# SUCCESS STORY

F.E. Warren AFB - December 2002

PROACT

A Base-level Pollution Prevention Resource sponsored by HQ Air Force Center for Environmental Excellence

## SPOTLIGHT ON: *F.E. WARREN AFB*

Francis E. Warren Air Force Base, opened in 1867, occupies 5,866 acres, and is located on the western edge of Cheyenne, Wyoming. The base was originally a cavalry post for the United States Army, established to protect Union Pacific Railroad working crews. Recognized as the oldest continuously active military installation within the Air Force, F. E. Warren serves as the home of Air Force Space Command's 90th Space Wing.

## MISSION

The mission of the 90th Space Wing is to defend America with the world's most powerful combat ready Intercontinental Ballistic Missile (ICBM) force. As the nation's largest and most modern strategic missile unit, the wing maintains Minuteman and Peacekeeper missiles in Wyoming, Nebraska, and Colorado. The 90th Space Wing employs about 3,650 military personnel and 600 civilian employees, and relies on the operations, logistics, support, and medical groups to accomplish its mission.

## GENERAL PLAN

F. E. Warren's General Plan and Comprehensive Planning program provides the 90th Space Wing Commander and other F. E. Warren key decision makers with a picture of present and future capabilities to support its mission. The primary goal is to provide the framework and general guidance for making effective programming, design, construction, and resource management decisions, while protecting and preserving the natural and built environments. The environmental objectives included in the plan are:

- Ensure continued compliance with federal, state and local laws, regulations, and policies regarding environmental protection
- Ensure the environmental impact analysis process is followed when development is proposed,
- Protect existing wetlands and habitats for threatened or endangered species,
- Minimize use of materials having the potential to cause pollution or generate regulated wastes,
- Continue Installation Restoration Program cleanup and storage tank management activities,
- Protect, preserve, maintain, and enhance the base's historic and archeological assets, and
- Encourage and promote the appreciation, development, and management of fish, wildlife, and other natural resources.

F. E. Warren AFB is the recipient of the Fiscal Year 2001 Secretary of Defense Environmental Award for environmental restoration, installation category.

### Environmental Success

# Cultural Resources

F. E. Warren AFB is home to an extraordinary number of cultural resources. The rich and diverse Native American and military history the area has witnessed has left a wealth of archeological and historical artifacts, structures, and sites. With over 200 distinguished red brick neo-colonial buildings located in the installation's historic district, and over 150 identified prehistoric and military archeological sites scattered across the installation, the task of maintaining and protecting these resources is monumental. In order to enhance these resources for today, and ensure their longevity for tomorrow, the 90th Space Wing has cultivated a comprehensive award winning cultural resource management program.

## Historic Buildings and Structures

The current needs of the Air Force are very different from those of the 19th century Army Cavalry Post F. E. Warren once was. Today the historic district contains 218 brick buildings constructed between 1885 and 1940, many of which were formerly stables, barracks, railroad depots, and warehouses, but now serve as administrative space, maintenance shops, and various offices. One of the core objectives of the

cultural resource program is to maintain the integrity of the historic district while allowing continuous and compatible uses for historic structures. To accommodate the sometimes-conflicting aspects of continuous use and preservation, the program has adopted a tri-fold approach that marries reuse, preservation, and rehabilitation. This approach supports the needs of today's mission through adaptive reuse of structures, preserves the historic integrity of structures from adverse effects through a rigorous review process for all repair and maintenance projects, and protects and restores structures through targeted rehabilitation projects. For example, of the many projects the base has undertaken, the installation is currently performing a porch restoration project on numerous buildings throughout the district. Two teams of restoration specialists are busy restoring, repainting, and in some cases, replacing structurally unsound columns with historically accurate replacements at officer and NCO quarters and other installation facilities.

