
Fiscal Year 2005
US Army Environmental Awards Winners
US Army
BEST PRACTICES
FOR THE ENVIRONMENT
Sustaining
the Environment
for a Secure Future

FY 2005 US ARMY ENVIRONMENTAL AWARD WINNERS: BEST PRACTICES

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INTRODUCTION

Fort Leonard Wood is located in the northern Ozarks in south-central Missouri, approximately 120 miles southwest of St. Louis and 85 miles northeast of Springfield. Fort Leonard Wood is home to the US Army Engineer School, the US Army Chemical School, the US Army Military Police School, the US Army Maneuver Support Center (MANSCEN) and the Fort Leonard Wood Garrison.

The training objective of Fort Leonard Wood is to support core missions of the MANSCEN, train and deploy assigned US Army Forces Command units, provide excellent quality-of-life facilities and services for Soldiers, families and civilians and promote civic and other partnerships.

The current population of Fort Leonard Wood is approximately 28,000 persons, including military personnel and dependents, US Army Reserve, National Guard, civilian and contract employees.

Fort Leonard Wood's 61,410 acres contain a rich diversity of cultural resources including pre-Columbian and historical settler archaeological sites and World War II and Korean War era properties. The installation contains nearly 600 prehistoric and historical archaeological sites, including prehistoric Native American caves, rock shelters, cairns and petroglyphs ranging from Late Paleo or Dalton to Late Woodland (8000 B.C. – A.D. 1400) and historical towns and farmsteads circa 1830-1940.

The military history of the installation began in 1940, with the construction of housing and training facilities. In the spring of 1941, the post received 10,000 Soldiers and by the summer of 1941, 16,000 more had arrived. The 1,600-building installation was designed for a capacity of 45,000 Soldiers. During the first six months of 1943, about 40,000 Soldiers were trained daily at Fort Leonard Wood. By 1946, World War II was over, training was halted and the post was deactivated. The post remained inactive until 1 August 1950 when it was reactivated during the Korean conflict. On 16 March 1956, it was designated as the United States Army Training Center and five days later was declared a permanent installation. Activity peaked in 1967, when post personnel trained about 123,000 Soldiers for the Vietnam conflict.

Petroglyphs depicting a shaman at the Lohraff Archaeological Complex

BACKGROUND

Fort Leonard Wood's Integrated Cultural Resources Management Plan (ICRMP) provides a comprehensive overview of all cultural resources; serves as a guide to databases, maps and site files; facilitates Cultural Resource Management Program integration; and supplies standard operating procedures for managing the cultural resources at Fort Leonard Wood. The ICRMP is current and due to be revised in 2008. The ICRMP focuses on the timely identification and evaluation of archaeological resources, both historic and prehistoric. By the end of FY 2005, cultural resources surveys totaled 60,764 acres (96 percent) of Fort Leonard Wood. To date, 308 archaeological sites, 22 historic buildings and a World War II prisoner of war stonework complex are eligible or potentially eligible for the National Register of Historic Places (NRHP). A Programmatic Agreement is in development with the Missouri State Historic Preservation Office regarding the historic buildings and structures on the installation.

Key cultural resources personnel at Fort Leonard Wood include the Cultural Resources Manager, Cultural Resources Manager Point of Contact, Historical Archaeologist, Natural Resource Specialist and other personnel within the Environmental Division.

Archaeological foundation and chimney at the Elkins-Gray Farmstead, circa 1900

PROGRAM SUMMARY

Fort Leonard Wood's Cultural Resources Management Program has strived to develop and employ new techniques and programs for managing and preserving the many cultural resources on the installation. Innovations range from developing a new methodological approach to determining the significance of historical archaeological sites to compiling Installation Maintenance and Repair Manuals for the 22 NRHP eligible buildings on Fort Leonard Wood. Other innovations have led to the location and recovery of subsurface features and artifacts in a timely and less invasive manner and new levels of communication between Fort Leonard Wood personnel and appropriate federally recognized Native American tribes.

Tremendous achievements have been made over the last two years to implement the ICRMP. The sections below detail how specific projects have addressed cultural resources management, mission enhancement and community involvement and outreach.

ACCOMPLISHMENTS

Historic Buildings and Structures

Using the Installation Building Survey (1941-1956) as a framework, the Cultural Resources Management Program, in cooperation with the Construction Engineering and Research Laboratory (CERL), compiled Installation Maintenance and Repair Manuals for the 22 NRHP eligible buildings on Fort Leonard Wood. These manuals provide Fort Leonard Wood with accurate, up-to-date assessments and recommendations to preserve and properly maintain the buildings' historic elements incorporating the Secretary of the Interior's standards for treatment of historic buildings. The manuals have been distributed to both the users (Fort Leonard Wood Museum, Environmental Division and Lodging) and those responsible for the maintenance of the historic buildings. Providing guidance to the users and maintenance personnel ensures the continued preservation of the historic buildings. The manuals have also fostered greater communication between historic property users and the Cultural Resources Management Program.

All historic buildings at Fort Leonard Wood are still actively used in a variety of capacities, either in direct support of the mission or quality of life. The following examples detail the use of several of the historic buildings:

- The WWII Temporary Building National Register Eligible District (Museum Complex) contains 13 buildings. The chapel, one of the 13 buildings, is used every week by the 14th Military Police Brigade. The other buildings in the district (mess halls, barracks, administrative buildings) contain displays interpreting the WWII, Korean and Vietnam eras;
- The WWII-era Garlington House, the Red Cross Building (the Ike Skelton House) and the Franklin Guest House are VIP guest quarters utilized by the Billeting Division, Directorate of Morale, Welfare and Recreation; and

- The Rolling Heath School House, circa 1912, is the only extant pre-installation building on Fort Leonard Wood. It is used for educational programs throughout the year and is the primary venue for the Cultural Resources Management Program's annual Missouri Archaeology Month, National Preservation Month and Earth Week activities.

Rolling Heath Reunion Attendees: (L-R) former students Paul Ramsey and Napoleon Ramsey with Cultural Resource Manager Point of Contact Dr. Richard Edging and local historian, Alex Primm.

The Integrated Facilities System, the real property inventory, is up to date for the 22 NRHP eligible buildings on the installation. Historical information has been entered for each building. Once the ongoing building inventory project is complete (spring 2006), the system will be updated again to reflect the new data.

Archaeological Resources

Inventory of Sites

To date, 573 archaeological sites have been recorded on Fort Leonard Wood. Of these, 368 are prehistoric Native American sites ranging from Late Paleo or Dalton to Late Woodland (8000 B.C. – A.D. 1400). The remaining 180 sites date to the early 19th century through 1940. Twenty-five sites contain both prehistoric and historical components.

Of the 573 sites, 308 have been determined to be eligible or potentially eligible for the NRHP.

Site Protection

Sixty-four caves have been recorded on Fort Leonard Wood property. All contain active ecological systems and many contain archaeological evidence and Pleistocene-age paleontological resources. Caves are highly vulnerable to vandalism and unintentional adverse impacts. The proper management of cave resources on Department of Defense (DoD) installations requires detailed baseline inventories, a systematic hierarchical ranking and programmed monitoring. The use of caves has provided an alternative military training environment and, although seven cave sites were selected for military training, many caves are restricted and have been protected through monitoring, stabilization or gating. Funding was secured from the Legacy Resource Management Program in FY 2003, and analyses were completed in FY 2005. A final report documenting the archaeological and biological resources – including detailed maps, photographs, species lists and a management plan – will be completed in 2006.

The CERL, Illinois State Museum Society, University of Illinois Natural History Survey and Missouri Department of Conservation collaborated on the project. Fort Leonard Wood has shared both acquired data and management plans with several federal and state agencies, including the National Park Service, US Forest Service and the Missouri Cave and Karst Conservancy, whose intent is to use the information as a model for similar programs. Results of the study have been presented at four DoD and natural resources conferences and workshops. In addition, a summary article appeared in the winter 2005 *Federal Facilities Environmental Journal*. Finally, CERL, in conjunction with the Cultural Resources Management Program,


World War II Temporary Buildings Historic District

developed a brochure highlighting the project that has been made available at multiple national and regional environmental conferences.

Research Initiatives and Scientific Contributions
Fort Leonard Wood staff completed the Historic Landscape Project, an innovative methodological approach to determining NRHP eligibility of historical archaeological sites, in FY 2005. A broader physical context for the historic-era landscape emerged from the staff's use of existing archaeological site data, historic context information, historic maps and photographs, archival records, relevant geographical data, architectural information and distinguishing landscape characteristics. This comprehensive perspective allows Fort Leonard Wood to determine which 19th and 20th century archaeological sites are most likely to contain useful information and ensures the installation's efforts are focused on significant sites. From this model, the installation developed a strategy to conduct archaeological investigations at 11 historic sites. The staff presented a poster highlighting the project components at the 2004 Society for Historical Archaeology (SHA) conference and discussed the implementation and results at the 2005 SHA conference. In addition, Fort Leonard Wood personnel shared this landscape approach methodology with many archaeologists, universities, companies, agencies and a tribal organization, and several of them are adapting it for use on their specific sites.

"Fort Leonard Wood's cultural resources program is a reflection of a true commitment to innovative solutions to meet mission needs at the installation. Its leadership in developing the tools and best practices for a cost-effective program has been a benefit to other federal and state agencies and the community. I commend Fort Leonard Wood for their efforts in protecting the Nation's cultural resources and providing community outreach while sustaining the military mission."

- Toni Patton-Williams,
Office of the Deputy Assistant Secretary of the Army for Environment, Safety and Occupational Health

Kenton Lohraff, Natural Resources Branch Wildlife Biologist, at Freeman Cave, one of 64 caves surveyed as part of the LRMP Cave Survey Project

Curation
The Cultural Resources Management Program has an ongoing curation program through an agreement with University of Missouri, Columbia (UMC) and the US Army Corps of Engineers, Saint Louis District. The UMC American Archaeology Division Collection Center contains a state-of-the-art facility that fully complies with 36 CFR 79. This money-saving arrangement allows Fort Leonard Wood to store its collections at a regional facility rather than incurring the cost of a similar facility at the installation. Over 80 percent of all artifacts and all Native American Graves Protection and Repatriation Act-related human remains and funerary objects collected from Fort Leonard Wood lands have been processed and permanently housed at the facility. Curating the Fort Leonard Wood collections at the UMC facility also provides access to the collection for scientific study by archaeologists and the general public.

By utilizing this regional facility alternative, Fort Leonard Wood personnel do not have to construct their own curation facility (potentially saving the installation hundreds of thousands of dollars) and hire curation staff, thereby saving annual salary and overhead costs, in addition to the cost of maintaining an on-site facility. The actual cost of curation since 1995 is $97,840, covering box and site fees for all artifacts recovered and sites recorded since the 1980s.

Cultural Resources Awareness and Education
The Cultural Resources Management Program participates in Missouri Archaeology Month,

National Preservation Month and Earth Week by offering both adult and children's activities including lectures, cave tours, school fieldtrips, archaeology open houses and teacher workshops. Five standardized lesson plans have been developed and distributed to elementary and secondary schools in the Fort Leonard Wood region. The lessons focus on archaeology, Native American rock art, historic farmsteads, one-room schools and historic cemeteries. Cultural Resources Management Program personnel are regularly invited to give presentations on post for events like Native American Heritage Month in November and off post at local universities.

When feasible, public tours are arranged to archaeological sites during Phase II investigations, and Fort Leonard Wood commanders and surrounding community leaders, in addition to the general public, are invited to attend. The goal is to show the value and necessity of archaeological investigations while reinforcing how the Cultural Resources Management Program supports the military training mission.

In FY 2004, *Made in the Timber: A Settlement History of the Fort Leonard Wood Region* by Steven D. Smith was published by Fort Leonard Wood and CERL. The book emphasizes the development of a regional history within the framework of the Ozark cultural and geographical landscape, and unifying these into a history of Pulaski County. Three thousand copies were provided to the Fort Leonard Wood and Pulaski County communities, all regional and local libraries, historical societies and interested public. Former residents of the Fort Leonard Wood lands and their descendents have been especially appreciative of the attention focused on their families and history. In turn, the Army has received grateful acknowledgement for its role in preserving the history of the region.

Mission Enhancement

The Cultural Resources Management Program has enhanced Fort Leonard Wood's ability to carry out its training mission. To develop additional resources, Fort Leonard Wood, in coordination with Integrated Training Area Management, selected survey areas to coincide with needed training areas and cleared a site in FY 2004 for a new convoy live fire training course. In addition, the preservation of the Museum Complex and chapel relocation and restoration has provided a chapel for the 14th MP Brigade, offered a more accurate portrayal of a WWII-era company area and assists in teaching basic trainees and other military personnel about the historical value of Fort Leonard Wood. Creating the building inventory of 1956-1971 era buildings in FY 2005 assisted in preparation for new barracks complex development at Fort Leonard Wood.

CONCLUSION

The Cultural Resources Management Program at Fort Leonard Wood has fostered a research approach within the context of compliance-generated projects. While the goal is to comply with federal preservation laws, the integration of a research framework has resulted in a series of exceptional scientific and historical projects that have served as a standard for archaeological, historical and geomorphological research in the northern Ozarks. However, while important archaeological and historical data has resulted from this work, it is not an end in itself. By complying with federal preservation laws, the Army is able to maintain its military missions and conduct training over vast tracts of land. Highly sensitive cultural and biological areas are monitored monthly and their locations updated annually on GIS maps that inform the Fort Leonard Wood Command. Additionally, compliance with federal preservation laws regarding historic buildings and stonework has enabled the Army to expand its mission in the developed cantonment area.

> **"The Fort Leonard Wood cultural resources team members not only developed effective strategies, they applied them, accomplished their goals and ensured that the results were shared with the professional and local community."**
>
> ***- Robin Burgess, Senior Archaeologist, Bureau of Land Management***

On the cover: A Tennessee Army National Guardsman sharpens his skills at Fort Leonard Wood, Mo.

FISCAL YEAR 2005 SECRETARY OF DEFENSE
US ARMY ENVIRONMENTAL AWARDS NOMINATION

CO_2 COOLING DEVELOPMENT TEAM
COMMUNICATIONS-ELECTRONICS RD&E CENTER

ENVIRONMENTAL EXCELLENCE IN WEAPONS SYSTEMS ACQUISITION

SUSTAINING THE ENVIRONMENT FOR A SECURE FUTURE

INTRODUCTION

During the 1990s, the Army made the optimization of its Environment Control Units (ECU) a priority among its research and development (R&D) efforts. An ECU resembles a window air conditioner and provides space heating and cooling for both equipment and personnel. The Environmental Systems and Fuel Cell Branch of the Communications-Electronics Research Development and Engineering Center (CERDEC) leads the development of these ECUs. The optimization of the Army's ECUs was undertaken in response to implementation of the Montreal Protocol International Treaty and amendments to the Clean Air Act. Both of these initiatives were designed to reduce and eventually eliminate worldwide dependence on ozone-depleting and greenhouse gases.

During the same time period, Army program managers were identifying the need to provide protective armoring to its fleet of tactical vehicles. Armoring vehicles required sophisticated air conditioning for operations in extreme climate conditions, where both efficiency and effectiveness of these units takes on even greater importance. Tactical vehicles were outfitted with a hydrofluorocarbon (HFC) R134a refrigerant – the same refrigerant presently used in automotive air conditioning (AC) systems. However, HFCs have been shown to be a dangerous greenhouse gas, and the signing and ratification by many countries of the Kyoto Protocol has led to a search for alternatives to fluorocarbon refrigerants; legislation has already been proposed in the European Union that will effectively ban the use of R134a for use in automotive AC in new vehicle types beginning in 2011.

An Army standard ECU modified to use CO_2 as the sole refrigerant.

These environmental concerns led to the development of prototype AC systems using naturally occurring carbon dioxide (CO_2) as the sole refrigerant. The advantages of using CO_2 instead of R134a are many (see Figure 1 below).

Figure 1. CO_2 vs. HFC R134a

Refrigerant	Global Warming Potential	Cost	Logistics	Performance
Carbon Dioxide (CO_2)	1	Approximately $.30/lb.	No need for EPA-required refrigerant recovery & recycling equipment and special training	When compared with R134a, the use of CO_2 presents a 25 to 50 percent improvement in capacity, a lower evaporator outlet temperature of 10 to 20°F, and achieved a 50 to 100 percent reduction in temperature pull-down time.
HFC R134a	1,300	Approximately $4.00/lb.	Costly recovery and recycling machines are required by Clean Air Act	

CO_2 provides a number of advantages over the currently used R134a refrigerant.

In 2003, as the Army's prime information technologies and integrated systems center responsible for equipping the war fighter with the latest technology innovations, CERDEC had already formed the CO_2 Cooling Development Team to be at the forefront of this technology. CERDEC fabricated and tested the world's first full-scale unitary CO_2 cooling unit in 2001. In late 2003, the team sought a way to broaden the use of this technology to an Army platform with a more critical and immediate application to the war fighter. Through discussions with the National Automotive Center and the Program Manager, Tactical Vehicles, an M1114 Up-Armored HMMWV (High-Mobility Multipurpose Wheeled Vehicle) was acquired for the fabrication of a prototype vehicle using a CO_2 cooling system. With an appropriation in the FY 2004 Defense Budget in place, the CO_2 Cooling Team began its efforts to integrate this technology into the M1114 HMMWV.

> **"Reduce the impact of refrigerant release on the environment and improve HMMWV air conditioning performance."**
> ***- Senator Herb Kohl (D-WI), identifying the two goals of the CO_2 Cooling Program***

BACKGROUND

Recognizing the need to bring together the nation's foremost authorities on CO_2 cooling technology, the CO_2 Cooling Team represented the successful collaboration of Army, industry and academia experts. This team not only developed and tested the technology, but also applied it directly to the war fighter.

The CO_2 Cooling Development Team consists of the following individuals:

- Mr. John Manzione – Special Projects Officer, US Army CERDEC;
- Mr. John Dolney – Special Projects Officer, Project Manager for Tactical Vehicles (PM TV);
- Dr. Stephen Memory – Manager, Global HVAC Technology, Modine Manufacturing Company;
- Mr. Samuel Collier – Manager, Advanced Systems Development & Technology, Modine Manufacturing Company; and
- Dr. Pega Hrnjak – Co-Director of the Air Conditioning and Refrigeration Center, Director University of Illinois – Urbana Champaign (UIUC).

POSITION DESCRIPTION

The team collaborated to design, fabricate and test an innovative, high-performance and environmentally responsible cooling system on the most critical tactical wheeled vehicle in the US Army inventory, the M1114 Up-Armored HMMWV.

