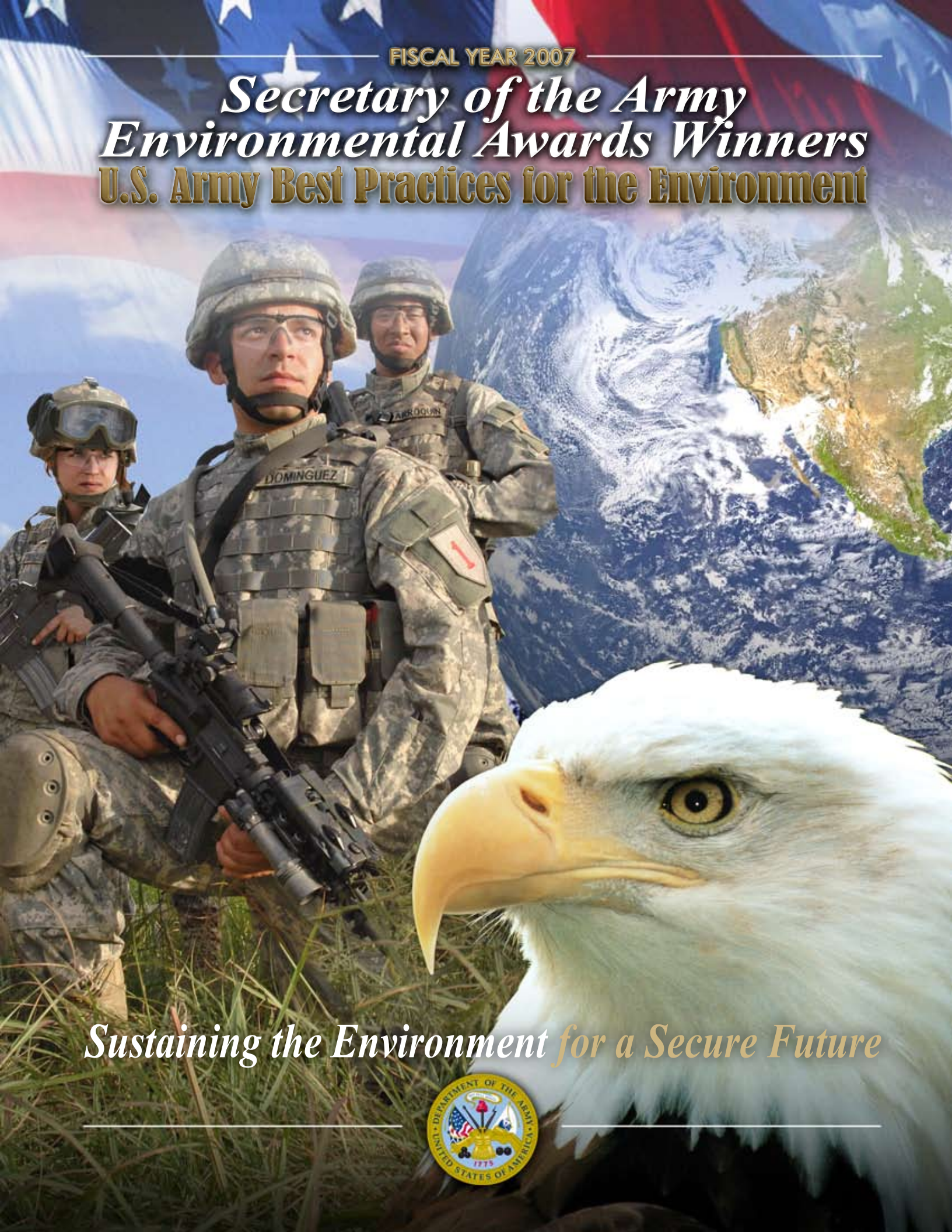
FISCAL YEAR 2007
Secretary of the Army
Environmental Awards Winners
U.S. Army Best Practices for the Environment
DOMINGUEZ
ARROQUIN
Sustaining the Environment for a Secure Future
DEPARTMENT OF THE ARMY
UNITED STATES OF AMERICA
1775

FISCAL YEAR 2007

Secretary of the Army Environmental Awards Winners

U.S. Army Best Practices for the Environment

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Sustaining the Environment for a Secure Future

Fort Hood, Texas

Environmental Quality, Non-Industrial Installation

SUMMARY

Fort Hood, at 217,337 total acres, is the Army's largest armored force active duty post in the United States. Fort Hood is committed to providing an environment amenable to mission readiness, deployability and sustainability; it serves the needs of over 250,000 Soldiers, family members, civilian employees and retirees.

Because air quality, energy management, pollution prevention and water quality most affect Fort Hood's mission and the quality of life of installation residents, Fort Hood's environmental program focuses heavily on these three sustainability and quality of life environmental aspects.

Highlights of Fort Hood's environmental management program include:

- Exceeded the Army's Sustainable Development and Design Policy by planning and implementing all new construction projects to adhere to LEED standards beginning in FY 2006, including a Silver-rated community of 232 homes for Soldiers and their Families
- Analyzed waste streams throughout the installation and implemented reuse and recycle initiatives that saved 3 million gallons of water and recycled 1 million gallons of hazardous waste
- Fostered sustainability through extensive EMS and environmental stewardship training, including 40,984 individuals trained on EMS General Awareness, which corresponds to the EMS policy and training requirements of ISO 14001.

Fort Hood is an Army leader in environmental sustainability – a fact that is demonstrated by the many awards the installation has won – and is recognized by several environmental organizations for being "first" in its environmental protection and promotion efforts.

"Fort Hood is demonstrating that a base can focus on the long term environmental sustainability of its facilities while enhancing their suitability for the Soldiers, civilians, families and neighbors, and reducing potential pollution impacts from its daily activities."

– Thomas W. Easterly, Commissioner, Indiana Department of Environmental Management

On the cover: Lt. Col. Timothy DeVito, commander of the 4-227 AV Regiment, 1st ACB, 1st Cav. Div., returning to Fort Hood from Iraq, gives high fives to Killeen's Trimmier Elementary School students as he walks into the school for a welcome home ceremony.

INTRODUCTION

Fort Hood, at 217,337 total acres, is the Army's largest armored force active duty post in the United States. Serving the needs of over 246,000 people – including Soldiers, family members, civilian employees and retirees – Fort Hood is committed to providing an environment amenable to mission readiness, deployability and sustainability.

The 1-21 FA Regiment is presented an award recognizing the battalion for its environmental stewardship as the first Fort Hood organization to score 100 percent green ratings on three consecutive semi-annual environmental compliance assessment.

Located in central Texas, Fort Hood originally opened in 1942 as a World War II training center, teaching Soldiers how to use tank destroyers against the German blitzkrieg. The installation has since expanded to become the Army's premier power projection platform, supporting a full range of military operations. It is the only U.S. military installation that is home to two divisions – the 1st Cavalry Division and the 4th Infantry Division – as well the III Corps Headquarters, the 13th Sustainment Command (Expeditionary), the 3rd Armored Calvary Regiment, 3rd Brigade 1st Infantry Division and other supporting organizations.

As the Department of Defense continually works to streamline military operations, Fort Hood is regularly looked upon as a model for installation operation and effectiveness. In the DoD's 2005 BRAC report, the Army ranked Fort Hood as the top installation for "Future" capability.

Fort Hood's ultimate vision, to maintain combat readiness, has been achieved through its dedication to high standards for Soldier training and support. The installation's environmental program supports this vision.

BACKGROUND

Fort Hood's environmental program, housed under the Directorate of Public Works, is executed by the Environmental Division. The Environmental Division consists of 104 personnel, including engineers, contractors, subject matter experts and technicians. There are also 20 certified Environmental Management System (EMS) internal auditors from across the installation. These personnel focus their efforts on solid waste generation, air quality, energy management, pollution prevention and water quality, because the installation's EMS has determined that these environmental quality aspects most affect the mission and quality of life of the installation's Soldiers and other inhabitants.

The Environmental Division is able to maintain a robust environmental program at Ford Hood that supports the installation's elevated operations tempo. With the war, Fort Hood has become a 24-hour a day, 7-day a week operation. In 2007, total troop strength reached over 50,000. In addition to being deployed and re-deployed from Fort Hood, most of these troops also received their training at Fort Hood. Fort Hood had to adapt its training program to accommodate light infantry training as well as armor training; and the coming and going of thousands of troops made continuity at the unit level challenging to maintain. The Environmental Division has been able to support these changes, however, and keep Fort Hood's mission successful by focusing on sustainability and quality of life. Fort Hood's environmental team is diligent in ensuring that new and returning personnel

are educated and updated on the environmental requirements of their organizations, and that all community members have the opportunity to learn about and practice sound environmental stewardship.

PROGRAM SUMMARY

Along with the more than 240,000 inhabitants and community members supported by the installation, over 40,000 U.S. Army Reservists and Army National Guard Soldiers have been trained and mobilized from Fort Hood. Considering the sheer number of people that use and rely on Fort Hood's physical resources, it is understandable that infrastructure maintenance and environmental sustainability is critical to support the installation's capabilities.

Highlights of the Fort Hood environmental management program include:

- Increased emphasis on constructing sustainable buildings that meet the high Leadership in Energy and Environmental Design (LEED) standards.
- Recycling and reuse strategies that mitigate waste and generate revenue and cost savings.
- Educating Soldiers, installation personnel and community members on the importance of environmental stewardship at all levels.

As a result, Fort Hood is an Army leader in environmental sustainability – a fact that is demonstrated by the many awards the installation has won – and is recognized by several environmental organizations for being "first" in its environmental protection and promotion efforts.

Figure 1. Recent Awards

2007	White House Closing the Circle Award, Waste/Pollution Prevention
2007	South Region Large Facilities /Military Electronics Recycling and Reuse Challenge Award from the Federal Environmental Executive and U.S. Environmental Protection Agency
2006	Recognized by National Registry of Environmental Professionals for EMS and Sustainable Design and Pollution Prevention
2006	White House Closing the Circle Award, EMS Implementation (Honorable Mention)
2006	Tree City U.S.A. Award

Figure 2. Notable "Firsts"

Clean Texas Member	First DoD installation recognized by the Texas Commission on Environmental Quality as a Clean Texas Member
Partner for Environmental Performance	First Federal facility to join Partners for Environmental Performance, the company 3M, and the Office of the Federal Environmental Executive for EMS implementation assistance
National Partnership for Environmental Priorities	First Army installation recognized by the EPA's National Partnership for Environmental Priorities; pledged to eliminate light bulbs containing mercury and reduce the use of batteries that contain mercury
Blue Skyways Collaborative	First DoD Installation recognized by the EPA's Blue Skyways Collaborative for innovative projects that meet air sustainability goals and reduce the Installation's environmental impact

ACCOMPLISHMENTS

Program Management

Environmental Management System

Fort Hood's recognized program management structure, its Environmental Management System (EMS), was one of the first in the Army to be developed and implemented. Incorporated into the EMS is a 25-year plan for sustainability. Fort Hood's sustainability goals are to:

- Use sustainable products and services, with active regional involvement, to minimize waste and environmental impact.
- Actively reduce its impact on regional air quality from all sources.
- Ensure that infrastructure and energy systems are planned, designed, constructed, and maintained to be sustainable and secure.
- Manage training landscapes to support current and future mission requirements while sustaining cultural, natural and land resources.
- Provide high quality potable water and reduce consumption while maintaining mission readiness and quality of life.

Technical Merit

The Fort Hood Environmental Quality Division developed successful master planning and waste reduction techniques during the period of performance that preferentially targeted the reduction of significant sources of waste, and promoted more efficient use of resources. These techniques are found in the installation's waste

management program and the Comprehensive Army Master Planning System (CAMPS).

Fort Hood's innovative Fuel Tanker Purge Facility was used to clean 193 vehicles, saving 965 man hours and 2,895,000 gallons of water from being discharged into the sanitary sewage system.

Commitment to Waste Reduction

Fort Hood analyzed waste streams throughout the installation and implemented reuse and recycle initiatives to mitigate unnecessary waste. This emphasis on waste reduction resulted in:

- 319,011 gallons of JP-8 fuel and 245,051 gallons of used oil recycled through the Fort Hood JP-8 Fuel and Oil Recycle Center, eliminating disposal costs and generating $322,575 in revenue and a cost savings of $262,289.
- 2,895,000 gallons of water saved from discharge into the sanitary sewer through the use of Fort Hood's Fuel Tanker Purge Facility, a closed-loop system using recycled water to clean fuel tanks. Also, 965 man hours were saved using the fuel tanker purge facility.
- 925,000 gallons of water saved from discharge into the sanitary sewer using the Fort Hood Mobile Kitchen Trailer Wash Facility, a system that cleans and captures pollutants from the mobile kitchen trailers.
- 70,844 gallons of antifreeze recycled, saving $32,942 in hazardous waste disposal costs.

CAMPS – Comprehensive Army Master Planning System

As the Army transitions to the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) rating system for military construction, Fort Hood is using the Comprehensive Army Master Planning System (CAMPS) to achieve its goal of creating and maintaining a sustainable environment and infrastructure. Fort Hood created CAMPS, an interactive web-based planning tool, to assist in decision making and build efficiencies into everyday planning to create a sustainable installation. This system incorporates Leadership in Energy and Environmental Design (LEED) standards into building design, which allows Fort Hood to readily access and incorporate sustainable design techniques into ongoing and future base construction. LEED is a comprehensive

Fort Hood exceeded the Army Sustainable Development and Design policy by planning all new construction projects to meet LEED standards beginning in FY06.

approach that covers all the aspects of building design: real property management, master planning, National Environmental Policy Act implementation, stationing, development plans and project management.

Fort Hood uses CAMPS to exceed the Army's sustainable development and design policy by planning and implementing all new construction projects to adhere to LEED standards beginning in FY 2006 – two years ahead of the Army's 2008 timeframe. Buildings meeting LEED standards typically consume 30 percent less energy and 20 percent less water. LEED buildings must comply with (American Society of Heating (ASHRAE) Standard 62.1-2004, which helps improve ventilation for indoor air quality, thus improving human health and productivity. Currently, Fort Hood Family Housing is planning construction of a LEED-Homes Silver community. The environmental team is working with Fort Hood Family Housing and Actus Lend-Lease to construct 232 homes for Soldiers and their Families to be completed before the year 2010. The project design phase is completed and construction will begin in March of 2008.

Fort Hood also engaged Soldiers and other installation staff by educating them on the importance of LEED's emphasis on environmental sustainability in regards to mission readiness. For example, Fort Hood's LEED Accredited Professional trained over 90 personnel that are directly involved in building planning, design and construction.

Orientation to Mission

The waste management and CAMPS programs are two environmental quality initiatives that will continue to contribute to Fort Hood's successful execution of its military readiness mission by ensuring the sustainability of the infrastructure and environment needed to support the installation's many large, active and combat-ready units, as well as the surrounding community. The environmental team also worked, through formal training and general education initiatives, to involve individuals directly responsible for Fort Hood's military readiness mission into its environmental awareness and promotion program.

ECAT Leading the Way

Fort Hood's Environmental Compliance Assessment Team (ECAT) is charged with spreading the word about environmental stewardship and the EMS to all levels of personnel throughout the installation. ECAT's efforts included:

- Conducting 190 briefings, at the request of installation commanders, that have trained 8,424 Soldiers, civilians and contractors on EMS and environmental awareness in regards to installation management and initiatives, deployment and redeployment, and mobilization and demobilization.
- Attending brigade and division staff meetings and working individually with command support to make it easy for leadership to become involved in environmental efforts, and to increase overall environmental awareness.

Working individually with command support to increase leadership involvement and environmental awareness, ECAT member Derrick Born gives Soldiers training about above ground storage tanks during the Environmental Compliance Officer training course. Fort Hood's ECAT conducted 190 briefings and trained 8,424 Soldiers, civilians, and contractors.

- Sponsoring a quarterly awards ceremony to recognize the environmental stewardship of superior units and Soldiers.
- Established a database matrix of unused, available goods that allows organizations to link up and get needed products, preventing unnecessary waste, disposal costs and purchasing costs.

Mission Support Through Education

Fort Hood's environmental policy states that everyone is responsible for protecting the environment at the installation. To promote the idea that environmental stewardship is important at all levels – from the individual family home to the leaders of the installation's many divisions and directorates - the Fort Hood environmental team:

- Conducted 76 training events, including Environmental Compliance Officer courses, that trained 7,923 Soldiers, civilians, and contractors.
- Trained 40,984 individuals on EMS General Awareness, which corresponds to the EMS policy and training requirements of ISO 14001.
- Educated 132 Fort Hood Family Housing residents on how to incorporate conservation into their daily lives through the Nurtured World Consumer Conservation Workshop in FY 2007.
- United States Department of Agriculture
- Texas Parks & Wildlife Department
- Texas Forest Service
- Environmental Protection Agency.

These partnerships provide the installation with support, resources, best practices and subject matter experts to continue its environmental mission. For example, entry into the Clean Texas program has provided reduced inspections, expedited permitting (with reductions from over a year to less than 6 months to finalize permits), free training and assistance in finding grant funding for projects.

Stakeholder Interaction

Commitment to Community Outreach

In keeping with its dedication to environmental education, Fort Hood developed a robust community outreach campaign that includes participation in several community-wide events:

- Texas Recycles Day: Over 300 Fort Hood Families attended, learning about the installation's wide-serving recycling program.
- Arbor Day: Fort Hood and the City of Killeen together participated in a tree planting ceremony.

Transferability – Knowledge Sharing

Commitment to Partnerships

Fort Hood Partners with organizations and agencies such as:

- Keep Texas Beautiful affiliates
- Texas State & Soil Water Conservation Board
- Central Texas Council of Governments
- Central Texas College
- University of Texas
- Baylor University
- City of Killeen
- City of Copperas Cove
- City of Austin
- Texas Commission on Environmental Quality

Silvia Rhoads, Executive Director of Keep Copperas Cove Beautiful, one of Fort Hood's many community partners, works with the City of Copperas Cove's superhero Recycle Michael to educate students about the importance of reducing, reusing, and recycling at the 2007 Fort Hood-CenTex Earth Day Spectacular Event.

- Pollution Prevention Week: An in-depth pollution prevention workshop trained 212 Soldiers. More than 200 Fort Hood Families attended a community learning event on how to prevent pollution and keep Texas clean.
- Nolanville Elementary Science Day: 800 students learned about Fort Hood's natural resources and the installation's recycling, energy and water conservation efforts.

Fort Hood also sponsored a region-wide Earth Day event, bringing together over 1,500 families and 1,800 students from eight school districts throughout Central Texas. Participants learned about sustainable design and construction, innovations in environmentally-friendly transportation, wetland conservation and pollution prevention, among other topics.

Christine Luciano, Environmental Outreach Coordinator, speaks to students about energy conservation and the differences between regular incandescent light bulbs and compact fluorescent light bulbs. More than 800 students were educated about Fort Hood's archaeology, natural resources, recycling, and energy and water conservation programs.

Using the medium of television to reach an even wider audience, Fort Hood produced *EnviroMinute*, a series of public service announcements addressing environmental challenges such as illegal dumping, recycling, the household hazardous waste turn-in program, carbon footprint and energy conservation in the Fort Hood community and Central Texas alike. *EnviroMinute* airs weekly on the local PBS station as part of the installation's television show "Fort Hood on Track." The show reaches about 30,000 Central Texas community members.

Jaime Harris, Fort Hood on Track Producer, tapes Christine Luciano, Environmental Outreach Coordinator, for an EnviroMinute segment encouraging Fort Hood residents to be conscious about conserving water and avoiding any possible water shortages during the summer time.

CONCLUSION

Fort Hood's environmental program plays an essential role in the installation's achievement of mission readiness. In FY 2006 and FY 2007, the environmental team met the challenges that came with an increased operations tempo, demonstrating mission support by providing broad-based environmental training and education to all levels of installation inhabitants. The environmental team also implemented a construction planning system which will help the installation remain sustainable and mission ready for years to come. The team's dedication to recycling and reuse education and community outreach has earned Fort Hood a reputation as a good environmental neighbor and partner throughout Texas.

FY 2007 Secretary of Defense Environmental Awards

Environmental Quality Team, USAG Daegu, Korea

Environmental Quality, Team

Sustaining the Environment for a Secure Future

Environmental Quality Team, USAG Daegu, Korea

Environmental Quality, Team

SUMMARY

U.S. Army Garrison Daegu, Korea (USAG Daegu), part of the Installation Management Agency-Korea Region headquartered at Yongsan Garrison in Seoul, Republic of Korea, is an integral player in Army Transformation and directly supports the 8th United States Army. It also provides support and services for 43 separate units and agencies in Area IV, the largest of the U.S. Army's four geographic regions on the peninsula, where a variety of missions in the defense of the Republic of Korea are performed. USAG Daegu serves about 11,000 U.S. military personnel; Korean Augmentation To United States Army (KATUSA) Soldiers; and American and Korean civilian employees, contractors and American family members.

"An exceptional entry, highlighted by a strong environmental management system, exceptional outreach and an array of hazardous and solid waste initiatives."

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

Highlights of USAG Daegu's environmental quality program include:

- A Qualitative Recycling Program that resulted in a solid waste diversion rate increase from local landfills of 250 percent in the past two years, with increases in revenue of 171 percent.
- On-target goal to protect vicinity of drinking water sources by upgrading/removing 20 percent of substandard above- and underground storage tanks by the end of FY 2008.
- Implementation of a water-dispersible chemical agent resistant coating paint system that will reduce emissions of volatile organic compounds by 13 tons and hazardous air pollutants by 7.5 tons per year.
- Hazardous materials management practices that average $382K cost savings per year, in addition to a hazardous waste shelf-life extension program that saved $300K, and an antifreeze recycling effort that saved $74K.
- Kyung Pook National University internship program that provided practical environmental science experience for college credit.
- Time spent with the local community on special days to demonstrate the Army's environmental stewardship efforts and build host nation confidence in the environmental program at U.S. Army Garrison Daegu, Korea.

On the cover: Soldiers, civilian workers and family members from USAG Daegu participate in a mass tree planting event on Waryong Mountain, celebrating Arbor Day.