## Archeological Resources

Native Americans began seasonally inhabiting the area that is now F. E. Warren 11,500 years ago. The story of their daily lives, diets, customs, and cultures through the millennia is realized and recounted at the many sites on F. E. Warren. The most prominent of these is the FamCamp site, located along Crow Creek. This small seasonal camp was unearthed during excavations conducted in 1991 and 1992. Several hearths, pottery shards, projectile points, berry and other plant seeds, and animal bone fragments were discovered. In 1994 the base opened an interpretive center at the excavation site complete with informative storyboards and several life size dioramas that help visitors visualize how the Native Americans who occupied the camp some 650 years ago, lived. The facility also includes an outdoor exhibit where a preserved fire hearth, exposed by an excavation trench, can be seen. Artifacts discovered at this site, and at other sites on base, are assigned a unique identification number and entered into a customized computer catalogue and tracking system. The artifacts are then taken to the base's secure climate-controlled curation facility for storage.

## Curation Facility

The installation's curation facility, formerly a turn of the century root cellar, houses approximately 18,000 artifacts, 7000 historic building plans, and various other historical items and documents including: photos, installation maps, newspapers, and even building maintenance records dating as far back as 1910. Rather than have these resources continue to be dispersed at various museums, libraries, and university repositories, the collection was consolidated in 1995 for permanent care in the then newly renovated facility. The facility provides access to holdings and includes laboratory and research space available to base personnel and visiting archeologists and historians. The holdings have proved invaluable to the installation's historic building renovation and repair efforts, and to researchers evaluating siting plans for new developments.

## Natural Resources

The 90th Space Wing is dedicated to species protection and habitat preservation. With nearly half the installation's 5,866 acres undeveloped, a large amount of land occupied by wetlands and floodplains, and two threatened species and several habitat areas, the installation supports a wide range of natural resource projects from creation of their own native seed bank to assisting the U.S. Fish and Wildlife Service (USFWS) in the recovery of the Black-footed ferret. A spirit of willing cooperation and close coordination with State and Federal wildlife agencies and local universities provides the foundation for a dynamic proactive team approach to natural resource management that is mission balanced and result effective.

## Black-footed Ferret

The Black-footed ferret is the most endangered mammal in North America. The ferrets once occupied grassland habitats throughout the Great Plains from Montana to Texas. In 1967 USFWS classified the ferret as an endangered species. By the mid 1980's the species was feared extinct until a small group of approximately 130 ferrets was discovered near Meeteetse, Wyoming. Shortly following their discovery, successive outbreaks of disease devastated the Meeteetse population reducing its numbers to a scant eighteen. In an effort to save the species from certain extinction, a captive breeding program was initiated by the

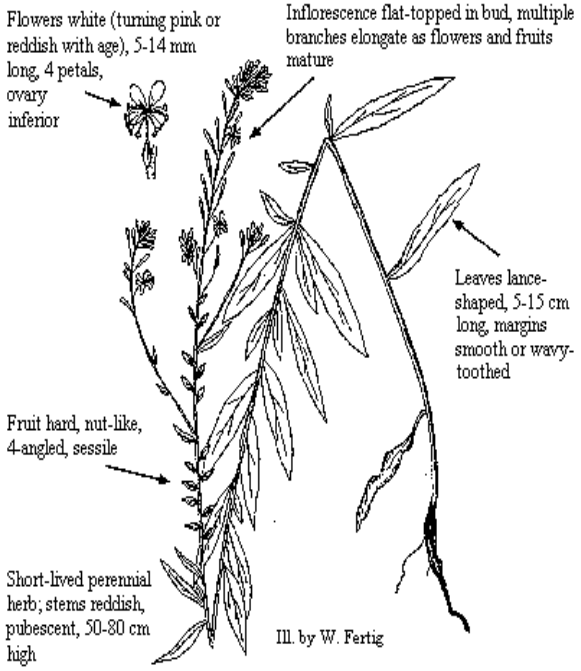
USFWS in 1987. The captive breeding program involving numerous zoo facilities across North America has successfully produced approximately 3000 ferrets to date. Ultimately the program seeks to re-establish a self-sustaining wild population. In support of this effort a pre-release conditioning facility was constructed at F. E. Warren.