- Mr. John Manzione formed the team and was assigned as the Contracting Officer's Technical Representative (COTR) for the contract with Modine Manufacturing Company. Mr. Manzione was responsible for daily management of the contract, budget and overall program direction. Mr. Manzione was selected as the COTR because he was and is the Army's prime expert for identifying and developing new cooling technologies for Army systems.
- Mr. John Dolney is assigned to the Project Manager's Office for Tactical Vehicles within the Program Executive Office (PEO) for Combat Support & Combat Service Support. Mr. Dolney provided the prototype M1114 HMMWV for testing on an Army platform. As the Special Projects Officer for PM TV, Mr. Dolney ensures that the latest technologies (including the CO_2 Cooling technology) can be applied directly to benefit the war fighter. During the CO_2 development process, he provided general design guidance and direction from a platform/user perspective.
- Dr. Stephen Memory and his team are responsible for exploring new technology opportunities to advance Modine Manufacturing's business development. For the past two years, Dr. Memory's team has been focused on spreading the CO_2 technology across industries.
- Mr. Samuel Collier led a team focused on integrating the CO_2 technology into mobile vehicles. Mr. Collier's team was instrumental in applying the CO_2 system to the M1114 HMMWV without modifying the current configuration of the vehicle.
- Dr. Pega Hrnjak and his team were contracted by Modine to perform all of the academic research and breadboard modeling necessary to prove the value and viability of the CO_2 technology. Dr. Hrnjak manages all of the labs that produced the scientific knowledge testing and guided the integration of the system into real-world applications.

AWARDS AND SERVICES

The primary reason for the CO_2 Cooling Team's success over the last two years lies within the knowledge and expertise of the team members. Individually, these five experts are some of the most respected professionals in the industry. Together, they have formed one of the most successful R&D teams found in the Army today.

Each member of the team is a valued leader within various professional organizations known throughout the air conditioning industry. Direct affiliations with organizations such as the American Society of Heating, Refrigerating & Air Conditioning Engineers, Society of Automotive Engineers, the Air Conditioning and Refrigeration Center at UIUC and the Mobile Air Conditioning Society have enabled a successful transfer of knowledge and experience.

Mr. Manzione was specifically recognized for his outstanding work on the CO_2 Cooling Team by the Army Materiel Command (AMC). From January 2003 through January 2004, Mr. Manzione was AMC's

"Engineer of the Year." During that same time, he was also one of the National Society of Professional Engineers' "Top Ten Federal Engineers."

Perhaps most significantly, the CO_2 Cooling Team was named a charter member of the Mobile Air Conditioning Climate Change Partnership with the US Environmental Protection Agency (EPA). Partners represent a growing team of corporate, government and environmental leaders working together to rapidly improve the energy efficiency of vehicle air conditioning systems.

Between them, Mr. Collier, Dr. Memory and their Modine teams have been awarded 14 US patents on both CO_2 system and component technology, with eight more patent applications pending. They have also authored and presented eight papers on CO_2 technology at various conferences and technical seminars.

Dr. Hrnjak is a distinguished and world-renowned member of academia with credentials as a research and teaching professor, consultant to industry, co-author of college textbooks, dozens of professional peer-reviewed journal articles and international conference papers. He has authored over 100 total publications on refrigeration science, many specific to the emerging CO_2 technology. Dr. Hrnjak is a Fellow in the American Society of Heating Refrigeration and Air-conditioning Engineers and Editor of the ASHRAE Research Journal.

"One remarkable benefit of the Army project is that DoD is seen worldwide as concerned about climate protection and on the cutting edge of new technology. Participation in global projects and conferences had the effect of training foreign researchers and government authorities to appreciate the unique circumstances of military combat vehicles."

- Stephen O. Andersen, Ph.D.
Director of Strategic Climate Projects, EPA

ACCOMPLISHMENTS

Weapon System Acquisition Program Summary
Over the past two years, the CO_2 Cooling Team has made great strides toward improving the CO_2 technology while increasing industry awareness of the need to identify an alternative to the environmentally harmful R134a refrigerant. Once the M1114 HMMWV test vehicle was obtained from the PM LTV, the team was directed to integrate the CO_2 technology into the test vehicle within the same space and weight limitations as the baseline R134a cooling system. This was done to ensure compatibility with the current fleet of HMMWVs.

In areas like Iraq and Afghanistan, extreme heat conditions are sometimes more of a concern than enemy fire. Up-armoring of the HMMWV has increased Soldier safety but has placed a stronger emphasis on the need for more efficient cooling systems.

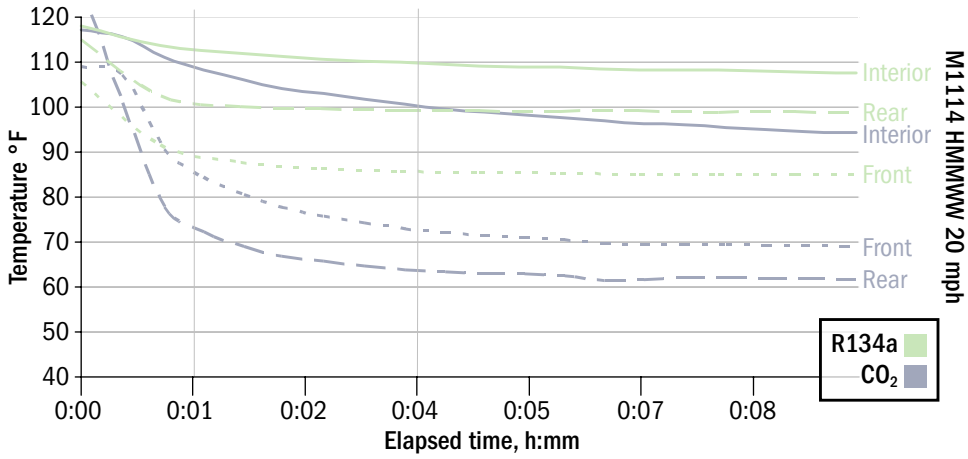
To meet this challenge while maintaining original program goals, the team created a comprehensive program management approach. Utilizing an integrated process team strategy ensured complete cooperation, synchronization and transparency among all partners. The team was split into functional working groups, each led by one of the team members. Through regular status meetings, progress reports, C/SSRs (Cost/Schedule Status Reports), Mr. Manzione was able to manage budget and program performance. He then met with the various industry, academic, federal and trade association partners to share intellectual capital and program breakthroughs.

Contracted partners worked under fixed-sum, cost-reimbursable contracts that allowed the team to show appropriate budget justification and return on investment. From the initial appropriation of $1.7 million in FY 2003 all the way through to FY 2005's appropriation of $3.6 million, this program management approach has continued to be a successful method of improving the CO_2 technology.

Technology Advancement
As of October 2003, the CO_2 tactical vehicle technology was considered to be at Technology Readiness Level 4, meaning initial breadboard testing had just commenced. Two years later, the CO_2 technology was classified as having reached

Technology Readiness Level 6, meaning the team had completed a full-scale prototype CO_2 cooling system on an authentic Up-Armored HMMWV. The prototype system had passed testing in both a high fidelity laboratory wind tunnel environment as well as a simulated operational environment at Yuma Proving Ground (see Figure 2). In June 2004, the HMMWV with the CO_2 air conditioning system and an identical HMMWV with an R134a air conditioning system were entered in the informal ride program at the Society of Automotive Engineers (SAE) Alternate Refrigerants Symposium. These informal rides are intended to simulate real world driving conditions.

Figure 2: System Testing Results



These tests show that the CO_2 cooling system delivered twice the cool-down performance of the R134a installed system in the armored HMMWV. In wind tunnel testing, at 120°F simulated ambient temperatures, the CO_2 Cooling System was producing air that was 40°F colder than ambient while the air produced by the R134a system was only 20°F below ambient. After just four minutes of operation, the CO_2 system had cooled the cabin by 20°F, doubling the 10°F achieved using the original R134a system.

The prototype CO_2 system, despite the constraining space limitations, was eight percent lighter in weight and 30 percent smaller in volume than the original R134a system. Space and weight claims for supporting subsystems are extremely critical on armored vehicles. Every pound saved and every square inch removed enables operators to carry additional mission-critical components and equipment.

"This new environmental control system will help keep the increasing proliferation of complex electronics cool while deployed on patrol with our war fighters. Not only does it improve cooling capacity 25 to 50 percent and reduce the vehicle cab temperature by another 10 to 20 degrees below the current system, its use of CO_2 eliminates complex maintenance requirements and the associated onerous logistics trail. Works better, cheaper and is more maintainable using common materials. It doesn't get much better than this."

- Col. Bob Mattes (USAF), Director, Comparative Testing Office, Defense Acquisition Challenge Program

Based in part on these results as well as the overall progress of the CO_2 technology, the CO_2 cooling system has already been written into industry planning documents for future blocks of the highly visible Future Combat System Program. CO_2 cooling systems are also being favorably considered for the future fleet of Light, Medium and Heavy Tactical Vehicles, which places the rapidly maturing CO_2 technology on a direct and definable path to Army fielding, concurrent with the anticipated arrival of the first commercial passenger vehicles from Europe and Asia.

In addition to current and planned Army applications, this technology has drawn the interest of the Department of Defense (DoD) and the other Services. The team has presented its findings to favorable audiences within the US Marine Corps, the Joint Logistics Commanders, the Corps of Engineers and the US Air Force. The CO_2 Cooling Team was also made a part of the Defense Acquisition Challenge Program. This program provides opportunities for both innovators and the DoD. For innovators, it means faster entry to the defense acquisition system. For the DoD Program Manager, it means increased technology insertions to improve systems. For the CO_2 Cooling Team, it means additional opportunities to get this technology to the war fighter quicker.

Education and Outreach

With an understanding that bolstering the industry awareness of the benefits of using CO_2 as a refrigerant is a key factor in the success of this technology, the members of the team are involved with worldwide outreach efforts, including participation in conferences, seminars, expositions and in the presentation of technical papers and reports.

Technical Papers on CO_2 Technology

- "Using CO_2 to Cool an Up-Armored M1114 HMMWV." Presented at the SAE Alternate Refrigerant Systems Symposium, Scottsdale, Ariz., June 2004.
- "Using R744 (CO_2) to Cool an Up-Armored M1114 HMMWV." Presented at the Vehicle Thermal Management Systems Conference and Exposition, Toronto, Canada, May 2005.

Presentations

- Keynote Speaker at a Mechanical Engineering Department Seminar at Virginia Polytechnic Institute and State University, August 2005.
- SAE Alternate Refrigerant Systems Symposium, Scottsdale, Ariz. July 2005 and June 2004.
- Verband Der Automobilindustrie E.V. (VDA) Winter Meeting, February 2005.
- Tactical Wheeled Vehicle Component Technology Demonstration (Yuma Rodeo), January 2005 and January 2004.
- DoD Comparative Technology Demonstration, November 2004.
- International Compressor Engineering Conference at Purdue University, July 2004.

The CO_2Cooling Team also enlisted the support of several industry and federal partners to take advantage of best practices and lessons learned that helped to ensure transferability and compliance. Working partnerships were formed with the following agencies and organizations:

- The US Army Research, Development and Engineering Command, The Program Executive Officer for Combat Support/Combat Service Support, The Assistant Secretary of the Army for Acquisition, Logistics and Technology, Program Manager, Light Tactical Vehicles and the US Air Force;
- The University of Illinois Air-Conditioning Research Center, the University of Maryland, Purdue University, the Norwegian University of Science and Technology, Georgia Tech and Virginia Polytechnic Institute and State University;
- Automakers, compressor and end item manufacturers, heat exchanger and other component suppliers and engineering prototype companies;
- The American Society of Heating, Refrigerating & Air Conditioning Engineers Air-Conditioning and Refrigeration Institute and SAE; and,
- The EPA, Department of Energy, National Institute of Standards & Technology and National Science Foundation.

CONCLUSION

Through its extensive public and private sector outreach, the CO_2 Cooling Team's efforts over the last two years have led directly to an increased awareness of this technology not only within DoD and academia, but also in the commercial auto industry. In two short years, the commercial auto industry has begun incorporating CO_2 into the cooling systems of new automobiles, the EPA has extolled the environmental advantages of using CO_2 instead of HFCs, and the Army is currently considering making it the standard cooling system on the future fleet of Tactical Vehicles. Less expensive, more efficient, non-toxic, environmentally friendly CO_2 is the future of air conditioning technology, and the CO_2 Cooling Team is sure to play a key role in helping the US military realize that future.

An Up-Armored M1114 HMMWV using the current Army standard cooling system appears on the left. The HMMWV on the right is outfitted with a cooling system using the CO_2 technology.

On the cover: An Up-Armored M1114 HMMWV outfitted with the more efficient, environmentally friendly CO_2 Cooling System.

Fiscal Year 2005 Secretary of Defense
US Army Environmental Awards Nomination

FORT STEWART AND HUNTER ARMY AIRFIELD
ENVIRONMENTAL SUSTAINABILITY MANAGEMENT TEAM

ENVIRONMENTAL QUALITY

SUSTAINING THE ENVIRONMENT FOR A SECURE FUTURE

INTRODUCTION

Fort Stewart and Hunter Army Airfield's (HAAF's) award-winning Environmental Sustainability Management team leads a comprehensive program focused on the key goals of environmental stewardship and supporting military readiness.

BACKGROUND

Fort Stewart is the home of the 3rd Infantry Division (ID) and serves as the US Army's premier power projection platform on the Eastern Seaboard of the United States. Through intense, year-round training on seven drop zones and seven tank and armored fighting ranges, two airfields and one landing strip, the 3rd ID, the "Rock of the Marne," is among the best-equipped divisions within the US Army. The installation is the Army's largest east of the Mississippi River, covering over 279,000 acres of southeast Georgia. The Fort Stewart community consists of approximately 20,000 Soldiers, 27,000 military family members and 3,800 civilian employees.

FORT STEWART/ HAAF MISSION: Provide the nation with a trained, equipped and ready fighting force, composed of Active and Reserve Components. Deploy them rapidly anywhere in the world in support of National Objectives.

The Environmental Sustainability Management (SM) team strives to sustain the training readiness mission of the 3rd ID while remaining committed to environmental stewardship. The goal of the team is to ensure Soldiers of the future have the land, water and air resources they need to train; a healthy environment in which to live and the support of the local community. At one time, a compliance approach drove the installation's environmental program, but today the program is proactively managed to work toward environmental sustainability. By planning for the future and forging strong relationships throughout the installation, community and the regulatory arena, the program is exceeding all legal requirements and preserving the environment for future generations.

TEAM MEMBERS

The Environmental SM team, under the Directorate of Public Works, consists of dedicated, passionate and experienced employees in each of the Environmental Division's three branches: Environmental Compliance, Fish & Wildlife and Forestry. Each member plays a crucial role in the success of the Sustainability Management Program:

Tressa Rutland is the chief of the Environmental Compliance Branch. She manages the environmental compliance program areas, including air, drinking water, stormwater, wastewater, underground storage tanks, aboveground storage tanks, environmental cleanup and restoration, National Environmental Policy Act, cultural resources, wetlands, erosion and sedimentation control, noise, Resources Conservation & Recovery Act, hazardous material and waste management, asbestos, lead-based paint, solid waste, recycling, and training and awareness/outreach programs that include a multi-discipline combined budget of approximately $16 million.

Tim Beaty is the chief of the Fish & Wildlife Branch and also manages the installation's Army Compatible Use Buffer (ACUB) and Joint Land Use Study (JLUS) programs.

Tommy Hilliard is the chief of the Forestry Branch. He manages the prescribed burning and reforestation of over 270,000 acres of military lands and is responsible for maintaining and constructing more than 400 miles of forest access roads.

George Harris is the National Environmental Policy Act (NEPA) Section Leader. He is responsible for all NEPA regulatory filings. Other duties include wetlands, surface mining inspections, cultural resources, noise and erosion control on training lands.

Veronica Frazier is the Sustainability Management System (SMS) Coordinator and leads the cross-functional Installation Sustainability team charged with overseeing the installation's SMS implementation effort, in addition to her daily responsibilities as an Environmental Protection Specialist.

David Hodges is the Waste Management Section Leader. He manages the installation's solid waste and operations for the Fort Stewart/HAAF's Recycling Convenience Centers and the Fort Stewart Processing Station. He manages contractors and the program budget, maximizes recycling revenues and educates Soldiers, personnel, and tenants regarding mandatory recycling requirements.

AWARDS AND SERVICES

Fort Stewart/HAAF's Environmental SM team is a recognized leader in global citizenship and sustainability values. The team has received over 17 honors in the past 10 years in various areas of environmental quality. During the previous two fiscal years, the program received a Secretary of the Army Environmental Award in Natural Resources Conservation (Individual) and was the first runner-up for the Secretary of the Army Environmental Award in Natural Resources Conservation (Large Installation).

> **"Fort Stewart's environmental program and staff continued to function as one of the premier environmental organizations within the Installation Management Agency (IMA) Southeast Region Office (SERO)."**
>
> ***- Mr. Robert Mlakar***
> ***EPAS Program Manager,***
> ***IMA SERO***

In July 2005, the team's environmental quality efforts were a major contributor to Fort Stewart/HAAF's winning the Army Communities of Excellence Award and the Commander in Chief's Award for Installation Excellence for the second consecutive year. Both honors were awarded to Fort Stewart/HAAF for superb performance using its resources to sustain the mission, increase the productivity of its workforce and enhance the Fort Stewart/HAAF community's quality of life.

Fort Stewart's environmental stewardship successes were profiled on the Turner South Network's program *The Natural South* in FY 2004.

ACCOMPLISHMENTS

Program Management

Over the past two fiscal years, the Environmental SM team used a proactive, collaborative and forward-thinking approach to environmental stewardship.

Mission Focused

Fort Stewart/HAAF personnel approach their environmental stewardship responsibilities in cooperation with the long-term goal of environmental sustainability. Sustainability is a concept that recognizes responsible environmental management is in the long-term best interest of the Army. It encourages an inclusive approach that takes into account the Army's needs today, such as the need to train forces and test weapons, while proactively managing environmental resources so they are viable for long-term use.

Successful Integration of Environmental Management Systems (EMSs)

Presidential Executive Order 13148, *Greening the Government Through Leadership in Environmental Management,* required federal facilities to create and implement an EMS before December 31, 2005.