INTRODUCTION

USAG Daegu, headquartered at Camp Henry, Korea in the city of Daegu and part of the Installation Management Command Korea, is an integral player in Army Transformation and directly supports the 8th United States Army. It was activated on March 28, 2007. USAG Daegu is a subordinate unit to the Installation Management Command-Korea Region located at Yongsan Garrison in Seoul, which was activated on Oct. 7, 2002. USAG Daegu assumed the base operations mission from the 20th Area Support Group (subsequently relocated to Camp Carroll and deactivated in June 2006). Area IV is the largest of the U.S. Army's four geographic regions on the peninsula. It covers 10,000 square miles and stretches from Daejon to Busan. USAG Daegu provides support for five installations and 10 sites. USAG Daegu is responsible for managing all aspects of U.S. Army installations in Area IV, such as: construction, family care, food management, environmental programs, well-being, logistics and public works in the lower third of the Republic of Korea. It provides support and services for 43 separate units and agencies in Area IV, which perform a variety of missions in the defense of the Republic of Korea, and about 11,000 U.S. military, KATUSA Soldiers, American and Korean civilian employees, contractors and American family members.

Soldiers attending the Environmental Compliance Officer Course visit the Camp Walker recycle point.

USAG Daegu's mission is to provide responsible management of affiliated installations, support mission readiness and execution, ensure the well-being of Soldiers, civilians and their Families, improve the installation's infrastructure and preserve the environment.

BACKGROUND

The Republic of Korea (host nation) has a high interest in the environmental impact of USAG Daegu activities, due to the proximity of many camps within densely populated cities. This presents both a challenge and an opportunity for the military community to demonstrate sound environmental stewardship.

USAG Daegu's Directorate of Public Works (DPW) is charged with the environmental management of the garrison. Each member of the Environmental Quality Team is employed by the Department of the Army. The seven-person staff brings a broad range of subject matter expertise and experience to the environmental program. This base of expertise allows assignment of secondary areas of responsibility, resulting in increased customer service by decreasing inquiry response time.

- Robert J. Chartier is Chief of the Environmental Division and Deputy Director of the Directorate of Public Works. His areas of responsibility include managing the environmental program and budgeting, acting as the installation's Environmental Management System's (EMS) management representative and sustaining and leading the Environmental Performance Assessment System. Mr. Chartier is a member of the Society of American Military Engineers

(SAME) and the Army Engineer Association. He was nominated as the garrison representative to the 2005 United States Forces Korea (USFK) "Professional of the Year" competition. In 2004, he received an Achievement Medal for Civilian Service for his efforts in Environmental Issues in Deployed Operations.

- Mark Y. Gettel is Chief of the DPW's Planning and Conservation Branch, responsible for air and noise quality, environmental training, pollution prevention and the EMS. Mr. Gettel is also in charge of contract management at Camp Walker.
- Yong Chin An is an Environmental Engineer with the DPW's Planning and Conservation Branch, responsible for lead-based paint management, pesticide management, recycling and Camp Walker digging permits.
- Dr. (Ms.) Kyong Ae Choe, also an Environmental Engineer with the Planning and Conservation Branch, is responsible for the environmental budget, conservation and planning level surveys. She is also responsible for managing natural and cultural resources and the environmental database. Ms. Choe was nominated as the garrison representative to the 2005 United States Forces Korea (USFK) "Technician of the Year" competition. As a result of her cultural resources management efforts, procedures were established through U.S. Forces Korea and the Status of Forces Agreement (SOFA) committee to process the first ever turn-over of cultural items to the Korean Governments Cultural Resources Administration, relinquishing control of 4 artifacts dating over 1,000 years old.
- Charles A. Harper is the Chief of DPW's Environmental Quality Branch and is responsible for above-ground storage tanks/underground storage tanks (AST/UST) management, contract management and EMS management at Camp Carroll.
- Chom Tong Kim is an Environmental Engineer in the Environmental Quality Branch. He is responsible for asbestos, Camp Carroll digging permits, drinking water, waste water, storm water and land farm operations.
- Hak Kyun Kim is an Environmental Protection Specialist in the Environmental Quality Branch. He is responsible for hazardous waste and PCBs and Camp Carroll recycling efforts.

Mr. Hak Kyun Kim and Mr. Chom Tong Kim were members of the environmental staff that won a USFK Environmental Award for an Industrial Installation in 1997, the Honorable Mention for the Secretary of the Army Environmental Quality Award for Non-Industrial Installation in 1998 and the Secretary of the Army Award for an Environmental Quality Overseas Installation in 1999.

Commitment to environmental stewardship earned USAG Daegu the distinction of first runner-up for the Oversees Environmental Quality category in the 2006 Secretary of the Army Environmental Awards.

ACCOMPLISHMENTS

The accomplishments of the USAG Daegu environmental program are due largely to the expertise and dedication of the Environmental Quality Team, the visibility EMS implementation has created throughout the garrison and the team's effort in promoting environmental awareness through many avenues. EMS implementation provided the mechanism for the Environmental Quality Team to clearly articulate to the community definitive objectives and assess and review them against the garrison goals. These initiatives provided natural resources benefits, tangible cost savings, cost avoidance and visibility to the environmental program while conserving critical staff hours for those issues most significantly impacting mission and the environment.

The Environmental Quality Team used a mission-focused, risk-based approach to EMS implementation that focused on the environmental program's areas of most significant concern to the environment and human health. The FY 2006 and FY 2007 environmental program's main areas of emphasis included:

- Creation of solid waste and recycling efforts
- Spills to water or soil
- Discharges to ground or surface waters.

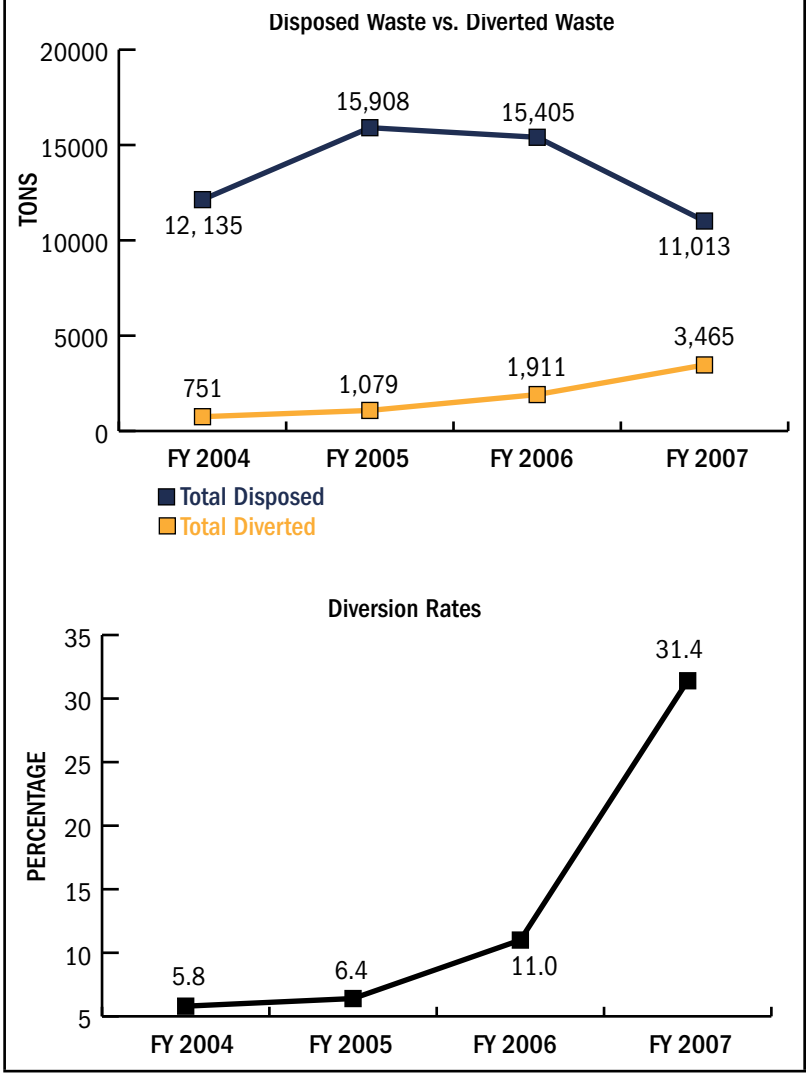
Technical Merits: Pollution Prevention and Waste Reduction

Qualitative Recycling Program (QRP)

The USAG Daegu's QRP is a dynamic, four-part effort that includes community education and outreach, collection of common recyclables, mission unit partnerships and operation of a land farm facility. The recycling program is a concentrated effort to decrease the amount of waste the garrison brought to the City of Daegu landfill. Prior to the implementation of the QRP, recycling efforts on the garrison were barely functional. This was viewed negatively by City of Daegu officials who were launching their own initiatives to decrease landfill usage.

The graphs at right depicts the increased diversion rate and decreased disposal rates for solid waste at USAG Daegu between FY 2004/ FY 2005 and FY 2006/FY 2007.

Figure 1. Solid Waste Diversion and Disposal Rates



These results were achieved, in part, through:

- Networking with the Defense Commissary Agency and the Army & Air Force Exchange Service to integrate them into the QRP.
- The Environmental Quality Team's involvement in a Lean Six Sigma Rapid Improvement Event evaluating the lead acid tactical battery recovery and turn-in process. This project determined that the lead acid was no longer required to be removed prior to recycling, thus eliminating over 14 tons of sulfuric acid from the hazardous waste stream and avoiding $8,000 in disposal costs.
- Focus on the wooden pallet recycle program increased the recycling rate from 0-4,400 through FY 2007.
- Salvaging 30 recycling containers from a closing installation and achieving a $5K disposal cost avoidance.
- Using a tub-grinder wood mulching machine to divert 100 tons of wood waste from the landfill, saving the garrison $90K dollars annually.

The QRP resulted in a revenue increase of 171 percent and a solid waste diversion rate increase from local landfills of 250 percent.

The Garrison QRP operates on a zero fee basis with profits split 50/50 between the Korean recycler and the garrison in accordance with their Status of Forces Agreement (SOFA). The garrison uses its share of the revenue to maintain the recycling program and related operations and maintenance costs. Cost avoidances realized by increased recycling were diverted to other mission enhancement base operations.

The USAG-Daegu QRP was so successful that the Installation Management Command-Korea Region Deputy Director, Mr. Davis D. Tindoll, Jr., recommended the program as a standard for other installations.

Storage Tank Management

USAG Daegu's implementation of the EMS highlighted the seriousness of spills associated with substandard above-ground and underground storage tanks (ASTs/

USTs) posed to water and soil resources. Of the nine petroleum, oil and lubricants (POL) contamination sites related to the AST/USTs, some were found to be in close vicinity of drinking water sources. This placed the task of mitigating and replacing substandard AST/USTs high on the garrison's Sustainment, Restoration and Modernization project priority list at the Garrison Real Property Planning Board in FY 2006/FY 2007. To date, the Environmental Quality Team is on target to meet its goal of upgrading/removing 20 percent of substandard AST/USTs by the end of FY 2008:

- Salvaging 30 Type II ASTs from Camp Hialeah prior to the camp's closure in FY 2006, thus saving the garrison $400K on future upgrade projects.
- Replacing 48 aging AST/USTs in FY 2006/FY 2007.
- Awarding a contract in FY 2007 to replace an additional 26 tanks.
- Awarding a contract in FY 2007 to convert from a fuel oil system to natural gas, resulting in the removal of the remaining 32 heating oil USTs at Camp Carroll, for a total UST reduction throughout the garrison of 90%.

As a result of upgrading the garrison storage tank system, the Environmental Quality Team achieved its goal of reducing accidental fuel releases by 50 percent. An 8-hour semi-annual Hazardous Material/Hazardous Waste handler course conducted in FY 2006 and FY 2007 in both the Korean and English languages contributed to this success. The attention focused on substandard AST/USTs mitigated risk of future spills that averaged between $500K to $1M in clean up costs.

Orientation to Mission

Safe, Effective Vehicle Paint System

In keeping with the installation's mission, the Environmental Quality Team helped one of its major units at Camp Carroll, the Material Support Center Korea, replace their chemical agent resistant coating (CARC) vehicle painting operation from a solvent-based to a water-dispersible paint system. The new paint system provides the same mission benefits as the old paint but it reduces emissions of volatile organic compounds and hazardous air pollutants by 13 tons and 7.5 tons per year, respectively. Not only is the water-based CARC system good for the environment, it also has benefits lauded by the workforce: the paint that is pre-mixed from the supplier reduces the risk of spills and the chance of error in the mixing process; it's easy to use, which promotes painting operation efficiency and consistency and saves man hours; and the backpack and wall mounted equipment is ergonomic, which decreases worker fatigue and injury.

Hazardous Waste Management

Use of the HAZMART facility by the Environmental Quality Team to track hazardous material usage, to reissue excess hazardous materials, to conduct shelf-life extension activities, and to operate an antifreeze recycler saved valuable mission unit resources for use in other priority efforts. Hazardous materials management averaged $382K cost savings per year in FY 2006/FY 2007. The shelf-life extension program realized a cost avoidance of approximately $300K and recycling used antifreeze saved $74K in disposal costs. Additional savings will be realized due to hazardous waste management projects that were established in FY 2007: two hazardous waste

US Army Material Support Center Korea Korean National employee uses the new water-based CARC paint application system.

accumulation points were constructed on Camp Carroll, and a contract to construct new Hazardous Waste Accumulation Point at the Busan Storage Facility was awarded. These efforts will consolidate substandard collection points and reduce the risk and number of costly hazardous waste incidents.

Mr. Mark Gettel USAG Daegu Environmental Office educates children from the School Age Services Program about the importance of recycling.

The education of garrison personnel on environmental goals and objectives was achieved through semi-annual Environmental Office and the Hazardous Material/Hazardous Waste Handlers Courses. Approximately 60 and 250 personnel, respectively, across the garrison units participated in these courses throughout FY 2006 and FY 2007. Participants received training on issues and concerns likely to impact the environment and the civilian and military communities. The Environmental Quality Team also engaged recently assigned personnel by providing environmental instruction at the garrison Newcomers Orientation briefings. Information covered included the installation's EMS objectives and other high risk environmental issues such as Asbestos and PCBs. Approximately 22 briefings were provided during FY 2006 and FY 2007, reaching an estimated 900 Soldiers, Marines, Department of the Army civilians and Family members. As a result, fewer incidences associated with these environmental media areas were reported. Also, public concern over such issues as Asbestos exposure and PCB contamination was reduced.

Community Outreach

For USAG Daegu, community outreach is an invaluable way to maintain a positive relationship with the host nation. In FY 2006 and FY 2007, the Environmental Quality Team sponsored six Kyung Pook National University student interns and volunteers who spent a total of 1,990 hours volunteering with the environmental staff, working in various environmental media areas such as safe drinking water quality, hazardous waste operations and natural resources. The internship program offered students an opportunity to witness the U.S. environmental culture first hand and receive college credit. The garrison also realized an opportunity to showcase its environmental programs.

The Environmental Quality Team also provided classroom instruction on garrison environmental activities to the Daegu American High School's Advanced Placement Environmental Science Class. Students learned what kinds of careers are available to those with an interest in environmental science and were able to witness a hazardous material spill response exercise first-hand.

USAG Daegu also took advantage of environmental awareness days – Earth Day and Arbor Day – to educate participants and encourage involvement in garrison environmental efforts. The garrison participated in Arbor Day mass tree planting ceremony on Waryong Mountain with garrison Soldiers, Family

members, civilian employees and the and Boy Scouts. Week-long Earth Day events included partnering with the Army Community Services Youth Center to provide field trips of the Camp Carroll Wastewater Treatment Plant. Information kiosks were set up and staffed at the Camp Walker Post Exchange and the Camp Carroll Community Activities Center. In-classroom instruction was also provided to the School Age Services program discussing the importance of recycling and caring for the natural environment.

Soldiers, Civilian workers and family members from throughout USAG Daegu participate in a mass tree planting event on Waryong Mountain in Daegu Korea celebrating Arbor Day.

CONCLUSION

USAG Daegu's Environmental Quality Team is committed to improving environmental quality not only for the benefit of the garrison's mission, but also to prove that the installation and the U.S. Department of the Army is a good steward of the host nation's land. In FY 2006 and FY 2007, implementing the Qualitative Recycling Program, upgrading the garrison storage tank system, installing a new vehicle painting system and managing hazardous wastes more efficiently garnered significant savings, both in terms of financial costs and mitigating harmful impacts to the environment. Hands-on environmental initiatives are bolstered by training and education across the garrison that extends out into the community. Through the efforts of its Environmental Quality Team, U.S. Army Garrison Daegu is demonstrating to its host nation that the Army is a good neighbor and a valuable asset in sustaining the environment in Korea.

Kyung Pook National University student intern works in the Camp Walker Hazardous Waste Storage Area. Six student interns were able to earn college credit while volunteering a total of 1,990 hours with the environmental staff.

FY 2007 Secretary of Defense Environmental Awards

Redstone Arsenal, Alabama

Cultural Resources Management, Installation

Sustaining the Environment for a Secure Future

Redstone Arsenal, Alabama

Cultural Resources Management, Installation

SUMMARY

Located in the heart of the Tennessee Valley and home to the U.S. Army Aviation and Missile Command, Redstone Arsenal is the premier location for the Army's rocket and missile programs. The arsenal is responsible for the first penetration of outer space by a U.S. missile, the development of the first ballistic missile and the establishment of NASA's Marshall Space Flight Center. Nearly 158,000 active, retired and dependent Soldiers and over 27,000 civilians at the installation are committed to Redstone Arsenal's mission to perform basic and advanced weapons system research and development while managing and providing weapon systems for troops and allies.

The cultural resources staff at Redstone Arsenal manage nearly one thousand archaeological sites and more than a thousand historic structures located on the arsenal's property. These sites range from Early Paleoindian lithic artifact scatters to ruins of early 20th century sharecropper houses. Inventoried structures on Redstone include two from before the arsenal was established in 1941, 714 dated to the World War II era, and 834 that were built during the Cold War era.

Implementing efficient and cost-effective procedures for the management and preservation of valuable cultural resources, Redstone Arsenal's cultural resources staff has fostered mission enhancement with the development of an innovative programmatic agreement, and heightened community enthusiasm for archeological conservation through educational classrooms and tours.

A few of the highlights of Redstone Arsenal's FY 2007 cultural resources management program include:

- A complete inventory of all archeological resources on 100 percent of Redstone Arsenal land, and initial evaluation of NRHP-eligible sites.
- Global Positioning System data collection and mapping of all archeological sites for site impact assessments and mission planning purposes.
- Development of a Memorandum of Agreement to reduce the cost and time of complying with state institutions regarding the treatment of historic buildings and structures while still meeting regulatory requirements.
- Coordination with local American Indian tribes to repatriate human remains and burial goods found on Redstone Arsenal's property.
- Full compliance with 36 CFR 79, the curation of Federally-Owned and Administered Archaeological Collections.
- Collaborations with state institutions in the development of a Programmatic Agreement to mitigate archeological sites in mission-critical areas without sacrificing valuable historic information.
- Establishment of an Archaeological Resources Outdoor Classroom and field trips for Huntsville City schoolchildren; and community outreach programs such as: archaeological tours, Earth Day celebrations and volunteer archeological excavations.

"The Cultural Resource program at Redstone Arsenal illustrates the impact that dedicated and professional staff can have in the preservation and management of significant resources, while maintaining the installation's focus on their mission."

– Caroline Hall, Preservation Compliance Coordinator, National Park Service

On the cover: Soldiers train on disarming explosives at the U.S. Army Ordnance, Munitions and Electronics Maintenance School, Redstone Arsenal, Al.

INTRODUCTION

Located in the heart of the Tennessee Valley and home to the U.S. Army Aviation and Missile Command, Redstone Arsenal is the premier location for the Army's rocket and missile programs. When Congress approved the funds to construct a second U.S. chemical manufacturing and storage facility in 1941, the Army chose Huntsville, Alabama, as the site for Huntsville Arsenal, renamed Redstone Arsenal in 1943.

The installation's initial purpose was to produce chemical ammunition for use in World War II. After the war was over, the chemical ammunition production was declared in excess to the Army's needs and the arsenal was put up for sale. However, the sale never took place after Army officials decided that the land was needed for the development of a new rocket and missile mission. In June of 1949, Redstone Arsenal was officially reactivated as the site of the Center for Ordnance Rocket Research and Development, and has been focused on weapons system research and development ever since.

Today, Redstone Arsenal is responsible for the first penetration of outer space by a U.S. missile, the development of the first ballistic missile and the establishment of NASA's Marshall Space Flight Center. Nearly 158,000 active, retired and dependent Soldiers, and over 27,000 civilians at the installation, are committed to Redstone Arsenal's mission to perform basic and advanced weapons system research and development while managing and providing weapon systems for troops and allies.

BACKGROUND

Redstone Arsenal's environmental management is led by the Division of Environmental Management (DEM), under the Directorate of Public Works. The cultural resources staff is the branch of the DEM that implements the Integrated Cultural Resources Management Plan (ICRMP) covering all 38,000 acres that make up Redstone Arsenal. Redstone Arsenal's ICRMP is current and due to be revised in 2011.

The Redstone Cultural Resource Management Program staff is comprised of three individuals: Danny Dunn, the DEM Cultural and Natural Resources Branch Chief; Carolene Wu, the Cultural Resource Manager; and Ben Hoksbergen, the DEM Staff Archaeologist who is contracted through Alexander Archaeological Consultants.

PROGRAM SUMMARY

Redstone Arsenal's cultural resources staff manages nearly one thousand archaeological sites and more than a thousand historic structures located on the arsenal's property. These sites range from Early Paleoindian lithic artifact scatters to ruins of early 20th century sharecropper houses. Inventoried structures on Redstone include two from before the arsenal was established in 1941, 714 dated to the World War II era and 834 that were built during the Cold War era.

When Redstone Arsenal updated the ICRMP in 2006, the cultural resources staff focused on four objectives: archaeological site inventory, evaluation of site eligibility for National Register status, completion of the historic structure inventory and site mitigation in mission-critical areas. In FY 2007, the cultural resources staff successfully completed the first three objectives and made dramatic strides toward the completion of the fourth, without going over budget.