Reintroduction is not easy for ferrets born and raised under artificial conditions. The Black-footed ferret is a predator whose natural diet consists mainly of prairie dogs. Because ferrets bred in captivity fail to develop and hone the knowledge and hunting skills critical to successful predation in their natural habitat, preconditioning efforts are essential to their survival in the wild. Recently, facilities like the one located at F. E. Warren, have been developed to expose the ferrets to the conditions they will experience upon reintroduction. Ferrets housed in the facility are given the opportunity to live, breed, and hunt in an enclosed grassland habitat complete with prairie vegetation and prairie dogs prior to being released. Research has shown the few months the ferrets spend in preconditioning have led to a ten-fold increase in survival.

## Colorado Butterfly Plant

The Colorado butterfly plant, a federally threatened species, is a short-lived perennial herb that occupies a very limited geographic range of approximately 1,700 acres in Wyoming, Colorado, and Nebraska. The species typically grows on sloping floodplains and in riparian environments along meandering streams and creeks. According to the USFWS the principle threats to the survival of the species are the conversion of riparian habitat to agriculture, invasion of noxious weeds, water diversions, and urban sprawl.

F. E. Warren is home to three of the largest extant populations of the Colorado butterfly plant. The populations are located along Crow and Diamond Creeks and an unnamed drainage area. Recognizing the importance of species preservation, the 90th Space Wing has contracted with the University of Wyoming to conduct a research project to help ensure the future sustainability of these populations.




Over the years many foreign plant species have been introduced to the area. Some, like the Canada thistle, have become critically invasive and threaten to displace the Colorado butterfly plant. In addition, abundant grass and forbs, once scoured out and thinned in seasonal flooding and fires, now completely cover vital barren habitat areas. Since it is not practicable to allow a natural flood regime within the watershed, the project seeks to develop a management technique which will mimic the beneficial results of the periodic disturbances the species depends on for suitable habitat. Several research plots have been established along Crow Creek where Canada thistle and grass and forbs species are being cleared, through mowing and controlled burns, to manage the competing vegetation and provide for bare ground needed for seedling germination. The data gathered from this project will help installation natural resource mangers determine how to best preserve and protect this treasured regional plant species.

## Elevated Nature Trail

Installation natural resource managers are planning for the construction of an elevated trail in order to protect and enhance vital habitat area of the Colorado Butterfly plant and the Preble's meadow jumping mouse, a federally threatened species that, like the butterfly plant, inhabits riparian areas, at an already established nature trail along Crow Creek. The Preble's mouse is by nature a skittish species averse to exposed areas like the wide swaths of uncovered space created by ground level trails. This barren space, as innocuous as it may seem, becomes a barrier to the mice and contributes to habitat fragmentation. Ground level nature trails also have a tendency over time to grow not only in width but also in length through the use of short cuts and switchbacks. Unintended trail growth can encroach upon established Colorado butterfly plants and cause erosion problems. The elevated trail will reduce fragmentation of habitat, provide better control of trail users, and help avoid potentially destructive erosion problems. The trail

will also include interpretive signs on topics such as ecosystem management, native vegetation, noxious weeds, wildlife, and the historic use of the area by Native Americans. The trail will be constructed from recycled "plastic lumber" to reduce maintenance and extend longevity.

## Landscape Architecture

Due to the high altitude and harsh climate of southeastern Wyoming, landscaping efforts at the base are very time, labor, and money intensive. The geographical location of F. E. Warren is renowned for strong, gusty winds, and receives only 12-15 inches of precipitation (snow and rain) per year. The soil in this area is incredibly alkaline, and is mostly populated with prairie grass and a few scattered trees. Seven hundred acres of the installation are designated as a National Landmark, and the entire base serves as a wildlife refuge for the numerous residential pronghorn antelope. They will eat almost any type of plant, shrub, or flower and have been known to eradicate gardens practically overnight. The base has tried using mothballs, human hair, canine urine and soap flakes as deterrents for the pronghorn; however, none of these methods have proven to be very effective at protecting the greenery. Efforts are being directed to identify plants and shrubs that are not so palatable to the pronghorn.