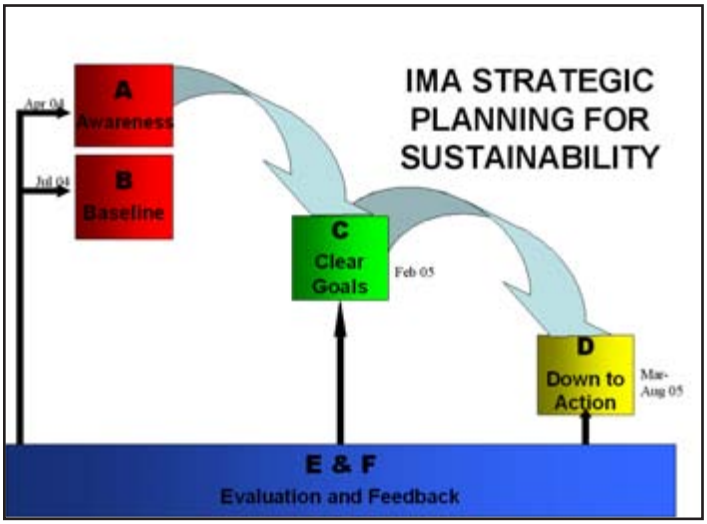
An EMS provides a framework that enables an organization to reduce its environmental impacts, increase operating efficiency and integrate environmental responsibilities into operations. The Army requires EMSs to fully conform to the ISO 14001 standard by September 2009 and recommends integrating them with sustainability into a Sustainability Management System (SMS). An SMS is an EMS that balances environment with mission and well-being to support the military's long-term ability to train and deploy combat-ready Soldiers.

The installation charged the Installation Sustainability Team with creating and implementing an integrated SMS. The team first developed an Installation Environmental Policy, which predicates environmental resources management on the primacy of the military mission and the necessity of military readiness while protecting the environment and being good neighbors.

A key success factor of the SMS was the involvement of key stakeholders in the planning process to ensure environmental challenges are addressed in concert with mission concerns. In FY 2004, the team hosted local government officials, regulatory and pollution prevention agencies, Army agencies, Fort Stewart/HAAF Directorates, private contractors and other agencies at two sustainability workshops to evaluate the current environmental conditions at Fort Stewart/HAAF and identify environmental challenges to installation sustainability.

In February 2005, the team hosted 138 stakeholders at a Sustainability Summit attended by representatives from the Georgia Department of Natural Resources, US Environmental Protection Agency, IMA and the Assistant Chief of Staff for Installation Management. The group toured Fort Stewart's cantonment and training areas to view wetland and range training areas, threatened and endangered species habitats, low-water crossings and other areas to increase awareness of sustainability efforts already underway at the installation.

Next, the Summit attendees jointly developed 25-year environmental sustainability goals and then broke them down into short-term objectives and targets. Most importantly, the goals and objectives developed by the stakeholder group were then incorporated into the installation's Garrison Strategic Plan that the Environmental SM team is committed to working toward.



The Environmental SM team met the requirements of EO 13148 and conformance with the ISO 14001 standard in September 2005. This is a huge accomplishment that jumpstarts the installation's continuing effort to improve environmental conditions at Fort Stewart through sustainability.

Technical Merits

Hazardous Materials Management

The team implemented a Hazardous Materials Management Program (HMMP) to enhance safety by properly disposing of or consolidating the storage of excess hazardous material and hazardous waste in unit areas. Nearly $2 million of excess material was recovered; hazardous waste was reduced by $24,000 on average per Unit of Action; $200,000 was saved through shelf life extensions; and $442,000 was saved through the collection and re-issue of serviceable product.

To further the goals of the HMMP, the Environmental SM team developed "Operation Clean Sweep." This one-time initiative capitalized on the realignment of Fort Stewart's units to purge outdated, unusable, unutilized or contaminated hazardous material and hazardous waste from maintenance facilities. The team brought hazardous material handlers to the customer to implement the program. Nearly 250,000 pounds of excess materials were captured and properly disposed. An additional benefit of the initiative was the identification of deficiencies in operating practices that were corrected by focusing resources on those areas. Operation Clean Sweep led to a successful EPA inspection that identified only minor deficiencies in April 2005.

Materials recovered during Operation Clean Sweep

Pollution Prevention

Under the guidance of the SMS, pollution prevention plays a vital role in guiding Fort Stewart/HAAF's environmental stewardship. The Environmental SM

team guided the $3.5 million rehabilitation of the Industrial Wastewater Treatment Plant (IWTP). The IWTP was constructed prior to the enactment of many of the modern, more stringent environmental regulations and had several structural deficiencies. The IWTP allows Fort Stewart to complete its industrial mission in an environmentally responsible manner. The industrial system starts in the motorpools at the washracks and maintenance bays, conveying oil entrained wastewater to the plant through a network of pipes and lift stations for treatment through a physical separation and removal process prior to its discharge. The cleansing process protects the environment and the endangered species habitats that exist within the installation's waterways. Completion of the projects at the plant ensures that the facilities and infrastructures are in place to handle byproducts of training readiness.

Environmental Planning

Through Fort Stewart/HAAF's robust environmental planning efforts, the team seeks to anticipate pending environmental obstacles to mission activities. This allows the team to proactively mitigate impacts to minimize mission impact. One example of this strategy is the optimal siting of the Digital Multi-Purpose Range Complex. As initially proposed, the project would have significantly depleted the installation's wetland bank. A multidisciplinary team developed a mitigation strategy to reduce this impact, enabling the division to justify the development of an Environmental Assessment versus an Environmental Impact Statement. The solutions proposed saved $14 million in potential mitigation costs and more than one year in project execution time.

Research and Technology

The Environmental SM team was instrumental in the development of the Environmental Information Management System (EIMS), a data-mining tool designed to access the Installation Restoration Program data records and maps of both Fort Stewart and HAAF. It enables the user to integrate dynamic data sources representing a wide range of data types (e.g., environmental, sampling, geographic). The Fort Stewart/HAAF EIMS gives the user precise control over the kinds of information he wants to see or correlate. This functionality allows an EIMS user to review construction projects to ensure that the site selected does not overlap into known contaminated areas, if the area is in a flood plain or other environmentally sensitive areas ensuring that the land is protected and that decisions regarding sustainable use are quickly made.

Military Readiness

Encroachment is an increasing problem for military installations. Put simply, encroachment is the rapid development outside an installation's fence line by surrounding communities that negatively impacts military readiness. The Fort Stewart/HAAF team undertook a variety of efforts to address this issue in a manner that benefited the environment.

In 2003, the team was instrumental in initiating a JLUS in partnership with DoD and neighboring community governments. The JLUS will facilitate the communities' use of zoning authority to help direct growth to areas where it will be compatible with military training. The study was completed in 2005, and the guidelines developed by the JLUS team are already proving useful as regional planners and installation staff seek to provide for sustainable, compatible growth and prosperity for the installation and the region while serving as an aid in preventing encroachment that might otherwise hamper the military mission.

Fort Stewart/HAAF quickly emerged as a leader of the ACUB program, which was established in 2003 to encourage partnerships that create buffer areas around Army installations to limit the impacts of encroachment. ACUBs can also benefit species and habitat recovery.

The installation initiated an effective partnership with the Trust for Public Land, The Nature Conservancy, and the Georgia Land Trust to seek opportunities to partner with neighboring landowners and encourage them to continue to manage their land in a way that is compatible with the installation's training activities. The initiative has already attracted interest from local landowners. In 2005, the first ACUB conservation easement was signed, providing permanent protection to over 100 acres adjacent to the installation; several thousand acres more are in the works.

Knowledge Transfer

To share its strong abilities in forest management through prescribed burning, the team developed a Memorandum of Agreement (MOA) between Kings Bay Naval Base and Fort Stewart to conduct prescribed burning of 1,000 acres in FY 2005. The MOA exhibits the great partnership between the Army, Navy and Georgia Forestry Commission. The objective is to provide field assistance to the Kings Bay staff to facilitate prescribed burns at the Kings Bay Naval Base for the natural resource management program. The team also provided fire training to 60 Eighth US Army students stationed in Korea. The students consisted of Army Range Division contractors, Korean Service Corps and Korean structural firefighters.

Fort Stewart/HAAF is a recognized leader in prescribed burning. Here, they pass on their expertise to Soldiers in Korea.

Stakeholder Interaction

The team believes it is vital to proactively educate and involve the community in Fort Stewart's environmental program. To promote awareness of the Army's environmental stewardship responsibilities among Soldiers, the team used the installation's intranet, newsletters and posters.

To encourage installation involvement in environmental successes, the Environmental SM team established a "Recycling Unit of the Quarter" award that rewards one unit from both Fort Stewart and HAAF for their outstanding recycling efforts during the quarter. Units are selected based on recycling performance, efforts to improve performance and education and outreach efforts. The winning unit receives $500, recognition in the *Frontline* – the installation's weekly publication – and a coin plaque. The award is highly effective and resulted in increased Soldier participation.

The Fort Stewart environmental community is also dedicated to serving the public through volunteer efforts. For example, Fort Stewart/HAAF was the first Department of Defense (DoD)-certified affiliate of Keep America Beautiful, the nation's leading community improvement organization focused on reducing waste, and beautifying communities. As an affiliate, Fort Stewart opens avenues to network with 500 communities and statewide affiliates programs, participate in public and private partnerships and receive free educational campaign materials for community activities.

Finally, the team seeks opportunities to give back to the communities that support its Soldiers and teach its neighbors about environmental management on the installation. The team participates in Earth Day, Read Across America Day, America Recycles Day, Native American Observance and many tours, speaking engagements and presentations to local schools, universities, civic and social organizations. Since October 2003, the team participated in or sponsored over 50 environmental awareness and outreach opportunities for Soldiers and their families, the local community, the environmental community and DoD, reaching an impressive 30,000 individuals.

"The public outreach efforts demonstrate that Americans owe a huge 'thank you' to the Fort Stewart environmental team. You are leading by example."

- Mr. Michael Bird, Federal Affairs Counsel, National Conference of State Legislatures

CONCLUSION

The Fort Stewart/HAAF Environmental SM team predicates environmental resources management on the primacy of the military mission and the belief that effective training can occur while protecting the environment and being good neighbors to the local community.

On the cover: Entrance to Fort Stewart, Georgia.


Fiscal Year 2005 Secretary of Defense
US Army Environmental Awards Nomination
FORT CAMPBELL, KY
ENVIRONMENTAL QUALITY
Sustaining
the Environment
for a Secure Future

INTRODUCTION

Fort Campbell is a premier training and power projection platform of the Department of Defense (DoD). It exists to support readiness and mission execution of its expeditionary forces, including the 101st Airborne Division, the 5th Special Forces Group, the 160th Special Operations Aviation Regiment and the 86th Combat Support Hospital. Ready troops from Fort Campbell deploy to every theatre of combat in the world.

The 105,068 acres that make up Fort Campbell support a military population of almost 25,000; a dependent population of over 57,973; and more than 4,300 civilian employees. Fort Campbell has the seventh largest military population in the DoD. Services provided by the installation include more than 4,100 family housing units; social, religious and recreational facilities; a large post exchange/ commissary complex; seven dependent schools; and a modern hospital.

Fort Campbell lies on the Kentucky-Tennessee border between Hopkinsville, Ky., and Clarksville, Tenn. Residents at the fort share in the heritage of two states rich in history and natural resources. They also share in the challenges inherent in the growth of communities surrounding the installation. Fort Campbell is valued as an important part of the economic development surrounding Clarksville and Hopkinsville, and as a member of their communities.

Educational Tours: Soldiers tour the Pollution Prevention Operation Center (PPOC) after receiving EMS training. The PPOC conducts 20 two-hour facility tours for units, commanders, students and civilians every year. Twelve environmental programs are featured within the tour emphasizing waste minimization through proper management and affirmative procurement.

BACKGROUND

Fort Campbell's environmental program focuses on 11 priority environmental aspects. The Public Works Environmental Division is organized, focused and resourced to support the installation environmental policy, objectives and targets related to these aspects. Each branch – Compliance, Pollution Prevention (P2) and Conservation – is staffed by subject matter experts who serve as program managers in various media areas. Total staffing includes 26 environmental professionals plus approximately 80 contractor support staff. Individual branch team efforts are integrated through environmental management plans aligned to the installation's environmental sustainability goals.

Prioritized Environmental Aspects

- Water Discharge and Use
- Air Emissions
- Encroachment
- Wildlife Habitat Alteration
- Solid Waste Generation
- Cultural Resources Alteration
- Land Damage and Loss
- Energy Use
- Haz. Waste Generation
- Materials Use
- Noise Generation

The key to Fort Campbell's environmental management approach is the Environmental Management System (EMS), which has been under development since 2003 and was instituted in 2004. Senior management championing and program participation have ensured an EMS for Fort Campbell that conforms fully to DoD policy and guidance, and a culture that embraces EMS implementation. As of FY 2005, civilian personnel in all eight directorates and all incoming military personnel receive environmental awareness training.

Development of the EMS at Fort Campbell was an effort that extended to the installation's total community. In September 2003 Fort Campbell hosted a goal-setting sustainability workshop that was attended by over 200 stakeholders from local, state and federal agencies to focus on infrastructure, procurement, regional development, transportation and training support. Facilitated group sessions at the workshop resulted in

development of nine 25-year goals, 18 near-term objectives and 114 separate actions to ensure sustainable operations. These goals, objectives and actions became parts of Fort Campbell's strategic and business plans. In this action, Fort Campbell led the Army in integrating sustainability into strategic planning. Recognizing the value of this approach, in FY 2005 the Army revised its installation strategic planning guidance to include environmental sustainability principles.

PROGRAM SUMMARY

Fort Campbell has an award-winning environmental program geared to meeting the installation's environmental challenges in a way that supports Soldier readiness. Highlights of the FY 2005 environmental program were EMS implementation, hazardous materials management, air emissions reduction, recycling and National Environmental Policy Act (NEPA) and community outreach. The following successes were realized:

- EMS milestones numbers four and five were met in FY 2005;
- Hazardous materials (HAZMAT) management resulted in a 25 percent increase in combat readiness;
- Volatile organic compound (VOC) emissions were reduced by 75 percent; hazardous air pollutant (HAP) emissions were reduced by 95 percent;
- The PPOC reduced hazardous waste disposal by 84.6 percent, realizing a 90.1 percent disposal cost reduction;
- Deconstruction on certain buildings reached a 95 percent salvage rate;
- The Range Division used Fort Campbell's NEPA Web site to choose physical training routes; and
- The Earth Day program celebrated its 35th year of community outreach.

Figure 1. Recent Awards

2005	White House Closing the Circle Award, Recycling Military (Honorable Mention)
2005	IPM Institute of North America, Star Certification
2004	Secretary of the Army Environmental Award for Pollution Prevention, Non-industrial Installation
2004	Governor's Award for Excellence in Hazardous Waste Management, State of Tennessee
2004	Governor's Award for Excellence in Local Government Stewardship, State of Tennessee

These successes represent what is unique about Fort Campbell's environmental program, namely that it is well established, encompassing, technically meritorious, well managed and cost effective. In all cases Fort Campbell's environmental program initiatives meet statutory and regulatory requirements, and in many cases they exceed them.

Figure 2. Required Documents

Document	Status
Installation Natural Resources Management Plan	Currently being revised
P2 Plan	May 04
Asbestos Plan	Aug 05
Stormwater Pollution Prevention Plan	Sep 05
Underground Storage Tank Management Plan	Currently being drafted
Restricted Management Plan	Nov 05
Ozone Depleting Substance Plan	Mar 01

ACCOMPLISHMENTS

EMS Implementation

With the groundwork laid in FY 2003 and FY 2004, Fort Campbell's EMS, called the Sustainable Installation Management System (SIMS), was implemented in FY 2005 when it met several foundational objectives (see figure 3). The garrison commander appointed himself as the EMS director and appointed an action officer to carry out the EMS implementation and oversee the day-to-day activities. He also created the EMS cross-functional team that represents the installation's directorates and hospital (tenant). Lessons learned were gathered from industry and used to meet a requirement of the implementation plan to identify, develop and publish eight procedures needed to execute the SIMS, including Document Control, Environmental Training and Corrective and Preventive Actions.

Figure 3. Completed EMS Objectives

Objective	Completed
1. Initial Policy Statement	Sep 03
2. Self Assessment/Gap Audit	Feb 04
3. Implementation Plan	Sep 05
4. Environmental Aspects List	Mar 05
5. Awareness Training	Mar 05
6. Management Review	Oct 05

Fort Campbell faced a significant challenge in meeting EMS milestone number five – to provide

environmental awareness training for all civilian employees and military personnel. In meeting this challenge, Fort Campbell's in-house staff developed an awareness training video based on lessons learned from industry. The seven-minute video was aimed at the maximum attention span of the average audience, and included key messages and images of the relationship of EMS to sustainability and mission accomplishment. The video was paired with other annual mandatory training for civilian staff and is shown to all incoming military personnel during in-processing. The video received accolades from the viewers and was one of three EMS "How To" videos recommended as models by the DoD.

Auditor training was also conducted, and the EMS Team conducted its first internal audit in FY 2005. The team found 100 percent conformance in several areas of the ISO 14001 standard (risk management, policy and monitoring and measuring) with an overall conformance of 83 percent. Expansion of operational planning in the directorates, begun in FY 2005 after the audit, will boost the overall conformance score significantly, putting Fort Campbell well ahead of the curve on the DoD requirement of full conformance with the ISO 14001 standard by 2009.

> **"Fort Campbell has implemented one of the most progressive environmental management systems in the United States military and demonstrated an exemplary commitment to environmental improvements and sustainability."**
>
> ***- Gary Sondermeyer, Chief of Staff State of New Jersey Department of Environmental Protection***

Operational Planning and Control

Operational planning began in August 2005 – eight months ahead of schedule – based on the installation's list of significant environmental aspects. This process requires the identification of all activities that the garrison performs and an evaluation of each activity to determine if it can create a significant environmental impact. For activities with controllable significant environmental impacts, objectives and targets are established to either meet environmental policy requirements or installation strategic goals. This process identified over 200 activities. Evaluation for significance was based on frequency of occurrence, mission impact, environmental impact, regulation and public concern. Findings were documented in the directorate business plans for 2006 with assigned targets and objectives for those activities with significant impacts. This feature of the EMS focuses resources and efforts on those activities that are most likely to impact missions, or cause environmental damage or compliance problems. Responsibility for environmental performance of the activity remains properly with the process owner in the directorate. Management review at the directorate provides close scrutiny of progress on targets and objectives. Overall environmental awareness has been increased by involving personnel directly in activities.

Similar strategic goals and objectives set for FY 2005, including EMS implementation progress, were measured by three installation-level Quality Management Boards (QMBs) consisting of installation mid-level managers. The Infrastructure QMB determined that EMS implementation fully met all metrics in FY 2005 by reaching Army EMS milestones four and five (aspects analysis, EMS training). Other sustainability objectives that achieved FY 2005 metrics included reducing solid waste, establishing transportation partnerships with Tennessee and Kentucky, implementing green building designs, updating a joint land use study to address encroachment, reclaiming and reducing acreage of an artillery impact area, maintaining access roads to training areas and initiating actions to obtain training maneuver area.