Implementing efficient and cost-effective procedures for the management and preservation of valuable cultural resources, Redstone Arsenal's cultural resources staff has fostered mission enhancement with the development of an innovative programmatic agreement, and heightened community enthusiasm for archaeological conservation through educational classrooms and tours.

A few of the highlights of Redstone Arsenal's FY 2007 cultural resources management program include:

- A complete inventory of all archaeological resources on 100 percent of Redstone Arsenal land, and initial evaluation of NRHP-eligible sites.
- Global Positioning System data collection and mapping of all archaeological sites for site impact assessments and mission planning purposes.
- Development of a Memorandum of Agreement to reduce the cost and time of complying with the National Historic Preservation Act regarding the treatment of historic buildings and structures while still meeting regulatory requirements.

- Coordination with local American Indian tribes to repatriate human remains and burial goods found on Redstone Arsenal's property.
- Full compliance with 36 CFR 79, the curation of Federally-Owned and Administered Archaeological Collections.
- Collaborations with state institutions in the development of a Programmatic Agreement to mitigate archaeological sites in mission-critical areas without sacrificing valuable historic information.
- Establishment of an Archaeological Resources Outdoor Classroom and field trips for Huntsville City schoolchildren; and community outreach programs such as: archaeological tours, Earth Day celebrations and volunteer archaeological excavations.

ACCOMPLISHMENTS

Archaeological Inventory

Surveying Archaeological Resources

Fiscal year 2007 marked the completion of Redstone Arsenal's Phase I inventory of archaeological sites. Because of the unpredictable distribution of significant intact Paleoindian and Archaic sites throughout the upland areas of Redstone Arsenal, it was decided that sampling through a predictive modeling approach would not be adequate to preserve significant archaeological resources. Therefore, the Phase I inventory consisted of a complete archaeological survey of 100 percent of the installation's land. This process resulted in the official identification of 904 archaeological sites within Redstone Arsenal boundaries. Of these, 418 were considered to be potentially eligible for listing on the NRHP and their preservation is taken into account when planning installation activities. The archaeological inventory included re-appraising previously surveyed areas where outdated methods were used and where Geographical Information System (GIS) analysis documented conspicuous gaps in the site densities. Phase I was considered completed by the end of 2007 but the inventory is still open to the potential inadvertent discovery of new sites in the future.

All 904 sites recorded on Redstone Arsenal territory were assigned state trinomial site numbers and have undergone initial evaluation as to their eligibility status for nomination to the NRHP. The complete inventory and original reports on individual sites were submitted to the Alabama State Historic Preservation Office (ALSHPO) by April of 2007. Of the 904 sites identified through the Phase I survey, the ALSHPO concurred that 418 are considered potentially eligible for NRHP nomination.

After Redstone Arsenal's Phase I survey was complete, the cultural resources staff advised NASA cultural resource management personnel on their survey methodology. The staff helped the cultural resources staff at Marshal Space Flight Center carry out their own archaeological inventory. (The NASA facility has a land use agreement with Redstone Arsenal and has a separate cultural resources management program). Because of the cultural resources staff's help, Marshal Space Flight Center now has completed a survey of all archaeological resources located on their lands.

Technical Merit

Resourceful Data Collection

The cultural resources staff's innovative incorporation of modern day technology has enhanced the installation's mission readiness while preserving the valuable cultural resources located on the arsenal's property. In an ongoing effort culminating in July of 2007, all recorded archaeological site boundaries were mapped using a Global Positioning System (GPS). The data collected from these GPS images were assimilated and stored as shape files in a limited access GIS layer in the DEM GIS database.

This mapping procedure helped Redstone Arsenal's Directorate of Public Works Master Planning Division with the challenging process of planning missions around the large number of archaeological resources located within the installation's boundaries. The shape files generated with the GPS data are now used daily to plan installation missions and activities around archaeological sites.

Historic Buildings and Structures

Memorandum of Agreement

Since the implementation of the National Historic Preservation Act of 1966 (NHPA), the cultural resources staff coordinated with the ALSHPO to perform a case-by-case assessment on every

undertaking that involved a building over 50 years old. Though coordination with the ALSHPO is required under Section 106 of the NHPA, and is necessary to guarantee the safe treatment of cultural resources, the case-by-case assessment process was costly and time-consuming; sometimes taking up to a year to complete.

To expedite the Section 106 process, the cultural resources staff consulted with the Advisory Council on Historic Preservation (ACHP) and the ALSHPO to develop a second Memorandum of Agreement (MOA) for the treatment and management of NRHP-eligible buildings and structures located on Redstone Arsenal property. The first MOA was signed in 2003 and covered the management of 413 NRHP-eligible historic buildings and structures to include:

- Three WW II Historic Districts (405 structures)
- One Cold War Historic District (three structures)
- Five Cold War individually eligible buildings

Part of the World War II carbonyl iron plant in the Carbonyl Iron Unit Historic District at Redstone Arsenal. This is one of only three known active carbonyl iron plants in the world. The district has undergone very little modification since it first began production in 1943.

The second MOA was signed in October of 2007 and covered 23 NRHP-eligible buildings and structures. A major part of Redstone Arsenal's ICRMP is the completion of the second MOA and the implementation of the two MOAs. After the signing of the second MOA, the cultural resources staff immediately started the ongoing process of carrying out the conditions of the agreement, which include:

- Management of 23 NRHP-eligible historic buildings and structures:
  - One WW II Historic District (8 structures)
  - Two Cold War Historic Districts (12 structures)
  - Three Cold War buildings individually eligible for listing on the NRHP.
- Preparation of Historic American Buildings Survey/ Historic American Engineering Record (HABS/ HAER) documentation on all eligible buildings.
- Scanning of existing architectural drawings and black and white photography of all the buildings.
- Scanning of drawings depicting the original equipment in the WWII historic district.

The implementation of the FY 2007 MOA is well underway. As a result, actions on all but one of the 437 NRHP-eligible buildings and structures on Redstone Arsenal will require no further coordination with the ALSHPO. The cultural resources staff greatly reduced review time from up to a year to days, thus reducing the overall cost of Section 106 compliance and leaving funds left over to positively impact Redstone Arsenal's mission.

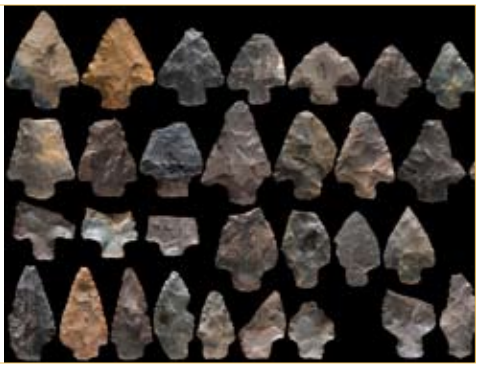
American Indian Cooperation

In accordance with the Native American Grave Protection and Repatriation Act (NAGPRA), Redstone Arsenal's cultural resources staff consulted with representatives from 17 American Indian tribes to reach agreements on the repatriation of the human remains and associated artifacts once buried on the installation's property. In FY 2007, as with every one or two years, a consultation meeting was held with the tribes to discuss repatriation and grave protection. Redstone Arsenal's ICRMP calls for the development of an MOA with the American Indian tribes to reduce the number of consultation meetings and move forward with the reburial of American Indian remains on the arsenal's property. In order to protect these reburied remains, all repatriated graves on base will be unmarked but designated as cultural resources to avoid disturbance of the sites.

Curation

The cultural resources staff continually curates artifacts from all projects in full accordance with federal standards. The curation efforts comply with 36 CFR 79, the Curation of Federally-Owned and Administered Archaeological Collections. Redstone Arsenal's collections are curated at the University of Alabama Erskine Ramsay Archaeological Repository in

the Moundville Archaeological Park in Moundville, Alabama. Part of this curation effort includes an inventory of all prehistoric diagnostic artifacts that appear in archaeological documents funded by Redstone Arsenal. All of the diagnostic artifacts inventoried are photographed and entered in an Access database that can be queried by site or artifact type.



Cotaco Creek type points from the Redstone Arsenal collection. This picture is as part of a photographic database of prehistoric diagnostic artifacts that were collected during cultural resource management projects on Redstone Arsenal.

"Redstone Arsenal has set a new standard for the effective management of important heritage assets while fully supporting the Army's vital defense mission."

– A. Lee Foster, Deputy Federal Preservation Officer, Office of the U.S. Army Assistant Chief of Staff for Installation

Mission Enhancement

Programmatic Agreement

In consultation with Redstone Technical Test Center (RTTC), one of the largest tenants on the installation, a number of NRHP-eligible archaeological sites were found to be particular impediments to mission activities. The test center had to work around archaeological sites, which inconvenienced their mission. Most of these sites were of a single type, namely late 19th to early 20th century house sites. Mitigation of these sites through data recovery would be cost prohibitive. The few recent Phase III data recovery projects conducted in Alabama each cost in excess of one million dollars. This cost would be in addition to that of any Phase II investigations that were conducted prior to data recovery.

To avoid such an expensive solution, an innovative programmatic agreement (PA) is being developed, in conjunction with the ALSHPO, for the mitigation of late 19th and early 20th century historic tenant and sharecropper house sites. These sites make up as much as 43% (n=181) of the NRHP-eligible archaeological sites on Redstone Arsenal. As part of this PA, historic site type models are being established by incorporating archaeological survey data, archival research and oral history collected from the former residents of the land now occupied by the installation. The goal of this research is to reconstruct the late 19th through early 20th century cultural landscape of Redstone and to identify the tenant/sharecropper houses so that a representative sample of the sites with the greatest potential to provide further information can be selected for preservation.

A double hearth and chimney base on an early 20th century house site excavated as part of the site sampling for Redstone Arsenal's Programmatic Agreement for historic house sites.

Data from limited Phase II testing of historic archaeological sites in mission critical areas is also being applied to the formation of the site type model. For the sites not selected for preservation, reports detailing the archival research and oral history serve as a substitute for mitigation through costly and time consuming archaeological data recovery excavations. In doing so, Redstone Arsenal is using the most cost-effective means of mitigating a class of archaeological sites, thus avoiding the long response time for Phase II testing and data recovery and freeing up installation land for mission-related development and land use while still preserving historical information. The

cost of performing Phase II evaluations on all 181 NRHP-eligible historic house sites is estimated at approximately $9 million. Further mitigation through data recovery of those sites confirmed to be NRHP eligible would far exceed this figure. The total cost budgeted for the collection of oral history and archival research in support of the PA is $598,272.90.

This agreement is the first of its kind, not just for military installations, but for the whole Southeast portion of the United States. The final completion of the PA is expected in 2010.

"Redstone Arsenal has demonstrated the capacity to think beyond the standard documentation practices to develop a cost-efficient and innovative mitigation plan for some of its historic properties, a plan that encourages community participation and supports the Army mission."

- Sarah Killinger, Liaison to the Army, Advisory Council on Historic Preservation

COMMUNITY RELATIONS

Community Tours and Volunteer Excavation

In June of 2007, the cultural resources staff organized a tour of the late 19th and early 20th century landscape of the installation for the former residents, and their descendents, of the land that became Redstone Arsenal. The excursion, which included two guided bus tours, was an opportunity for the former residents and their descendents to reunite with their cultural backgrounds and learn more about the history of the area they once occupied. The goal of the tours was to show appreciation to the portion of the community who contributed oral history to the PA site type model. The cultural resources staff acquired many new potential informants for additional oral history through this effort.

In July of 2007, the cultural resources staff, in coordination with the Alabama Archaeological Society (AAS), hosted a volunteer archaeological excavation. A total of 28 people participated, including both professional and amateur members of the AAS and civilian DoD employees and their families. Staff from the *Huntsville Times* were also on hand and published an article on the excavation. Data from the excavation was analyzed and presented by the DEM Staff Archaeologist at the annual winter meeting of the AAS.

Alexander Archaeological Consultants, Inc. personnel excavate a test unit on a historic house site as part of the site sampling for Redstone Arsenal's Programmatic Agreement for historic house sites.

CULTURAL RESOURCES AWARENESS AND EDUCATION

Outdoor Classroom

Beginning in 2006, the cultural resources staff collaborated with the Huntsville City School's EARTHSCOPE Program to establish an Indian Education/Archaeological Resources Outdoor Classroom. The center piece of the outdoor classroom is a full-size replica of a Late Mississippian Period wattle and daub house, which was constructed throughout FY 2007 by the DEM Staff Archaeologist, with the help of a Public Education Grant from the AAS and volunteer help from Huntsville City Schools teachers, local members of the AAS, and children with American Indian ancestry of U.S. Army enlisted personnel who were stationed at Redstone Arsenal. The cultural resources staff and EARTHSCOPE organized over a dozen field trips to the outdoor classroom for Huntsville City School fourth graders from late October to November of 2006. More than 1,200 students from almost all of the Huntsville City Public Schools participated in the four-hour long field trips.

In FY 2007, the cultural resources staff collaborated with the Huntsville City School's EARTHSCOPE Program to make the field trips a yearly event. The cultural resources staff is planning to host several

Outdoor Indian Education Classroom	
Action	**Results**
Demonstration archaeological dig	Students gained better understanding of how an archaeological dig is carried out and how archaeologists use artifacts to learn about the past.
Construction of 10 permanent cultural resources interpretive signs	Signs illustrate American Indian culture throughout prehistory. They also demonstrate how American Indians utilized natural resources for survival.
Demonstration of pre-historic lifeways, such as flint-knapping, atlatl (spear-thrower) use and American Indian games	Students were able to see how native peoples survived by adapting to their environment. Games allowed students to have fun while learning how native peoples entertained themselves.
Construction (with volunteer help) of a full-scale replicated Late Mississippian period wattle and daub house	Students had the opportunity to tour the replicated house to see first-hand how native peoples lived.
Cultural resources quizzes	Students were quizzed at the end of the field trips to help them retain the information they absorbed.

field trips again during National American Indian Heritage month in November of this year.

Annual Earth Day Celebration

Redstone Arsenal's DEM hosts a yearly Earth Day Celebration at the Path to Nature Outdoor Education Area. Approximately 300 fifth-grade students from local public schools attend the festivities each year. Like the outdoor classroom, the cultural resources staff educates participants on American Indian culture through the demonstration of prehistoric skills and games. Lectures are given on such topics as how archaeologists learn about past cultures from material remains, the importance of natural resources to prehistoric American Indians and the importance of preserving cultural resources. The reconstructed Mississippian house that the cultural resources staff constructed is also open for tours during the celebration. Many students who attend the Indian education field trips as fourth graders return to Redstone Arsenal for the Earth Day Celebration.

Redstone Arsenal's public outreach and education programs have gained widespread support from local government and organizations. The University of Alabama and Alabama A&M University have both used the Path to Nature Outdoor Education Area for research and classes, and the field trips for the

Redstone DEM Staff Archaeologist Ben Hoksbergen demonstrates prehistoric fire-making technology to local home school students at the Garrison Redstone annual Earth Day celebration in April of 2007.

Huntsville City School fourth graders were covered by the *Huntsville Times*. Since its inception in 1995, the annual Earth Day celebration is attended each year by the Huntsville City Mayor, Loretta Spencer; the Madison City Mayor and Mary Jane Caylor, an Alabama State Board of Education member.

"(Redstone Arsenal's) partnership building with the community through volunteer efforts and its leadership role in numerous educational activities acts as a true outreach success story with wide implications both on and off the installation."

– Kelly Yasaitis Fanizzo, Historic Preservation Specialist, Advisory Council on Historic Preservation

CONCLUSION

Not only does Redstone Arsenal's comprehensive ICRMP conform fully to DoD policy addressing the management of cultural resources on a military installation, the Cultural Resources Management Program promotes the protection of heritage assets while supporting the military mission through creative practices of site mitigation and cost reduction. The installation's public outreach and education efforts have raised awareness of cultural resources management and protection among personnel on base and in the surrounding community. Redstone Arsenal's cultural resources management program sets an example for military installations around the world.

FY 2007 Secretary of Defense Environmental Awards

M115A2-M116A1 Simulator Perchlorate Replacement Team

Excellence in Weapons System Acquisition, Team

Sustaining the Environment for a Secure Future

M115A2-M116A1 Simulator Perchlorate Replacement Team

Excellence in Weapon System Acquisition, Team

SUMMARY

Approximately 500,000 M115A2 and M116A1 munitions (combined) are fired on Army training ranges every year. A 2001 study by the Army Environmental Command estimated that these munitions account for as much as 70 percent of all perchlorate released on Army ranges. This information prompted the Project Manager, Close Combat Systems (PM CCS), to develop a program to eliminate perchlorate in the training simulators. The Research, Development and Engineering Command (RDECOM) assembled the M115A2 and M116A1 Perchlorate Replacement Team with funding from PM CCS and the Deputy Assistant Secretary of the Army for Environment, Safety and Occupational Health. The U.S. Army Armaments Research, Development and Engineering Center (ARDEC) Pyrotechnics Branch and the Edgewood Chemical and Biological Center (ECBC) worked together to develop a perchlorate replacement for the training simulators. Together these organizations successfully developed and demonstrated a perchlorate replacement for the M115A2 and M116A1 training simulators.

"This program is part of an overall DoD-wide effort critical for demonstrating to the U.S. Congress and the public that DoD seriously considers potential risks to human health from perchlorate releases and is willing to act to reduce those risks quickly and efficiently."

- Shannon Cunniff, Director,
Emerging Contaminants Directorate,
Office of Deputy Under Secretary of Defense
(Installations & Environment)

Perchlorate Replacement Team Accomplishments:

- Developed a unique flash-bang replacement formulation for perchlorate without changing the function of the simulators. The switch to perchlorate-free simulators is transparent to the Soldier.
- Implemented a replacement formulation for perchlorate through an engineering change proposal in FY 2007, ensuring the production of the first perchlorate-free training simulators in FY 2008.
- Made an addition to the Engineering Change Proposal to modify the Technical Data Package which restricted the production of training simulators containing the pollutant perchlorate.
- Ensured the production of perchlorate-free simulators to begin in 2QFY 2008 and the contaminant simulators to be out of the supply system by the end of FY 2009.
- Reduced the amount of potassium perchlorate utilized on ranges and in Army ammunition plants by up to ten tons per year.
- Greatly reduced the potential for the release of perchlorate into the environment and drinking water.
- Made great strides in identifying other potential integration opportunities for perchlorate-free formulations; research may eventually replace perchlorate in M117/M118/M119 Family of Booby Trap simulators and the M274 Smoke Signature Practice Warhead for the Hydra 70mm rocket.

On the cover: Four M116A1 simulators mimic an IED attack on a convoy at Aberdeen Proving Ground, Maryland.

INTRODUCTION

The Department of Defense (DoD) uses many types of non-lethal training munitions on its installations and ranges. Two of the most widely used devices are the M116A1 Hand Grenade Simulators and M115A2 Ground Burst Projectile Simulators. The simulators create flash, bang and whistle (M115A2 only) effects that simulate battlefield conditions such as incoming projectiles, hand grenades and improvised explosive devices. These systems traditionally utilized a pyrotechnic composition that consists of potassium perchlorate and aluminum to produce the required effects. However, the Environmental Protection Agency (EPA) identified the perchlorate ion (ClO_4^-) as a contaminant of concern due to its high solubility, persistence in the environment and potential effects on human health.

The U.S. Army Environmental Quality Technology Ordnance Environmental Program. The M115A2 and M116A1 Perchlorate Elimination Program was the first project in this Program. Pictured from Left to Right: Dr. Brad Forch, ARL, Dr. Bill Anderson, ARL, Mr. Frank Novak, JMC, Dr. John Beatty, ARL, Ms. LaShanda Felton, AMRDEC, Mr. Mark Motyka, ARDEC, Ms. Sally Gaines, Corrpro/JMC, Dr. Gary Chen, ARDEC, Mr. Mike Hartley, ARDEC, Ms. Shawna Showalter, ARDEC, Mr. Christopher Fish, ARDEC, Ms. Gretel Raibeck, ARDEC, Dr. Ross Sausa, ARL, Dr. Mike McQuaid, ARL, Mr. Larry Warren, ARDEC, Mr. Noah Lieb, HAI/RDECOM, Dr. Mark Johnson, USACHPPM, Mr. Dave Redding, ECBC, Dr. Maggie Hurley, ARL, Mr. Joe Domanico, ECBC, Dr. Betsy Rice, ARL, Dr. Ed Byrd, ARL, Mr. Bill Ruppert, HAI/RDECOM.

A combined 500,000 M115A2 and M116A1 munitions are fired on Army training ranges every year. A 2001 study by the U.S. Army Environmental Command (USAEC) estimated that these munitions account for as much as 70 percent of all perchlorate used on Army ranges. This information prompted the Project Manager, Close Combat Systems (PM CCS), to initiate a program to eliminate perchlorate in the training simulators. The Research, Development and Engineering Command (RDECOM) assembled the M115A2 and M116A1 Perchlorate Replacement Team with funding from PM CCS and the Deputy Assistant Secretary of the Army for Environment, Safety and Occupational Health. The technical leads for the program, the U.S. Army Armaments Research, Development and Engineering Center (ARDEC) Pyrotechnics Branch and the Edgewood Chemical and Biological Center (ECBC), worked together to develop a perchlorate replacement for the training simulators. Together these organizations successfully developed and demonstrated a perchlorate-free flash-bang formulation for the M115A2 and M116A1 training simulators. The formulation was implemented through an engineering change (ECP) proposal in FY 2007 and the first perchlorate-free training simulators will be produced in late FY 2008.

This was the first DoD program to eliminate perchlorate compounds from a munition based solely on environmental concerns. These efforts will eliminate perchlorate releases from training with the M115A2 and M116A1 simulators on every single Army infantry training site and at the Radford Army Ammunition Plant.

Perchlorate Background

Early concern about perchlorate came about after technology improvements enabled researchers to detect perchlorate in groundwater at significantly lower levels. EPA placed perchlorate on its Contaminant Candidate List for possible regulation in 1998 and required it to be monitored in drinking water under the Unregulated Contaminant Monitoring Rule in 1999. On February 18, 2005, the EPA established an official oral reference dose of 0.0007 mg/kg/day for the perchlorate ion, which translates to a drinking water equivalent level of 24.5 parts per billion (ppb). This level is consistent with the recommended reference dose included in the National Academy of Science's January 2005 report on perchlorate, which established a safe level for total daily perchlorate intake. This study found that perchlorate can inhibit thyroid functions by blocking the uptake of iodine by the thyroid gland. Pregnant

women, children and those with already low iodine levels are particularly at risk from perchlorate exposure.