When the cavalry first arrived at this plains area, they planted several hundred cottonwood trees, now recognized as the Wyoming State tree. The life span of the cottonwood ranges between 80 and 100 years. When the cottonwood starts to die, it rots from the inside out, weakening its base and making it vulnerable to the high winds. Several of these enormous grandfathers have been identified for removal because of old age. All other cottonwood trees are monitored periodically for signs of weakness, disease, and rot. Trees exhibiting these symptoms are taken down and all parts of it are sent for composting. A replacement tree, a hybrid mix of the cottonwood and a Burr oak, is planted in its place.

In an effort to reduce use of herbicide, the installation routinely rents a shepherd and sheep to graze certain areas of the base. The sheep eat only new forbs and do not eat the indigenous grass.

## Water Conservation

To combat drought conditions, base residents water grassy areas at night with the use of battery-operated sprinkler systems. The first year the base started using pre-set timing devices on the sprinkler systems, an estimated savings of approximately $200,000.00 was realized in water usage alone.

Besides native prairie grass, the base has Kentucky blue grass. Studies are being conducted to identify an "in-between" grass, something sturdy, yet does not use a great deal of water. Some areas of the base have been planted with a hybrid Buffalo grass, that requires only one-fourth of the water and fertilizer needed by Kentucky blue grass. Xeriscaping activities are also used abundantly at the installation.

## Native Seed Bank

In cooperation with the University of Wyoming, the 90th Space Wing has undertaken to produce a native seed bank from indigenous plant species found at F.E. Warren. Native seeds are collected by hand from plants and then taken to greenhouses where they are sown. Upon plant maturity the greenhouse-propagated native seeds are harvested and bagged for use on the installation. Seeds produced through this program will be used in restoration and construction projects to inhabit disturbed areas with plant species well suited to the harsh dry windy conditions of the high plains, and that act as a natural deterrent to the spread of noxious weeds. Their use is expected to result in valuable saving of precious water resources.

# Pollution Prevention Initiatives

## Composting Program

The compost facility at F. E. Warren has grown steadily since it was established five years ago. Equipment additions, a new compost facility shop, and the employment of innovative composting technology are testaments to the installation's continuing and proactive support of Air Force pollution prevention goals. The composting operation is responsible for the diversion of the majority of the installation's lumber and timber waste from local landfills to lawns, gardens, parks, and golf courses.

The facility accepts grass clippings, limbs and branches, felled trees, and all conventional lumber excluding painted and/or treated wood. Materials are segregated by type, mulched, and then prepared for introduction into the in-vessel composting system. This system utilizes long plastic tubes made of low density polyethylene recycled plastic called EcoPODs® (long cylindrical bags) which are approximately five feet in diameter and two hundred feet in length. A hopper is used to fill the pods with material. As pods are filled a specially designed hopper also compacts the material and inserts an aeration tube throughout the length of the bag. The pinhole-perforated tube extends outside the pod where it is attached to an air pump ready to deliver oxygen necessary for complete aerobic decomposition. When full, the pods are sealed. Since moisture is added and adjusted upon filling, and consistently maintained throughout the composting process, no additional water is added. Essentially the whole composting process is controlled at the air pump where airflow is reduced or increased to maintain optimal temperatures. A full composting cycle can be accomplished in 12 to 14 weeks. This system was selected because it is ideal for small composting facilities where wind blown litter and odor control, temperature extremes, and site area are concerns. Once the cured compost is screened to remove any large wood chips, it is piled ready for customer pick up.


The composting facility is open to all installation residents and personnel free of charge for pick up and drop off seven days a week. One of the most important aspects of the operation's continuing development and success is a steadfast pledge to user convenience. The "no fences policy" is rooted in the understanding that without cooperation and support of the base community, gained through reliable service, quality compost, and open access, the operation could not be successfully sustained. The community is the beginning and end of this recycling program; it supplies the raw materials and consumes the finished product. The degree to which their support has contributed to the continuing success of the composting program cannot be overstated.