Hazardous Materials Management

The Fort Campbell Pollution Prevention Operation Center (PPOC) provides centralized management of HAZMAT to 234 units and activities both for day-to-day and deployment operations. The daily HAZMAT delivery service restocks and inspects each of the over 553 hazardous material lockers on the installation. Instead of large quantities, custom hazardous material stock levels for each location are created based on strong relationships between PPOC personnel and unit commanders. This coordination ensures that adequate but

minimal HAZMAT is available to the Soldier at all times. In FY 2005, the PPOC ordered, managed and packaged 1,100 different hazardous products required for the mass deployment of over 20,000 personnel. Commanders reported a 25 percent increase in combat readiness as a result of the contingency operations program. After deployment, PPOC service specialists closed 553 unit hazardous material storage lockers, waste lockers and other areas of environmental concern and managed these materials in the centralized facility.

The PPOC packaged 1,100 different hazardous materials required for mass deployment of over 20,000 personnel.

Air Emissions Reduction

Fort Campbell's largest aerospace spray booth transitioned in FY 2005 from using a two-part chemical agent resistant coating (CARC) to using water reducible chemical agent resistant coating (WR-CARC). This transition helped to reduce VOC emissions by 75 percent and HAP emissions by 95 percent for this source. Reductions were so significant that a new spray booth that will be completed in FY 2006 will also use the WR-CARC technology. Fort Campbell is working with the State of Kentucky on the draft Title V Operating Permit, and the transition to WR-CARC significantly supports compliance with air emissions regulations.

Robust Recycling

Significant savings were realized in Fort Campbell's recycling program in FY 2005. Through the PPOC:

- Over 27,700 gallons of antifreeze were recycled, providing a total program cost avoidance of $207,750;
- 45,830 gallons of solvent were recycled, providing a 96 percent reduction in hazardous waste disposal since 1994;
- The program's operating costs have decreased from $436,000 to $200,000;
- Battery testing initiatives resulted in a 55 percent reissue rate, providing a $1.5 million procurement cost avoidance and a $44,640 disposal cost avoidance;
- 292,918 gallons of used oil and fuel were recycled, generating over $49,878 for morale, welfare and recreation (MWR) programs;
- 263,565 pounds of lead acid batteries were recycled, generating $10,286 for MWR programs;
- The PPOC achieved an 84.6 percent reduction in pounds disposed, resulting in 90.1 percent disposal cost reduction since 1992; and
- Concrete grinding of demolition landfill provided a 34,048 ton waste diversion and a $1,061,675 cost savings.

One-Stop NEPA Resource

The Fort Campbell NEPA Process Action Team, created in FY 2005, developed a Web site on Army Knowledge Online (AKO) for environmental project managers. The site contains information about cultural and natural resource issues, erosion control measures, etc. and enables project managers to make informed decisions about their approach prior to initiation. The Range Division used the NEPA site in FY 2005 to choose the physical training route that had the least impact to the environment. The

Figure 4. Waste Operations

AKO Web site also increases the efficiency of the military construction project process by providing any environmental concerns or issues to the Master Planning Branch in a timely manner. In addition, the site allows for integration of project information within the Environmental Division.

Community Relations

Community outreach has long been an important part of the installation's environmental education program. Environmental education at Fort Campbell has a long history. The Earth Day program established in 1970 enjoys an annual participation exceeding 1,000 students. In FY 2005 Fort Campbell celebrated the 35th anniversary of Army Earth Day with more than 40 booths of environmental information and activities for more than 1,300 attendees, including students, faculty, Soldiers and family members. Participants from over 30 local, state and surrounding community organizations, including area museums, state and community parks had booths at the Earth Day fair. The program was expanded in FY 2005 to include an Earth Day, Every Day environmental incentive program, where elementary and middle schools on post earn points for environmental projects they undertake throughout the year. The school with the highest score receives a trophy on Earth Day.

Fort Campbell's outreach program includes P2 mascots. Fanny, Freckles, Dee Dee and Ducky teach P2 lessons to pre-school, elementary and middle school students with notable sightings at the Wenk Magic of Recycling Show (2,995 in attendance), the Extravaganza of Extreme Science Experiments (600 in attendance) and regular performances at the Fort Campbell library where they read stories with environmental messages.

Fanny and Freckles teach stormwater, pollution prevention and recycling lessons to kids.

Environmental education at Fort Campbell reaches many children, but it also benefits adults. In FY 2005 Fort Campbell also provided 135 environmental education classes and workshops to Soldiers and civilians.

Figure 5. Environmental Classes and Workshops

Class	Number of Classes	Hours Per Class	Students Taught in FY 2005
Environmental Quality Officer (EQO) Course	9	40	300
Fuel Handlers Course	3	1	175
On-site training	10	2	750
Commander and First Sergeants Course	4	0.5	175
Asbestos and Lead-based Paint Awareness	4	3	125
PPOC Tours	21	2	250
Archaeological Resources	1	24	35
Stormwater Erosion and Sediment Control	1	8	150
Conservation	1	8	150
EQO Meeting	6	2	350
EQO School System Meeting	6	1	50
Rear Detachment Cmdrs Course	4	1	300
Strategic Deployability School	12	1	250

CONCLUSION

Fort Campbell is on the forefront of integrating the EMS into an already well-established and robust environmental program. Every year Fort Campbell realizes successes that have received recognition from military and civilian organizations. FY 2005 was especially productive for Fort Campbell's environmental program, evidenced by successful implementation of the EMS, mission support through efficient HAZMAT management, substantial savings and avoidances in pollution prevention measures, extensive training and education initiatives and more. Fort Campbell personnel are proud of the role they play in the nation's defense.

On the cover: Army Capt. Alfonso Prieto from the Military Transition Team, 1st Battalion, 327th Infantry, 101st Airborne, Fort Campbell, Ky., sits in the gun turret of a tactical vehicle waiting to convoy to an Iraqi military base in Kirkuk, Iraq.


Fiscal Year 2005 Secretary of Defense
US Army Environmental Awards Nomination
THE PYRAMID LAKE
TORPEDO AND BOMBING RANGE
RESTORATION PROJECT
ENVIRONMENTAL RESTORATION
SUSTAINING
THE ENVIRONMENT
FOR A SECURE FUTURE

INTRODUCTION

The US Army Corps of Engineers (USACE) led a team who located, retrieved and disposed of ordnance discarded decades ago on the Pyramid Lake Torpedo and Bombing Range (PLTBR) on the Pyramid Lake Paiute Tribe Reservation. They utilized an innovative approach by partnering with the Paiute Tribe, the US Navy and private contractors. Furthermore, they used non-traditional leadership approaches to problem-solving, advanced US Navy protocols for deep diving at high elevations and developed a unique Deepwater Ordnance Recovery System (DORS) that overcame challenges and reduced costs. The team solved problems, expanded the boundaries of known technologies and successfully recovered ordnance from a sensitive environment with minimal disturbance.

BACKGROUND

Pyramid Lake Paiute Tribe Indian Reservation

In 1859, the Bureau of Indian Affairs established the Pyramid Lake Reservation, located in the Great Basin area of Nevada, for the Northern Paiute Tribe.

Figure 1. Pyramid Lake Indian Reservation Facts

Founded	1859
Location	35 miles NE of Reno, Nev.
Size	477,000 acres (742.2 mi^2)
Nearby towns	Sutcliffe, Nixon and Wadsworth
Pyramid Lake	119,000 acres (26 x 10 miles) 350 feet depth

Pyramid Lake is wholly contained within the reservation and is home to the endangered Cui-ui lake-sucker and the threatened Lahontan cutthroat trout. The Paiute Tribe holds the lake and its wildlife in high regard culturally because of the history with the tribe's ancestry. Pyramid Lake is one of the tribe's most valuable economic and cultural assets. The reservation's economy is centered on fishing and recreational activities, like boating, day use and overnight camping.

Pyramid Lake Torpedo and Bombing Range

In April 1944, the Department of Navy negotiated and entered into two separate leases with the Pyramid Lake Paiute Tribe and the Pyramid Lake Ranch for a total of 76.5 acres of land. The acreage was used as a mobile water target and dive-bombing practice area, strafing area and a supporting shore facility. The leases were canceled in December 1945 and January 1946.

The Department of Defense (DoD) is responsible for the environmental restoration of properties formerly owned by, leased to or otherwise possessed by the United States and under the jurisdiction of the Secretary of Defense. Such properties are known as Formerly Used Defense Sites (FUDS). The PLTBR was declared a FUDS in September 1999.

Native American Lands Environmental Mitigation Program (NALEMP)

NALEMP is a DoD program created to address the environmental impacts of prior DoD activities at FUDS located on Native American or Alaska Native Claims Settlement Act (ANCSA)-conveyed lands. While these activities were critical to the DoD mission to defend and protect the nation, they may have impacted the tribal environment, health, safety, economy and cultural ways of life. NALEMP is tailored to resolve environmental impacts in agreement with the unique Native American way of life, in particular the subsistence lifestyle and cultural significance of nature.

The USACE is DoD's lead agency for executing NALEMP. The USACE works with the tribal government to create a Cooperative Agreement (CA), which forms a partnership to complete remediation. This partnership confers a large degree of responsibility for the project to the tribe that leverages their existing skills and knowledge and ensures their concerns are appropriately addressed. Moreover, the CA is a winning solution for both parties as it facilitates a long-lasting partnership and builds the tribe's expertise, which positively impacts economic development.

PROJECT SUMMARY

In May 2002, the USACE contacted the Paiute Tribe regarding the PLTBR and the tribe's eligibility for NALEMP funding to remediate impacts from the Navy's activities in the 1940s. The tribe viewed the discarded ordnance as a potential environmental and health hazard and looked to DoD to rectify any environmental injuries caused by defense activities.

The USACE worked with the tribe to develop a CA to complete a Strategic Project Implementation Plan

(SPIP), map Pyramid Lake, locate any ordnance in the lake and remove abandoned land-based structures. The first CA was signed in September 2002.

The USACE mapped Pyramid Lake using sonar and magnetic surveys, focusing on areas where historical evidence indicated ordnance might be found. Sediment sampling was also conducted at this time and did not find any accumulation of toxic or hazardous agents. At this point, the USACE pursued a partnership with Explosive Ordnance Disposal (EOD) personnel at Naval Air Station (NAS) Fallon, Nev. NAS Fallon dispatched divers to Pyramid Lake to explore shallow water anomalies. No ordnance was found at that time, but this new relationship would prove fruitful later in the project.

A remotely operated vehicle (ROV) was deployed to further inspect 36 sites, resulting in the discovery of military ordnance at depths of 46 to 220 feet. Confirmation of ordnance in Pyramid Lake prompted a second CA between DoD and the tribe, signed in July 2004, which called for locating and removing ordnance from the lake to the maximum degree possible.

Figure 2. PLTBR Project Milestones

Sept 2002	· First Cooperative Agreement Signed
July 2003	· Strategic Project Implementation Plan Complete
Nov 2003	· Lake Mapping · Land-based Structures Removed · Sediment Sampling · Debris Investigation by Divers
Apr 2004	· Debris Investigation by ROV
July 2004	· Second Cooperative Agreement Signed
Aug 2004	· Operation Sutcliffe Rocket Lift Phase 1
Apr-Jun 2005	· Operation Sutcliffe Rocket Lift Phase 2

The tribe wanted to avoid recovering the ordnance through excavation or dredging due to Pyramid Lake's cultural significance, the sensitivity of the federally endangered Cui-ui and the recreational and sport fishing value of the lake. Moreover, the lake bottom contained settled contaminants from natural and manmade runoff that could have endangered environmental health and the tribe's economic well being if disturbed.

Addressing the tribe's concerns necessitated the use of a non-traditional approach to ordnance recovery. To do so, the team leveraged its working relationship with the Navy's EOD Unit to develop a strategy that used sonar technology to target ordnance disposal areas and Navy divers to recover the ordnance. The entire ordnance recovery effort was dubbed Operation Sutcliffe Rocket Lift. Phase I focused on recovering ordnance in shallow waters up to 100 feet, while ordnance located in depths up to 220 feet was recovered during Phase II.

Ordnance handlers from NAS Fallon grapple with recovered ordnance during Phase II.

Team Member Responsibilities

As project manager, **Jerry Vincent** (USACE Sacramento District FUDS program manager and NALEMP project manager) provided contract vehicles, funding and information on NALEMP; provided CA guidance to the Paiute Tribe; and facilitated team communication.

Anna Keyzers, the NALEMP project manager and Pyramid Lake Paiute Tribe project manager, supported the team by managing budgets, contracts and contractors; supervising and coordinating activities with tribal leaders; and assisting in developing CAs.

Dan Gross (Senior Chief, Master EOD Technician, US Navy Ret., EOD Mobile Unit Eleven, Detachment Fallon, NAS Fallon, Nev.) acted as project site manager. In this role, he oversaw planning and coordination of logistics, operations, personnel and safety; and developed procedures for recovery, storage, protections, transport and disposal of recovered ordnance.

Raymond Kayona (Senior Chief, Master Diver, US Navy, EOD Mobile Unit Eleven, Whidbey Island, Wash.) served as project site supervisor and performed planning, management and safety tasks for dive operations and served as technical expert on deepwater diving, dive equipment and ordnance recovery.

Jon Dasler, PE, the director of marine services from support contractor David Evans and Associates, Inc., managed the survey, mapping and ROV exploration components of the project. In this role, he provided technical consultation on development of recovery methods and technical approach; and designed the barge mooring layout and four-point mooring system.

Tim Chapman, PE, acted as the senior program manager for EM-Assist, Inc. He provided technical support to the Paiute Tribe and USACE.

Cindy Vincent, also of EM-Assist, Inc., was the team's public affairs specialist.

AWARDS AND SERVICES

In January 2006, the PLTBR project received an Engineering Excellence Award from the American Council of Engineering Companies of Oregon. Moreover, the team consisted of accomplished professionals who participate in diverse professional organizations:

Figure 3.

Prior Recognition	Representative Professional Affiliations
· Navy Achievement Medals (seven) · Navy Commendation Medals (four) · Commander's Award for Public Service (two)	· Sierra Army Depot Restoration Advisory Board · National Tribal Air Association · National Groundwater Association · Society of American Military Engineers · National Society of Professional Engineers · Society of Professional Journalists

ACCOMPLISHMENTS

Technical Achievements

Operation Sutcliffe Rocket Lift Phase II presented a special challenge due to Pyramid Lake's high elevation and depth. Moreover, the required resurfacing time for divers in such conditions was extraordinary for relatively small amounts of time at depth, which might have affected the project's schedule and cost. All team members helped to develop a tailored solution to overcome these challenges.

High Altitude/Deepwater Diving Tables

The high altitude limited the use of current dive tables to safely dive beyond depths of 100 feet using standard SCUBA equipment. Navy EOD personnel recruited a Master Diver from their parent unit to resolve this problem. The Master Diver determined that the MK 16 MOD 1 Closed-Circuit Mixed-Gas Underwater Breathing Apparatus (UBA) could be used to complete the project. However, that equipment had never been used at high altitudes. The Master Diver enlisted Naval Sea Systems Command (NAVSEA) to develop protocols to use the MK16 MOD1 at higher elevations. In April 2005, NAVSEA issued guidance and procedures for use of the apparatus at high altitude.

Deepwater Ordnance Recovery System (DORS)

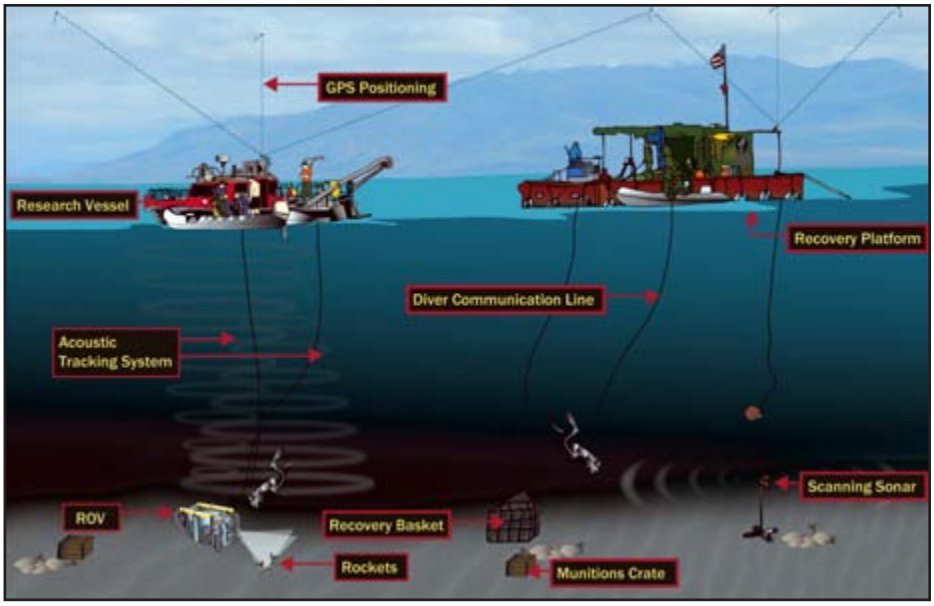
The team jointly developed a one-of-a-kind DORS to locate and recover ordnance using the Navy diver. It consisted of two specially modified 20 by 40 foot barge platforms, an innovative mooring configuration for placement and movement of the two barges, sonar to locate ordnance and a crane lift to retrieve ordnance from the bottom. The diving system was also modified to include a two-way communication system.

The sonar was lowered from each barge and displayed images to the sonar operator and dive supervisors on deck. Ordnance could be located and recovered from each of the platforms in an area approximately 300 feet by 300 feet. The barges were systematically moved to pre-determined moorings to cover the entire 500 feet wide by one mile long ordnance field. Sonar personnel used the two-way communication system to direct the diver to ordnance for placement in the recovery basket. The barge layout, equipment, anchoring, underwater sonar and anomaly interpretation, communication between sonar operator and diver, and systematic movement was crucial to precise positioning of the barge and diver over the ordnance fields, minimizing bottom time for the divers. This reduced decompression time, maximizing time to recover ordnance. Barge anchoring systems designed to withstand the high winds and waves permitted efficient barge movement.

Program Management

Partnerships to Leverage Expertise

As the NALEMP project manager, the USACE directed the creation of a robust project plan in collaboration with key stakeholders to incorporate and address the Paiute Tribe's concerns. Furthermore, the USACE proactively partnered with the Paiute Tribe, the US Navy and contractors to leverage each partner's resources and unique knowledge.



The PLTBR team successfully addressed challenges by designing the unique Deepwater Ordnance Recovery System (DORS).

Collaborative Cross-Organization

These partnerships were key to achieving the CA goals. The team was dedicated to investigating and determining the environmental impacts of previous defense activities to Pyramid Lake and to recovering ordnance in a manner consistent with the tribe's concerns within available funding constraints.

This effective management strategy resulted in stakeholder needs being met, leveraging skills among all parties, cost savings, knowledge sharing and opportunities for training and growth.