To date, EPA has detected perchlorate in groundwater in at least 34 states. Several states have been proactive in regulating perchlorate by developing a maximum contaminant level (MCL). The MCL for California is 6 ppb and the MCL for Massachusetts is 2 ppb. These regulations are much lower than the recommended federal guidance of 24.5 ppb and could impact the use of perchlorate-containing munitions in these states. Although current federal regulations do not exist today, perchlorate may be regulated under the federal Clean Water Act in the future. The Office of the Secretary of Defense Emerging Contaminant Directorate placed perchlorate on the Action List because continued use of perchlorate has significant potential impacts to human health and the environment as well as the DoD mission.

The M116A1 (shown) is a 4" tall cylinder - roughly the size of a deck of cards.

Perchlorate compounds can potentially be released into the environment at any phase in the munitions life cycle: chemical manufacturing, cartridge loading and assembly, transportation, storage, use or demilitarization. However, one of the greatest areas of concern is the use of perchlorate-containing munitions on training ranges where releases can occur in two ways: if the munition does not function at all (i.e., a dud), or functions partially (i.e., a low-order round).

BACKGROUND

The Perchlorate Replacement Team's success is due to the contributions and capabilities of its members.

- Ms. Maryalice Miller – Director, Environmental Acquisition and Logistics Sustainment Program, Headquarters RDECOM / Acting Director, Environmental Support Office
- Mr. James Wejsa - Branch Chief, ARDEC Pyrotechnics
- Col. Raymond Nulk - Project Manager, PM CCS
- Mr. Frank Novak – Industrial Base Specialist, Joint Munitions Life Cycle Management Command (JMLCMC) Headquarters
- Mr. Joseph Domanico - Team Leader, ECBC Pyrotechnics
- Dr. Mark Johnson - Directorate of Toxicology, U.S. Army Center for Health Promotion and Preventative Medicine (USACHPPM)
- Ms. Kimberly Watts - Director, USAEC Sustainable Ranges Program
- Mr. William Ruppert - Assistant Program Director, Hughes Associates, Inc.
- Mr. Phil Grucci – President, Pyrotechnique by Grucci, Inc.
- Dr. Edward Bouwer - Professor, Department of Geography and Environmental Engineering, Johns Hopkins University

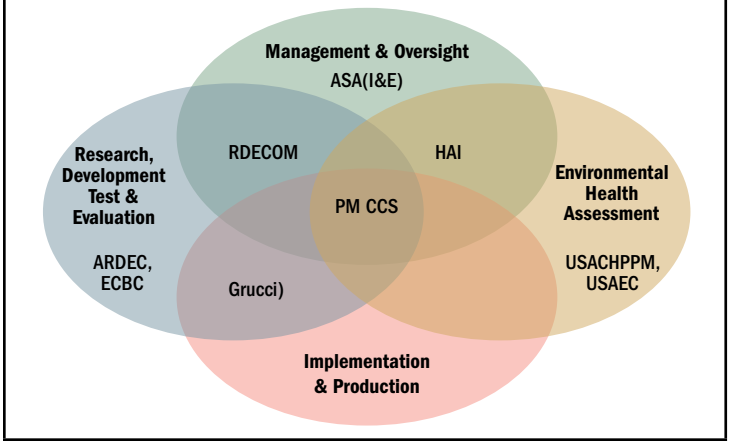
POSITION DESCRIPTION

Program Director Ms. Maryalice Miller at HQ RDECOM, and Assistant Program Director Mr. William Ruppert at Hughes Associates, Inc., managed the Perchlorate Replacement Team. They provided oversight to the program and facilitated interim progress reviews (IPRs). PM CCS manages the M115A2 and M116A1 programs for the Army and maintains munition availability and performance. PM CCS initiated this program to eliminate perchlorate from the munitions solely based on the potential environmental impacts of continuing to train with perchlorate-containing munitions. Mr. James Wejsa, ARDEC, and Mr. Joseph Domanico, ECBC, served as co-technical leads on this project. Each group competed to develop unique replacement materials that were tested side-by-side with the baseline perchlorate formulation. These efforts lead to a joint solution. Mr. Phil Grucci, President of Pyrotechnique by Grucci, used his facility at the

Four M116A1 Simulators Mimic an IED Attack on a convoy.

Radford Army Ammunition Plant to produce small-scale and limited production-scale runs of the replacement formulations for testing. Most major tests and demonstrations were also completed at the Grucci facility. Dr. Mark Johnson, USACHPPM, completed environmental health assessments (EHAs) for the replacement formulations to ensure that the replacement was more environmentally benign than the perchlorate formulation. Ms. Kimberly Watts, USAEC, helped develop the program by identifying the combined use of M115A2 and M116A1 simulators as one of the largest sources for perchlorate use on training ranges. The Johns Hopkins University conducted and published the most comprehensive study of its kind on perchlorate chemistry, occurrence and remediation. A representation of the Perchlorate Replacement Team's involvement is found in Figure 1.

Figure 1. Perchlorate Replacement Team



AWARDS AND SERVICES

- The Perchlorate Replacement Team was awarded the Secretary of the Army Award for Environmental Engineering in Weapon Systems Acquisition in January 2008.
- ARDEC received the 2007 Malcolm Baldrige National Quality Award.
- Dr. Gary Chen, ARDEC technical POC, received the 2006 Army Research and Development Achievement Award for the Reduced Optical Signature Emissions Solution program.
- Participants in the program are members of the National Defense Industrial Association and Association of United States Army.

ACCOMPLISHMENTS

Weapon System Acquisition Program Summary

The Perchlorate Replacement Team's goal was to develop a perchlorate-free flash-bang formulation to meet the specifications of MIL-S-10058 and MIL-S-10057 (Table 1). Another goal was to make the

Table 1: Performance Specifications

Requirement	M115A2 (MIL-S-10058)	M116A1 (MIL-S-10057)
Delay after Ignition	Whistle: 6-10 sec. Burst: 8-14 sec.	Burst: 6 to 12 sec. (Acceptance 8.5 sec. min.)
Burning Time	Photo Flash: Instantaneous Whistle: 2-4 sec	Photo Flash: Instantaneous
Sound Level	138 decibels at min. 75 ft. (Mil-S-10058H)	125 decibels at min. 75 ft. (Mil-S-10057H)

transition to a perchlorate-free simulator transparent to the Soldier. To do this, the team established a full set of end user requirements – sound, fragmentation, light, smoke, feel – with the objective of creating perchlorate-free simulators physically indistinguishable from the current M115A2 and M116A1 simulators.

The program was designed to mitigate technical risk from the start. ARDEC and ECBC competed to produce perchlorate-free prototypes. After exploring a large number of alternatives for a perchlorate-free oxidizer, ARDEC and ECBC selected different materials to develop two separate formulations for testing: one based on strontium nitrate (ECBC) and one based on potassium nitrate (ARDEC). During initial testing, the strontium nitrate formulation did not provide sufficient or consistent performance, so the potassium nitrate formulation was initially selected as the replacement. At the production scale, the potassium nitrate formulation did not perform as consistently as in the small-scale testing, so a third formulation of black powder and aluminum was investigated. The black powder formulation proved to be the most consistent at meeting all sound requirements and it was selected as the perchlorate replacement. All system requirements were met or exceeded, and the look, feel and performance of the perchlorate-free simulators will be exactly the same to the Soldier. In addition, this transition will require minimal changes to the current manufacturing line.

During qualification testing of the new formulation in the M115A2 and M116A1 simulators, active military trainers took part in a human factors assessment of the new design and reported that there were no significant differences noted between the new design and the older baseline design.

The new simulators formulation was approved and implemented through an Engineering Change Proposal (ECP) in April of 2007 to modify the Technical Data Package for the training simulators. This modification requires that the M115A2 and M116A1 training simulators are no longer produced using potassium perchlorate. Production of M115A2 and M116A1 simulators loaded with the perchlorate-free pyrotechnic formulation will begin in 2QFY2008, and the perchlorate-based versions will no longer be produced. The majority of perchlorate-based simulators will be out of the supply system by the end of FY2009. PM CCS invested additional funding to upgrade and expand the existing simulator production lines at Radford Army Ammunition Plant to take full advantage of the success of this program. This investment ensures full production capacity with the new formulations and will maintain munition availability, Soldier readiness and training capability.

Based on annual average usage numbers and the amount of perchlorate in the previous formulation, this project has reduced the amount of potassium perchlorate utilized on ranges and in Army ammunition plants by up to ten tons per year, benefiting Soldiers and surrounding communities by greatly reducing the potential for perchlorate exposure. In addition to reducing perchlorate used in the M115A2 and M116A1 simulators, the Perchlorate Replacement Team strives to identify other potential horizontal integration opportunities for these perchlorate-free formulations. RDECOM is directly leveraging this research to develop perchlorate replacements in other weapon systems including the M117/M118/M119 Family of Booby Trap simulators and the M274 Smoke Signature Practice Warhead for

Simulators create battlefield conditions during training.

the Hydra 70mm Rocket system as part of the U.S. Army Environmental Quality Technology Ordnance Environmental Program.

M116A1 used to simulate IED attack.

Team Communication and Coordination

Communication and coordination was a key factor in the Perchlorate Replacement Team's success. The Perchlorate Replacement Team combined environmental personnel with the technical energetics community to develop an environmentally preferable solution. This required communication between the groups to ensure that all goals were met. RDECOM managed the environmental aspects of the program, while USAEC sustainable range personnel and USACHPPM toxicologists played key roles in defining the impact of continuing to train with perchlorate-based munitions and ensuring that the replacement formulations would be environmentally preferable. RDECOM and USACHPPM analyzed environmental impacts of all candidate pyrotechnic ingredients and compositions, plus other simulator components such as fuses, coatings and adhesives, and provided expert recommendations in support of all key program decisions and down-selections. ARDEC and ECBC provided monthly reports to RDECOM to promote communication and ensure that all new formulations met environmental criteria as early in development as possible. The entire team met for regular IPRs to update the status of the program.

The manufacturer (Pyrotechnique by Grucci) played an integral role in assessing feasibility and producibility of the candidate materials. Grucci was involved from the start of the program and provided input into material development. The Grucci manufacturing facilities at Radford Army Ammunition Plant produced all limited scale production runs used in the testing and demonstration of the perchlorate-free simulators. In addition, Grucci hosted several IPRs, production plant tours and functional tests at their facility.

Incorporating ESOH Integration into Systems Engineering

The program was managed through the complete lifecycle engineering concept. Environment, Safety and Occupational Health (ESOH), factors were considered in all aspects and decisions throughout the entire life-cycle of the munition. The program considered post-production and fielding issues including manufacturing, Department of Transportation (DOT) Transportation Hazard Classification, depot storage, Soldier usage and demilitarization as part of the complete life cycle. The new design will not add any unacceptable risks or liabilities in these post developmental areas.

ESOH Risk Management

First and foremost, the simulator perchlorate replacement effort was an environmentally-driven program. Therefore, the new materials had to be environmentally preferable when compared to perchlorate. USACHPPM was tasked to determine if the newly developed materials were more environmentally benign than the current formulations. USACHPPM developed the Environmental Health Assessment (EHA) program to support this effort by evaluating the ESOH impacts of replacement compositions and systems through a step-wise, phased approach to determining the environmental impacts of perchlorate replacements. USACHPPM worked with project leaders in parallel with their research to develop EHA reports for the perchlorate

replacements. This ensured that any potential environmental impacts of the new energetic formulation were known and that the alternatives had a significantly lower overall environmental impact than the current materials. This program made environmental performance as important as energetic performance. The EHA program has been implemented in the entire Environmental Quality Technology Ordnance Environmental Program and a similar program is being adopted by the Emerging Contaminants Directorate.

In order to assess and manage risks associated with environmental impacts, system safety and health hazards, PM CCS prepared and maintained a Programmatic Environment, Safety and Occupational Health Evaluation as required by DoD Instruction 5000.2, a Life Cycle Environmental Assessment per National Environmental Policy Act guidelines and a Health Hazard Assessment by USACHPPM on the perchlorate-free simulators.

The ARDEC Safety Office and the Army Safety Center issued Final Hazard Classifications (FHC) for both perchlorate-free simulators. The FHC for the perchlorate-free simulators will stay the same as for the previous formulation. There will be no additional hazards associated with implementing the perchlorate-free formulation.

Potential life cycle cost avoidances from implementing the perchlorate-free formulation include reducing range and ground water cleanup for perchlorate contamination, mitigating legal liability associated with perchlorate contamination and limiting training restrictions on key U.S. war fighter training ranges that would result in less than optimal training levels and Soldier readiness.

Hazardous Materials Management and Pollution Prevention

This program did not introduce any new hazardous materials or wastes. The Perchlorate Replacement Team took steps to select materials that posed the least risk throughout the life cycle of the system. Environmentally preferable products were identified and tracked for inclusion in technical manuals and authorized materials. This was assessed and confirmed by the USACHPPM, Army Developmental Test Center, Army Evaluation Center and the DOT. No new waste streams were generated that exceeded the risks or severity of the baseline design.

External Coordination

The Perchlorate Replacement Team coordinated with stakeholders throughout the entire process. The entire program was structured around meeting user requirements and requests. The Energetic Materials Qualification Board Integrated Project Team (IPT) influenced the team's activities. This board was responsible for assessing the necessary material characterization tests performed and the results that were acceptable before the Perchlorate Replacement Team could proceed with the perchlorate-free formulations. The Insensitive Munitions (IM) IPT assessed the new candidate munitions for the proper IM testing and the test results and the new formulation meets all requirements.

The Perchlorate Replacement Team provided input to Mr. Alex Beehler, Assistant Deputy Under Secretary of Defense (Environment, Safety & Occupational Health), before he testified before the House Committee on Energy and Commerce on April 25, 2007 to address the DoD's usage and approach to remediation of perchlorate ion activities. The team's efforts were highlighted to show that the DoD is actively pursuing perchlorate replacements where possible.

CONCLUSION

Through the hard work of the Perchlorate Replacement Team, the Army has greatly reduced the potential for the release of perchlorate into the environment. This project alone reduced the amount of potassium perchlorate utilized on ranges and in Army ammunition plants by up to ten tons per year. To put that in perspective, that amount of perchlorate is enough to contaminate 70 billion gallons of water at the 24.5 ppb threshold. This is roughly 200 times more water than the Tidal Basin in Washington, D.C. contains or nearly twice as much as the world-wide consumption of bottled water in 2004. This will greatly benefit Soldiers and their friends and families in the surrounding communities by eliminating a source of perchlorate used on training ranges. The team has eliminated the possibility that the military's future use of these simulators will contaminate drinking water with perchlorate.

FY 2007 Secretary of Defense Environmental Awards

Camp San Luis Obispo, California ARNG

Natural Resources Conservation, Small Installation

Sustaining the Environment for a Secure Future

Camp San Luis Obispo, California ARNG

Natural Resources Conservation, Small Installation

SUMMARY

Established in 1928, Camp San Luis Obispo is the primary training site for the California Army National Guard (CAARNG). The mission of the installation is to provide a full spectrum of support for live and constructive training in support of professional development and individual and company level collective training for Army National Guard, Army Reserves, active Army and other military Services. With a total of 5,700 acres, the installation provides a variety of ecosystems for training, including chaparral, scrub, montane, and hardwood-conifer ecosystems, as well as a riparian ecosystem that is the habitat for three federally-listed endangered species.

Natural resources management leadership at Camp San Luis Obispo has enhanced the quality of life for the installation and the community through the installation commitment to community education, the protection and conservation of endangered species, and the prevention of soil erosion that can effect both the training mission and water quality around the installation. Camp San Luis Obispo effectively uses partnering with the interests of natural resources management agencies, private conservation groups, regulatory agencies and the local community to conserve resources while providing an optimal atmosphere for military training. The installation has also leveraged funding from partners to implement INRMP projects. The success of the Camp San Luis Obispo and CAARNG's Natural Resources Conservation Program reflects a strong commitment to the conservation of current natural resources.

"The Camp San Luis Obispo natural resource program proves that a small installation with limited financial resources can use basic conservation principles, extensive partner relationships and imagination to enhance the environment and, consequently, the mission."

- Tom Vorac, Forester,
U.S. Army Environmental Command

Camp San Luis Obispo Accomplishments:

- Exempted in 2006 from Critical Habitat designation for the California red-legged frog by the U. S. Fish & Wildlife Service based on the implementation of the installation INRMP.
- Awarded the California 2007 Governor's Environmental and Economic Leadership Award for Ecosystem and Watershed Stewardship based on the Dairy Creek erosion control project which stabilized several drainages leading directly to the riparian corridor. Stabilization efforts supported compliance with the Clean Water Act, protected habitat of multiple endangered species and species of concern, and kept training lands available to the war fighter.
- Partnered in 2006 with the Land Conservancy of San Luis Obispo through the Army Compatible Use Buffer Program to acquire 315 acres to prevent urban encroachment on important training areas.
- Reduced fire hazards and fuel loads by conducting prescribed burns on approximately 300 acres annually. Prescribed burning keeps training land suitable for military maneuvers and enhances its use by migratory grassland birds.
- Leveraged over $441,500 in funding from eight different partners to implement INRMP projects.
- Restored 8,000 native plants on the site of a former chromium mine as part of an erosion control project.
- Controlled the spread of purple star and wooly distaff thistle, invasive species with large spines that hinder the ability of the military to train and can cause injury to Soldiers.

On the cover: U.S. Army Soldiers from the California Army National Guard conduct fire team movement techniques during mobilization training. (U.S. Army Staff Sgt. Russell Lee Klika)

INTRODUCTION

Established in 1928, Camp San Luis Obispo is the primary professional training site for the California Army National Guard (CAARNG). The mission of Camp San Luis Obispo is to provide a full spectrum of support for live and constructive training in support of professional development and individual and company level collective training for Army National Guard. Other entities, including active Army, Army Reserves and other military Services, utilize ranges, training areas and classroom facilities. The installation also hosts the 223rd Infantry Regiment, which is the regional schoolhouse for Non Commissioned Officers and Officer Development. Camp San Luis Obispo has about 400 full-time staff.

Camp San Luis Obispo is a 5,700 acre installation packed with a variety of ecosystems. The chaparral/scrub/montane hardwood-conifer ecosystem covers approximately 32 percent of the training site. The grassland ecosystem covers approximately 47 percent, and the oak woodland ecosystem covers approximately six percent. The riparian ecosystem covers approximately one percent along intermittent and perennial streams. Approximately 44.46 miles of streams help make up the Morro Bay Watershed, which includes 11 percent of Camp San Luis Obispo.

The installation's Integrated Natural Resources Management Plan (INRMP) was completed in November of 2001 and was last reviewed for operation and effect in February of 2007 by statutory stakeholders. Goals and objectives were examined and projects involving soil erosion and endangered species were both updated and developed. Efforts to manage natural resources at Camp San Luis Obispo highlighted in the INRMP have achieved preservation of 3,000 acres – over 60 percent – of the installation in its natural state.

BACKGROUND

The goals and objectives of Camp San Luis Obispo's INRMP include extensive environmental work and initiatives to ensure ranges and training areas are sustained to serve the training needs of the military for both the immediate and long term future. In order to meet training demands, the installation addressed the impacts to threatened and endangered species. Working with the U.S. Fish and Wildlife Service, the installation currently operates under two biological opinions; one that allows for maintenance of San Benito Creek, and another that addresses grazing in the Chorro Creek bog thistle enclosure.

The goals, objectives, projects and timelines outlined in the INRMP have been incorporated into the installation's Environmental Management System (EMS). The goals and objectives are periodically measured and monitored to ensure progress is being made and that they are still suitable and adequate for the constantly evolving mission of the installation. This proactive management ensures that the installation's senior leadership is aware of and appropriately mitigates risk to the mission and the environment.

The Camp San Luis Obispo natural resources management program is managed jointly between the Conservation Branch of the Environmental Directorate at the State's Joint Forces Headquarters (JFHQ) and the headquarters staff at Camp San Luis Obispo. The conservation branch staff includes a senior environmental planner who also serves as the program manager, four biologists and a cultural resources specialist. Three members of the staff are state employees and six are contractors. The conservation staff is complemented by the integrated training area management (ITAM) coordinator and a land rehabilitation and maintenance (LRAM) specialist.

PROGRAM SUMMARY

A milestone of Camp San Luis Obispo's Natural Resources Management Program was validated in 2006 when the U.S. Fish and Wildlife Service determined that the installation's INRMP provides a conservation benefit to the California red-legged frog and did not designate critical habitat on the installation. The INRMP objective of conserving threatened and endangered species in accordance with the Endangered Species Act also worked to the Army's advantage by ensuring the installation's continued ability to support training and operations.

Another milestone came in 2007 when Camp San Luis Obispo staff completed the Dairy Creek Erosion Control Project. Land was stabilized in multiple

riparian corridors with increased native vegetation and tree plantings to stave off erosion. Camp San Luis Obispo staff complied with the Clean Water Act and the Endangered Species Act by sustaining and protecting these riparian corridors used by multiple endangered species. These efforts won the CAARNG the 2007 California Governor's Environmental and Economic Leadership Award for Ecosystem and Watershed Stewardship. Soil stabilization and erosion reduction efforts meet the INRMP objectives of sustaining training lands through rehabilitation and management of natural resources within the spirit and letter of environmental laws, including the Clean Water Act.

Sustaining and protecting riparian corridors won the CAARNG the 2007 California Governor's Environmental and Economic Leadership Award for Ecosystem and Watershed Stewardship. It also stabilizes the corridors for use as training areas.

To better manage for encroachment and its affects on training and natural resources, the installation began partnering, in 2006, with the Land Conservancy of San Luis Obispo. Camp San Luis Obispo, as part of the Army Compatible Use Buffer (ACUB) program, acquired 315 buffer acres that secure the training mission by preventing urban encroachment. This is the first step of the ACUB process in conserving up to 1,500 acres of land from 72 separate tracts of land, with the primary focus being on land that will affect range operations, followed by land with water rights to the Chorro Reservoir Watershed. The process of installation buffering is an objective of the INRMP, specifically ensuring no net loss in the capability of installation lands to support existing and projected military training and operations.