## Pest Management

The entomology shop on F. E. Warren is proud of their "Poison Free Program," established as a self-help store where base residents can obtain environmentally friendly, safe to use items for insect and rodent control. During the spring and summer months, the entomology shop provides

briefings and demonstrations for base personnel, showing them what is available and how to use it. They also conduct a pest control seminar once a year. Pest control products are available for flying insects, crawling insects, wasps, bees, and mice.

Base personnel are very satisfied with the way these environmentally friendly products work, and the demand for them has increased significantly. According to entomology shop personnel, the demand has tripled since the inception of the program. The products are considered "fail safe" in that there are no negative effects if products are misapplied or overused.

Using environmentally friendly and safe products for pest and rodent control has also helped to reduce the amount of man-hours normally required for entomology personnel to apply conventional, potentially dangerous, insecticides. No certification is needed to use the environmentally friendly products provided by the entomology shop, and base personnel feel comfortable using them.

VECTOLEX, used for mosquito control on F.E. Warren, is a larvicide that can kill mosquitoes during the larvae stage of development. The active ingredient in this product is a naturally occurring bacterium (Bacillussphaericus). Although poison-free, this product must be applied by a professional. According to the manufacturer's literature, VECTOLEX is not harmful to humans. When used around water, the bacteria are rapidly destroyed, and their toxins do not appear to be harmful to fish and most other marine life.

Not all of the products used in the entomology shop are environmentally friendly and safe for the general public to use. They still maintain an inventory of heavy-duty, hard-hitting chemicals for use in some applications. To prevent contamination of vehicles used to transport/carry/deliver these chemicals, the shop visited a local establishment that specializes in truck bed protective coverings. Palamino Incorporated, Cheyenne Wyoming, supplies a heavy-duty protective spray sealant for the beds of their entomology trucks, and a lighter protective coating for the vehicle seats.

## Oil Analyzer

The 90th Transportation Vehicle Maintenance Team has implemented several programs targeting elimination of waste generation wherever possible by recycling and reusing vehicle maintenance fluids. Currently in use is the OilView Analyzer, Model 5100 manufactured by Computational Systems Incorporated (CSI). The OilView Analyzer is used extensively in testing engine oil, differential fluid, and transmission fluids at the 90th Transportation Group in an effort to not only save money in needless oil changes, but to significantly reduce the amount of waste oils being generated at the shop.

The 90th Transportation Group started using the OilView Analyzer approximately four years ago, and personnel in this shop rely heavily on the data output for making vehicle maintenance decisions. This unit is designed to test oil for water, fuel or particle contaminants, and the tracking software provides maintenance history of oil changes. The vehicle registration number is first entered into the program, the oil sample is then shaken up to distribute particles and placed on the analyzer. Testing of the sample for degradation, contaminants, water, fuel or particles is completed within minutes, and the analysis data is stored under the unique vehicle registration number. Vehicle maintenance personnel use this information to determine if an oil change-out is needed. Samples that test positive for contaminants are sent to Computational Systems Incorporated for further analysis, and identification

of the contaminant. Since oil quality is critical for life and maintenance of vehicles, the qualitative analysis performed by the company enables maintenance personnel to easily identify vehicles requiring maintenance.

## Antifreeze Recycling

The 90th Transportation shop also recycles and reuses antifreeze on site. Antifreeze recycling is performed utilizing the Wynn's Du ALL power drain and fill bulk recycler. The chemical and filtering process removes contaminants, like metals, particulates, and scale deposits, and introduces additives to the process to maintain the integrity of the antifreeze. At a cost of less than $2.00 per liter to fully recycle used antifreeze, the system has reduced costs by eliminating shipment and disposal fees, and has led to a 50% reduction in new product consumption.


## Alternative Fuels

Use of alternative fuels is rapidly becoming commonplace in many areas of the country. F. E. Warren is the first location in Wyoming to use biodiesel, a cleaner-burning, and environmentally safer fuel. The F. E. Warren AFB military service station recently began using a 20 percent blend of biodiesel in all diesel-powered vehicles in their inventory.