Significant Savings

The methods and system used to recover ordnance from the submerged environment resulted in greatly reduced time and costs compared to estimates produced by the USACE's Remedial Action Cost Engineering and Requirements® (RACER®) estimating tool.

The significant reduction in cost and time to complete is the result of many factors:

- The impact of the strategic partnership, including:
  - Synergies from the combined knowledge and collaboration that resulted in the proposition of unique and tailored solutions;
  - Partners completing their specialized tasks in agreement with each other; and
  - Use of lower cost tribal, military and government employees and military and government equipment when practicable.
- The CAs and SPIP focused team members on common goals;
- Effective use of historical data and technology to target possible ordnance disposal areas for further exploration; and
- The DORS system and use of Navy divers resulted in precision diving that enhanced recovery efforts.

Figure 4.

	Years to Complete	Cost to Complete
RACER® Estimate	50	$142.8 million
Actual	3	$1.5 million

Stakeholder Interaction

Facilitation of NALEMP Cooperative Agreements

The USACE-initiated contact with the Paiute Tribe resulted in a mentoring relationship with the tribe and provided a conduit for funding, information and ideas between NALEMP and the tribe. This initial contact set the foundation for a relationship built on trust, common goals and shared responsibilities that was a winning solution for all parties. For the tribe, an economic resource and cultural emblem was restored. For the government, a positive partnership was created and a restoration project was successfully completed.

Community Outreach

The partnership between DoD and the tribe deeply involved tribal leadership. The Tribal Council served as a vital partner during the project and was kept informed by the project team throughout the project.

The project team included a public affairs specialist who addressed tribal members' long-running concerns about the impacts of the Navy's use of their lake, while also educating key stakeholders about the remediation process and updating them on project progress. The team created five inserts for the tribe's newsletter at key milestones, which were distributed to all tribe members. Tribal Council meetings were also effectively utilized to update the tribe in an open forum. Finally, media relations activities were conducted that targeted local television and newspapers to inform surrounding communities of remediation efforts.

Knowledge Transfer

The development of high altitude dive protocols and the design of the unique DORS will be useful in similar applications to locate and retrieve widely dispersed ordnance at underwater locations. A number of actions ensured the knowledge gained from this project was captured and will be available for future use:

- The revised protocols for deepwater, high altitude diving using MK 16 MOD 1 Closed-Circuit Mixed Gas UBA were documented in NAVSEA guidance used by the diving community;
- This project will be presented at the annual Navy Working Divers Conference (May 2006); and
- Project briefings and displays were created for use at related conferences, including the Partners in Environmental Technology Technical Symposium & Workshop (December 2005) and the Army Environmental Cleanup Workshop (January 2006).

The Paiute Tribe benefited from the partnership with DoD as well. One of the project goals was to foster economic development by building on preexisting tribal expertise. The mapping data collected was shared with the tribe and will be used to enhance their recreational activities and economic development endeavors. The project also created training and mentoring opportunities for tribe members and staff. For example, tribe members were invited to participate in the 40-hour Hazardous Waste Operations and Emergency Response training to expand their knowledge and to fulfill a requirement for participation in cleanup operations. Finally, the tribe demonstrated mutual goodwill by placing some recovered items in a tribal history museum recounting military activities at Pyramid Lake.

> "The lake mapping data has a wide range of uses for Pyramid Lake Fisheries, Water Resources and future economic development."
>
> *- Anna Keyzers, Paiute Tribe, Environmental Dept.*

> "The Pyramid Lake Paiute Tribe applauds the clean-up effort and positive working relationship with the Department of Defense."
>
> *- Norman Harry, Tribal Chairman*

Military Readiness

The cost-effective execution and training benefits of the PLTBR project enhance military readiness. Cost efficiencies improve military readiness by freeing monetary resources for reallocation to pressing mission needs. Moreover, the project was a unique cross-training experience for more than 20 sailors. The Navy EOD technicians previously had little opportunity to dive on live ordnance and therefore gained immeasurable diving experience, while the Navy divers' prior experience focused on salvage and repair, not ordnance recovery. Team members enhanced their skills by combining diving and EOD functions with specialized equipment. This will enhance their performance and influence command mission capability for the rest of their careers.

CONCLUSION

The USACE, the Pyramid Lake Environmental and Fisheries Department, Navy divers and support contractors successfully partnered to execute the ordnance recovery effort. In August 2004, Phase I resulted in the recovery of 204 high velocity rockets and 12 crates of small arms from depths up to 100 feet. Phase II was executed over six weeks in April through June of 2005 and recovered 243 rockets and 182 crates of small arms munitions weighing more than 13 tons over the course of 149 successful dives from depths up to 220 feet. In July 2005, the tribe acknowledged the project team with a special ceremony on the reservation.

On the cover: Top: Scenic view of Pyramid Lake. Bottom: Navy divers prepare to conduct a recovery dive in Pyramid Lake.


Fiscal Year 2005 Secretary of Defense
US Army Environmental Awards Nomination
FORT LEWIS, WA
ENVIRONMENTAL RESTORATION
Sustaining
the Environment
for a Secure Future

INTRODUCTION

The Fort Lewis Environmental Restoration Program (ERP) has undergone an innovative paradigm shift in environmental management strategy that has produced dramatic results during the past two fiscal years. Fort Lewis' methods and strategy have not only been successful for this installation but also have significant implications for use throughout other Department of Defense (DoD) installations.

> "By creating the new ERP team, they showed a strong commitment to the environment. Fort Lewis has always gone beyond the minimal regulatory requirements – they don't just do what's necessary, they do what's right."
>
> *- Bob Kievit, USEPA*

The Fort Lewis environmental management strategy involves use of an in-house team of qualified professionals to complete routine engineering work rather than relying solely on support from outside organizations. The most immediate and notable results of this management strategy to date have been: 1) significant cost savings; 2) increased performance in restoring land for military missions; 3) improved ability to successfully employ innovative technologies for site investigation and cleanup; and 4) improved community relations and regulator acceptance.

BACKGROUND

Located in western Washington near the southern tip of Puget Sound, Fort Lewis is surrounded by the communities of DuPont, Lakewood, Roy, Steilacoom and Spanaway. Tacoma and Olympia, two of Washington's largest cities, are located to the northwest and south of the installation. In addition to more than 25,000 Soldiers and civilian workers, the installation supports 120,000 retirees and 29,000 family members, making it the Army's fourth most populous installation.

The 87,000-acre installation is the premier Army installation in the Northwest Region and is the only power projection platform on the West Coast. Yakima Training Center, a 327,000-acre sub-installation of Fort Lewis, is a high quality Army maneuver training area located in the desert of central Washington.

Fort Lewis is home to the Army's first two Stryker Brigades. Above, a Stryker and its crew participate in maneuver training at Yakima Training Center.

The Fort Lewis ERP is tasked with the investigation and cleanup of sites at Fort Lewis and its sub-installations that are regulated by the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) or the Resource Conservation and Recovery Act (RCRA) corrective action program. Community and regulator involvement are critical components of the program.

The Program is responsible for four sites on the CERCLA National Priority List (NPL) and manages 12 non-NPL CERCLA sites. The program is also responsible for completing RCRA corrective actions at hundreds of RCRA corrective action sites at Fort Lewis and Yakima Training Center.

For the past five years, the Fort Lewis ERP has been responsible for both the Environmental Restoration and Compliance Cleanup Programs. Although ERP and Compliance Cleanup are separately funded programs, Fort Lewis has found tremendous synergy in managing the two programs with a single in-house team since the nature of the work is identical.

Sites managed by Fort Lewis ERP include former landfills, former small arms ranges, underground storage tanks, disposal pits, industrial yards and spill sites. Common contaminants include heavy metals, chlorinated solvents, petroleum products, pesticides and munitions constituents.

PROGRAM SUMMARY

Prior to FY 2003, the Fort Lewis ERP operated in much the same manner as ERPs across the country. The primary function of the Fort Lewis ERP was to transfer ERP and Compliance Cleanup funding and technical workload to the United States Army Corps of Engineers (USACE), who in turn usually contracted the requested work out to an engineering consulting firm. In essence, USACE contractors completed

the projects while USACE and Fort Lewis provided additional layers of management and quality control.

Beginning in late FY 2002, the Fort Lewis ERP Manager and supervisors within Fort Lewis' Public Works decided to make an innovative change in the way Fort Lewis' ERP operates. Fort Lewis realized that by hiring the same quality of experienced contractors used by USACE, an in-house ERP team could complete the same work in a more streamlined fashion. In doing so, the in-house team would dramatically simplify the layers of management, communication, contracting, funding, reporting and quality control from three organizations (i.e., the installation, USACE and USACE contractors) to just the installation.

The Fort Lewis ERP Manager began by adding an Environmental Engineer/Hydrogeologist to the ERP staff. When cost savings and improved performance exceeded expectations, Fort Lewis hired a Civil Engineer and Geologist in FY 2004 and a Chemist in FY 2005 to complete the ERP Manager's vision.

Typical technical tasks for the in-house ERP team include: 1) completing the planning, field work and reporting tasks for projects in all remedial action phases from preliminary assessment through remedy implementation; 2) writing decision documents for remedy selection and site closeout; and 3) maintaining the administrative record, community relations program and land use control plan.

Groundwater monitoring wells are installed as part of an in-house Site Investigation at one of Yakima Training Center's ERP sites.

ACCOMPLISHMENTS

Cost Savings

The cost savings realized through the redesign of the Fort Lewis ERP are significant. As shown in Table 1, the team has realized savings of $500,000 per year by completing recurring remedial action operation and long-term monitoring tasks in-house at five Fort Lewis ERP sites.

Table 1. Annual Remedial Action Operation and Long-Term Monitoring Costs at Five Sites

Site #/Phase	Previous Annual Cost ($K) [1]	Current Annual Cost ($K)
FTLE-33 RAO	735	383 [2]
FTLE-54 LTM	30	1
FTLE-57 LTM	80	3
YFCR-01 LTM	25	3
YFCR-53 LTM	25	5
TOTAL	**$895K**	**$395K**
[1] From FY 2003 or FY 2004 Installation Action Plan		
[2] Includes labor cost of two contracted in-house staff		

The in-house team also realized almost $4 million in savings during FY 2004 and FY 2005 by completing various phased, non-recurring ERP projects as shown in Table 2.

Table 2. FY 2004/2005 Phased Project Savings

Site #/Phase	Estimated Cost ($K) [1]	Actual In-house Cost ($K)
FTLE-18 Decision Document	5	0
FTLE-31 Remedial Action	3000 [2]	0
FTLE-59 Site Investigation	55	8
FTLE-62 Remedial Investigation	130	0
FTLE-69 Remedial Action	400	3
FTLE-18/46/69 Well Decommissioning	40	13
YFCR-01/32/34 Site Investigation	260	68
YFCR-47 Remedial Action	45	0
YFCR-49/50 Site Investigation	255	70
Labor cost of one contracted in-house staff for two years		250
TOTAL	**$4,190K**	**$412K**
[1] From FY 2003, FY 2004 and/or FY 2005 Installation Action Plan		
[2] Based on January 2005 Decision Document		

Similar cost savings have also been produced for Compliance Cleanup-funded sites. Prior to FY 2004, the annual budget spent on Compliance Cleanup work at Fort Lewis and Yakima Training Center ranged from $1.5 million to $2 million per year. At the end of FY 2005, the total cost-to-complete estimate for all Fort Lewis and Yakima Training Center Compliance Cleanup sites has been reduced to only $537,000. In fact, the former Evergreen Infiltration Range cleanup described below was funded in FY 2004 – years ahead of schedule – because the Fort Lewis ERP realized an FY 2004 Compliance Cleanup cost reduction of approximately $1 million.

Increased Performance in Restoring Land for Military Missions

The objective of any restoration program is to complete remediation of contaminated sites. As established by Defense Planning Guidance, one of the most important performance metrics is obtaining Remedy-in-Place (RIP) status. As illustrated in Table 3, Fort Lewis' ERP has officially obtained RIP status for eight of the 10 remaining CERCLA sites over the past two fiscal years and is positioned to obtain RIP for all sites well ahead of the RIP deadline.

Table 3. RIP Status at Fort Lewis CERCLA Sites

Site #	RIP Goal (FY)	Actual RIP Date (FY)	Site #	RIP Goal (FY)	Actual RIP Date (FY)
FTLE-10	2007	1999	FTLE-46	2007	**2005**
FTLE-16	2014	**2005**	FTLE-51	2014	2007 (projected)
FTLE-17	2014	1999	FTLE-54	2011	**2004**
FTLE-18	2007	**2005**	FTLE-57	2007	**2004**
FTLE-28	2014	1999	FTLE-58	2007	1992
FTLE-31	2007	**2005**	FTLE-59	2014	2006 (projected)
FTLE-32	2007	1999	FTLE-67	2007	2002
FTLE-33	2007	**2005**	FTLE-69	2014	**2005**

Fort Lewis' ERP has obtained response complete (RC) status, the ultimate ERP goal, for two of its CERCLA sites in the past two years and a third site slated to receive RC status in FY 2006. Fort Lewis' ERP has also positioned itself to obtain RIP or RC status for the entire Yakima Training Center sub-installation by the end of FY 2006.

The ERP team has also been able to obtain RC status for the majority of Fort Lewis RCRA corrective action sites over the past two fiscal years. The number of non-RC sites and the amount of land those sites occupy on Fort Lewis has been dramatically reduced from 92 separate sites covering approximately 1,200 acres in FY 2003 to 18 sites totaling only 80 acres at the end of FY 2005.

> "The first thing that struck me was how responsive Fort Lewis and the Army were when the new program was implemented. Working with the in-house team seemed to take only one-third of the time. [It] truly was a world of difference between the former program and how it is now."
>
> *- Greg Caron, Washington Department of Ecology*

The increased performance of Fort Lewis' ERP has enabled the Program to more effectively enhance the military and civil works mission at Fort Lewis by: 1) decreasing the amount of Fort Lewis and Yakima Training Center lands with environmental restrictions; 2) increasing funding for other Army programs by decreasing required funding for ERP and Compliance Cleanup sites; 3) effectively implementing land use controls via a comprehensive land use plan that does not discourage appropriate redevelopment or training; 4) championing sensible brownfield redevelopment projects such as construction of a softball complex on top of a former landfill; and 5) improving ERP outreach to other land use planning and training organizations at Fort Lewis through a dig permit process, land use "deconfliction" meetings and master planning coordination.

Employing Innovative Technology

Since the in-house ERP team is designed for routine and recurring engineering work, Fort Lewis' ERP continues to partner with USACE Seattle District, Army and national laboratories, and contractors when specific technical expertise or substantial project support is needed. However, the interaction with these experts is now more efficient with the in-house team. Four prominent examples of successful innovative technology partnerships at Fort Lewis

in FY 2004 and FY 2005 have been: 1) electrical resistance heating (ERH) at the Logistics Center NPL site; 2) ERH performance assessment activities; 3) research projects funded by DoD research and development programs; and 4) a soil recycling project at a former small arms range.

ERH at the Logistics Center. The Logistics Center site includes a former industrial landfill, where chlorinated solvents and other wastes were historically dumped. The landfill has contaminated groundwater with multiple trichloroethene plumes. By using ERH – an in-situ electrical heating technology that applies electricity into the ground to volatilize contaminated soil and groundwater for subsequent recovery – the team has recovered and destroyed more than 2,800 pounds of solvents and 24,000 pounds of various other hydrocarbons from the landfill. The ERH project has prevented future groundwater contamination and has reduced the projected cleanup timeline from the very distant to the foreseeable future.

Electrical resistance heating, an in-situ technology, in use at the Logistics Center NPL site.

ERH Performance Assessment. When the Army decided it needed to verify the effectiveness of ERH at Fort Lewis, since the technology has the potential for application at other DoD sites, the in-house Fort Lewis ERP team provided the necessary leadership to keep a complex team of researchers and stakeholders from Fort Lewis, the US Army Environmental Center, US Environmental Protection Agency (EPA), USACE, Pacific Northwest National Laboratory, multiple teams of university researchers and various contractors on schedule and within budget. A discussion of the specific innovative technologies used to assess the performance of ERH is beyond the scope of this nomination as evidenced by the acceptance of eight technical abstracts from the larger Fort Lewis ERP team of experts at Battelle's 2006 Remediation of Chlorinated and Recalcitrant Compounds Conference.

DoD Research. There have been many notable research projects undertaken at Fort Lewis in recent years. One of the more promising research projects has been a pilot test funded by the Environmental Security Technology Certification Program. This project is studying enhanced dissolution of chlorinated solvents prior to in-situ bioremediation. Preliminary results indicate that proprietary additives can increase mass transfer of non-aqueous phase liquid into the dissolved groundwater phase, which greatly improves biodegradation of chlorinated solvents in groundwater.

Soil Recycling Project. An expedited cleanup of lead in soil at the former Evergreen Infiltration Range was required due to construction of military barracks on the site. The cleanup was completed after 9,000 tons of soil and nearly one ton of bullets were removed. By separating bullets from the soil and utilizing a phosphate additive that prevents lead in soil from leaching, Fort Lewis' ERP was able to recycle the excavated soil at an active small arms range – which resulted in significant cost savings by minimizing hauling and disposal costs compared

At the former Evergreen Infiltration Range, a phosphate-based stabilizer is added to prevent lead in the soil from leaching during a soil recycling project.

to a traditional "dig and haul" approach. Other innovative project optimizations included the use of a performance-based contract, use of EPA's "Triad" investigation approach, use of an X-ray fluorescence instrument to guide excavation, and dry sieving of soil to remove uncontaminated gravels from the waste stream.

Improved Community Involvement and Regulator Acceptance

Due largely to the fact that Fort Lewis' ERP consistently completes projects that are timely, cost-effective and protective of human health and the environment, surrounding communities have expressed no interest in establishing a Restoration Advisory Board (RAB) at Fort Lewis or Yakima Training Center. Despite the absence of a RAB, Fort Lewis ERP continues to employ many traditional community involvement methods such as maintaining the installation's administrative record, seeking public comment on proposed remedies, holding monthly regulator meetings and participating at regional and national conferences.

Not content with the status quo, Fort Lewis ERP has also improved its community involvement and outreach program by conducting annual open houses of its facilities, hosting field trips, distributing annual community newsletters and sponsoring research projects.

As part of its community involvement and outreach, Fort Lewis hosts annual open house events at its facilities. Above, exit interviews are conducted during the 2005 Installation Restoration Program Open House.

Fort Lewis has always enjoyed strong relationships with the EPA and state regulators. Since regulators were intimately aware of the time and cost involved with the traditional ERP management model, EPA and state regulators were supportive of the switch to the Fort Lewis ERP in-house team. Since creation of the in-house team, they have repeatedly praised the Fort Lewis ERP for its improved ability to investigate and clean up sites in a more effective and less time- and cost-consuming manner.