ACCOMPLISHMENTS

Program Management

The installation ITAM and Natural Resources Management staffs meet regularly with installation training support, ITAM program staff and associated facility operations personnel to:

- Map out suitable locations for training operations and activities, and include timelines.
- Address conservation of training lands and any required restoration efforts.
- Examine other topics (endangered and sensitive species, prescribed burning, grazing issues) that training support needs to be aware of .

The installation uses the National Environmental Policy Act (NEPA) to make informed decisions to determine natural resources impacts on projects like training activities and construction. The INRMP objective of ensuring the Camp San Luis Obispo Natural Resources Program is coordinated with installation organizations is met.

Camp San Luis Obispo has a number of projects within its INRMP to support the installation's goals and objectives. The installation has implemented a large percent of INRMP projects identified over the last two years. To use money most efficiently, the installation has prioritized projects for implementation and has worked hard at pursuing alternate funding streams and methods to accomplish INRMP projects. Partnerships (Table 1) and cost savings related to partnering (Table 2) have allowed Camp San Luis Obispo to implement a number of projects that have saved the installation over $441,500.

Best management practices learned on Camp San Luis Obispo are translated to other installations in the region, including Camp Roberts Training Site. By providing best management techniques, (erosion control and wildlife management), among multiple installations, funding can be allocated for projects that produce the greatest benefits.

Mission Enhancement

All installation activities at Camp San Luis Obispo are designed to maintain and enhance the quality of training lands for natural resources and Soldiers.

Table 1: Key Partnerships

Partner	Cooperative Activity
Central Coast Regional Water Quality Control Board	Testing areas for site drainages and monitoring sediment loads and turbidity.
U.S. Fish & Wildlife Service	Cooperative partner for development and implementation of the installation's INRMP. This includes the management of federally listed T&E species.
California Department of Fish and Game (CDFG)	Cooperative partner for the development and implementation of the installation's INRMP.
Morro Bay National Marine Estuary Program (MBNEP)	Partnership in the management of migratory fish and protection of Morro Bay National Estuary.
California Department of Forestry	Land management in conjunction with Los Padres National Forest and watershed protection.

Table 2: Partnership Cost Savings

Activity	Total Funding	Partners	Partner Funding	CAARNG/ NGB Funding
Watershed Assessment	$155,000	CDFG, MBNEP, Pacific Watershed Associates, CA Polytechnic University	$143,500	$11,500
2006 ACUB Program	$448,000	LCSLO and MBNEP	$98,000	$350,000 (federal funding-OSD)
2007 ACUB Program	$350,000	LCSLO, MBNEP and the City of San Luis Obispo	Unknown at this time	$350,000 (federal funding-NGB)
CCC Watershed Crew-2007	$15,000	California Conservation Corps and MBNEP	$15,000 (grant)	$0
CCC Watershed Crew-2006	$10,000	California Conservation Corps and MBNEP	$10,000 (grant)	$0
Dairy Creek Management	$15,000	MBNEP	$15,000 (grant)	$0
Cattle/ Wildlife Water Sources Development	$100,000	NRCS	$100,000 (grant)	$11,400
Riparian Fencing	$60,000	MBNEP	$60,000 (grant)	$0

Prescribed burns not only create better habitat for grassland birds, but also reduce fuel loads within live fire impact areas. In the case of Camp San Luis Obispo's erosion control projects, road and land stabilization ensures continued access to training areas, while grazing programs improve area quality by reducing shrubs, which can impede equipment mobility and make traversing training lands unsafe for Soldiers. Camp San Luis Obispo enjoys extraordinary integration and coordination between Command, Environmental, ITAM and Facilities directorates. ITAM and Natural Resources staffs work together with trainers on a daily basis to ensure all environmental and training needs are fully compatible.

Bank stabilization with native vegetation staves off soil erosion.

Land Use Management

The Camp San Luis Obispo grazing lease returns a maximum of $40,000 to the installation, depending on any work-in-kind performed by the lessee. Use of these reimbursable funds is at the discretion of the commander, but traditionally, monies have been used for projects like pasture and perimeter fencing and cattle guards. The agricultural lease raises approximately $1,500 a year. This money is received back at the installation in the form of reimbursement dollars that are available for implementing INRMP activities, such as soil erosion and threatened and endangered species projects. Cattle grazing helps reduce wildfire fuel loads (a critical issue in California) and manage impacts of invasive species while creating open pastureland for training.

Camp San Luis Obispo lies within the headwaters of the Chorro Creek watershed, which drains into the protected Morro Bay Estuary, and contains two tributaries that are designated as significant evolutionary units for the federally endangered steelhead trout. Water conservation and erosion/sediment control are critical for steelhead trout and ensures that sedimentation concerns do not interrupt the trout lifecycle.

The remediation at a former chromium mine is in its second year of implementation. The first season (2006) of restoration involved planting approximately 8,000 native plants. Vegetation is monitored continuously with photo points to track plant survival and establish an erosion control baseline. As part of ecosystem management and sustainability, 45 different seed species were collected on site for erosion control. The overall project is stabilizing soils and preventing negative sedimentation impacts to sensitive species in Chorro Creek and Morro Bay National Estuary.

Sustainable land rehabilitation and maintenance is a very important component for the installation's ITAM program. Training lands that are not maintained can become unsuitable for training (e.g., soil erosion, vegetation depletion) and in turn reduce the training footprint on the installation. Maintaining lands suitable for training meets the INRMP objective of ensuring no net loss in the capability of installation training lands to support training.

Forest Management

Camp San Luis Obispo does not have an active forestry program but prescribed burning does occur on impact ranges to reduce fuel loads, maintain ecological health, and improve training site quality. Approximately 300 acres are burned annually, creating ideal conditions for nesting grassland birds and keeping large expanses of training lands open.

Fish and Wildlife

Three federally endangered species (Chorro Creek bog thistle, steelhead trout and California red-legged frog) are found on Camp San Luis Obispo. Habitat exists on the installation for two other species (California condor and Least Bell's vireo) to potentially occur.

Camp San Luis' INRMP protects the California red-legged frog.

There are no state listed species, other than the Chorro Creek bog thistle which is both a state and federally listed species, found on the installation.

Besides the endangered species found on Camp San Luis Obispo, the installation must consider the management of other sensitive species. Seven animals found on the installation are federal species of concern and California Department of Fish and Game Special Concern Species. Thirteen other animals are solely California Department of Fish and Game Special Concern Species.

The team is well aware that ecosystem management is the common goal for both the installation and the state and that natural resources management does not end at the installation fence line. Camp San Luis Obispo has begun to identify areas where the goals of the State Wildlife Action Plan (SWAP) can be incorporated into the installation's INRMP and vice-versa. This includes work with sensitive bird species and the Chorro Creek bog thistle. To assist in the process of communicating with the state and sharing ecosystem oriented concepts, several staff members have attended a DoD sponsored SWAP workshop.

Installation Outreach

Due to the large diversity of migratory birds on Camp San Luis Obispo, the local Audubon Society frequently conducts birding fieldtrips and their annual Christmas bird count on the installation. The establishment of ACUB lands outside the fence line will expand public recreation opportunities, including hiking and biking. Camp San Luis Obispo offers non-profit organizations the opportunity to hike some of the existing trails on the installation.

The Environmental Office staff botanist works with a group of Southern California botanists who share practical information on the management of botanical resources. She also works with the San Luis Obispo Weed Management Area group addressing and coordinating invasive plant species management throughout the county.

Camp San Luis Obispo hosted a workshop put on by the UC Berkeley Jepson Herbarium. Attendees were given a tour of some of the special botanical areas on the installation with emphasis on viewing sensitive species, like the Chorro Creek bog thistle, and education on the installation's management of these species.

Prescribed burning destroys invasive plants and makes training areas safer for Soldiers.

ITAM staff has supported the county of San Luis Obispo botanical garden by securing plant material (*Juncus* spp.) to rebuild a Native American structure. This activity supports the INRMP objective of providing human-valued products of renewable natural resources.

Invasive Species Control and Pest Management

Invasive species that harm biodiversity and impinge upon training are being managed both mechanically and chemically, when necessary. Several invasive plant species hinder training at Camp San Luis Obispo, including purple star and wooly distaff thistles, both of which occur over much of the Camp San Luis Obispo training lands. These plants have very sharp spines that can cause pain and injury to troops, especially during dismounted maneuvers. The environmental office and ITAM staff have coordinated their efforts to control these and other invasive plants by mapping invasive locations, prioritizing areas and plants to be treated, developing treatment strategies and funding treatment costs. ITAM and the Environmental Office have also worked together with the California Conservation Corps (CCC) for removal of purple star thistle growing in close proximity to the federally and state endangered Chorro Creek bog thistle. The installation has an up to date pest management plan and an invasive species component of the INRMP that are used to assist installation personnel with the control of invasive species and pests. The plans are reviewed annually and updates are made as needed. All application of herbicides and pesticides is done by certified applicators in accordance with state and federal laws.

Conservation Education

Camp San Luis Obispo staff participates in the annual San Luis Obispo Earth Day and Pearl Harbor Day celebrations, manning booths at the events to educate the community about environmental activities at Camp San Luis Obispo. The installation also actively works with local groups, specifically the Boy Scouts, through tree planting and environmental education.

The Grizzly Youth Academy, a 22 week resident program for second chance kids, is located on base. The purpose of the program is to take advantage of the Camp San Luis Obispo environment through hiking and outdoor education. The Camp San Luis Obispo staff provides tours and uses program cadets on some of the installation's projects, like planting native flora, as part of their job shadowing program.

Achievement House is a school for the mentally handicapped and is a base tenant. Natural resources staff have taken participants on nature tours, seed collecting walks and assisted them in growing plants for installation projects, including Dairy Creek restoration and stabilization.

The Camp San Luis Obispo staff is committed to sharing the lessons learned and successes achieved in regards to erosion, soil stabilization and threatened and endangered species management throughout the military. Staff attend the annual ITAM and other conservation conferences and workshops to discuss their land management techniques, stewardship and exchange best practices with multiple military agencies and states.

Community Relations

Community leaders and adult organizations are often invited to tour Camp San Luis Obispo to learn more about installation stewardship, including what training is occurring and its effects on natural resources of the region. The communities around Camp San Luis Obispo expect the installation to be good stewards of the land. By conducting tours of the installation, Camp San Luis Obispo is able to alleviate misconceptions about training impacts on installation lands and educate the public about land management and current projects that prevent soil erosion, control invasive species, establish productive riparian areas and properly manage endangered species.

The California Men's Colony is a state prison that resides just south of Camp San Luis Obispo. The ITAM coordinator has worked inside the prison with vocational landscape department personnel and has provided classroom assistance in native plant propagation and culture. Plant material grown at the California Men's Colony has been used in projects, including Dairy Creek and mine restoration.

The natural resources staff is heavily active in organizations outside of Camp San Luis Obispo. Wildlife biologists Michael Moore, Jen Moonjian and Paige Farrell are members of the Wildlife Society. The Environmental Directorate's botanist, Jody Olson, is a member of the California Native Plant Society, the California Invasive Plant Council and the California Society for Ecological Restoration. The LRAM Coordinator, Pete Waldburger, is a member of the local chapter of Small Wilderness Area Preserve.

CONCLUSION

Natural resources management leadership at Camp San Luis Obispo has enhanced the quality of life for the installation and the community through their commitment to community education, the protection of listed species and the prevention of soil sedimentation. Components of the Natural Resources Program effectively integrate Camp San Luis Obispo's chain-of-command with the interests of natural resources management agencies, private conservation groups, regulatory agencies and the local community to conserve resources while providing an optimal atmosphere for military training and readiness. The success of the Camp San Luis Obispo and CAARNG's Natural Resources Conservation Program reflects a strong commitment to the conservation of current resources and supports the military mission. The U.S. Fish and Wildlife Service recognized Camp San Luis Obispo for its efforts towards managing threatened and endangered species and its maintenance of training land thorough erosion control and stabilization. Camp San Luis Obispo has ensured that sustainable conservation on post will continue, regardless of any staffing changes or change to the military mission.

Problems at Dairy Creek were solved using bank stabilization techniques.

FY 2007 Secretary of Defense Environmental Awards

AVCRAD Connecticut ARNG

Pollution Prevention, Installation

Sustaining the Environment for a Secure Future

AVCRAD Connecticut ARNG

Pollution Prevention, Installation

SUMMARY

Aircraft painting innovations of the Connecticut Army National Guard (CTARNG) Aviation Classification Repair Activity Depot (AVCRAD) chromium replacement program set the standard within the aviation community for environmentally-sound painting practices. As a result of the success of AVCRAD's new non-chromium-6 painting system based on a water-dispersible chemical agent resistant coating, the Army Aviation and Missile Command is now revising its technical manuals for the military in favor of the new system. Soon chromium-6 will be eliminated at every Army aviation and maintenance facility, representing a tremendous breakthrough in human health and environmental protection. Accomplishments of the CTARNG Aviation Classification Repair Activity Depot in FY06-FY07 include:

- The switch to non-chromium products and the elimination of methylene chloride for depainting aircraft in favor of plastic media blast has cut the AVCRAD's paint shop hazardous waste stream by over 440,000 pounds annually. Potential disposal cost savings could be as high as $75,000.00 annually for the CTARNG over the next few years.
- The AVCRAD streamlined and improved hazardous material management with the implementation of its own EMS and is on track for ISO 14001 certification by FY09.
- The AVCRAD holds an aviation summit every two years that is attended by major private aviation corporations and military facilities to promote transferability of information regarding improved processes and alternative products.
- Due to these commitments, the CTARNG AVCRAD remains on track to convert from a large-quantity to a small-quantity waste generator and is striving to achieve a completely green aircraft maintenance program.

"Under Executive Order 13423, "Strengthening Federal Environmental, Energy, and Transportation Management," agencies are required to reduce the quantity of toxic and hazardous chemicals acquired, used, and disposed. AVCRAD's willingness to test and demonstrate the viability of alternative, non-chromium-based aircraft primers will help eliminate they Army's use of chromium-6, resulting in significant protection of human health and the environment. OFEE applauds AVCRAD for helping to meet the E.O. while achieving its mission."

- Dana Arnold, Chief of Staff,
Office of the Federal Environmental Executive

On the cover: U.S. Army Spc. Victor Piacente, of 1st Battalion, 102nd Infantry Regiment, Connecticut National Guard, scans his sector while his convoy stops for a break during an extended patrol in the Gardez province of Afghanistan. (U.S. Army photo by Staff Sgt. Michael Bracken)

INTRODUCTION

The Connecticut Army National Guard (CTARNG) and its Aviation Classification Repair Activity Depot (AVCRAD) 1109th implemented the aviation industry's first non-chromium-6-based coating and painting system; a breakthrough for human health and environmental protection. AVCRAD provides deployable aviation logistics support to Army aviation as well as aircraft repairs, service, test flights and maintenance for the 14 states in its region. The AVCRAD team initiated and now manages the effort of chromium-6 elimination in both military and private organizations. Its main partner is the United States Army Aviation and Missile Command (AMCOM). Responsibilities include:

- *Support Deploying Forces Reception, Staging, onward movement and Integration (RSOI)* – The team performs various maintenance tasks to prepare aircraft for shipment and onward movement, including scheduled and unscheduled maintenance and repairs, disassembly and reassembly of aircraft and coordination of air and sea ports of embarkation and debarkation worldwide.
- *Establish and Operate Theater Aviation Maintenance Program (TAMP)* – TAMP is a centrally-coordinated and controlled aviation logistics sustainment program that assists units for deployment and redeployment, provides technical assistance and supports increased operational tempo to sustain Army aviation operations.
- *Assigned Depot Level* – The AVCRAD provides National Maintenance Program repairs, limited depot airframe repair, aircraft painting and major airframe repair.
- *Classify, Inspect, Manage Aviation Class IX* – The AVCRAD is the regional aviation parts warehouse operation for 25% of the Army National Guard aviation units in the Northeastern United States.

The AVCRAD is located in Southern Connecticut and is a tenant of the Groton New London Airport in New London County where it occupies approximately 20 acres. The airport is bounded by the Poquonock River and Bluff Point State Park Peninsula to the northeast. East is Baker Cove, an estuary of Fishers Island Sound. The pristine Long Island Sound is to the south and southwest. Conrail railroad tracks and

The AVCRAD Paint Force accomplished all material substitution testing. Team members are pictured from left to right: Randy Peckham, John Kerouack, Terry Zurn, Steven Petit, Mark Cinotti, Rorry Williams, Patrick Cianciolo, Lindsay Saunders, William Lewerk, Thomas Newman, Scott Burdick, Astuti Giuseppe, & Louis Pemberton. Not pictured: Mark Perrault, and George Lewis.

Tower Avenue are to the west and northwest. The town of Groton (where AVCRAD resides) is located on the Thames River. During the 2000 census, the city's population was 39,907. Groton is the home of the Electric Boat Corporation, which is the major submarine contractor for United States Navy. The Pfizer pharmaceutical company is also a major area employer. The Avery Point section of Groton is home to a regional campus of the University of Connecticut. Groton is located in an area of large military presence with local economies heavily dependent upon the military; therefore, the political climate is generally highly supportive of the military and government operations.

The AVCRAD performs major aircraft repairs that cannot be performed at an Army Aviation Support Facility. The repair work consists of four operations: aircraft and engine repair, engine testing, aircraft stripping and aircraft coating. The AVCRAD employs over 300 military personnel and civil contractors and contributes approximately $60 million annually to the local economy.

BACKGROUND

One of the Army's greatest needs is to minimize the environmental footprint of its forces and systems to comply with federal, state, local and international

environmental, safety and occupational health (ESOH) regulations. Vehicle coating system application and removal represent a significant waste stream for the AVCRAD, constituting approximately 85% of the overall hazardous material use and waste disposal, and 50% of the air emissions at the facility. However, the requirement to provide tactical and life-cycle protection to these combat and support systems has driven the Army to use coating systems that are contrary to most existing and potential ESOH regulations. In October 2004, the Occupational Safety and Health Administration (OSHA) issued a proposed new rule that significantly lowered permissible exposure limits (PEL) for hexavalent chromium (Cr^{+6}), a key compound in current coating systems. The PEL was reduced from 0.57 mg/m^3 to 0.001 mg/m^3, and the proposed rule also mandated significant control requirements on facilities to prevent inadvertent inhalation exposure to hexavalent chromium compounds and waste materials.

The Program Executive Office (PEO) for Aviation initiated a testing program that evaluated potential replacement coating system components in order to address the ESOH issues. The program tested individual coating components – pretreatment, primer and chemical agent resistant coating (CARC) top coat – as a "coating system" to evaluate how it protects the test substrates. It also helped identify coatings that were non-chromate, low volatile organic compounds (VOC) and low hazardous air pollutants (HAP). The coatings' main use was for Army rotary wing aircraft exterior substrates, primarily aluminum alloys. The program also evaluated the compatibility of the selected coating system on other aircraft substrates including high strength steels, magnesium alloys and composite materials.

The Trivalent Chrome Process (TCP) is used for the pretreatment of aluminum substrates and requires process and material changes. TCP is a conversion coating material developed by Naval Air System Command (NAVAIR) that has nearly equivalent performance to the hexavalent chromium-based Alodine 1200S that was previously used. The TCP is now a commercially-available product manufactured by several vendors. The new TCP application process has three-primary steps that must be completed to provide the finished TCP conversion coating. The processes use new cleaners, require a deoxidation step following cleaning (new requirement) and end with the application of the TCP to the aircraft.

The new CARC top coats exceed the performance of the preceding versions and reduce the VOC and HAP emissions, thus aiding in compliance with the Clean Air Act regulations and State Implementation Plans (SIPs). The new CARCs leave a smoother, more mar-resistant finish coating. They are also more resistant to fading and chalking, which will minimize cosmetic painting requirements.

Coating Application

Prior to starting the new coating system application process, the AVCRAD team took the following steps:

- Stripped the test CH-47's old coating and repaired the fuselage.
- Repainted the interior spaces and preserved them with current procedures.
- Sprayed the TCP onto the aircraft exterior while it was still wet from the deoxidation rinse step.
- Performed all of the cleaning, deoxidation and TCP application steps with minimal suggestions from the technical representatives.
- Indicated the process was simple to understand and easy to perform.

The test program used two different epoxy-based primers. One was a solvent-based product conforming to MIL-PRF-23377 Type I Class N, and the other was a water-reducible product conforming to specification

The non-chromium-6 primer painted on this UH 60 Blackhawk helicopter is effective and safer for the environment.

MIL-PRF-85582 Type I Class C. The AVCRAD team applied the Class N primer to one-half of the aircraft located above the fuel cell sponsons and over the top of the fuselage. The Class C primer was applied to the other half of the aircraft on the fuel cell sponsons and below. The purpose of using two different primers on the same aircraft was to evaluate their adhesion and corrosion protection performance to minimize any potential differences in exposure during the test effort. The AVCRAD team applied the CARC coating conforming to specification MIL-DTL-64159 Type II after allowing the two different primers sufficient "flash off" time (nominally four hours) for initial cure.

After a successful field demonstration, the next steps were for AMCOM Life Cycle Management Command (LCMC) G-4 Environmental Division to coordinate the issuing of a Maintenance Information Message (MIM) to advise field activities of the new coating system process and materials. G-4 personnel will also revise pertinent technical manuals (TMs) and depot maintenance work requirements (DMWRs) to begin the transition to the new, non-hexavalent chromium coating system for all activities responsible for aviation maintenance and repair. The AMCOM G-4 Environmental Division will coordinate interim MIMs by advice activities of the new CARC coating specification changes and new primer coatings available for use on Army rotary wing weapon systems.

