to prevent or suppress pests in a given situation. Although IPM emphasizes the use of non-chemical strategies, chemical control may be an option used in conjunction with other methods. IPM strategies depend on surveillance or scouting to establish the need for control and to monitor the effectiveness of pest management efforts. The four main areas of IPM are: 1) mechanical and physical control, 2) cultural control, 3) biological, and 4) chemical.



*Ground squirrel burrow holes make life difficult for players and maintenance personnel alike.*

The primary focus of IPM at the golf course is in cultural control. Maintaining a vigorous and healthy turf grass will discourage weeds, insects and

diseases from gaining a foothold and causing large amounts of damage. Maintaining a healthy turf grass will also allow the plant to recover quickly if any pest damage occurs.

Most of the course's efforts to control pests are on the greens where dollar spot, grubs, and beetles are the major problems. However, Richardson's Ground Squirrels have also proven to be a challenge for golf course staff creating holes throughout the course. These holes can be a tripping hazard. Other pesticide problems in the past have been with maintenance practices, and are shown in past ESOHCAMP findings found in building 835. The findings have typically dealt w/improper storage of equipment and materials, signage, and personal protective equipment.



*Maintenance facility where pesticides are stored.*

### **Driver/requirement**

- North Dakota Pollutant Discharge Elimination System

### **Management practice**

Mowing is the single most time consuming effort on the golf course. Proper mowing techniques are required on the course in order to retain turf density, retard annual grass and weed invasion, and maintain an aesthetically pleasing quality and to offer a superior playing surface.

Mowing activities also directly impact pest management operations and can create problems if not done properly. All mowing equipment is thoroughly maintained and cutting edges are kept sharp and in good working order. Improperly maintained equipment and dull cutting edges will cause damage to plant leaves resulting in the plants increased susceptibility to insect and disease damage. Mowing equipment is thoroughly cleaned after use to prevent the possible spread of turf diseases from one area of the course to another.

Many irrigation issues and challenges face the golf course. Too much or too little water can encourage the growth of fungal diseases and contribute to pest management problems and increased pesticide use. The superintendent or his assistant makes decisions to water or not to water on a daily basis after carefully considering numerous factors.

The following chemicals are kept on hand for staff use to control pests: Fungicide V, Fungicide X, Fert/Fung

Il, Promax Supp, Sulfur, Round Up, Golden Eagle, and Prophecy. These fungicides and pesticides are applied when problems are evident by spotters or upon daily inspection by the greens superintendent. Each area is visually inspected and sometimes a core sample for root inspection and condition is taken to determine pest infestation and appropriate chemical use to treat the problem. In some cases, it is determined that an application of fertilizer with a fungicide mix is best to help turf production and prevent diseases. Each of the listed products was chosen for optimal use in the northern cool climate of the Plainsview Golf Course.

The course staff works to keep pesticide application certification/licensing up-to-date, and also sends employees to local training events to keep abreast of the current knowledge base.

Richardson's Ground Squirrels are controlled by using smoke cartridges, and shooting as needed. The golf course staff indicates that these efforts seem to do little to control the infestation. Poison has been recommended by the 2005 SAV report, but other attempts base-wide for safety, health, and environmental reasons have rejected this control measure.

### **Target**

Continued compliance with federal and state environmental laws and regulations resulting in 100% ESOHCAMP findings closed by Jan 2008.

### **Objectives**

Plainsview Golf Course is fully committed to the Department of Defense's Measures of Merit for pesticide reduction. Every effort shall be made to first thoroughly engage non-chemical means of pest control, prior to application of pesticides. Ensure that all personnel are appropriately trained, have appropriate equipment, and are protected during application of any pesticides. Lastly, all appropriate signage must be in place following all applicable Air Force and Environmental laws.

### **AIRFIELD CRITERIA VIOLATIONS**

The Grand Forks AFB clear zone extends into the Plainsview Golf Course facility.

### **Driver/requirement**

- 319 ARW OPLAN 91-202 (BASH)
- AFI 32-1026, Planning and Design of Airfields
- 14 CFR, FAR Part 77, Subpart C
- DoD Instruction 4165.57
- AFI 32-7063, Air Installation Compatible Use Zone (AICUZ) Program

### **Management practice**

Coordinate tree removal and replacement with approval from installation environmental management staff. Install only BASH-approved plant material listed in the INRMP low-growing shrubs or trees suitable for the airfield requirements. Continue to pursue project funding for course tree and shrub improvements.