Intangible Benefits

While this nomination highlights some of the quantifiable results produced by Fort Lewis, there are other direct benefits created by the in-house team, which include: 1) improved retention of institutional knowledge; 2) improved program flexibility; 3) streamlined communication; 4) improved program decision-making; 5) improved ability to educate regulators and resolve regulatory conflicts; and 6) improved manpower to support other core Fort Lewis Public Works' functions such as the Sustainability Program, the Safe Drinking Water Act Program and the Toxic Substances Control Act Program.

CONCLUSION

A successful restoration program is critical to an installation's ability to maintain mission readiness. The creation of an in-house Fort Lewis ERP team has enabled Fort Lewis to maintain mission readiness and address environmental challenges in a more responsive, dynamic and efficient manner. The innovations and efficiencies realized by Fort Lewis can be applied at other appropriate installations. The synergy, flexibility, innovation, performance and cost savings realized by the Fort Lewis ERP are indicative of a program second to none.

> **"It's heartening to look at Fort Lewis and be able to see real environmental benefits as a result of the new ERP program."**
>
> ***- Greg Caron, Washington Department of Ecology***

On the cover:
Top: Aerial view of Mount Rainier. Bottom: Pfc. Jose Ruiz overlooks Mosul from a rooftop during a combat operation. Ruiz is a member of the 3rd Battalion, 21st Infantry Regiment, 1st Brigade, 25th Infantry Division (Stryker Brigade Combat Team) from Fort Lewis, Wash.

FISCAL YEAR 2005 SECRETARY OF DEFENSE
US ARMY ENVIRONMENTAL AWARDS NOMINATION

MINNESOTA ARMY NATIONAL GUARD
NATURAL RESOURCES CONSERVATION TEAM

NATURAL RESOURCES CONSERVATION

SUSTAINING THE ENVIRONMENT FOR A SECURE FUTURE

INTRODUCTION

The Minnesota Army National Guard (MNARNG) Natural Resource Conservation Team is located at Camp Ripley, a 52,758-acre training site, and at Arden Hills Army Training Site (AHATS), a 1,500-acre training site located in metropolitan Minneapolis. The Natural Resource Conservation Team is part of the Minnesota National Guard environmental office. Due to its size and mission within the MNARNG, Camp Ripley is the primary focus of the team. In addition to serving as a military training site, Camp Ripley is the second largest statutory game refuge in the state and has a significant economic influence as one of the largest employers in central Minnesota. Based on the 2005 economic impact statement, Camp Ripley contributes more than $180 million to the local economy.

BACKGROUND

The Natural Resource Conservation Team includes the following members:

- Col. Rich Weaver, MNARNG, Post Commander;
- Capt. Keith Ferdon, MNARNG, Training Area Coordinator, Integrated Training, Area Management (ITAM) Coordinator;
- Staff Sgt. Jamie LeClair, MNARNG, Training Area Coordinator, AHATS;
- John Ebert, MNARNG, Environmental Director;
- Marty Skoglund, MNARNG, Environmental Supervisor;
- Dave Hamernick, MNARNG, Environmental Program Administrator;
- Jay Brezinka, MNARNG, Natural Resources Specialist
- Bill Brown, MNARNG, Cultural Resources Specialist;
- Craig Erickson, MNARNG, Geographic Inofrmation Systems (GIS) Manager;
- Brian Dirks, Minnesota Department of Natural Resources (MNDNR), Animal Survey Coordinator;
- Julie DeJong, MNDNR, Animal Survey Assistant;
- Tim Notch, The Nature Conservancy, Land Steward;
- Lee Anderson, St. Cloud State University, GIS Specialist; and
- Tom Rothleutner, MNARNG, Facilities Manager

POSITION DESCRIPTION

The Natural Resource Conservation Team at Camp Ripley monitors all natural conservation programs for MNARNG statewide. The team is involved in land rehabilitation and maintenance and is responsible for planning, designing and implementing monitoring programs for all flora and fauna on Camp Ripley and AHATS. During the achievement period, the team's responsibilities included restoring land damaged from training activities, correcting serious erosion problems and conducting annual assessment projects. Challenged with maintaining varied ecosystems and essential training activities, the Natural Resource Conservation Team approaches its mission with a focus on sustainability, community outreach and partnership (see Figure 1 below).

Figure 1. Natural Resources Conservation Partnerships

Partner	Cooperative Activities
Minnesota Department of Natural Resources	Conducting baseline surveys, assisting with bird and animal surveys; large-scale Land Condition Trend Analysis monitoring; lead cooperative partner on Army Compatible Use Buffer program.
The Nature Conservancy	Prescribed burning training and assistance; developing forest inventory and animal surveys for the red-shouldered hawk and Blanding's turtle. Army Compatible Use Buffer partner.
St. Cloud State University	GIS support and training; hosted national geographic information system training seminar on behalf of National Guard Bureau; geographic information system assistance in animal and vegetation surveys, invasive species management and water quality trend analysis.
Central Lakes College	Natural resources management students intern in the MNARNG environmental office in all conservation activities.
US Fish & Wildlife Service	Partner in native grass seed harvesting; partner in annual Habitat Day; development and review of the INRMP.
Veterans' Administration	Helps conduct annual veterans' deer hunt and turkey hunts at Camp Ripley, the first of their kind on a military installation.
Minnesota Deer Hunters' Association & Minnesota State Archery Association	Co-sponsors in holding youth deer hunts at Camp Ripley and first ever youth deer hunting opportunity in metro area Arden Hills Army Training Site.
Mille Lacs Band of Ojibwe (Native American Tribe)	Provides advice and recommendations on natural resources conservation activities that relate to tribal interests; uses Camp Ripley as a youth training site for lessons in wildlife and land management.

AWARDS AND SERVICES

Team members continually receive recognition and awards for their commitment to their cause and service. The team won the 2004 National Guard Bureau Environmental Security Award for Natural Resource Conservation-Large Installation. In 2004, the team was nominated by the US Fish and Wildlife Service (USFWS) for the Department of Defense (DoD) Conservation Installation of the Year. The team is a co-sponsor with the USFWS of the annual Habitat Day at the Crane Meadows Wildlife Refuge, a public event that attracts hundreds of attendees.

> "The people and natural resources of the great state of Minnesota benefit in many ways from the cooperative partnership of the Minnesota Army National Guard and the Minnesota Department of Natural Resources. We value this relationship and are committed to build upon it for future generations of Americans."
>
> *- Gene Merriam, MNDNR Commissioner*

In FY 2003, the conservation program was featured in the first Army National Guard Environmental Excellence Documentary designed and produced by the Public Affairs Office of the National Guard Bureau. This recognition resulted in two television features of the Camp Ripley conservation program in FY 2004: the Minnesota Bound television program and the first-ever Brainerd Bound documentary.

ACCOMPLISHMENTS

Overall Conservation Management

Integrated Natural Resource Management Plans (INRMP) at Camp Ripley and AHATS provide the foundation for managing natural resources. The team prepared the INRMPs in-house, including the completion of environmental review requirements. The INRMPs not only include all the components of Army Regulations but were also developed in concert with the Site Development Plans for the installations to achieve a desired future condition for the military mission. This appealed to Soldiers training at Camp Ripley and AHATS and has enhanced community relations by showing a scientifically based plan for natural resources management compatible with a larger landscape.

Projects within the INRMPs are fiscally efficient to the Army because they are transferable to land managers at other military installations. The projects have been featured at national conferences in FY 2004 and 2005 (e.g., ITAM conferences, conservation workshops and community outreach workshops).

Camp Ripley has established a leadership role in the application of GIS, having completed the first enterprise GIS management plan within the National Guard in FY 2005. Camp Ripley's GIS operator has expanded applications throughout all disciplines within the Minnesota National Guard, from planning military exercises to facilities management. This has been possible through an interagency agreement with St. Cloud State University, which provides fulltime GIS project support. The GIS operator provides spatial information and applications to help support decision making concerning natural resource management initiatives such as forest management, cultural resource management and wildlife habitat analysis.

St. Cloud State University's Outlook Magazine featured a unique partnership between the university and Camp Ripley in its fall 2005 issue. Faculty and graduate students collect and analyze plant and animal data on Camp Ripley's 52,758 acres and provide it to the installation, which uses the research to demonstrate it is maintaining a healthy ecosystem.

Land Use Management

Land rehabilitation and maintenance (LRAM) activities performed by the team during the achievement period reduced sedimentation rates to pre-settlement conditions on Camp Ripley. Achieving over 50 percent savings as a result of doing land rehabilitation and erosion work in-house, LRAM is the most critical element of the Sustainable Range Program since it enables team members to accomplish repairs to the landscape that are

caused by training exercises. The in-house team has been able to accomplish projects more efficiently than outside service providers, providing significant benefit to the military. For example, the team began work on an erosion problem along the Mississippi River in FY 2003 and completed the project in FY 2005 at a cost of $138,000. Based on estimates, this project would have cost $300,000 if it had been performed by an outside contractor.

Forest Management

The team developed a forest management plan for Camp Ripley in FY 2003 both to promote good silvicultural practices and to ensure compatibility with Camp Ripley's military mission. Harvests are designed by considering land use, wildlife, visual concerns, aesthetics, best management practices and prevention of site damage. The team began implementing the plan in FY 2004 with many improvements, including forest reshaping, new tree plantings and fencing construction to protect new trees from deer. These actions are ongoing, with the exception of the deer proofing project, which was completed in FY 2005. The team sculpts the forested landscape to achieve a desired condition for the benefit of training using heavy duty brush cutting equipment that literally grinds trees, brush and stumps within the area of interest.

The team continues to use forest management to maintain habitat for the red-shouldered hawk, a state-listed species of special concern. Red-shouldered hawk populations are projected to decline under all timber harvesting scenarios for Minnesota for the next 50 years. Camp Ripley maintains the largest breeding population of red-shouldered hawks in the state, due to its large intact stands of forest.

Camp Ripley maintains the largest breeding population of red-shouldered hawks in the state.

In FY 2004, Minnesota Department of Natural Resources biologists partnered with the Minnesota National Guard Bureau to track the birds as they migrate, allowing them to determine the factors that affect population declines.

In FY 2004 and 2005, the team implemented a commercial forestry program to achieve forest thinning and desired future condition in support of military training. This has resulted in harvesting 3,000 to 4,000 cords of timber and has generated over $650,000 in revenue to the state general fund.

In FY 2004 and 2005, the team performed prescribed burns for ecological enhancement and hazard reduction covering up to 15,000 acres per year. Those prescribed burns not only maintain the natural prairie ecosystem, but also ensure troops are able to continue training safely in ideal conditions by reducing fire hazards.

Fish and Wildlife

With a population of 30 deer per square mile and a reputation for trophy bucks, Camp Ripley has been nationally recognized as having a remarkably healthy deer herd. Also, Camp Ripley's wild turkey population has grown exponentially since releases were made outside of the installation in the late 1990s. Turkeys from Camp Ripley will soon be used to stock other areas in the state. Camp Ripley and Arden Hills host impressive numbers of birds (more than 200 species at Camp Ripley) throughout various times of the year, and in FY 2004 and 2005, both were nominated as Important Bird Areas by the Audubon Society.

Perhaps the best example of biodiversity and compatibility with training at Camp Ripley is the existence of a thriving gray wolf population in the heart of an active training area. While the presence of a threatened species such as the gray wolf could have negatively impacted training in the absence of sound research, the team has provided scientific evidence that the gray wolf population has greatly benefited from military land use practices.

Two packs of wolves are thriving on Camp Ripley, coexisting with troops in training.

The team properly applies land protection and maintenance measures on Camp Ripley, which provides an island of optimum wolf habitat in a highly populated and fragmented landscape. The team's gray wolf tracking and monitoring program, one of the only such programs in the nation, has determined that the wolves have adapted to all regional habitats and are thriving, even in habitat areas that were once considered unacceptable. Camp Ripley's gray wolf population represents the southern-most pack of gray wolves in Minnesota and the only breeding population of gray wolves on any military installation in the lower 48 states.

Camp Ripley is also home to four pairs of nesting eagles, which, during essential nesting periods, are protected from inadvertent disruptions due to military training through the use of buffer zones.

Other protected species include the state-listed tiger beetles, jumping spiders, Blanding's turtles, hooded warblers, yellow rails, red-shouldered hawks, prairie voles and various mussels and plants. Habitat for all protected species has been identified, and individual management plans are in use for each species. Animal surveys conducted in FY 2004 and FY 2005 provide a basis for understanding the population dynamics of these species.

> "Camp Ripley is home for two federally listed species, including the bald eagle and the gray wolf. Both of these species are thriving on the base, in large part due to the work of your environmental staff working with all people that use the Camp for training."
>
> *-Dan P. Stinnett*
> *Field Supervisor, US Fish and Wildlife Service*

Invasive Species Control and Pest Management

Camp Ripley researchers tested invasive species control methods on individual test plots during the last two fiscal years, and they are continuing to look for the right mix of chemical, biological and mechanical control. Biological and mechanical pest control techniques are favored in addressing invasive plant species. For example, Camp Ripley is using a biological control involving insect release for purple loosestrife. These methods have enabled MNARNG to reduce the pounds of active ingredients of pesticides from 600 pounds per year to less than 100 pounds per year, thereby achieving the DoD Measure of Merit calling for a 50 percent reduction.

To monitor the prevalence of tick-borne diseases, the team has implemented a Lyme Disease Risk Assessment Survey. Camp Ripley now has the largest database on tick infestation in the state of Minnesota. Camp Ripley continues to partner with the US Army Center for Health Promotion and Preventive Medicine, the University of Minnesota and the Minnesota Department of Health to monitor frequencies of tick-borne diseases such as Lyme and Human Granulocytic Ehrlichiosis. During the last two years, the team established a monitoring program for West Nile Virus, a growing concern in mosquito-infested territories.

Community Relations

Camp Ripley is proud to be a leader in its environmentally conscious community. At the local level, Camp Ripley has been named an eco-tourism destination by local government, providing field tours and educational materials to visitors. The team hosts annual deer and turkey hunts for disabled veterans at Camp Ripley, the first of their kind in Minnesota. The team also hosted the 2004 and 2005 archery deer hunts for youth at AHATS and Camp Ripley. In 2004 and 2005, the team was a co-sponsor of the annual Habitat Day at the Crane Meadows Wildlife Refuge. The USFWS is the primary host of this public event, which attracts hundreds of attendees who help create wildlife habitat.

> "The MN National Guard was the first organization to sponsor a youth hunt for whitetail deer in the state of MN. Since then, there have been over 10 youth hunts sponsored throughout the state by other state, federal and non-profit organizations. The success of that hunt was not in harvesting deer but in the memories and the smiles on the faces of the youth and their mentors. This effort has created many future outdoor enthusiasts. I applaud the MN National Guard for leading the charge."
>
> *- Mark Johnson, Executive Director, Minnesota Deer Hunters' Association*

Conservation Education

Students and interest groups throughout the state travel to Camp Ripley to learn about protecting and managing the environment. Hundreds of school and community groups use Camp Ripley each year to learn about the environment through guided tours and bird watching adventures. An environmental learning center was expanded and updated in FY 2004-2005, and now contains approximately 200 bird and 60 mammal specimens, plus collections of fish, butterflies and dragonflies. Approximately 10,000 to 15,000 people visit the classroom each year and are able to learn more about the National Guard, Camp Ripley and the environment.

Little Falls High School students build a nature trail on Camp Ripley as part of a bog-walk project on National Public Lands Day.

Mission Enhancement

Throughout the growth and diversification of the team's activities, the link to its military mission has never been forgotten. Sustainability of natural vegetative cover has been a top priority in all planning efforts to ensure a realistic training environment and quality wildlife habitat. All natural resources conservation activities are designed to maintain and enhance training areas for Soldiers, thus serving the military mission. By creating training area options, the team also allowed for relief to over-used areas. Planning ensured that no adverse environmental impacts occurred due to landscaping changes.

The team also invests in its relationships with the surrounding community to ensure that forces outside the installation do not hamper training. One such positive community relationship derives from the team's participation in the Army Compatible Use Buffer (ACUB) program, a federal program that authorizes a military installation to enter into agreements with landowners to limit encroachment on lands neighboring the installation. Camp Ripley has the distinct honor of being the second installation in the nation to have an ACUB approved by the Army and DoD. Limiting incompatible land uses such as residential development near the installation is essential to ensuring continued training at this installation in the future. Military training, with its typical byproducts of noise, dust and smoke, would not be sustainable adjacent to most residential or commercial uses of land.

ACUB implementation began in 2004 and continued in 2005. The program addresses the pressure of development outside the boundaries of Camp Ripley. Two neighboring counties have permanently set aside more than 17,000 acres of land with an estimated market value of $35 million for the Camp Ripley ACUB, at no expense to MNARNG. In addition, other local partners secured approximately 1,800 acres in the ACUB area at an estimated cost of $2.5 million. The program has been embraced by local county government representatives, demonstrating Camp Ripley's positive relationship with the community. Additionally, more than 115 private property owners have volunteered to participate in the ACUB to date, representing approximately 18,000 acres of land.

The Camp Ripley ACUB takes the relationship between conservation and readiness to the next level, simultaneously preserving undeveloped land and ensuring excellent training areas in perpetuity. The team worked with planners and trainers to create specific training areas while still maintaining ecological integrity.

CONCLUSION

The success of MNARNG's Natural Resource Conservation Team reflects a strong commitment to conservation of current resources. The team's leadership in natural resource management has enhanced quality of life for the installation and the community. Components of the program integrate installation chain-of-command with the interests of resource management agencies, private conservation groups, regulatory agencies and the local community to conserve resources while providing an optimal atmosphere for military training and readiness.

On the cover: Chief Warrant Officer Kelly Nokes, a Minnesota National Guard pilot, cleans snow off a Blackhawk helicopter.


Fiscal Year 2005 Secretary of Defense
US Army Environmental Awards Nomination
FORT CUSTER TRAINING CENTER
MICHIGAN ARMY NATIONAL GUARD
NATURAL RESOURCES CONSERVATION
Sustaining the Environment for a Secure Future

INTRODUCTION

Located in southwest Michigan, Fort Custer Training Center is an Army National Guard (ARNG) installation that visibly supports the ARNG federal mission: "To maintain properly trained and equipped units, available for prompt mobilization for war, national emergency or as otherwise needed." Fort Custer consistently adapts its facilities to meet current military needs, while its civilian personnel manage a premier natural resources conservation program.

Fort Custer is managed and operated by 100 full-time employees; 25 are civilian personnel and 75 are active ARNG. Approximately 300,000 people use Fort Custer's training facilities every year; half are active military forces, and the other half are comprised of local police departments, the Michigan State Police, the Federal Bureau of Investigation, the Central Intelligence Agency and Reserve Officer Training Corps students.