Biodiesel fuel is made from organic, renewable sources such as vegetable oils, animal fats, and recycled cooking oil. It is non-toxic, biodegradable, and operates in combustion-ignition engines, and can be used in almost any vehicle that normally uses diesel fuel. The most common blend is 20 percent biodiesel mixed with conventional petroleum diesel. This low level blend requires no modifications to the engine and can provide the same payload capacity and range as conventional diesel. Not only does the use of biodiesel decrease dependency on foreign oil supply, it also reduces the amount of carbon dioxide, ozone-forming hydrocarbons, and hazardous diesel particulates released to the air. Biodiesel also has a very high flash point (300°F), making it one of the safest of all alternative fuels

## Hazardous Waste Program

F. E. Warren boasts an aggressive recycling program and strives to reclaim, reuse, and recycle the following materials and items:

- √ Flammable liquids; sent for fuels blending to be used in kilns
- √ Universal waste batteries including: aluminum, nickel cadmium, phosphorus, liquid sulfur dioxide, and lithium

- √ Fluorescent lamps; fully recycled reclaiming mercury, glass, and other metals
- √ All latex paints
- √ Enamel and oil based paints; fuels blending

## SAP Management

Good record keeping is essential to the proper operation of satellite accumulation points (SAPs). F. E. Warren has 15 SAPs and due to the excellent

record keeping practices, has never had any non-compliance issues. Each SAP maintains one continuity binder with all relevant information

arranged by tab index for easy reference. The tabs are arranged to include the letter of appointment for the SAP manager and alternate, job descriptions, training requirements and records, lab testing results, material safety data sheets, spill response plan, equipment inventory, inspection checklists, hazardous waste turn in procedures and miscellaneous letters or message traffic guidelines. An example of the SAP continuity binder index and explanation of contents is available from PROACT.

## Lead/Radon

The Lead Management Program on F.E. Warren is a massive program, and is very labor intensive due to the number of historic facilities on the installation that contain Lead Based Paint. There are 219 historic facilities, of which 156 are historic brick homes built in the early 1900s, now used for military family housing units. Renovations to these historic facilities require extensive work to ensure compliance with EPA, OSHA, HUD, and the State Historic Preservation Laws. Virtually all painted surfaces in these historic houses are potential sources of lead, and therefore require an extremely aggressive maintenance program to ensure LBP is in good condition. This also requires comprehensive awareness education to all personnel. Town hall meetings were conducted to remind base residents of the dangers associated with LBP and every family living in base housing is provided with a disclosure letter informing them about the presence of LBP in their residence. The disclosure letter informs the tenants that LBP has been found in their quarters and asks residents to watch for any chipping, peeling or cracking of painted surfaces. If any LBP deterioration is found, residents are directed to notify the base housing office. The letter also provides answers to frequently asked questions about LBP and how to make sure it does not become a danger to the residents.

The majority of housing at F.E. Warren has also undergone testing for radon in air. Approximately 40 percent of all houses in Wyoming test above 4 picocuries per liter for radon in air. Testing results at F. E. Warren AFB, indicate a much lower percentage, and all homes that have tested above the Environmental Protection Agency established "action level" have had active sub-slab depressurization radon mitigation systems installed. Additional testing for homes not previously tested has been programmed.

## Environmental Excellence for Today and Tomorrow

F. E. Warren AFB is aptly referred to as "Guardian of the High Frontier," not only for their dedication and service to protecting our nation, but for their ongoing commitment and pride in protecting the environment and its natural resources. Whether it is through innovative use of technologies, proactive team oriented management approaches, or steady recognition and employment of cost effective pollution prevention opportunities, the 90th Space Wing continually exhibits why it is a model for all Air Force installations to follow.

***Pollution Prevention Success Stories - F.E. Warren AFB, December 2002***

*Success stories are a product of PROACT, a service of the Environmental Quality Directorate, Headquarters Air Force Center for Environmental Excellence (HQ AFCEE/EQ), Brooks AFB, Texas. Any comments or suggestions are welcomed and should be directed to PROACT at DSN 240-4240, (800) 233-4356, or pro-act@brooks.af.mil.*

Printed on Recycled Paper