**Target**

Eliminate 25% of the clear zone obstruction by FY 2012.

**Objectives**

In direct support of the Grand Forks AFB mission, the Plainsview Golf Course staff will continue to cooperate and assist Air Installation Compatible Use Zone Program and BASH reduction efforts.

**BIRD/WILDLIFE AIRSTRIKE HAZARD (BASH)**

Birds and airplanes do not mix. Any BASH issues pertaining to the golf course has a possibility of hindering the installation's ability to perform its mission. The Plainsview Golf Course staff is dedicated to minimizing this possibility.

**Driver/requirement**

- 319 ARW OPLAN 91-202 (BASH)
- AFI 32-7064, Integrated Natural Resource Management Program

**Management practice**

Coordinate tree removal and replacement with approval from installation environmental management staff. Install only BASH-approved plant material listed in the INRMP low-growing shrubs or trees suitable for the airfield requirements. Continue to pursue project funding for course tree and shrub improvements.

The golf staff will regularly attend all Bird Hazard Working Group meetings to ensure adequate communication with airfield management is ensured.

**Target**

Immediately eliminate and maintain all potential golf-related BASH issues within our control.

**Objectives**

In direct support of the Grand Forks AFB mission, the Plainsview Golf Course staff will continue to cooperate and assist Air Installation Compatible Use Zone Program and BASH reduction efforts.

## GEM Plan goals & objectives

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

- Develop/post a map of special needs areas around the golf course
- Train/document all maintenance employees on pesticide use, storage & application.
- Develop tree management plan that is cohesive with existing base planning efforts

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 2009.

- Upgrade irrigation system to reduce inefficient water use
- Host an environmental awareness golf tournament

## 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 Plainsview Golf Course, Grand Forks AFB, ND:

- Incorporate GEM program materials into new employee orientation and training
- Continue to work closely with base environmental office on all “environmental” issues
- Develop/Provide brochures for players highlighting golf course environmental practices

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 Grand Forks AFB 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 Grand Forks AFB environmental and golf staff members.

## 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.



*Drainage work on the 7th fairway.*



*Old grease tank was the subject of now closed ESOHCAMP finding.*



*#8 fairway drainage.*



*Temporary bulk sand storage area.*



*#7 green covered for winter.*



*Fertilizer and pesticide storage.*



*Equipment wash facility.*



*Maintenance shop.*



*Equipment storage building.*



*New double-walled grease tank is compliant with regulations.*



## Bibliography

Audubon International, Environmental Performance Audit, *Integrated Environmental Management*, Golf Course Superintendents Association of America, February 2000, New Orleans, LA.

The Center for Resource Management, *Golf & the Environment: Charting a sustainable future*. Environmental Principles for Golf Courses in the United States, 1996, Salt Lake City, UT.

AFCEE/TDN, GEM Plan Template, accessed from AFCEE GEM website on 31 Oct 07.

AFCEE/ECS, *Integrated Natural Resources Management Plan* (Original), GFAFB INRMP, Sep 04.

319 CES, *Integrated Natural Resources Management Plan* (Update), GFAFB INRMP, Dec 05.

HQ AFCEE/TD (Mr. Kevin G. Porteck, OPR), Integrated Natural Resource Management Program, AFI 32-7064, Sep 04.

HQ AFSVA/SVPA, (Richard Boehm, CGCS Golf Turf Specialist Air Force Golf) *Staff Assistance Visit, Maintenance Report for Plainsview Golf Course*, 12–16 Jul 05.

Mr. George Rockwell, Grand Forks Golf Course Maintenance Plan, Oct 07.

319 Air Refueling Wing, 319 ARW OPlan 91-202, Bird Aircraft Strike Hazard (BASH) Plan.





**Air Force Center for Engineering & the Environment  
Technical Directorate  
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Please visit our Golf course Environmental Management (GEM) Program website:  
**<http://www.afcee.brooks.af.mil/ec/golf/>**