Fort Custer's 7,540 acres are managed under its Integrated Natural Resources Management Plan (INRMP). The acreage is divided into a 100-acre cantonment area; 2,400 acres of semi-improved areas, including ranges and surface danger zones; and 5,000 acres of unimproved training areas.

Whitman Lake Fen. A high quality natural area at Fort Custer featuring emergent wetland, fen and bog habitats. Photo by Daniel Zay, DLZ Michigan, Inc.

Fort Custer boasts a unique array of natural features. The installation's natural areas include 5,000 acres of hardwood forest; 1,200 acres of wetlands and alkaline fens; 1,200 acres of open prairie lands; and 100 acres of surface water, comprised of three small lakes and six creeks whose headwaters are located on the installation. These diverse landscapes provide habitats that support an array of flora and fauna, including 26 state and two federally threatened or endangered species.

BACKGROUND

Formally established in 2001, Fort Custer's INRMP is an active, working document that is meticulously reviewed every year and updated to reflect changing military training needs and to ensure efficient natural resources management. Fort Custer has fully implemented its INRMP and has completed all planning-level surveys to protect the installation's vital natural resources. Numerous partnerships and cooperative agreements support the INRMP; in particular, a Letter of Concurrence with the US Fish and Wildlife Service and the Michigan Department of Natural Resources has approved of Fort Custer's management of fish and wildlife since 2001. Fort Custer is additionally supported by contracts with local agencies, non-profits and universities.

> **"In southwestern Michigan, it is extremely important to protect the resources we have and to identify threats to the long-term environmental health of the region. The efforts of Fort Custer's environmental staff allow us to develop management plans that provide the best opportunity to conflicting needs of local flora and fauna."**
>
> ***- Ray Adams, Director of Research Kalamazoo Nature Center***

Fort Custer Training Center's environmental team consists of four full-time staff members: the Installation Environmental Manager, two Natural Resources Specialists and one Technician. Led by the Installation Environmental Manager, the Natural Resources Specialists focus on the management of fauna and flora and coordinate projects using global positioning system (GPS) and geographic information system (GIS) technology, while the Technician manages both installation plantings and the operation of heavy equipment. Weekly staff meetings with the post Commander and major

directorates allow close coordination of natural resources management initiatives with current military training schedules.

With funding assistance from partners, the Environmental Program regularly completes in-house projects to meet INRMP objectives, saving the ARNG thousands of dollars per year. Using outside contractors for GPS/GIS projects would normally cost between $50,000 and $100,000 per year; completing projects in-house cost Fort Custer only $10,000 in FY 2005. When 200 acres of hardwood forest were cleared between FY 2004 and FY 2005 to create a training range for new weapons, the open area was reestablished as prairie lands – a benefit to the installation's natural resources. The cost to establish these prairie lands with help from outside contractors would have been $60,000 annually, for three years, but in-house coordination cost only $8,000.

PROGRAM SUMMARY

Fort Custer's environmental staff successfully attained all INRMP objectives during FY 2004 and FY 2005, resulting in considerable cost savings for the ARNG. Figure 1 highlights the significant efforts.

Figure 1. Significant INRMP Achievements

INRMP Categories	INRMP Implementation
Sensitive Species	Fort Custer annually assesses the effects of training activities on the population of sensitive species such as the prairie vole.
Fish & Wildlife	Fort Custer annually conducts a two-week deer hunt to reduce the herd size and takes an annual census of neotropical bird breeding in timber cut areas and across the entire installation.
Forest Resources	Fort Custer manages annual timber harvest and vegetation management activities and in FY 2005, completed a survey of metal contamination of timber resources in sawtimber stands.
Pest Management	Fort Custer performs annual purple loosestrife control via biological agents and garlic mustard control through herbicides.
Fire Management	Fort Custer monitors multiple prescribed burns per year for habitat enhancement of prairie lands and forests, and to improve training lands' capabilities.
Soil, Water and Air Management	Fort Custer closed 52 wellheads in FY 2004 to reduce water contamination problems on the installation and conducts ongoing operations to control major erosions on roads and trails.
Integrated Training Area Management	Fort Custer biannually inspects high use training areas and potential problem areas for significant environmental impacts.

ACCOMPLISHMENTS

Overall Conservation Management

Fort Custer's Environmental Program has implemented and maintained unique natural resources conservation projects during the achievement period and continues to advance in every area of the installation. The increased use of GIS technology has enabled Fort Custer to be more efficient in meeting INRMP goals and coordinating multiple management programs while still meeting the ARNG mission. GIS files are annually updated with information gathered from the Range and Training Land Program, which is designed to help restore areas damaged from training activities. GIS is also used to monitor flora and fauna as well as to mark progress, ensuring no adverse effects to the environment as a result of ARNG activities.

Land Use Management

The environmental staff at Fort Custer knows that well-maintained lands are essential to natural resources management and military training. During the achievement period, Fort Custer has been extremely successful at controlling erosion on post. Under the INRMP, the staff monitors training land erosion control and performs ongoing operations to manage major erosion on roads, trails and training sites. In addition, road-creek crossings are constantly stabilized and the installation's perimeter trail for tracked vehicles is consistently repaired. Due to such efforts, approximately 100 tons of soil erosion are reduced each year. Working with the Natural Resources Conservation Service, the staff is in the process of developing short grasses for ranges and ammo bunkers, which will help to further eliminate erosion and reduce expensive lawn management.

An environmental staff member conducts a prescribed burn in a high quality fen at Fort Custer.

Fort Custer Training Center makes regular improvements to installation grounds, while consistently maintaining overall ecological integrity. During the achievement period, a perimeter tank trail and a 200-acre maneuver training area for track vehicles was installed; staff also constructed a new tank range with local materials, saving the installation about $750,000. During FY 2004, 52 wellheads were closed to reduce water contamination problems, and firing range berms were sifted for lead to reduce the impact on local surface water.

Fort Custer Training Center is home to five globally rare or threatened natural community types. The environmental staff will continue to implement an aggressive management plan to restore and enhance all of these areas. By using prescribed fire (over 1,000 acres were burned in 2005), habitats are preserved for species such as the federally endangered Karner blue butterfly and state-endangered prairie vole. Areas containing species of concern, such as stiff goldenrod and prairie orchids, are managed by the High Quality Natural Community Management Program, instituted by the environmental staff. Currently, these areas comprise approximately 578 acres.

Forest Management

Fort Custer has successfully implemented a comprehensive forest management plan, which is based on the installation's INRMP. In 2000, Fort Custer began a forest fragmentation study that would later influence INRMP plans for timber harvests and habitat management for neotropical breeding birds. The fragmentation study used Landsat Imagery and other remote sensing products to assess the continuity of Fort Custer's closed-canopy mature forest conditions.

Fort Custer annually monitors a timber harvest of approximately 150,000 board feet. The timber is sold, yielding significant revenues that are, in part, given to local school districts, counties and environmental partners. Over the past three years, approximately $500,000 was raised through the forest harvest and sale program. Fort Custer Training Center employs forest management practices to enhance riparian buffers and uses salvaged timber to improve the installation's perimeter roads. Fort Custer's Environmental Program finds innovative ways to save funds on a yearly basis; for example, the program saves $20,000 by conducting in-house tree transplantations and managing a native seed harvest.

> **"A well-run base from both military and environmental standpoints, Fort Custer is an absolutely essential military training area and natural area for neotropical migrating birds."**
>
> ***- Jim Coury, Regional Coordinator***
> ***Resource Conservation & Development Council***
> ***US Department of Agriculture***

Fish and Wildlife Management

The environmental staff effectively monitors the installation's wildlife populations, including 11 state threatened or endangered species (trumpeter swan, prairie vole, Blanchard's cricket frog, Blanding's turtle, cerulean warbler, hooded warbler, Cooper's hawk, Eastern box turtle, pugnose shiner, Sprague's pygarctia and watercress snail); and two federally threatened or endangered species (bald eagle and Indiana bat). Various monitoring techniques are used to track these species; for example, the Eastern box turtle is tracked using GPS/GIS and embedded telemetry chips, and mistnetting with acoustic profiling is used to track the Indiana bat. Whitetail deer, although not threatened or endangered, are tracked using radio telemetry due to the large population size and subsequent effect on the installation's natural communities.

Cerulean warbler netted at Fort Custer. Photo by Brian Nelson, Kalamazoo Nature Center.

Partnerships with the US Forest Service, US Department of Agriculture, Natural Resources Conservation Service, county conservation districts

and local universities aid in Fort Custer's successful wildlife management program. The installation is particularly known for successfully managing a large population of neotropical migratory birds. The environmental staff conducts a yearly nest predation study of cerulean warbler, hooded warbler, acadian flycatcher and woodthrush. Additionally, annual bird counts have identified approximately 50 other neotropical migrants, as well as 20 short distance migrants and 30 resident species. Fort Custer is currently monitoring long-term avian population changes on the installation; in partnership with researchers from Kalamazoo Nature Center, Fort Custer hopes to identify factors affecting the productivity of birds nesting on installation lands. By utilizing these stakeholder resources, the Environmental Program saves the installation $50,000 every year.

Invasive Species Control and Pest Management
Pest management at Fort Custer is intimately linked to the installation's INRMP. The Environmental Program regularly conducts herbicide treatments and prescribed burns to effectively manage the installation's invasive species, and is currently experimenting with various integrated pest management techniques to control species such as purple loosestrife.

Fort Custer's most impressive act of invasive species control and pest management during the achievement period was the leveraging of partner funding to participate in a regional invasive species hyper spectral remote sensing flyover during FY 2005. The technology used in the flyover allowed the environmental staff to accurately discriminate between purple loosestrife and other vegetative species. Relying on partnerships and in-house expertise, Fort Custer staff managed to spend only $3,000 for a project that would have cost $90,000 had they done it on their own through the use of contractors.

Other Natural Resources
Several recreational activities on the installation such as bird-watching and hunting are available to the general public. Bird-watchers take full advantage of Fort Custer's neotropical bird populations, participating in annual bird counts such as the nationally known Christmas Bird Count and other events.

The Fort Custer deer hunt includes hunting opportunities for disabled hunters. Photo by Jonathon Edgerly, Fort Custer.

Annual hunts at Fort Custer are quite large, and their goal is to reduce the whitetail deer population. Over 1,200 hunters participate in the hunts. Hunting events are geared towards youth, disabled veterans and the public. Partners supporting annual hunts at Fort Custer include Whitetails Unlimited and Paralyzed Veterans of America.

Conservation Education
Fort Custer recognizes that education is a key component to successful natural resources management. During the achievement period, the installation hosted both regional and state Envirothon competitions, which test high school students in six environmental areas and include a public service project. Fort Custer has an active partnership with local schools to maintain a native seed inventory and has held Environmental Field Days for at-risk students attending the Michigan Youth Challenge Academy.

For the general public, staff members lead native plant identification tours, as well as general tours highlighting various natural resources conservation initiatives. Groups like the Michigan Prescribed Fire Council and the Wild Ones of Calhoun County have participated in regional cooperation/education activities on post that have highlighted conservation techniques. Fort Custer also partnered with the National Wildlife Turkey Federation starting in FY 2003 to sponsor young hunter safety classes, in preparation for the annual turkey hunt.

Community Relations
Stakeholder interaction, community outreach and partnerships drive natural resources conservation

at Fort Custer. Fort Custer partnered with more than 20 organizations during the achievement period. Fort Custer participated in National Public Lands Day during FY 2004 and FY 2005; and with Legacy Grant support for the third year in a row, worked on small conservation projects geared towards involving the general public. Using only volunteers and donations, the installation provided improvements in FY 2005 to a pavilion (adding an outhouse, a parking area, a stone grill and a storage shed) to provide space for Soldiers and the public to enjoy the natural resources of Fort Custer Training Center.

Environmental Enhancement

The successful management of natural resources has increased environmental quality at Fort Custer and the quality of life in surrounding communities. Fort Custer is remarkable because it has been able to preserve its unique, high-quality natural areas in a highly industrial and commercialized area, a feat that requires partner collaboration and excellent oversight by management. Fort Custer is considered to be the third largest, contiguous undeveloped area in southwest Michigan, and the Environmental Program strives to continually maintain that status.

Mott Road Prairie at Fort Custer one day post brush control treatment. Photo by Michele Richards, Fort Custer.

Mott Road Prairie at Fort Custer five months post brush control project. Photo by Daniel Zay, DLZ Michigan, Inc.

Mission Enhancement

The Environmental Program at Fort Custer ensures that natural resources conservation activities are dedicated to maintaining and enhancing training lands, so that military training continues unimpeded at this critical installation. Fort Custer continues its record of no Notices of Violation for the past 22 years, which keeps regulatory threats to training at a minimum. Management practices such as erosion control allow for vehicle movement training and Soldier preparation. Through constant collaboration between the Program staff, trainers and range personnel, Fort Custer Training Center is able to meet the ARNG mission.

CONCLUSION

The Environmental Program at Fort Custer is a recognized ARNG leader in the area of natural resources conservation. The environmental staff successfully implements sound management practices under the installation's INRMP. Other installations can learn valuable lessons from natural resources conservation initiatives implemented at Fort Custer Training Center through information-sharing via quarterly training center newsletters, training programs frequently offered onsite, presentations at national conferences and regional organization participation. Fort Custer continually shares its successes – particularly with regard to prairie restoration, erosion control and invasive species control – so that other ARNG installations may benefit from lessons learned at Fort Custer. The Environmental Program at Fort Custer is an icon that balances the need to prepare Soldiers to fight in our nation's wars with the never-ending quest to conserve our natural resources.

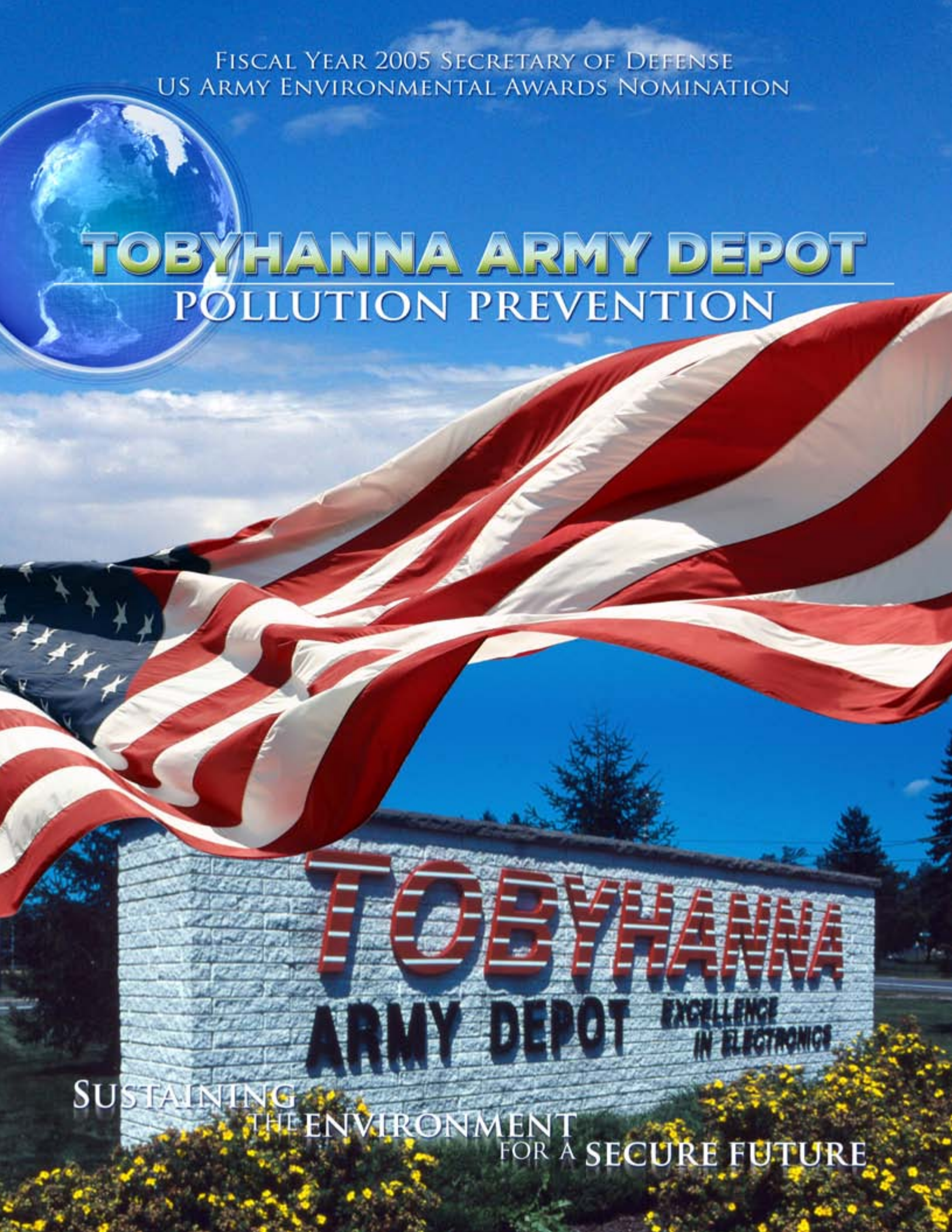
> **"Fort Custer Training Center continually demonstrates how a military training base can serve as a 'laboratory' for exploring, testing and evaluating alternatives for environmental management."**
>
> ***-Dr. Katherine Gross, Director W. K. Kellogg Biological Station Michigan State University***

On the cover: Second-year male cerulean warbler netted at Fort Custer. Photo by Brian Nelson, Kalamazoo Nature Center.

FISCAL YEAR 2005 SECRETARY OF DEFENSE
US ARMY ENVIRONMENTAL AWARDS NOMINATION

TOBYHANNA ARMY DEPOT

POLLUTION PREVENTION



SUSTAINING THE ENVIRONMENT FOR A SECURE FUTURE

INTRODUCTION

Tobyhanna Army Depot (TYAD) is considered the largest, most progressive electronics maintenance facility in the Department of Defense (DoD). Its mission is full-service repair, overhaul and fabrication and support of command, control, computers, communications, intelligence, surveillance and reconnaissance systems. TYAD sustains all branches of the Armed Forces, maintaining critical US Air Force (USAF) "go-to-war" ground communications-electronics systems, and USAF and US Navy tactical missile guidance and control systems. TYAD ensures that war fighters have critical systems and support to succeed in the global war on terror.

Strategically located in the Northeastern Pocono Plateau region of Monroe County, Pennsylvania, the 1,296-acre depot is bounded by state parks and game lands. TYAD manages 161 acres of wetlands and the headwaters of Hummler Run, a high-quality cold water fishing stream. Although no federally listed threatened or endangered species reside at TYAD, the Natural Resources Program supports stewardship for seven state-listed rare species, such as the Osprey.