PROGRAM SUMMARY

The most important part of the environmental and health program was eliminating the chromium-6 coating process. This accomplishment took seven years of preparation before the Occupational Safety and Health Administration (OSHA) regulations on chromium-6 exposure were finalized. Chromium-6 is an extremely toxic compound that is widely used in aircraft paints and primers. The Primary Health Impairments & Effects that result from workplace exposure to hexavalent chromium (Cr(VI)) in humans are lung cancer, asthma and damage to the nasal epithelia and skin. Prior to 2006, OSHA limited exposure levels in aviation to 50 micrograms per cubic meter 50[mu]g/mL^3 of air over eight-hour time weighted averages. These limits were due to the adverse health effects and dangers (including potential for cancers) at higher exposure levels. This limit was reduced in 2006 to 25 micrograms per cubic meter of air 25 [mu] g/mL^3 over eight-hour time weighted averages for the aeronautic industry. Rather than simply change air filtration equipment, the AVCRAD found green alternatives to chromium-6 coatings that do not pose health risks. These substitutes also reduce the environmental harm caused by release or disposal of chromium-6.

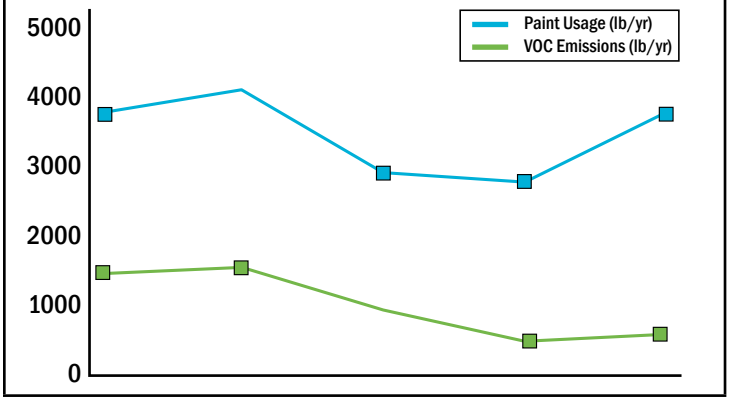
AVCRAD obtained approval from the Life Cycle Management Command, G-4 Environmental Division and AMCOM to begin use of an alternative primer non-chromium-based coating. This accomplishment was due to working relationships with National Guard Bureau (NGB), AMCOM and private industry aircraft manufacturers. After two years of rigorous product testing with these partners on an aging fleet, the new primer was deemed a suitable substitute in terms of its capacity to protect aircraft surfaces from corrosion with the added benefit of reduced health risks. Coordination, testing and information sharing was achieved without harm to classified or proprietary aviation information. This effort was possible via the collaboration of the organizations mentioned above.

Given that new OSHA regulations were put in place on May 30, 2006, AVCRAD's implementation of this material substitute paved the way for military, private and nautical aviation facilities to make the same change. This switch represents a significant reduction in the release of chromium-6 in wastewater as well as air emissions. With this change and earlier process improvements, the AVCRAD is nearly chromium-6-free for all aircraft painting elements, and will be entirely chromium-6-free upon exhaustion of current material inventories that still contain chromium-6. The CTARNG is transferring its knowledge of this product substitution to all other CTARNG facilities that use chromium-6. In the coming year, the AVCRAD anticipates that process changes will significantly reduce the volatile organic compound (VOC) and hazardous air pollutant (HAPS) emissions from the paint coatings applied at the paint booths, and achieve a "greener" aircraft.

Material Substitution

The AVCRAD Quality Control Office is the initial receiver of all Mil-Spec standards, technical manuals, maintenance requirements, etc. This office reviews all incoming material and disseminates the relevant information to top management. The management then distributes it to the end use level. This information includes requirements for the use of regulated substances or environmentally friendly alternative products. The AVCRAD utilizes internal Environmental Management System management review procedures to identify where environmentally friendly alternative products are approved for use and eliminate language requiring the use of regulated substances where approved. They then initiate the removal of language that previously called for the use of regulated products from all internal documents.

2003 - 2007 Annual Helicopter Paint Usage vs. VOC Emissions (lb/yr)



The AVCRAD maintains continuous communication with the Aviation Engineering Division to identify alternatives to harmful substances. Through this interaction, the AVCRAD is able to stay abreast of approved environmentally friendly alternative substances. Additionally, it has been a test bed for certain alternative products suitability for possible future use DOD wide.

The AVCRAD team utilizes exhaustive testing methods to determine alternative product suitability as an aviation facility. In the case of the non-chromium-6 primers, over 2,000 hours of exposure to the elements was completed prior to application of the primer to functional aircraft.

The UH 60 Blackhawk has non-chrome primer applied, which has improved adhesion over other existing primers.

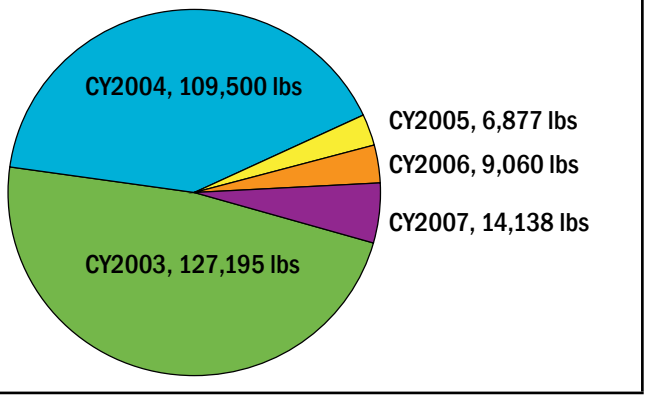
The AVCRAD eliminated both methylene chloride and methyl ethyl ketone from the paint stripping waste stream via the switch to water-based CARC paint. In addition to the benefits of removing such harmful chemicals, there is the potential to reduce future liability related to disposal. The waste stream is now only characteristically hazardous as opposed to being hazardous because of the presence of listed wastes. This allows the characteristic waste to be rendered non-hazardous through treatment prior to disposal, whereas a listed waste cannot be rendered non-listed through treatment.

Process Modification or Improvement

When the AVCRAD began operations in 1979, aircraft were etched with an alodine rinse that contained hexavalent chromium to prepare aircraft for the next stage of the painting process. Disposal of this waste stream cost the CTARNG approximately $45,000 annually. The alodine rinse is an effective method for etching aircraft prior to painting. However, the hexavalent chromium present in the alodine rinse is a known carcinogen that can be harmful both to applicators and as a disposed waste.

The AVCRAD now utilizes an alodine rinse containing trivalent chromium as opposed to hexavalent chromium for aircraft etching. Although disposal costs remain relatively the same, there is a health benefit gained by the use of the non-carcinogenic trivalent chromium. This reduces worker exposure to carcinogens as well as removes a known carcinogenic from the waste stream for disposal. Additionally, the

Annual Listed Hazardous Waste Generation Reduction from Painting Program at CTAVCRAD



AVCRAD reduced the quantity of alodine rinse applied utilizing a process change in 2003. This process change reduced material applied from approximately 40 gallons per aircraft down to approximately 5 gallons per aircraft. This reduced both exposure to the chemical and concentrations in the waste stream.

Immediately upon approval of the alternative products, the AVCRAD duplicated the process in its blade booth to paint aircraft rotor blades. The use of this technology in the blade booth had the additional benefit of reducing rotor blade weight by two pounds per blade, which extends blade life by allowing blade balance to be maintained for a longer period of time before the blade must be removed from service. This saves approximately $100,000 for each blade that stays in service. The following are recent pollution prevention (P2) initiatives at AVCRAD:

- Conversion from chromium-6 paint stripper. The AVCRAD targeted waste water containing alodine rinse and chromium by switching the paint operations to water-based CARC paints.
- Streamlining and improving hazardous material management with the implementation of an EMS that is on track for ISO 14001 certification by FY09. Detailed and accessible standard operating procedures (SOPs), records and monitoring data have helped raise awareness of and responsibility for P2 and material management throughout the entire facility.
- The AVCRAD's inventory and pharmacy system, HAZMART, improved overall material management through tracking and controlling material usage. Any hazardous material requests are reviewed by AVCRAD personnel to determine if more environmentally friendly products are available. The system also ensures that inventory data on hazardous material is up-to-date. This includes usage, shelf life, disposal and purchase procedures, location and safe handling.

"Environmental awareness is part of the culture of success at the 1109th AVCRAD. An effective and compliant program could not be accomplished without the dedication and discipline of all of our employees. We take our responsibilities to the environment and our employees seriously."

- Thomas E. Boland
COL, AV, CTARNG Commander
1109th AVCRAD

Program Management

In the past two years, the AVCRAD established a number of process and equipment improvements to reduce waste and virgin material purchase at the AVCRAD. The number one project milestone accomplished was the elimination of toxic chromium-6 from the aircraft coating processes. In addition, during the judging period, the AVCRAD eliminated chromium-based paint materials and processes and implemented non-hazardous materials and green equipment. The objectives of the P2 program at AVCRAD address various environmental issues, which include non-chrome and chrome-6-free aircraft coating. This use of alternative products reduces hazardous material use, disposal and air emissions.

These accomplishments were made possible by close coordination between AVCRAD personnel, CTARNG command, NGB and the CTARNG environmental office. The AVCRAD paint shop averages between 25 and 50 helicopters stripped and painted per year. P2 savings include the avoidance of significant hazardous waste disposal, fewer air emissions and increased recycling of spent plastic media. The switch to non-chromium products and the elimination of methylene chloride for depainting aircraft in favor of plastic media blast (as well as recycling the spent plastic media) has cut the AVCRAD's paint shop hazardous waste stream by over 440,000 pounds annually.

Potential disposal cost savings could be as high as $75,000.00 annually for the CTARNG over the next few years.

The AVCRAD staff always looks for ways to improve material processes, reduce waste and enhance safety and environmental stewardship. Due to its commitment, the CTARNG AVCRAD remains on track to convert from a large-quantity to a small-quantity waste generator and achieve a completely green aircraft maintenance program.

The AVCRAD has not only implemented an EMS to guide management, it has also worked with the U.S. Navy's Consolidated Hazardous Materials Reutilization Inventory Management Program (CHRIMP) to control hazardous material inventories.

This integrated management approach and the innovations above have allowed the AVCRAD to cut both waste streams and the costs associated with them. The staff learned from peers within the National Guard Bureau and to share their experiences and lessons-learned with other units. They attend workshops and conferences, such as the annual Integrated Compliance Workshop.

The elements of the AVCRAD's P2 and waste reduction program are transferable since their innovations are not necessarily unique to aviation facilities alone. Any paint shop worldwide could benefit from their material substitution and waste treatment improvements. Additionally, the team's approach to interagency cooperation could benefit all military branches to find better cost and process efficiencies. The AVCRAD's commitment to environmental protection endures via excellent standard operating procedures, management plans and eMS.

CONCLUSION

The AVCRAD's chromium replacement innovations set the standard within the aviation community. Private industry has already begun to adopt these material changes. AMCOM is now revising its technical manuals for the military due to the AVCRAD's substitution success. Therefore, chromium-6 will soon be eliminated at every Army aviation and maintenance facility and this is a tremendous breakthrough nationwide to human health and the environment.

The nature of the AVCRAD's work has limited opportunities for community and staff interaction. Because of this, outreach is largely directed at the military community. The AVCRAD staff looks at the CTARNG Soldiers and staff as ambassadors to their families, friends, employers and communities. The lessons the CTARNG soldiers learn are carried far beyond the AVCRAD or other CTARNG installations. With this attitude, the AVCRAD implemented a rigorous training program. All personnel, approximately 300 people, are trained annually in P2 and waste management, compliance and safety. The staff is also trained whenever a new process or equipment change is implemented. This training, along with the continuously demonstrated overall commitment to compliance and waste reduction, has made the AVCRAD one of the nation's leaders in both aviation maintenance and environmental stewardship.

FY 2007 Secretary of Defense Environmental Awards

Fort Ruger, Hawaii ARNG

Environmental Restoration, Installation

Sustaining the Environment for a Secure Future

Fort Ruger, Hawaii ARNG

Environmental Restoration, Installation

SUMMARY

For decades, Diamond Head has been the first natural feature that nearly seven million visitors and tourists see on approach to the Hawaiian Islands, whether they are traveling to Hawaii via ship or airplane. The State of Hawaii is committed to preserving the natural beauty of this very recognizable feature, and the Army is supporting the state's objective through the Diamond Head environmental restoration project developed by personnel at Fort Ruger. Many challenges had to be overcome: remediation of the site to a level commensurate with public use in an area currently open to the public, safe handling of unexploded ordnance, managing the project with the least impact possible on the local community and keeping the community informed of projects plans and milestones; and coordinating the efforts of approximately 20 state, local, and DoD agencies.

"Hawaii Army National Guard demonstrated that the environment can be cleaned up in a sustainable and cost efficient manner. Their creative approach to soil washing highlights their focus on environmental stewardship."

- Kristine Kingery, Chief, Cleanup Branch, Office of the Assistant Chief of Staff for Installation Management

Following is a list of the program's accomplishments in FY 2006-2007:

- Executed the cleanup project timeline without once closing the park to the public at an aggressive pace to accommodate city plans for a benefit concert at Diamond Head.
- Remediated 30,000 tons of soil in four months at a cost of only $3.8 million, realizing a projected savings of $8 million to $10 million.
- Removed and recycled over 14 tons of particulate metal from the Diamond Head Crater.
- Cleared the area of invasive plant species and promoted native vegetation growth.
- Benefited the local community by using local small businesses to achieve the cleanup.
- Worked directly with Diamond Head neighbors to accomplish the cleanup without negative impacts on the community by minimizing traffic noise and dust.

The level of quality outreach and communication, in combination with the program management and technical merit employed in the Diamond Head Crater restoration project, has helped to reinforce the Hawaii Army National Guard's long record as a good steward of the beautiful and sensitive environment of Hawaii, and as a good neighbor to the people who live there.

On the cover: An aerial view of Diamond Head Crater, Fort Ruger, HIARNG.

INTRODUCTION

The Hawaii Army National Guard (HIARNG) at Fort Ruger serves 300 military personnel and supports the surrounding local community of 200 on the slopes of Diamond Head, and over 50,000 people within close proximity. Fort Ruger has supported the Diamond Head facility since 1909. For 30 years its ranges were used for pistol and rifle qualifications. This former practice left the land with a legacy issue of lead ammunition fragments in the range soil. The land mass of the restoration site contains 20 acres, all of which the HIARNG is dedicated to restoring.

The environmental and geographical settings of the site are quite unusual – it is actually inside Diamond Head Crater, which is a extinct volcano. Diamond Head Crater is now a state monument managed by the State Department of Land & Natural Resources. It is located in Honolulu, to the east of Waikiki on the south shores of the island of Oahu. The site is also home to a small wetland. Since active use of the ranges ended in the 1960s, the site has been maintained by the Hawaii Army National Guard Environmental Office, the State Department of Defense and the State Department of Land & Natural Resources (State Parks Division).

For decades, Diamond Head has been the first natural feature that eight million visitors and tourists see, whether they are traveling to Hawaii via ship or airplane. Diamond Head Crater is a symbol of Aloha for the State of Hawaii. As such, the State of Hawaii is committed to preserving the natural beauty of Diamond Head Crater. The Army is supporting the state's goals through the environmental restoration program at Diamond Head, developed by personnel at Fort Ruger.

BACKGROUND

Restoration Team

The Fort Ruger environmental restoration team has developed, and is implementing, a master plan that has been approved by the state of Hawaii. The HIARNG staffing and management approach consists of top level management (an environmental officer and the deputy) and managers for the compliance and conservation environmental pillars, as well as National Environmental Policy Act (NEPA), geographical information systems (GIS), and cultural and natural resources staff. The entire environmental staff performed as a team on this project to address any and all issues. Within the past 12 months, the HIARNG environmental office has accomplished a

A view from the summit of Diamond Head looking east. In the center is the project processing site. Immediately beyond the rim is the district of Waialae Kahala (other wise known as the gold coast). In the far background is where Hanauma Bay (a wildlife preserve) is located.

tremendous milestone in this effort with a large-scale restoration and remediation project involving two ranges and cleanup of 30,000 tons of soil.

Local Community Agreements

From the start, the community was thoroughly involved with the project. The Fort Ruger environmental restoration team ensured that it briefed not only the scope of the project, but also the actual remediation process and the technology that would be used. The team addressed all concerns that came to their attention in town meetings, discussing issues such as noise, dust, traffic, security, lighting, work hours, project length, health and safety concerns, responsibilities, project manager availability, resource management, pollution prevention, solid waste management, recycling and hazardous materials control.

UXO Removal Initiative

Of particular concern was how the team would handle unexploded ordnance/munitions (UXOs). The Fort Ruger environmental restoration team reviewed and adjusted the plan to ensure that any UXO discovered was handled immediately and safely. Further dedicating themselves to the community, HIARNG staff ensured that everyone knew and understood the UXO plan to include discovery, notification, security, safety, assessment, disposal and communications.

PROGRAM SUMMARY

The mission of the Diamond Head Crater restoration project is threefold:

- Conservation: Continue endangered species recovery, noxious weed eradication and awareness training and education for Hawaii's youth; safeguard project team members and the public.
- Compliance: Continue to monitor for regulatory compliance and implement pollution prevention initiatives and affirmative procurement actions, and increase waste stream diversion.
- Land Management: Continue to implement restoration, GIS, and integrated training area management projects to protect and enhance the natural resources of Hawaii's Army National Guard training lands. Attain sustainability in training lands. Improve design, management and use of lands to ensure long-term sustainability.

A view from the summit of Diamond Head looking down at the processing site and its equipment.

The first challenge the Fort Ruger environmental restoration team tackled with this restoration project was figuring out what technology would be the best solution, considering all the aspects and impacts. The installation's environmental management system (EMS) (ISO 14001) was used to inform all aspects of the restoration project. The next challenge was to facilitate communications among the many project team organizations, and serve as a communications contact for the community. One person was chosen for these responsibilities, which included resolving project and contractor issues, managing any extraneous issues among partner agencies and informing the public of project plans and progress. The purpose of choosing a single, dedicated contact for these responsibilities was to ensure complete and accurate communications.

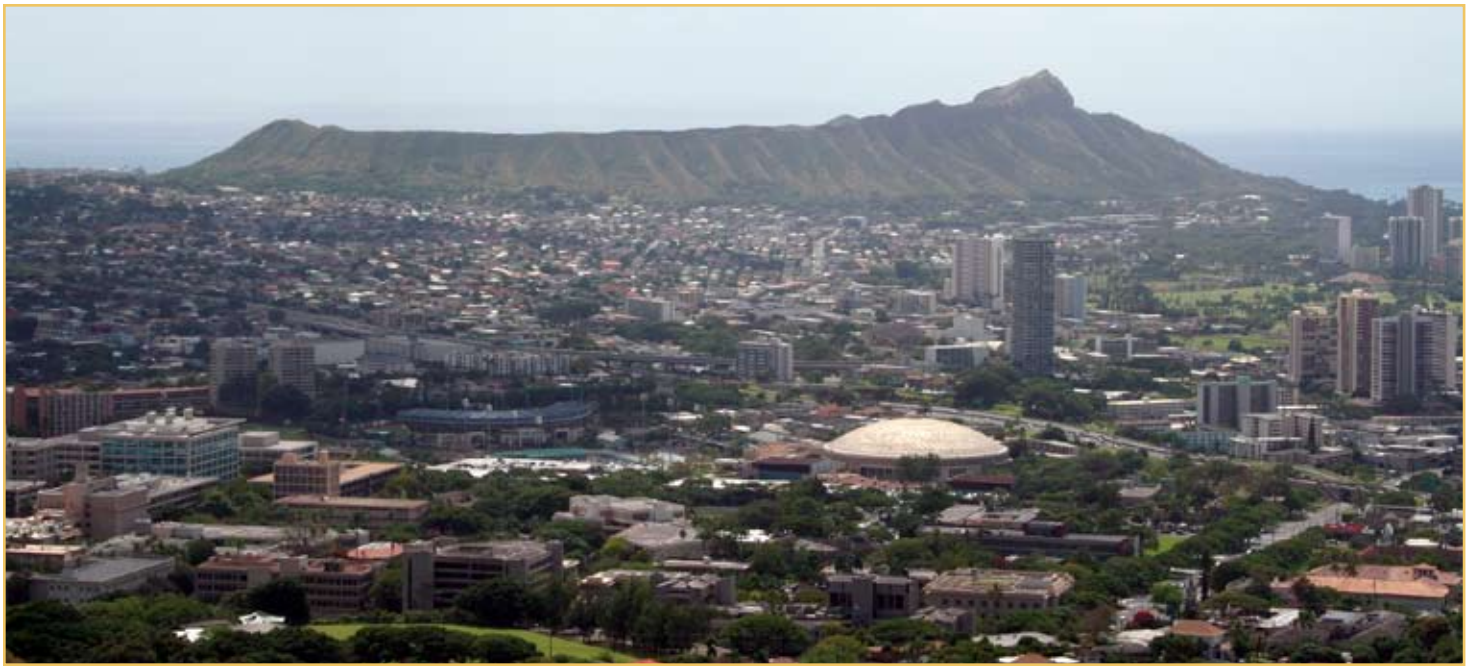
There were three main challenges to overcome once the project was approved and funded. The first was communication and information sharing with the community and involved agencies. As a

local landmark with historical importance, it was imperative that the community and all involved stakeholders were kept apprised of project milestones. The HIARNG environmental restoration team provided information to the public through community meetings, neighborhood boards and advisory council meetings, all held throughout the project lifecycle. The restoration team also maintained contact with all affected state and Army agencies.

- United States Army Corps of Engineers
- United States Army Explosive Ordnance Disposal (EOD) Team
- United States Department of Homeland Security
- Hawaii Department of Defense
- Hawaii State Civil Defense
- Hawaii Department of Land and Natural Resources
- Hawaii State Parks
- Hawaii Department of Health
- Hawaii Sheriff Department
- Hawaii Department of Business, Economic Development & Tourism
- Hawaii State Historic Preservation Division
- Honolulu Police Department
- Honolulu Fire Department
- HIARNG Engineering Office
- HIARNG Joint Director of Military Support (JDOMS)
- HIARNG Plans, Operations & Military Support Officer (POMSO)
- Diamond Head Citizens Advisory Committee
- Diamond Head Public Affairs Office
- City and County of Honolulu
- Picatinny Arsenal

Another challenge was with time and scheduling. As a state monument and park, impact to the visitors at the monument had to be minimized. The Fort Ruger environmental restoration team was able to plan the cleanup project timeline so that the park never had to be closed to the public. The timeline also accommodated the park by ensuring completion of the project on a very tight deadline so that plans to use the park for an outdoor benefit concert would not have to be delayed.