> **"Tobyhanna Army Depot is one of our largest employers in Monroe County and has always been a leader in implementing environmental efficiency."**
>
> ***- Mr. Robert Phillips, President/CEO of the Pocono Mountains Chamber of Commerce***

Memories of past environmental impacts from the anthracite coal mining era make these natural resources precious to the regional community, which has transitioned to a light industry and tourism based economy. As the region's leading industrial center and employer, TYAD has an annual economic impact of $1.8 billion. It houses 27 tenant organizations, employs about 4,400 workers from 10 counties and serves as home to 200 military personnel and family members.

BACKGROUND

Tobyhanna Army Depot became ISO 14001 third-party registered in November 2003 and maintains this registration. TYAD is also third-party registered in ISO 9001, is an Occupational Safety and Health Administration Voluntary Protection Program Star Site, employs Lean Six Sigma process changes and incorporates a team-directed approach to management.

Environmental Challenges

TYAD faced the challenge of meeting 40 percent and 20 percent increases in mission workload in FY 2004 and FY 2005, respectively. The depot has planned to ensure that sufficient environmental permits and utility capacity are available to accept the new workload by meeting all permit and regulatory requirements. The depot is a Clean Air Act Title V facility, has a Resource Conservation and Recovery Act (RCRA) Part B permit for hazardous waste (HW) storage, maintains a Safe Drinking Water Act permit and manages a National Pollutant Discharge Elimination System permit for industrial and municipal treatment and storm water flows. The depot also manages over 100 underground/aboveground storage tanks. The depot did not receive any official notices of violation during the reporting period. (See attached. "In Viol" for RCRA related to interpretation of when HM becomes HW. TYAD immediately changed process; however, it took several months to change the Enforcement and Compliance History Online.)

Organization, Staffing and Management

The Environmental Management Division (EMD) operates within the Directorate of Industrial Risk Management, which reports to the Commander (CO). The division's 16 employees provide expertise in pollution prevention (P2), National Environmental Policy Act implementation, hazardous materials

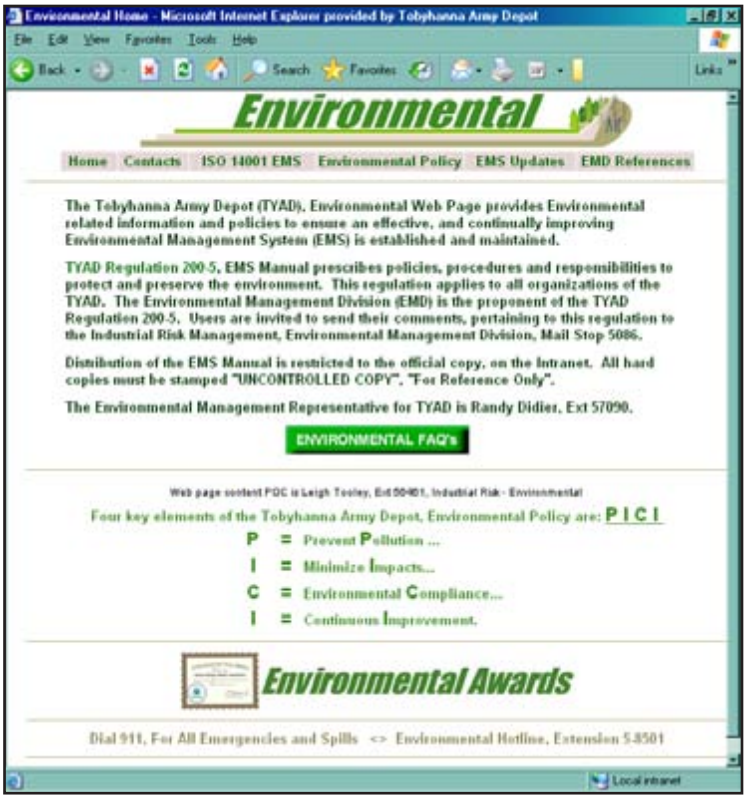
(HM), recycling, buy-recycled (green procurement), air and water quality, energy conservation, HW, environmental restoration, pest management, solid waste, drinking water and natural/cultural resources. The CO holds Quarterly Environmental Quality Control Committee meetings, where the directors and CO provide direction to ensure the maintenance of a high level of environmental stewardship. Each directorate has one or more ISO 14001 representatives that meet quarterly with the Environmental Coordinator to manage the Environmental Management System (EMS).

Conformance with DoD and EMS Policy and Guidance

On 3 November 2003, TYAD became ISO 14001 third-party registered. The depot continues to maintain this high environmental stewardship status. TYAD operates the ISO 14001 process with the EMS manual and the CO's Environmental Policy. All employees have ISO 14001 awareness training and participate in the ISO 14001 process. Analysis of environmental impacts and aspects is performed regularly by each organization as part of the ISO 14001 process, and since the initial analysis, great advances have been made in mitigating these impacts. The biggest environmental impacts for TYAD were determined, and several ISO 14001 Objective and Target (O&T) teams were formed from employees throughout the depot to focus on each of these impacts, including O&T teams for the industrial wastewater recycling plant, sandblast and air emissions.

Green Procurement Program

TYAD implemented the Recycling Program to conserve natural resources and landfill space, and to reduce refuse removal costs. This enables the program to be operated to the benefit of the environment as well as the depot mission. Buying recycled, also known as green procurement, is a part of this program. All depot employees are responsible for buying recycled-content items. Recycled-content products regularly purchased by TYAD employees range from office products, such as copier/printer paper, file folders and printer/toner cartridges to vehicle products, such as re-refined lubricating oils.



TYAD's environmental intranet page provides employees with information to maintain both ISO 14001:2004 and environmental compliance.

Stakeholder Involvement and Community Outreach

TYAD participates in various environmental programs involving and educating their 4,000+ employees and the surrounding community. TYAD encourages employees to bring in their recyclables from home and deposit them in county-owned recycling bins. The county annually receives credit for state grants from all depot recycled material.

Not only did TYAD participate with Monroe County, other businesses, industries and offices, in a "Clean Your Files Week" paper-recycling program, but the depot also launched a pilot program that provides convenient means for depot personnel to recycle their personal printer cartridges directly from their home or they can bring the cartridges into work to recycle.

TYAD leaders realize the importance of educating their employees and the public on environmental issues. Environmental awareness training is provided to all employees via the depot's public address and visual information system, newspaper, e-mail, intranet, employee bulletins, weekly staff meetings and environmental displays. Environmental awareness is also provided to the public via TYAD's

Internet page, news releases, annual Earth Day displays and environmental management displays during open house at TYAD.

TYAD also participates in various P2 environmental advocacy organizations. Their environmental management innovation is supported through active membership in the Pollution Prevention/Energy Efficiency (P2E2) Round Table of the Pennsylvania Association of Environmental Professionals and the Pocono Mountain Chamber of Commerce Environmental Council. A representative from TYAD's EMD also sits on the Monroe County Solid Waste Advisory Committee. TYAD also became a charter member of the Pennsylvania Environmental Partnership, which consists of military installations, the Environmental Protection Agency (EPA) Region III and Pennsylvania Department of Environmental Protection (PADEP) personnel working together to improve environmental conditions within the state. A representative from TYAD also participates in the Environmental, Health and Safety module of the Army Materiel Command's Logistics Modernization Program (LMP) to transition HM tracking and monitoring with the LMP.

"Since 1996, Tobyhanna Army Depot was a founding member and strong supporter of Pennsylvania's Northeast Pollution Prevention and Energy Efficiency Roundtable. They are always willing to share information with other organizations and businesses through this forum and currently co-chair the Roundtable. The Depot is not only responsible for their own environmental management systems and accomplishments, but also provide valuable ideas that help other companies to increase their bottom line, improve product quality, increase production and energy efficiencies and reduce environmental liabilities. Their continuing efforts to promote environmental awareness and environmental progress, not only for the sake of their own organization, but for the benefit of the region as a whole, makes them an asset to the northeast region."

- Ms. Janet Warnick, Pennsylvania Department of Environmental Protection, Northeast Regional Office, Office of Energy and Technology Deployment

Further community outreach includes a quarterly, voluntary, after-hours Adopt-A-Highway cleanup program. The proceeds from the recycling and sale of aluminum cans are donated to Operation Santa Claus, while the proceeds of sales of other recyclables support TYAD's morale and welfare functions, pay recycling employees' salaries and support other beneficial depot projects.

EMD personnel provided several ISO 14001 briefings to local organizations and other federal facilities. The briefs explain how the ISO 14001 process is implemented. Also presented at the briefs are depot continuous environmental improvement initiatives.

PROGRAM SUMMARY

The objectives of the P2 Program at TYAD are far-reaching and address various environmental issues including water pollution and conservation, HM disposal and air emissions. The depot has also initiated projects to validate assorted environmental technologies such as a vegetative roof and a fuel cell generator. These efforts are made to reduce mission operating costs, which ultimately help the war fighter. Several of the more significant reductions are shown in the Reductions Achieved section.

The ISO 14001 Industrial Wastewater Recycling Plant O&T team focused on reducing metal discharges from plating operations. This team oversaw the commissioning of the P2 projects associated with the Industrial Operations Facility (IOF) plating shop. Projects included implementing the use of microfiltration of acid baths to extend bath life and recycling of rinse waters using reverse osmosis and other filtration methods. Concentration on water conservation included installation of a water chiller at the IOF, so that hot byproduct water may be reused.

Additionally, in coordination with PADEP, a Source Water Assessment Plan has been designed to identify and correct potential contaminated areas within the depot's watershed. Increased monitoring of watersheds is one aspect employed under this plan. This project also has Force Protection ramifications, which greatly improves the security of the depot's drinking water system.

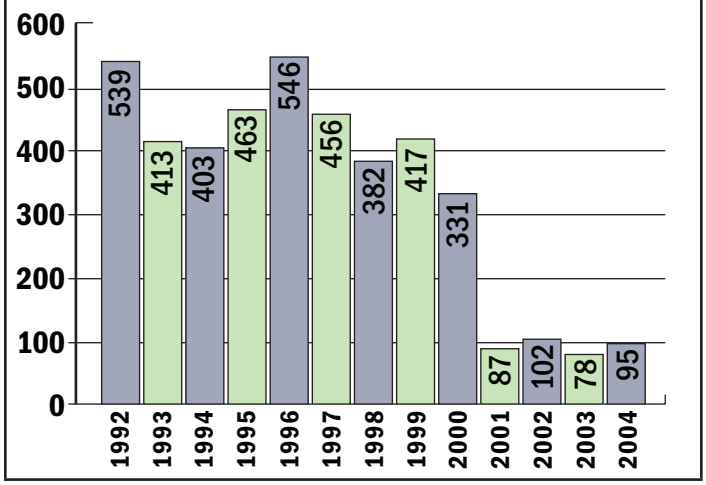
Improved Material Management

TYAD has demonstrated improvements in handling HM using the Hazardous Material Management System to track usage, HW generation and disposal, and to exceed environmental regulatory reporting requirements. The ISO 14001 Air Emissions O&T team is managing the installation of a new HM pharmacy at the large item paint facility to reduce HM usage and reduce volatile organic compound (VOC) emissions by intensively managing shelf-life materials. Low VOC-containing paints are being used to reduce surface emissions and low nitrogen oxides natural gas burners in boilers further reduced emissions. Under this system, HM is delivered to a storage facility and receives a bar-coded tracking label via 14 HM pharmacies. Authorized Use Lists are prepared for each organization, which informs HM pharmacy operators what HM each employee is trained to use, and warns of possible unauthorized transactions. TYAD is partnering with DoD, Oracle, Intel, and others to develop Radio Frequency Identification technology for hazardous material application. This technology can have far-reaching impacts in public safety, incident response, automation and more. Phase II of the ChemSecure project will include an automated hazardous material pharmacy/hazardous waste generation point at TYAD.

The ISO 14001 Sandblast O&T team developed procedures to reduce emissions from sandblasting and painting operations. An enclosure for sandblasting dust collectors is in construction (should be completed in FY 2006). The new enclosure will substantially reduce weather-related equipment failure, as well as provide containment for potential spills or releases to the atmosphere.

In September 2005, sustainable installation projects were started using funding approved under the Joint Services Initiative (JSI). A vegetative roof is being installed over one wing of the main administrative building to validate the benefits of this technology. Storm water (quantity and quality) and energy savings will be measured by comparing two wings of the same building. This project has the potential to double or triple the useful life of the roof. JSI funding was also approved for a fuel cell generator which will provide backup electrical power to operate the environmental offices to validate the reliability of fuel cell power generation.

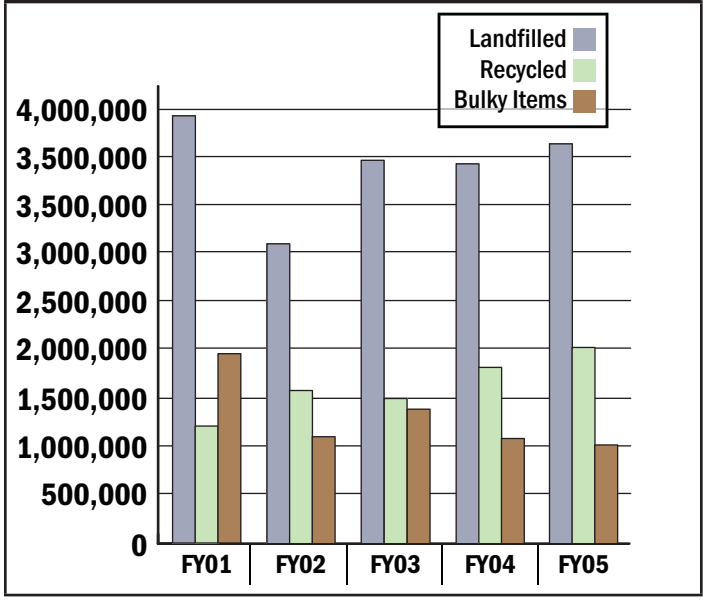
Figure 1. Air Pollutants Emitted (in Tons)



Recycling Program

The Recycling Program has reduced the amount of solid waste disposed of in landfills by 40.6 percent during FY 2004 and 42 percent during FY 2005. TYAD recycles the usual materials, such as white paper, corrugated cardboard, glass and plastics, as well as unusual items, such as used safety shoes, CD-ROM discs and plastic stretch wrap. It encourages employees to reduce the amount of solid waste generated by using electronic mail and double-sided copies and reusing items such as pallets, recharged toner cartridges and retread tires, just to name a few.

Figure 2. Recycled Material



REDUCTIONS ACHIEVED

Technologies implemented by the various ISO 14001 O&T teams and other depot P2 initiatives

have allowed TYAD to reduce environmental impacts in various ways, demonstrating a progressive and advancing environmental program that includes top-quality management of depot-level industrial processes.

Figure 3. Pollution Prevention (P2) Initiative Reductions and Cost Savings

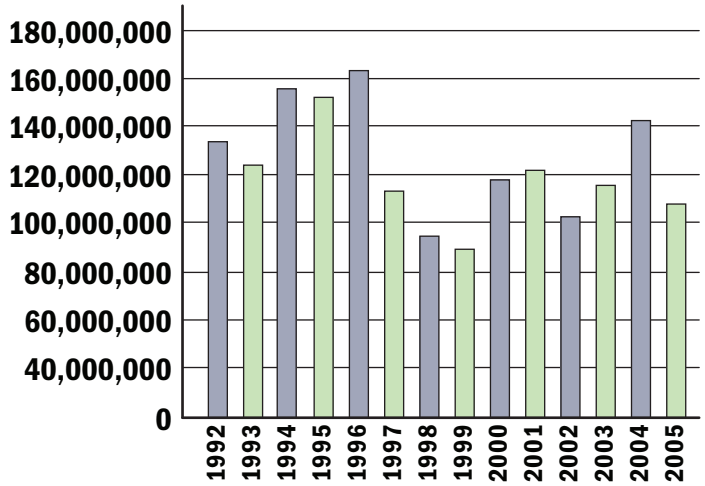
P2 Initiative	Reduction Achieved	Cost Savings
Recycling of Rinse Waters	Recycles over 900,000 gallons of rinse waters each month, reducing the need to draw this water from groundwater.	Over $100,000 saved annually.
Air Emissions from Sandblasting and Painting	Surface coating emissions have been reduced almost 50 percent (from 27,398 pounds to a projected 14,090 pounds).	Saved in annual emission fees $313.
Reuse of Hot Byproduct Water	Saves in excess of 2.1 million gallons of depot water each month.	$91,494 saved in the first five months of operation.
Recycling	Achieved recycling rate of over 40 percent, a 58,691 cubic yards solid waste reduction.	Saved the depot $291,186.03 in disposal costs and generated >$430,000 for the depot.

Filtration/Coalescing systems were purchased to recycle unusable diesel from military vehicles. So far, 350 gallons of unusable fuel has been salvaged. Another unit is being used to clean mineral oil for reuse.

In addition, the P2 program achieved less quantifiable savings, including the development of a Source Environmental Protection Plan designed to identify and correct potential contaminated areas within the depot's watershed, and the initiation of two sustainable installation projects (a vegetative roof and fuel cell generator). Additional accomplishments include improvements in overall HM management, encouraged by the ISO 14001 process, allowing the closure of a 60,000 square foot facility formerly used to store unusable (expired or no longer needed) HM. TYAD also became the first federal facility to enter the EPA National Waste Minimization Partnership Program with goals of eliminating lead solder and reduce the use of cadmium by 52 percent by CY 2008.

Other DoD and local organizations have easily adopted several of the depot's P2 programs, such as EMS implementation, the recycling program, the use of HM tracking and HM pharmacy and the use of less harmful HM. Other programs, such as the vegetative roof/fuel cell projects and compliance monitoring procedures, can be adopted and are shared with others through forums already mentioned. For example, hundreds of people have been briefed on TYAD's ISO 14001 implementation.

Figure 4. Total Gallons of Water Produced per Year



CONCLUSION

TYAD's mission presents environmental aspects and challenges similar to those of major manufacturing and industrial facilities, while operating in a four-season tourist and resort region. TYAD meets these challenges to excel as a leader in environmental quality and pollution prevention through a mature EMS that is integral to the fabrication/repair of communications and electronic equipment. The depot successfully created and nurtures a workforce culture that promotes and integrates environmental stewardship responsibilities into its mission to support the nation's war fighters every day. TYAD continues to achieve environmental excellence and to demonstrate devotion to mission sustainability, EMS implementation and community environmental stewardship. TYAD continues to implement innovative and effective programs that protect and improve the environment, increase productivity, save money and support the war fighter.

On the cover: Entrance to Tobyhanna Army Depot, PA.

For more information about the Secretary of the Army's Environmental Awards Program,
go to http://aec.army.mil.usaec/publicaffairs/awards00.html
or call the US Army Environmental Center Public Affairs Office at 410-436-2556.