The third challenge was the mobilization and demobilization of the heavy equipment and machinery that would be utilized during this project. Significant coordination was needed to ensure that during this process, the public and surrounding communities would not be impacted by impeding traffic and noise. During the project, the



View of Diamond Head and the surrounding community.

The contractors working on the processing equipment. Notice the cleaned and processed soil falling from the conveyor belt. Also notice the pillbox located on the rim of the crater.

environmental restoration team constantly monitored the cleanup activity to ensure that noise, dust and accessibility were minimized as much as possible. At the end of the project, the team point of contact once again met with the local community's Diamond Head Association to provide a final report on the project.

ACCOMPLISHMENTS

Working in Congruence with DoD and Non-DoD Entities

The Fort Ruger environmental restoration team worked in coordination with many state, local and DoD agencies to ensure that the project at Diamond Head Crater was cleaned-up on schedule and without adversely impacting the community and other missions. For example, the firing range lands at Diamond Head are jointly administered by the Hawaii Department of Land & Natural Resources' Division of State Parks, the State of Hawaii, DoD, and the HIARNG. Additionally, HIARNG environmental staff worked with the Hawaiian Department of Health, the State Historic Preservation Office and the City and County of Honolulu emergency services departments and water branches. This extensive interagency coordination enabled HIARNG to complete the restoration in full compliance – preventing any completion delays. Additionally, this allowed for a thorough and up-to-date implementation of all associated management plans for the site.

Fast Track Soil Cleanup

The soil cleaning endeavor was the most extensive and impressive aspect of the Diamond Head Crater restoration project. It took only four months to remediate the 30,000 tons of soil coming in at a cost of $3.8 million. The state cost analysis estimates predicted this project would come in at a cost of $12-$14 million, indicating a cost savings of between $8 and $10 million. The Fort Ruger environmental restoration team began the process by excavating contaminated soil from the firing ranges. The depth of excavation ranged from a little more than one foot to as much as 12 feet deep. In total, approximately 30,000 tons of soil were collected from the range for cleaning.

The restoration team tested a variety of soil washing equipment and techniques, ultimately finding a new soil washing machine powerful enough to thoroughly wash soil after only one pass through the system. By using a closed loop soil washing process, the water itself was recycled and used throughout the

Soil removed during the restoration project was returned clean to this former riffle range. The range was hydroseeded with native grass, which was irrigated to promote growth.

entire project, significantly reducing the need to draw on fresh water resources. At each step in the process, the restoration team found ways to reuse and conserve resources for maximum environmental benefit. At each step in the process, the restoration team found ways to reuse and reduce resources for maximum environmental benefit. All the cleaned soil was then placed back into the former ranges after its cleaning to support the native plant development.

With so many benefits resulting from the soil cleanup process, the Fort Ruger environmental restoration team received final concurrence from the Hawaii Department of Health that no further or additional action was required. With the formal project closure, the land was formally conveyed to the Hawaii Department of Land & Natural Resources and the state was able to reopen the former range, now a state park, for public access and recreation.

Metal Removal

In the process of cleaning up the Diamond Head Crater, the Fort Ruger restoration team collected all lead bullet fragments and other metals, including copper, from the former pistol range. All told, this particulate metal amounted to a much cleaner environment voided of over 14 tons of waste. When it was recycled, the restoration team realized a $5,000 profit for Fort Ruger's Qualitative Recycling Program.

Plant Species Management

The cleanup project also presented an opportunity to rid Diamond Head Crater of invasive plant species and promote native plant propagation. The challenge was to accomplish the first task without using prescribed burns, which are forbidden in the area.

The Fort Ruger environmental restoration team set to the task of digging up the offensive plants manually so as not to impose impacts on the environment by using chemical pesticide sprays. Once the soil in the area was washed and redistributed, the restoration team worked with a nursery to provide a variety of native seeds, and the entire area was hydroseeded with native grass species and irrigated until the grasses took root and recovered the natural state of the land.

Community Consideration

Hawaiians as a community are generally very concerned about and involved in preserving the beautiful natural environment in which they live. The Fort Ruger environmental restoration team could never have accomplished such an extensive cleanup of a treasured public area in so short a period of time without consideration for the local community. Aspects of the cleanup project were developed specifically to benefit local businesses, accommodate local residents and include local agencies.

Though special equipment like the soil washing machine had to be imported from the mainland United States, the restoration team made a concerted effort to purchase or lease bulldozers and other vehicles from local small businesses and hire local labor crews. As a result, the restoration project directly impacted the local economy, with much of the $3.8 million project expenditure going directly back into the state economy.

The Fort Ruger environmental team also worked directly with Diamond Head neighbors to accomplish the cleanup without negative impacts on the community, specifically in the areas of noise and dust control. This was accomplished by meeting with the neighbors to understand their primary concerns, and engaging them throughout the restoration planning and implementation process to ensure the community's concerns were being addressed. Noise test results demonstrated that noise levels remained under 86 decibels, and 13-foot-high dust and silt traps were installed to capture any dust kicked up into the air. Water trucks also sprayed dry soil before disturbance to keep dust levels to a minimum.

The staff also met regularly with the Diamond Head Advisory Board, a group established to oversee the development of the state park, in order to share updates and information sheets. The board helped to further disseminate this project information to Diamond Head neighbors and tourists, allowing the Fort Ruger restoration team to reach out to a larger segment of the community.

This restoration project was fast tracked for cleanup completion in just four months to expand Diamond Head's public recreation resources by 42 acres. The former ranges will be used for outdoor concerts and festivals, allowing even more visitors to enjoy the area's exceptional natural beauty.

CONCLUSION

The level of quality outreach and communication, in combination with the program management and technical merit employed in the Diamond Head Crater restoration project, has helped to reinforce the Hawaii Army National Guard's long record as a good steward of the beautiful and sensitive environment of Hawaii, and as a good neighbor to the people who live there.

The irrigation lines have been removed and placed along the silt fence.

FY 2007 Secretary of Defense Environmental Awards

James G. Arnold, Oregon ARNG

Environmental Restoration, Individual

Sustaining the Environment for a Secure Future

James G. Arnold, Oregon ARNG

Environmental Restoration, Individual

SUMMARY

James G. Arnold is the restoration manager for the Oregon Army National Guard (ORARNG). He is responsible for matters related to environmental condition of property, environmental baseline studies, compliance-related cleanup and military range assessments. Mr. Arnold is committed to streamlining and fast tracking cleanup processes, exemplifying environmental stewardship and reducing risks to human health and the environment, and improving partnerships between the Department of Defense (DoD) and other entities.

Mr. Arnold's efforts have allowed him to achieve significant advances in three environmental projects: landfill cleanup at Camp Rilea, large-scale range cleanup at Camp Withycombe and environmental restoration at Army Aviation Support Facility #1 (AASF #1).

James G. Arnold Accomplishments:

Camp Rilea

- Developed two baseline studies that revealed a low level of residual contaminants in a landfill site used from the 1940s to the 1980s.
- Concluded that landfill contaminants posed little risk to the environment or human health but organized the construction of an asphalt cap on the landfill to eliminate surface exposure and rainwater infiltration.
- Completed landfill asphalt cap in four days ensured it could be used as a parking lot for the maintenance shop.

Camp Withycombe

- Worked closely with a freeway project consortium to clean up an old range site to be turned into a highway.
- Integrated all cultural resources-related work into the range cleanup process to ensure artifacts and sites were properly protected.
- Saved the ORARNG over $2 million by implementing a soil cleaning, rather than soil-removing process, to treat contaminated soil at the range site.

Army Aviation Support Facility #1

- Conducted a baseline study to assess and delineate contamination levels in soil and groundwater around a legacy World War II Navy underground storage tank.
- Provided technical guidance and support to the installation and neighboring property owners about chlorinated solvent and chromium leaks into soil and groundwater.

"Jim is a very good technical manager, he knows a lot about the clean-up process and how we do things at DEQ, so it's been very helpful for me to work with him."

- Bob Williams, Project Manager,
Oregon Department of Environmental Quality

On the cover: Soldiers from the Oregon National Guard demolished the Sitka Smokestack in Coos Bay, Ore. as part of a training exercise to give them experience with structures and explosives.

BACKGROUND

James G. Arnold, Restoration Manager, U.S. Army National Guard – Oregon

POSITION DESCRIPTION

As Restoration Manager for the Oregon Army National Guard (ORARNG), Jim Arnold is responsible for matters related to environmental condition of property, environmental baseline studies, compliance-related cleanup and military range assessments. Mr. Arnold manages five active sites with compliance-related cleanup projects.

- Military Munitions Response Program: two active sites
- Formerly Used Defense Sites: two active sites
- Non-DOD Owned Non-Operational Defense Sites: 53 potential sites identified
- Operational Range Assessment Program: three active sites
- Environmental Condition of Property: Coordinates environmental aspects

The majority of Mr. Arnold's time is spent working on 12 different installations. The remainder of his time is split between the remaining 44 fixed facilities and leased training support land, working on community service projects and proposed/pending real estate actions. Specifically, at the Camp Rilea Wastewater Treatment Plant Operation, Mr. Arnold is responsible for permitting compliance matters and coordinating design for planned plant expansion and permit modification. At the Camp Rilea Water Supply System Operations, Mr. Arnold coordinates water withdrawal permitting, water right certification, system design and implementation.

Jim Arnold is committed to streamlining and fast tracking cleanup processes, exemplifying environmental stewardship and reducing risks to human health and the environment and improving partnerships between the Department of Defense (DoD) and other entities. His efforts have allowed him to achieve significant advances in three environmental projects: landfill cleanup at Camp Rilea, large-scale range cleanup at Camp Withycombe and environmental restoration at Army Aviation Support Facility #1 (AASF #1).

"Jim Arnold has clearly done an exceptional job as Restoration Manager for the Oregon Army National Guard. He has excelled in all areas of restoration management - program management, technical merit/innovation, orientation to military mission and stakeholder interaction."

- Jo Anne Walser, Senior Project Manager for Federal Programs, O'Brien & Gere

AWARDS & SERVICES

Mr. Arnold's restoration expertise earned recognition from the ORARNG when he received a 2006 Oregon National Guard Meritorious Service Medal. The medal highlighted Mr. Arnold's work – specifically calling out his demonstration of outstanding ability and initiative in supporting ORARNG environmental programs – and his leadership within the ARNG, notably becoming the ORARNG's "go-to" man for environmental issues.

Mr. Arnold actively participates in a variety of professional organizations including the Northwest Environmental Conference, the Environmental Law Education Center and the Oregon Association of Environmental Professionals. Active participation in these organizations provides an avenue for Mr. Arnold to communicate and interact with community stakeholders and identify effective solutions for cleanup challenges and procedures. These groups allow him to stay in contact with key stakeholders such as the Oregon Departments of Water Resources, Forestry and Fish and Wildlife. Further, Mr. Arnold is able to maintain continuity with federal and state regulators including the U.S. Environmental Protection Agency (EPA) and the Oregon Department of Environmental Quality (ODEQ). These groups act as open forums for the regulated, legal and technical communities to discuss environmental issues and solutions.

ACCOMPLISHMENTS

Dedication to Fast Track Cleanup by Working with Non-DoD Entities and Stakeholders

Over the past two years, Mr. Arnold has succeeded in developing environmental restorative programs for the ORARNG. He instituted No Further Action for a legacy underground storage tank (UST) site, implemented restoration activities for the largest cleanup project in the ORARNG and established a landfill capping initiative. Highlights of his work over the past 24 months include:

Professional Highlight	Description
Mr. Arnold reviews the restoration program plan and collaborates with the ORARNG environmental program manager and branch chiefs from operations, construction and master planning offices.	This collaboration allows Mr. Arnold to identify department goals and timelines and ensure that the condition of all properties is ideal for each mission. His compliance-related cleanup program is reviewed twice a year, and Mr. Arnold has successfully met every data call on time.
Mr. Arnold tailored the restoration program to comply with the ORARNG environmental management system (EMS) and Environmental Policy Statement requirements.	By incorporating the planning, communication, reporting, accountability and sustainability protocols, Mr. Arnold's restoration program is successful.
Mr. Arnold strives to simplify and streamline all cleanup processes, supporting restoration decisions with extensive quantitative analyses to ensure the greatest cost efficiency is achieved.	Mr. Arnold is advancing a plan for using new soil washing technology for the range soil remediation at a savings of $2 million. Mr. Arnold's decision to cap an existing landfill is less expensive than excavation/ disposal at a hazardous waste landfill, or by re-establishing grade at the landfill site by importing fill material.
Mr. Arnold completes restoration activities without interruption and delivers results on time, and often ahead of, project schedules.	Advance planning and completion of timely estimates allows Mr. Arnold's projects to receive full funding from NGB and the Compliance Cleanup Program.

Completed engineered cap over former landfill at MARF Range Maintenance Building, Camp Rilea.

Camp Rilea: Fast Track Cleanup to Reduce Risks to Health and the Environment

Mr. Arnold conducted assessments and developed a streamlined plan for managing a former landfill site at Camp Rilea. The landfill on the installation was used from the 1940s to the 1980s. In the 1990s, a maintenance shop was constructed over the landfill. The extent of the landfill was not specifically known, and there were environmental concerns for contamination. Excavating the fill site would have meant demolishing the maintenance facility and disrupting weapons training and qualification on the adjacent Modified Automated Record Fire (MARF) Range – two options that would negatively impact Camp Rilea's military mission. Instead, Mr. Arnold conducted an investigation to find a regulatory compliant solution that would demonstrate stewardship and be oriented to ORARNG's needs.

Landfill debris is removed from the Camp Rilea restoration site.

Using technological demonstrations and initiatives, Mr. Arnold used existing Environmental Assessment (EA) data to develop two baseline studies that augmented information on the landfill. The first study used hydraulic push-probe equipment to rapidly delineate contaminant extents and concentrations in the soil and groundwater around the site. Results identified only a low level of residual contaminants, which did not present an adverse risk to human health or the environment. The second study conducted was a groundwater feasibility study where several wells were installed for ground water monitoring. The samples have thus far confirmed that contamination is not an issue. Based on Jim Arnold's research and monitoring, ORARNG received ODEQ approval for leaving the landfill in situ for long-term, natural attenuation.

The landfill was capped with asphalt to eliminate surface exposure and rainwater infiltration. As it was environmentally necessary to build a cap over fill material, ORARNG designed the cap as a parking lot for the MARF Range Maintenance Shop, demonstrating an efficient use of resources. The gravel parking area that existed before the cap enhanced infiltration into the former landfill. The asphalt cap now prevents infiltration of storm water into the former land fill and provides additional parking for the maintenance building. Thanks to Mr. Arnold's investigation, the ORARNG successfully implemented this environmentally sound, timely and cost effective solution to landfill infiltration problems without impeding activities at the maintenance shop or adjacent weapons ranges. The project was completed in four days and cost $85,000.

Camp Withycombe: Innovative Approach to Soil Washing for Fast Track Cleanup

The range restoration project at Camp Withycombe remains the largest cleanup project in the ORARNG, with deadlines that have motivated Mr. Arnold to find new ways to accelerate the process. Ownership of the closed Withycombe ranges was transferred to the Oregon Department of Transportation (ODOT) for construction of a new highway. ODOT plans to break ground on the site in 2010, and the restoration project remains very high-profile, due to its size and importance to regional transportation development. The size of the Camp Withycombe project involves five former small-arms ranges and twelve contaminated post-target impact areas, amounting to 25,000 cubic yards of soil.

Soil washing treatment technology will be utilized at the small arms firing range restoration project at Camp Withycombe to clean the soil and reclaim lead for recycling.

Jim Arnold works closely with the freeway project consortium to accomplish all investigations and forward planning. Constructed in 1909, Camp Withycombe is known as the original Known Distance range and it contains cultural resources from the early 20th century. Mr. Arnold is integrating all cultural resources-related work into the cleanup process ahead of pending ODEQ requirements to ensure cultural resources are appropriately protected and potential delays avoided. While ODEQ staff worked on setting up historical excavation procedures, he took the initiative to set up a plan to continue cleanup of the site – keeping in mind Army, National Guard and state procedures and ORARNG Cultural Resource Management plans – while also incorporating site reconnaissance and surveying. This plan included correspondence with Oregon State Historic Preservation Offices and nine Oregon American Indian tribes to deal with inadvertent discovery. Elements of the historic ranges, such as target lifters and stone work, will be preserved and displayed at the Oregon Military Museum at Camp Withycombe. The planning process is nearly complete with actual cleanup set to begin in 2008.

Jim Arnold knew there was a more technologically innovative way to manage contaminated soil from the range than through an onerous removal process. Removing the 25,000 cubic yards of soil would take over 2,000 trips to the disposal site, which includes driving through the Columbia River Gorge National Scenic Area, an air quality maintenance area. He concluded that soil washing was the most effective way to remove soil contaminants without impacting the environment. The method was also cost effective, saving Camp Withycombe more than $2 million. Over 50 percent of soil was cleaned and ready to be used in reforestation to refill a mountain. 25 percent is clean enough to be used as structural fill and 25 percent will have to be moved to a waste site.

This photo shows typical expended rounds found in post-target impact area soil of the small arms firing range restoration project at Camp Withycombe.

The soil washing process is as follows: the untreated soil is delivered by conveyor belt to the wet screening plant where the soil is separated into size fractions. Inside the plant the soil is sprayed with a high-pressure burst of water to break down the soil clods. The soil is distributed into the following individual size fractions:

Debris Size	Definition of Material
Oversized debris	Consists of rock and mineral material greater than ¾ of an inch in size
Dense material	Consists of soil less than ¾ of an inch in size and larger than a #10 mesh [2 millimeters (mm)] soil sieve size
Moderate material	Consists of soil less than a #10 mesh (2 mm) soil sieve size and greater than a #200 mesh (0.074 mm) soil sieve size
Fine fraction	Consists of soil and organic material that is less than a #200 mesh (0.074 mm) soil sieve size

The next step of the treatment process is different for each of the individual soil size:

- The oversized debris is removed from the treatment plant following the wet screening process. The oversized debris is generally considered to be clean, as it is primarily mineral rock.
- The dense material is distributed to a gravity separation circuit to remove particulate metal from the soil. Heavier metal fragments are retained on a screen at the bottom while the lighter rocks and debris are removed in the overflowing water stream. The heavier metal fragments are removed from the jig and stored in one-ton supersacks. The lighter rock and debris material is transported to a sandscrew and dewatered.
- The moderate material and fine fraction material is pumped from the wet sieving process directly through a series of sandscrews for dewatering. The

moderate material is delivered by the conveyor through a belt press.

- The fine fraction that settles at the bottom of the clarifier is sent on a conveyor to a dewatering belt press. The belt press generates a dewatered fine fraction product, typically with residual moisture content from 15 percent to 20 percent.

Finally, recovered water generated during the screening, dewatering and clarifier processes is reused and recirculated within the treatment system. The clear water is removed from the top of the clarifier and pumped through a fine mesh screen to remove small-sized vegetation. Process water is subjected to treatment for lead and suspended solids removal between runs and upon project completion.

Army Aviation Support Facility (AASF) #1 – Fast Track Cleanup of Underground Storage Tanks

Jim Arnold addressed concerns associated with several USTs at Army Aviation Support Facility #1. At the AASF #1, environmental staff found a legacy World War II Navy UST system had leaked fuels into the ground. However, the system's components were removed between 20 and 50 years ago. To solve this mystery, Mr. Arnold put together a phase two environmental baseline study, in combination with historical data research and analysis. Based on the data results, he then used hydraulic push probe equipment to rapidly assess and delineate contamination levels in soil and groundwater around the UST system's tanks and fuel dispensing hydrants. To implement the sampling program, Mr. Arnold conducted historical research to determine the location of the sample points and obtain ODEQ concurrence.

The historical research revealed that the former components were located in the path of current active flight lines, requiring Mr. Arnold to coordinate with the state aviation office. He improved the site characterization technique by cooperating with local small business utility companies to avoid high profile fiber optic lines, and in the course of investigation Mr. Arnold used an air knife system to create drill holes that would not cut utility lines. Once the borehole was clear, the hydraulic probe finished the drilling to complete the soil and groundwater sampling. Overall, this process allowed optimal borehole placement and demonstrated that contamination levels were well below risk-based concentrations, allowing Mr. Arnold to institute No Further Action.

Drilling contractors installing groundwater monitoring well for vapor intrusion assessment use a limited access sonic drilling rig adjacent to active flight line at Army Aviation Support Facility #1.

Jim Arnold is also assisting with an important environmental cleanup project on the property adjacent to the AASF. Past industrial operations at the neighboring property released chlorinated solvents and chromium into soil and groundwater, which migrated onto the AASF #1. Mr. Arnold is providing technical guidance and support to the ODEQ, Department of Justice and property owners in the environmental restoration process. His assistance on this endeavor will reduce risk to both neighboring business personnel and the overall local environment.

Working as a Team for the Mission

All of Jim Arnold's work is motivated to support the ORARNG training and readiness mission. His oversight on the environmental condition of properties and coordination with trainers and planners, ensures that all ORARNG's facilities are kept ideal for military activities. With regard to the projects over the past two years, Mr. Arnold has

Jim Arnold collects location coordinates of a groundwater monitoring well with a handheld Global Positioning System (GPS) unit at one of his project sites.

found ways to minimize the costs and time required for restoring or maintaining compliance, as in the Camp Withycombe soil washing project. He has also successfully avoided impacts due to restoration, as with the Camp Rilea landfill project, which was completed without impeding maintenance shop or range use, and provided an additional source of parking for the maintenance shop. Joint coordination on the restoration management plan within the ORARNG ensures that restoration projects will continue at the same level of excellence, even if Mr. Arnold is no longer there to oversee them.

In the past, ODEQ assigned individual project managers to each restoration project, which did not allow stable relationships or continuity between the agencies. In short, multiple ODEQ project managers had to be "trained" to the Army restoration process. Sensing this would be an escalating challenge, Jim Arnold developed a plan in concurrence with the Oregon Department of Justice and obtained an ODEQ buy-in to dedicate two project managers to the entire ORARNG restoration program. Because of this, he now has stable relationships and continuity with the ODEQ, as well as increased face-time, communication and trust. Mr. Arnold also conducted outreach in support of the Camp Withycombe project. Though there is not an official Restoration Advisory Board (RAB) for the site, there is a Freeway Corridor Committee, consisting of ODOT, ODEQ, ORARNG personnel, local businesses and public representatives. Mr. Arnold frequently presents updates to this group on all restoration project progress. This commitment to open engagement with all stakeholders demonstrates responsiveness, provides transparency and helps ensure that Mr. Arnold's projects proceed smoothly, while reinforcing the ORARNG's reputation as an excellent environmental steward.

CONCLUSION

Jim Arnold's dedication to communicating with key stakeholders allows him to successfully complete his projects within schedule and save funds. His connection to ODEQ, specifically, has grown to a mutually beneficial relationship. His successes at Camp Rilea, Camp Withycombe and the AASF #1 site proves his excellence in environmental restoration programs – fast tracking cleanup, historical site preservation and innovative soil washing techniques – to reduce environmental risks to employees at these sites and the environment.

FY 2007 Secretary of Defense Environmental Awards

Natural Resources Conservation Team, Pennsylvania ARNG

Natural Resources Conservation, Team

Sustaining the Environment for a Secure Future

Natural Resources Conservation Team, Pennsylvania ARNG

Natural Resources Conservation, Team

SUMMARY

The Pennsylvania Army National Guard (PAARNG) Natural Resources Conservation Team is located at Fort Indiantown Gap National Guard Training Center in Central Pennsylvania. Fort Indiantown Gap is the only live fire, maneuver military training facility in the state. It is also a critical habitat location for a federal species of concern, the regal fritillary butterfly, and home to an additional 96 state species of concern. The Fort Indiantown Gap Natural Resources Conservation Team has been able successfully to balance one of the region's most ecologically diverse areas with a military mission that supports over 18,000 PA Army National Guard personnel each year.

The Natural Resources Conservation Team is responsible for all management associated with natural resources, including:

- Land rehabilitation and maintenance
- Planning, designing and implementing all monitoring programs for flora and fauna
- Managing the installation's hunting, fishing and forestry programs
- Supporting the overall military mission

Stryker driver training in the engineer dig site which has three permanent sediment control structures.

Additionally, some of the team has responsibilities for the 112 statewide Department of Military and Veterans Affairs (DMVA) facilities (armories, readiness centers, maintenance shops and veteran's homes) throughout the Commonwealth.

The Natural Resources Conservation Team's accomplishments include:

- Prevented the designation of the regal fritillary butterfly (a Pennsylvania state listed species and Army Category 2 species at risk) as a federally endangered species by increasing the number to roughly 1,000 animals by relocating mechanized training around butterfly habitat.
- Adjusted training times and locations to minimize the impact to vegetation, soils and waterways.
- Restored five acres of wetlands to functioning status and constructed a wetland interpretive trail.
- Applied dust palliative on gravel combat trails to keep it out of waterways and air, which reduces the impact on Soldiers and wildlife.
- Addressed soil erosion issues and possible stream siltation.
- Tracked forest inventories on GPS-enabled tablet field computers, reducing paperwork and decreasing the amount of time it takes to prepare timber sales.
- Conducted prescribed burns to manage fuel loads, forests and regal fritillary butterfly habitat.
- Built and monitored over 150 nesting boxes used by more than 12 species, including owls, ducks, kestrels, songbirds and bats, to track the migratory patterns of birds.
- Reduced the unsustainable deer population to 17.4 deer per square mile by issuing antlerless deer tags to hunters.

"The PAARNG team, balancing a dramatic increase in operational tempo with a sustained focus on managing their natural resources, once again demonstrates that accomplishing the mission and sustaining the environment are not independent goals."

– Mr. Jeff Hatch, Attorney, U.S. Army Environmental Command

On the cover: Stryker driver training at Fort Indiantown Gap in an engineer dig site, which has three permanent sediment control structures.

INTRODUCTION

The Pennsylvania Army National Guard (PAARNG) Fort Indiantown Gap National Guard Training Center is the only live fire, maneuver military training facility in the state. Located in Central Pennsylvania, Fort Indiantown Gap has a military mission that supports over 18,000 PA National Guard personnel each year, including the largest and most deployed Army and Air Guard, the 56th Stryker Brigade Combat (SBCT) and the 28th Infantry Division. Guard, Reserve, Active Army, Navy and Marine units, law enforcement entities from Pennsylvania and other states, as well as Joint Services with the Air Force, swell the training lands and facilities users to over 130,000 personnel each year.

Native Grassland on Fort Indiantown Gap.

Fort Indiantown Gap is also a critical habitat location for a federal species of concern, the regal fritillary butterfly, and home to an additional 96 state species of concern. With 17,150 acres of grassland, scrubland, savanna, wetlands and forest, it is the largest landholding in the Swatara Creek Watershed. Fort Indiantown Gap also features 112 miles of streams and two mountains. The Fort Indiantown Gap Natural Resources Conservation Team has the weighty responsibility of balancing one of the region's most ecologically diverse areas with an important military training and support mission.

BACKGROUND

Key members of the Fort Indiantown Gap Natural Resources Conservation Team include military and government civilian personnel and environmental contractors from the Pennsylvania State University.

- Lieutenant Colonel William Yearwood, Director of Plans, Training and Security, PA Army National Guard
- Michael Ney, Integrated Training Area Management (ITAM) Coordinator, Penn State University
- David Walton, Training Site GIS Manager, Penn State University
- Captain John Boggan, Range Officer, PA Army National Guard
- Steve Snyder, Range, Training Land Program Coordinator, Penn State University
- Sergeant First Class Luke Long, Range Control, NCOIC, PAARNG
- Michael McAllister, Range Complex Technician, Department of Military and Veterans Affairs
- Lieutenant Colonel David Edwards, Training Site Engineer, PA Army National Guard
- Staff Sergeant Russell Mohle, Facility Manager, PA Army National Guard
- Eric Drupp, Grounds Manager, Department of Military and Veterans Affairs
- Shannon Henry, Forestry Manager, Department of Military and Veterans Affairs
- Tim Haydt, Forester, Department of Military and Veterans Affairs
- Joseph Hovis, Wildlife Manager, Department of Military and Veterans Affairs
- David McNaughton, Wildlife Biologist, Penn State University
- Mark Swartz, Monitoring Biologist, Penn State University
- Nick Hoffman, Habitat Biologist, Penn State University
- Virginia Tilden, Regal Biologist, Penn State University

POSITION DESCRIPTION

The Natural Resources Conservation Team is responsible for all management associated with natural resources, including:

- Land rehabilitation and maintenance
- Planning, designing and implementing all monitoring programs for flora and fauna
- Managing the installation's hunting, fishing and forestry programs
- Supporting the overall military mission

Additionally, some of the team has responsibilities for the 112 state-wide Department of Military and Veterans Affairs (DMVA) facilities (armories, readiness centers, maintenance shops and veteran's homes) throughout the Commonwealth. The first forester, biologist, ITAM coordinator, GIS manager and the second training site engineer for the training site are still in place, helping to maintain institutional knowledge. In fact, the team ITAM Coordinator has over 30 years of experience working at Fort Indiantown Gap.

AWARDS AND SERVICES

In 2006, Fort Indiantown Gap was awarded the Army National Guard's Environmental Security Award for Natural Resources Conservation on a Large Installation. The award lauded the installation, interns and the team, for their work integrating land management practices with military training, and for providing recreational opportunities for the public. Team members are active in multiple organizations in support of natural resources:

- Shannon Henry is the Vice-chair of the PA Prescribed Fire Council.
- Joseph Hovis is the current Chair and David McNaughton is the Secretary of the National Military Fish and Wildlife Association (NMFWA) Herpetology Working Group.
- Tim Haydt recently completed a GIS Fire Atlas for his Master's Degree in GIS that tracks all installation fires and presented the results at the 2007 Sustainable Range Program Conference.
- Dave McNaughton presented the talk "Adapting Protocols For Efficient Fire Monitoring" at the 72nd Annual North American Wildlife and Natural Resources Conference in 2007.
- Nick Hoffman presented the paper, *A Case Study In Maneuvers And Woody Succession*, at the 2007 NMFWA Conference.
- Virginia Tilden was an invited speaker at The Entomological Society of America Eastern Branch Annual Meeting in 2007.

These are just a few of the 16 presentations that the team has given over the last two years.

ACCOMPLISHMENTS

Program Management

The installation's Integrated Natural Resources Management Plan (INRMP) has an up-to-date list of class 0 & 1 projects to be carried out by the installation to meet the natural resources goals and objectives. The team has worked hard at pursuing alternate funding streams and methods to accomplish these projects. Partnering has been the most successful method and has allowed the team to accomplish many projects. Figure 1 contains a list of some of the key partners that have provided funding and services to accomplish INRMP projects at Fort Indiantown Gap.

Figure 1

Partner	Cooperative Activities
The Pennsylvania State University	Research for prescribed fire effects, forest management and wildlife; four peer-reviewed journal articles
The Nature Conservancy	Training for prescribed burns and assistance with regal fritillary butterfly research; two peer-reviewed journal articles
Pennsylvania Department of Conservation and Natural Resources	Wildland fire training and demonstrations, forest growth studies and interpretive trail maintenance and patrolling
Chesapeake Bay Foundation	Wetland restoration, stream buffers and the construction of an interpretive trail
Pennsylvania Fish and Boat Commission	Fish stocking, law enforcement and patrolling, guidance on state species of concern, Adopt-a-Stream program; INRMP external stakeholder
Pennsylvania Game Commission	Trap and tag bears, consultation on hunting program, antlerless deer tags, harvest data, law enforcement; INRMP external stakeholder
Shippensburg University	Butterfly and dragonfly research resulting in two M.S. theses
Fort Indiantown Gap Conservation Club and Trout Unlimited	Assistance in running cooperative nursery, data collection, wildlife habitat improvement, Adopt-A-Stream program and annual stream clean-up projects

Fort Indiantown Gap does not have any federally listed endangered species but the team works hard, both on and off the installation with stakeholders, to manage species so that if a listing occurs the team will have data to minimize encroachment. This is most evident with the regal fritillary butterfly. The team successfully managed to keep the regal fritillary butterfly off the

federal endangered species list while continuing to effectively train by relocating mechanized training areas around butterfly habitats. The Army considers Fort Indiantown Gap a very important installation in the Army arsenal for training and natural resources. This concept is confirmed by they Army's allocation of over $1.6 million for INRMP implementation in FY 2006 & FY 2007. The installation's INRMP was reviewed for operation and effect in 2007 with the installation internal stakeholders and the state. Based on input, the INRMP will be revised to reflect new training requirements.

Working with the state, the team has begun to identify areas where the goals of the State Wildlife Action Plan (SWAP) can be incorporated into the installation INRMP and vice-versa. The team understands that natural resources management does not end at the installation fence line and realizes that ecosystem management is the common goal for both the installation and the state.

The team uses the INRMP as its mechanism to meet Environmental Management System (EMS) requirements. Team members keep track of INRMP projects and timelines to make sure implementation is occurring. Projects that cannot be completed due to funding or weather conditions (e.g., prescribed burning) are updated in the INRMP to be completed the following year.

Mission Enhancement

Having more Soldiers and Airmen in the PA Army National Guard than acres at Fort Indiantown Gap is a team challenge. Over the past two years, the team has met a significant program management milestone by implementing or updating a variety of new management plans and construction projects outlined in the Environmental Impact Statement (EIS) for Enhanced Training and Operations, including 42 projects. Before any projects in the EIS were executed, the team was given a new mission to transform the 56th Brigade into a SBCT. The PA Army National Guard completed a second 1,871-page EIS (including 49 statewide actions and installations in five other states) for the transformation in 2006 and started the 300-page supplemental EA for the construction of a Multi Purpose Training Range. These documents cleared the way for the construction of 41

The largest documented population of the regal fritillary butterfly is protected at Fort Indiantown Gap.

new/upgraded ranges and facilities and for the nine new ranges for the 56th Stryker Brigade. Over $150 million of new construction was executed. All the team activities at Fort Indiantown Gap are designed to enhance the quality of training lands, not only for natural resources, but for Soldiers as well. The team's success proves that training and ecosystem management are not mutually exclusive. The team meets monthly with compliance, NEPA and other PAARNG staff to determine project priority, timing and budgeting. A partnership with Wildlife Services-United States Department of Agriculture reduces Fort Indiantown Gap wildlife hazards at Muir Army Airfield and Bollen Air-to-Ground Range for bird aircraft strike hazard (BASH) and wildlife damage to ranges and infrastructure.

Land Use Management

Proper and sustainable land rehabilitation and maintenance is a very important component for the team. The Integrated Training Area Management (ITAM) Program is an integral component supporting both management of training lands and environmental quality. Training schedules are adjusted to times and locations which will minimize the impact to vegetation, soils and waterways.

In FY 2006, the team completed restoration of five acres of wetlands to functioning status and constructed a wetland interpretative trail: seven miles of stream buffer in the cantonment area and 25 acres of warm season grasses in a training corridor. The project addressed soil erosion and stream siltation issues. This was accomplished with a $35,000 Environmental Protection Agency grant and over $50,000 of partner assistance for habitat restoration.

The team has implemented a water resource management plan to guide the protection of water resources at Fort Indiantown Gap. Water monitoring is conducted by the United States Geological Survey (USGS). The data from the USGS indicates that on-post sampling sites have better biotic assemblages, higher stream quality, higher habitat assessment scores and minimal sediment loads than some sampling sites taken from nearby waters. USGS results are mirrored by Range and Training Land Assessment (RTLA) land condition assessments that have shown low amounts of erosion activity and sediment transport in open training lands. The data clearly demonstrates that training, through implementation of erosion control methodology by the team, is not negatively impacting the Chesapeake Bay watershed.

A key ITAM project is the annual application of dust palliative on 25 miles of gravel combat trails. The product decreases safety hazards and vehicle maintenance while keeping costly gravel on the trail surface and reducing dust, thereby keeping it out of waterways and air. This reduces the impact on soldiers and wildlife. Best management practices developed by the Pennsylvania Dirt and Gravel Roads Program have been adopted by the team to upgrade over 25 miles of trails annually. The team collects native seed on-site to promote native plant utilization and partnered with Ernst Conservation Seeds to collect native seed and propagate commercially. This rare seed source was used in Fort Indiantown Gap construction projects and is utilized by the United States Fish and Wildlife Service, National Park Service, Natural Lands Trust and Pennsylvania Energy Company restoration projects. It was also incorporated into the Fort Indiantown Gap Design Guide, which provides the specifications for all construction and maintenance projects, and is published by the Engineering Office. The use of native seeds/grasses is also beneficial to migratory grassland birds and supports the military mission by providing excellent cover for training activities on Fort Indiantown Gap.

Forest Management

The primary mission for the forestry program at Fort Indiantown Gap is to provide a sustainable forested environment that meets the requirements of the current military mission scenario and looks ahead to manage anywhere from five to 50 years out. When Fort Indiantown Gap was designated to be the home of the 56th SBCT, nine new training ranges were required and proper forest management was needed. Contracting with local timber companies, over 1,000 acres were cleared/thinned, generating approximately $800,000 in support of the largest construction effort since 1941. Revenues generated from the forestry program are returned to the installation where they supplement the natural resources program and help fund INRMP projects; including gypsy moth control, forest regeneration, timber stand improvements and urban forestry/landscaping.

Using-state-of-the-art forest management inventory computer programs on GPS-enabled tablet field computers designed by the Penn State University School of Forestry and adapted to fit Fort Indiantown Gap, forest inventories are tracked in detail, reducing paperwork and decreasing the amount of time to prepare timber sales. The Forestry Office partnered with the U.S. Forest Service to conduct forest growth and yield studies. The team provides back-cross tress and chestnuts to the American Chestnut Foundation for development of blight-resistant American chestnut trees.

The team, in cooperation with installation range operations and the fire department, conducts prescribed burns in-house and provides training for other state agencies interested in implementing burn programs. The team annually burns approximately 1,500 acres to manage fuel loads, forests and regal fritillary butterfly habitat, as well as to reduce training restrictions on pyrotechnic and ordnance use. The installation has the largest prescribed fire program on a single landholding in Pennsylvania.

Fish and Wildlife

The team is devoted to conserving and managing wildlife on Fort Indiantown Gap. Soldiers share their training areas with 97 species of concern and 18 state listed plant communities of concern. Fort Indiantown Gap has the best quality and greatest quantity of warm season grass in Pennsylvania. All habitat for regal fritillary butterfly is found on former or current ranges. The regal fritillary butterfly is

found in only two locations in the East; Radford Army Ammunition Plant, Va. and the largest documented population in the world at Fort Indiantown Gap. As a Pennsylvania state listed species and an Army Category 2 species at risk, Fort Indiantown Gap, using installation stakeholders and external partnerships, has been proactive and very successful in the protection of the butterfly, increasing the estimated population to around 1,000 and preventing designation as a federally endangered species. Regal fritillary butterfly areas are currently off-limits to mechanized training. To facilitate training, the team developed training scenarios around the 219 acres of regal fritillary butterfly habitat and notionally designated butterfly habitat as "mine fields" as part of training exercises, which allows mechanized training to continue and butterfly habitat to thrive.

The Fort Indiantown Gap Team and the National Park Service are reintroducing the regal fritillary butterfly into the Gettysburg National Military Park. Funding from the DoD Legacy Program, in partnership with the Nature Conservancy, resulted in a grant to create satellite populations within the park and reduce potential encroachment issues on the installation and training mission. In support of this effort, the Academy of Natural Resources conducted genetic work and trial captive rearing.

The team has partnered with the 2nd Pennsylvania Breeding Bird Atlas Program, logging in over 76 species in 10 survey blocks including new and rare observations for the region and 21 species of concern. The team monitors over 150 nesting boxes with use by over 12 species including owls, ducks, kestrels, songbirds and bats. In 2007, Fort Indiantown Gap Boy Scout Troop 431 Eagle Scout constructed 50 new bird boxes to be used in support of the installation migratory bird program.

The installation partnered with the Pennsylvania Game Commission Deer Management Assistance Program to distribute additional antlerless deer tags to hunters in order to reduce the deer population from an unsustainable level of 39.3 deer per square mile to 17.4 in 2006.

The Wildlife Data Collector (tablet computer with GPS capabilities and relationship database) intertwines scientific study and opportunistic observations of both biota and their habitat. The data collector replaces paper forms with digital tables, saving the team hundreds of hours of office work. This system, with powerful new decision-making Global Information System (GIS)-enabled software (NetWeaver), combines expert knowledge, integrated systems, dependency networks and feedback loops in a manner similar to the Military Decision Making Process (FM 101-5).

Using GPS to record butterfly milkweed, a key nectar plant.

The installation has an active hunting and fishing program, thanks to the work of the team and its partners. The monetary contributions of over 2,400 recreational hunters, trappers and anglers, who pay to use installation grounds, supplements the management of natural resources and identified INRMP projects. To meet the needs of veterans and the community, the team maintains five handicap-accessible hunting platforms. A cooperative nursery produces over 7,000 trout annually for stocking.

Invasive Species Control and Pest Management

Invasive species occurrence (e.g., ailanthus and mile-a-minute plant) and rate of spread are tracked with a new GIS-enabled automated system, simplifying eradication. Judicious herbicide use and manual labor are employed as necessary to control invasive plants. The installation has an up to date pest management plan and an invasive species component of the INRMP that is used to assist installation personnel.

The pest management plan and invasive species component are reviewed annually and updates are made as needed. All application of herbicides and pesticides are done by certified applicators. Invasive species do not currently prevent or alter training due to implementation of the INRMP component. Without adherence to the invasive species component, invasives like ailanthus and mile-a-minute plant would directly impact training and butterfly habitat.

Community Education and Outreach

The team takes advantage, whenever possible, to present their findings, accomplishments and responsibilities to other military organizations. This includes the National Guard Bureau, ITAM and NMFWA conferences, as well as national and regional natural resources conservation conferences. At NMFWA 2007, wildlife staff chaired a session on the ecology of military training and the paradox of biodiversity on military installations. The wildlife staff also provided session presentations on monitoring prescribed fire, using native plants and beneficial impacts of mechanized maneuver training.

Fort Indiantown Gap Youth Group.

The installation is host to the Second Mountain Hawkwatch, an organization that has been monitoring annual raptor migration for 25 continuous years through counts on Second Mountain, an Audubon Important Bird Area. The team conducts multiple educational tours with local schools and scout troops on topics including environmental and outdoor education. Community leaders, local chambers of commerce, outside conferences and adult organizations are often invited to tour the installation to learn more about what training is occurring and its effects on the natural resources of the region. In FY 2007, recreational users volunteered over 1,300 hours feeding and stocking trout, pruning apple trees, seeding legume enhanced training areas and assisting with the Outdoor Recreation Orientation Briefs. This volunteer help assisted the team in the completion of natural resources projects and vital land enhancements, while saving the installation money.

The Training Site Commander, working with the installation team, opens up training areas for butterfly enthusiasts, averaging about 125 people per year, to visit and view the rare regal fritillary butterfly. This positive program enhances relations with the community and helps develop further partnerships, which can bring additional dollars to the base for butterfly/ecosystem improvements. The 25th Anniversary Conference for the Pennsylvania Natural Heritage Program was held on the installation in 2007. The team was able to promote the diversity and stewardship of its training lands and ranges to a distinguished cross section of professionals and educators.

Conclusion

PAARNG Natural Resources Conservation Team's leadership in natural resources management has enhanced the quality of life for the installation and the community. Components of the program effectively 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. Partnerships are integral to the installation for accomplishing INRMP projects at a cost savings and the team works hard at identifying new external opportunities while keeping current partners satisfied with the excellent work performed and accomplishments made. The team and installation actively promote recreation within the fence line and work with the community to better understand the military mission of Fort Indiantown Gap and how the military has successfully integrated training with natural resources conservation. Biodiversity, quality water, a diverse ecosystem and healthy natural resources thrive at Fort Indiantown Gap.

For more information about the Secretary of the Army Environmental Awards program, go to http://aec.army.mil/usaec/publicaffairs/awards00.html or call the U.S. Army Environmental Command public affairs office at (410) 436-2556.